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## New and rare lichenicolous fungi and lichens from the North American Arctic

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**Abstract**—*Pronectria dillmaniae* and *P. walkerorum* are described as new to science. A new combination, *Flavocetraria minuscula* is introduced. *Biatorella contigua* and *Flavocetraria minuscula* are reported as new to North America, *Pycnothelia papillaria* as new to Alaska and the North American Arctic, *Steinia geophana* as new to the North American Arctic, and *Agonimia tristicula* as new to Alaska.

**Key words**—Ascomycetes, new species, floristic finds

We report herewith two new species of lichenicolous fungi and a few interesting lichens collected by the first author or obtained by him from the lichen collections of D. A. Walker or the High Latitude Mycological Research Institute's (HLMRI) herbarium of G. A. Laursen. The material was examined using standard microscopic techniques. Microscopic characters were studied using hand made sections or squash preparations mounted in water, 1% Lugol's Iodine solution, 10% KOH, lactophenol cotton blue, lactic acid, or Congo red. Micrographs were taken with a Nikon Coolpix 5400 digital camera. Lichen chemistry was examined with TLC or standard chemical tests with KOH (K), Ca(ClO)<sub>2</sub> (C), Ca(ClO)<sub>2</sub> immediately after KOH (KC), and C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> (P). Measurements of ascospores size and length/width ratio (l/w) have been usually given as: (min.–){X–SD}–X–{X+SD}–(max.), the former were rounded to the nearest 0.5 µm, where min. and max. are the extreme values, X the arithmetic mean, and SD the corresponding standard deviation. Novelty of the finds was checked in the relevant literature, Internet resources and in the University of Alaska Museum Herbarium (ALA) database. Lichen nomenclature follows Esslinger (2004). Voucher specimens are housed in the Komarov Botanical Institute Herbarium (LE), unless otherwise indicated.

### *Agonimia tristicula* (Nyl.) Zahlbr.

This is a widespread but overlooked boreal-nemoral species, growing on soil, mosses or other lichens, mostly over base-rich rocks, but rarely on rock or nutrient-rich deciduous bark (Diederich & Serusiaux 2000, Hafellner & Turk 2001, Purvis et al. 1992, Santesson 1993). It reaches the alpine belt in montane regions and has recently been discovered in

the Severnaya Zemlya archipelago (unpublished data of M. Zhurbenko), where it may be a relict species. It has been long known only from the northern hemisphere, but was found recently in Australia as well (McCarthy 1991). Recently it was reported as new from British Columbia, Canada (Goward et al. 1994). NEW TO ALASKA.

SPECIMENS EXAMINED: USA, S.E. ALASKA: NORTHERN PART OF PRINCE OF WALES IS., EASTERN SLOPE OF EL CAPITAN PEAK, 56°12' N, 133°17' W, alt. 570 m, on turf soil and detritus above limestone rocks, 12 Aug. 2001, M. Zhurbenko 01226; central part of Prince of Wales Is., near Balls Lake, 55°42' N, 132°50' W, alt. 130 m, on soil above open rocky wall by a road, 12 Aug. 2001, M. Zhurbenko.

***Biatorella contigua* N.S. Golubk. & Piin**

*Biatorella contigua* is a species characteristic of frost boils in polygonal and spotted tundras. Previously, it was only known from the Taimyr Peninsula and Severnaya Zemlya archipelago, ranging from the southern shrub tundra to the polar deserts (Piin 1977, 1984; Piin & Martin 1978; unpublished data of M. Zhurbenko). *Biatorella contigua* differs from the other terricolous arctic-alpine species of the genus in its well-developed thallus, its large apothecia to 1 mm diam., its tall hymenium to 170 µm, and its ascospores containing 50–100 predominantly (sub)globose ascospores. Since the species may well be overlooked in the Arctic, we provide a short description of this specimen. Thallus producing a verruculose-nodulose crust 1–2 mm thick, occasionally film-like at the periphery, predominantly dirty white, opaque, with a rough surface, occasionally intermingled with olive-brownish, gelatinous, translucent and more smooth portions. Apothecia 0.5–1 mm diam., reddish-brown, convex to semiglobose and constricted at the base, sometimes confluent in a few. Epiphyllum yellow-brown. Hymenium colourless, I+ blue. Paraphyses not or sparingly branched above, ecapitate, 1–1.5 µm diam. Hypothecium medium brown. Ascospores globose or more rarely subglobose, 5–7 × 5–6 µm, up to 100 per ascus. NEW TO NORTH AMERICA.

SPECIMEN EXAMINED: USA, N. ALASKA, NORTH SLOPE, SAGWON, 69°26' N, 148°40' W, ALT 275 M, LOESS HILL WITH FROST BOILS, ON BARE FROST BOIL CONSISTING OF SANDY SOIL WITH MOSS REMNANTS, 7 AUG. 2003, D. WALKER

***Flavocetraria minuscula* (Elenkin & Savicz) Ahti, Poryadina & Zhurb., comb. nov.**

**Figure 1**

BASIONYM: *Cetraria cucullata* (Bellardi) Ach. f. *minuscula* Elenkin & Savicz, Trudy Bot. Muz. Imp. Akad. Nauk 8: 43 (1910).

TYPE: Russia, Khabarovsk Region, Dzhugdzhur Range, Chelasin [River], ca. 57° N, 137° E, alt. 400–1000 m, dry peat bog, 21 May 1903, Ir. M. Shchegolev, 1909 (LE).

? SYNONYM: *Cetraria cucullata* (Bellardi) Ach. var. *rabetovii* Oksner, Bot. Zhurn. (Kiev) 1(3–4): 47 (1940).

This is a morphologically distinct species (Fig. 1), characterised by slender, erect, tube-like lobes (0.5–)1–2(–3) mm wide and 2–3(–4) cm tall, with convoluted, overlapping and occasionally fused, flexuous, crisped margins and typically helmet-shaped hooked tips which occasionally bear inconspicuous patches of white pruina. No apothecia have been detected. The spot tests with K, C, and P are all negative, but usnic acid and protolichesterinic acid have been identified with TLC. *Flavocetraria minuscula*

is like a miniature morph of *F. cucullata* (Bellardi) Kärnefelt & Thell, which it also matches in thallus chemistry. It differs from that species, however, in having narrower, more tubular lobes with helmet-shaped lobe tips. *Cetraria cucullata* f. *minuscula* was described by A. Elenkin and V. P. Savicz (1910) from a mountain range along the Pacific coast of the Russian Far East. Previously, it was only known from a few scattered coastal and inland localities in northeastern Asia. As opposed to *F. cucullata*, which is a widespread circumpolar arcto-boreal species, *F. minuscula* seems to have an amphi-Beringian distribution (Eastern Siberia, Chukotka, Interior Alaska), being mostly confined to boreal forests, both on mountains and in lowlands. One find is from the tundra zone, though *F. minuscula* is most probably absent from the High Arctic. Indeed, specimens from Franz Josef Land, Severnaya Zemlya, Taimyr Peninsula, and annotated as "f. *minuscula*" in the herbarium LE, have proved to be just small morphs of *F. cucullata*. In the interior of Alaska, *F. minuscula* was observed to be locally rather abundant, forming distinct patches among "normal" *F. cucullata*. It grows in mesic

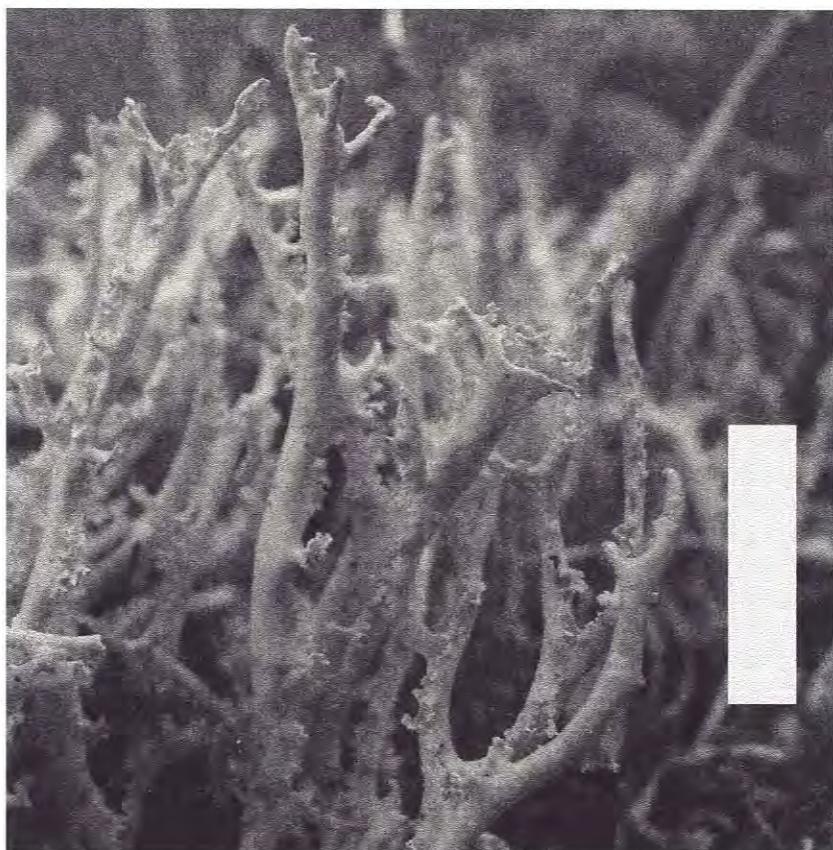


Fig. 1. *Flavocetraria minuscula* (Zhurbenko 04295), habitus. Scale = 1 cm.

conditions on soil, mostly within lichen-moss carpets, and was once found over a rotten mossy log imbedded in the soil. *Cetraria cucullata* var. *rabornovii*, described from southern Sakha Republic (Yakutiya) (Oksner 1940), is most probably a synonym of *F. minuscula*. We have not found the type of the variety, but its protologue matches *F. minuscula* very well. More data on this species and its range will be given in another paper, which is being prepared by Teuvo Ahti (Helsinki) and Lena Poryadina (Yakutsk). NEW TO NORTH AMERICA.

SPECIMENS EXAMINED: USA, INTERIOR ALASKA: DENALI NATIONAL PARK AND PRESERVE, 200 KM S. OF FAIRBANKS, NEAR C-CAMP BY THE ROCK CREEK TRAIL, 63°43' N, 148°57' W, ALT 650–700 M, MESIC DWARF-SHRUB-LICHEN-MOSS *Picea glauca* mixed forest, on soil in lichen-moss carpet, 16 Aug. 2004, M. Zhurbenko 04359 (KPABG, LE); *ibid.*, 17 Aug. 2004, M. Zhurbenko 04204 (H, LE); *ibid.*, rock outcrops with *Picea glauca* forest, on soil in lichen-moss carpet, 20 Aug. 2004, M. Zhurbenko 04165; Fairbanks area, Chena River State Recreation Area at Mi. 29 Chena Hot Springs Road, southeast of the Rosehip Campground on a southern terrace of the Chena River, 65°21' N, 146°16' W, dwarf-shrub-lichen-moss wetland with sparse *Picea mariana*, on soil in lichen-moss carpet, 29 Aug. 2004, A. Carroll & M. Zhurbenko 04295, 04296, 04297, 04300. — RUSSIA: Khabarovsk Territory (see type); Khabarovsk Territory, Dzhugdzher Range, Isnyakan River, right tributary of Vatomga [Batomga] River which is left tributary of Maya River, ca. 57° N, 136° E, 28 June 1912, F. V. Sokolov 591; Chukotskii Avtonomnyi Okrug, Chukchi Peninsula, Kresta Bay, vicinities of Egvekinot settlement, mountain stream valley, on soil, 17 Aug. 1977, I. I. Makarova 174.

***Fuscopannaria viridescens* P.M. Jørg. & Zhurb.**

This recently described arctic-alpine species is still known in North America from only a few scattered localities (Jørgensen & Zhurbenko 2002). Reported here is an additional find located about 140 km west of the species type locality.

SPECIMEN EXAMINED: USA, N.W. ALASKA, NEAR KOTZEBUE, 66°53' N, 162°31' W, ALT 50 M, HILLY LOWLAND, ON MOSSY SOIL IN SPOTTY TUNDRA, 1961, B. NEILAND.

***Pronectria dillmaniae* Zhurb. sp. nov.**

**Figure 2**

*Fungus lichenicola in thallis Catapyrenium parasiticus. Similis Pronectria terrestris Lowen & Diederich, sed ab ea imprimis differt ascosporis brevioribus, (6–)9–10–11.5(–12) × (4–)5–5.5–6(–7) µm.*

TYPE: USA, NW Alaska, 140 km E of Kotzebue, middle Kobuk River, NW margin of the Great Kobuk Sand Dunes, 67°06' N, 159°00' W, alt. 60 m, depression with *Dryas*-moss-lichen vegetation on sand, on *Catapyrenium cinereum* (Pers.) Körb. (thallus), 13 Aug. 2000, M. Zhurbenko 00462 (LE 210331, holotype).

ILLUSTRATIONS: Fig. 2.

DESCRIPTION: Ascomata perithecia, obpyriform, (100–)150(–200) µm diam., (125–)200(–250) µm tall, with truncate papilla 50–70 µm diam., pores not seen, asetose, intensively orange- or brownish-red throughout, immersed with only the ostiolar area exposed, scattered. Peridium ca. 30 µm thick, composed of one layer of more or less elongated cells 5–15 × 2–5 µm in vertical section, yellowish brown to orange in squash preparation, not changing colour in lactic acid or KOH. Ostiolar filaments dense, interascal filaments sparse, ca. 2 µm diam., moderately branched. Centrum with

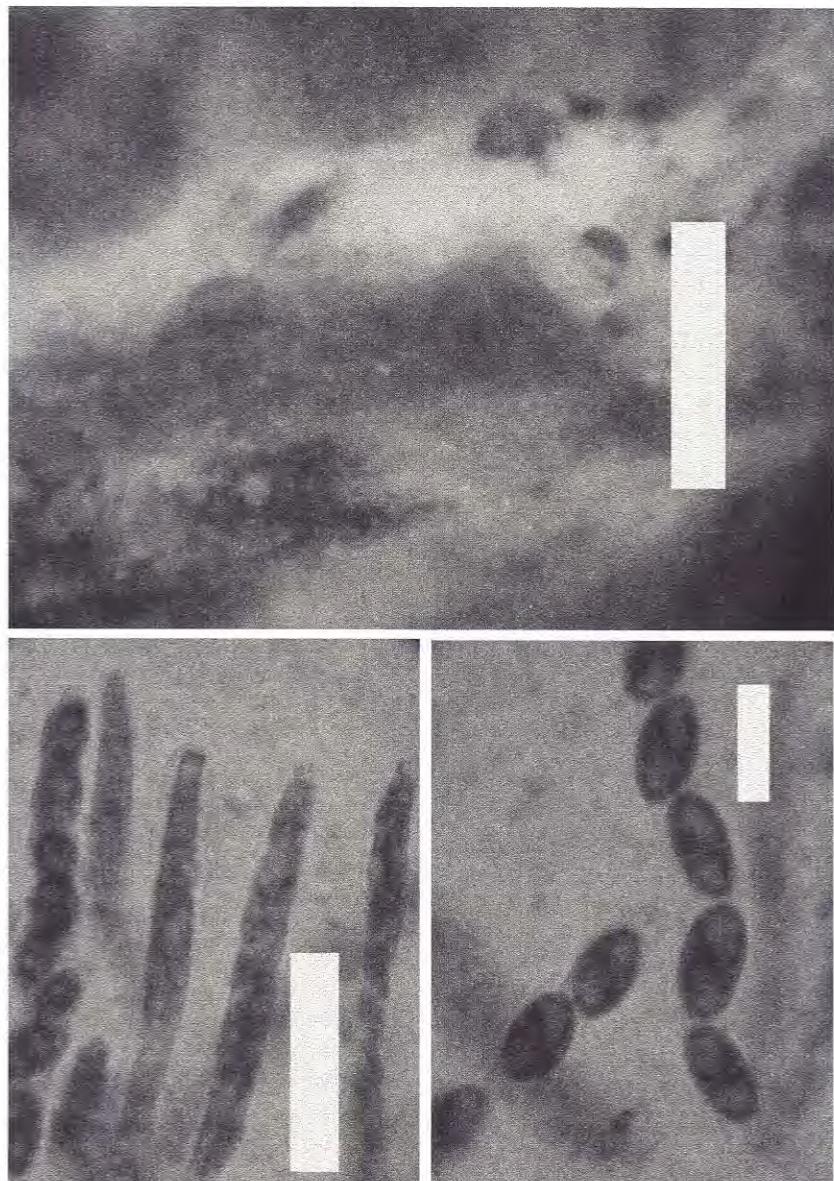


Fig. 2. *Pronectria dillmaniae* (A, holotype; B, C, Zhurbenko 00200): A, perithecia in cross section; B, asci in cotton blue; C, ascospores in cotton blue. Scales: A = 250  $\mu\text{m}$ ; B = 30  $\mu\text{m}$ ; C = 10  $\mu\text{m}$ .

numerous orange oil droplets. Ascii unitunicate, cylindrical, with truncate apices, (50–)62–**70**–77.5(–80) × 6–7–8 µm (n=33, in water or cotton blue), 8-spored. Ascospores colourless, mostly elliptic, occasionally narrowly elliptic or subglobose, 1-septate or rarely simple (when subglobose), not constricted at the septum, (6–)9–**10**–11.5(–12) × (4–)5–**5.5**–6(–7) µm, l/w = (1–)1.6–**1.9**–2.1(–2.8) (n=122, in water or cotton blue), granulate, uniseriate and usually overlapping. Anamorph not seen.

**ETYMOLOGY:** Dedicated to Karen Dillman in recognition of her contribution to the study of Alaskan lichens and help in collecting type material of this species.

**MATRIX AND BIOLOGY:** The fungus grows on the thallus of *Catapyrenium cinereum* (*Verrucariaceae*, *Verrucariales*) causing strongly bleached patches.

**DISTRIBUTION:** The new species is known only from the type locality, which is situated within a peculiar sand dunes ecosystem at the northern limit of the taiga zone.

**DISCUSSION:** *Pronectria dillmaniae* is distinguished from most species in the genus by its short ascospores. It is probably most similar to *Pronectria terrestris* which itself grows on a squamulose terricolous lichen (*Thrombium*, *Thrombiaceae*, Ascomycota inc. sed.). The latter species is distinguished by its very pale, red to yellowish ascomata, narrowly clavate, shorter and wider asci 60–70 × 8–10 µm, smooth and longer ascospores 12–17 × 5.5–7 µm, l/w = 2.3, which are biseriate in the middle of an ascus (Lowen & Diederich 1990). *Pronectria dealbans* (Müll. Arg.) Etayo & Breuss, colonizing *Endocarpon loscosii* Müll. Arg. (also *Verrucariaceae*), is another species known on squamulose lichens growing on soil. It can readily be distinguished from *Pronectria dillmaniae* by its inflated, shorted and wider asci 55–60 × 11–14 µm and longer ascospores (13–)16–21(–24) × 5–7.5 µm, which are constricted at the septum (Etayo & Breuss 1996). No nectrioid fungi have been previously reported from *Catapyrenium*, but three more species are known to occur on other genera in the *Verrucariaceae*, viz. *Pronectria verrucariae* (Vouaux) Lowen, *Nectria tatreensis* Alstrup, and *Nectriopsis indigens* (Arnold) Diederich & Schroers. All of them are readily distinguished from the new species by the following characters: *Pronectria verrucariae* has 2- to 4-spored ascii and longer ascospores, 16–21 × 5–7 µm, which are pale orange at maturity (Rossman et al. 1999); *Nectria tatreensis* has perithecia covered by short white hyphae and bigger ascospores, (15.5–)19–22 × 8.5–9 µm (Alstrup 1996); *Nectriopsis indigens* has hairy ascomata, often 4-spored ascii, and bigger ascospores, 12–19 × 6–9 µm (Clauzade et al. 1989, Etayo 1998).

**ADDITIONAL SPECIMENS EXAMINED:** USA, N.W. ALASKA, 140 KM E OF KOTZEBUE, MIDDLE KOBUK RIVER GREAT KOBUK SAND DUNES, 67°05' N, 158°58' W, ALT 50 M, DEPRESSION WITH SPOTTED *Dryas*-lichen vegetation on sand, on *Catapyrenium cinereum* (thallus), 2 Aug. 2000, M. Zhurbenko 00200 (LE 210321); same locality, depression with lichen heath with sparse *Picea glauca* on sand, on *Catapyrenium cinereum* (thallus), 4 Aug. 2000, M. Zhurbenko 0059 (LE 210311).

### *Pronectria walkerorum* Zhurb. sp. nov.

### Figure 3

*Fungus lichenicola in thallis et apotheciis Ochrolechia spp. crescit. Similis Pronectria robergei* (Mont. & Desm.) Lowen, sed ab ea imprimis differt ascis majoribus 70–90 × 5–9 µm, ascoporis partim simplicia, majoribus, (8–)12–**14.5**–17(–20) × (4–)5.5–**6.5**–7.5(–10) µm et hospite diverso (Pertusariales).

TYPE: Canada, North West Territories, Canadian Arctic Archipelago, Prince Patrick Is., 2 km S of Mould Bay weather station, 76°14' N, 119°19' W, polar desert, moist slope below snow bed with vegetated (graminoids, dwarf shrubs, mosses, lichens) mounds, on sterile *Ochrolechia* sp. (thallus) growing on moss remnants, 24 July 2004, D. Walker (LE 210371, holotype).

ILLUSTRATIONS: Fig. 3.

DESCRIPTION: Ascomata perithecia, obpyriform to occasionally subglobose or with flattened bottom, 250–350  $\mu\text{m}$  diam., 250–400  $\mu\text{m}$  tall, with truncate papilla 100–125  $\mu\text{m}$  diam., 100–150  $\mu\text{m}$  tall, pores ca. 20  $\mu\text{m}$  diam., asetose, pale to medium apricot or brownish-orange, pore area usually darker, immersed with only the ostiolar area protruding, scattered. Peridium 20–30  $\mu\text{m}$  thick, orange, not changing colour in lactic acid or KOH. Ostiolar filaments dense, interascal filaments sparse, moderately branched, ecapitate, 1–2  $\mu\text{m}$  diam. Centrum with numerous orange oil droplets. Ascii unitunicate, cylindrical, with truncate apices, 70–90  $\times$  5–9  $\mu\text{m}$  (n=9, in cotton blue), with apical ring, 8-spored. Ascospores colourless, mostly narrowly elliptic, occasionally (sub)globose, broadly elliptic, oblong or fusiform, apices usually acute, sometimes rounded, (0–)1-septate, not or occasionally strongly constricted at the septum, (8–)12–**14.5**–17(–20)  $\times$  (4–)5.5–**6.5**–7.5(–10)  $\mu\text{m}$ , l/w = (0.9–)1.8–**2.3**–2.8(–4) (n=174, in water or cotton-blue), markedly granulate (as seen in cotton blue; similar granules are sometimes also seen on walls of ascii), usually with large oil guttules, overlapping uniseriate to occasionally entirely or partly biseriate. Anamorph not seen.

ETYMOLOGY: Dedicated to Marilyn and Donald Walker in recognition of their contribution to the study of the Arctic vegetation, and for collecting the holotype of this species.

MATRIX AND BIOLOGY: The fungus grows on healthy-looking thalli of *Ochrolechia androgyna* and *Ochrolechia* spp. (*Pertusiaceae*, *Pertusariales*). No pathogenic effect was observed.

DISTRIBUTION: The species is, so far, known only from North America and Svalbard, where it ranges from the northern taiga to the polar desert.

DISCUSSION: The new species is most similar to *Pronectria robergei*. The latter, however, has an often yellow and paler peridium consisting of two layers, shorter ascii (40–)55–**63**–70  $\times$  5–6–7(–8)  $\mu\text{m}$  (n=25) [40–70  $\times$  8–9(–14)  $\mu\text{m}$  according to Rossman et al. (1999)]; always 1-septate, smaller ascospores (11–)12.5–**13.5**–14.5(–17)  $\times$  3–4–5(–6.5)  $\mu\text{m}$ , l/w=(2.1–)2.8–**3.4**–4.1(–4.7) (n=83, in water or cotton blue), [8–16  $\times$  (3–)4–8  $\mu\text{m}$  according to Rossman et al. (1999)], with less prominent granules, different hosts (*Peltigera* and *Solorina* species, *Peltigeraceae*, *Lecanorales*), and causing local bleaching of the host tissues. Another three necrotoid fungi have been previously reported on *Pertusiaceae*: *Pronectria robergei* (on terricolous *Ochrolechia frigida* (Sw.) Lynge), *Nectriopsis indigens* (Arnold) Diederich & Schroers and *Pronectria pertusariicola* Lowen (on *Pertusaria* spp. growing on bark of broad-leaved trees). Occasional reports of *Pronectria robergei* on *Ochrolechia frigida* (Alstrup & Elvebakk 1996, Santesson 1993) may refer to *Pronectria walkeroni*. *Nectriopsis indigens* differs from *Pronectria walkeroni* in its hairy ascocarps and often 4-spored ascii; this species also mainly grows on various saxicolous lichens not belonging to the *Pertusiaceae* (Clauzade et al. 1989, Etayo 1998). *Pronectria pertusariicola* differs

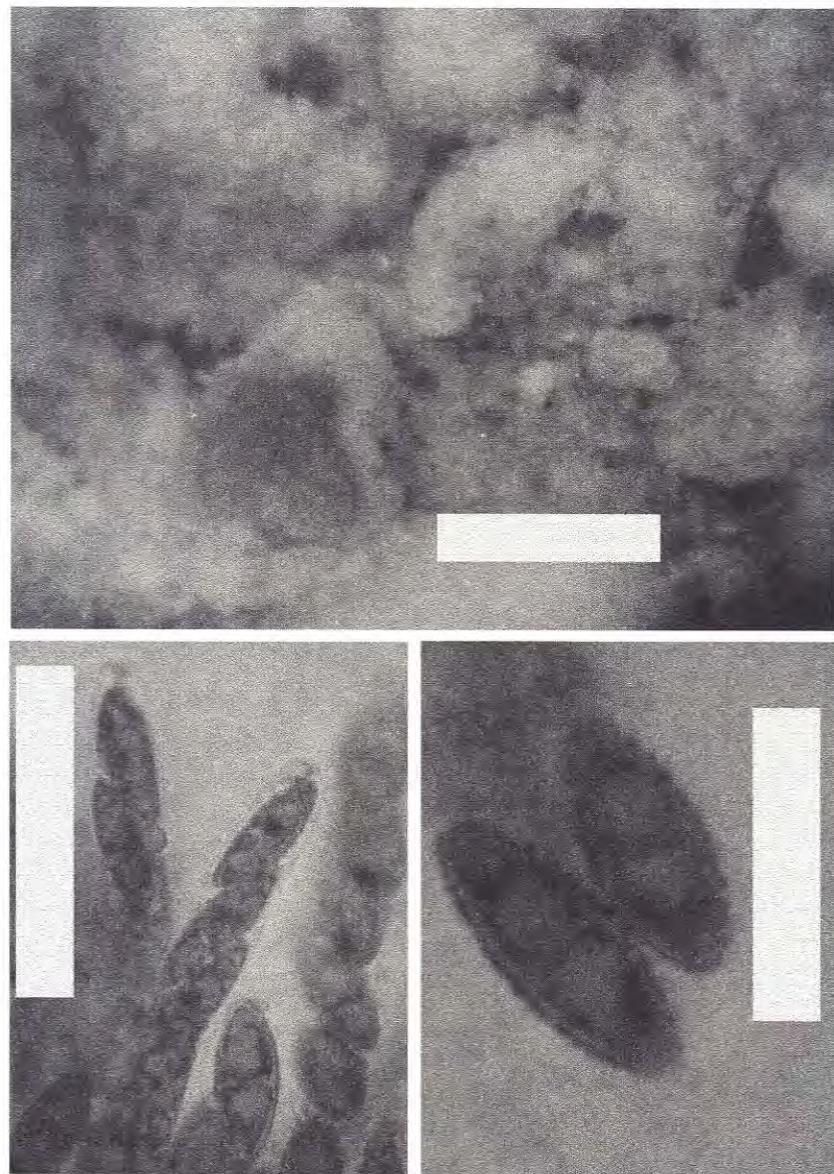


Fig. 3. *Pronectria walkerorum* (A, C, 3 Aug. 2003, Walker; B, Zhurbenko 00458): A, section of perithecium; B, asci with ascospores in cotton blue; C, ascospores in cotton blue. Scales: A = 300  $\mu\text{m}$ ; B = 30  $\mu\text{m}$ ; C = 15  $\mu\text{m}$ .

in forming ascomata in aggregates of 20–100, as well as by its ovoid, 1-septate, longer and narrower ascospores (9–)15–20 × 4.5–5(–6) µm (Rossman et al. 1999). *Pronectria tibellii* ("tibellae") Zhurb. differs from the new species in its smaller ascospores (8–)9.5–11.5–13.5(–16) × 3–3.5–4.5(–5) µm and different hosts (*Cladoniaceae*, *Lecanorales*) (Zhurbenko & Alstrup 2004). *Pronectria echinulata* Lowen differs in its smaller, 100–130(–160) µm diam., orange brown ascomata that become darker in KOH, and are aggregated in raised discoloured areas of the host thallus, as well as in its brownish lateral peridium, its ellipsoid-ovoid, 1-septate, fragile, spinulose, biseriate ascospores, and its different host species (*Physciaceae*, *Lecanorales*) (Rossman et al. 1999).

ADDITIONAL SPECIMENS EXAMINED: USA: N.W. ALASKA, 140 KM E OF KOTZEBUE, KOBUK RIVER BANK NEAR JUNCTION WITH KAVET CREEK, 67°07' N, 159°03' W, ALT 50 M, MARGIN OF HIGH RIVER TERRACE, DWARF SHRUB-MOSS LICHEN-PICEA-BETULA FOREST, ON *Ochrolechia androgyna* (Hoffm.) Arnold (thallus) growing on sandy soil, 9 Aug. 2000, M. Zhurbenko 00458 (LE 210391); N. Alaska, Howe Is., 70°19' N, 148°00' W, alt. 10 m, polygonal tundra with sandy frost boils, on sterile *Ochrolechia* sp. (thallus) growing on moss remnants, 3 Aug. 2003, D. Walker (LE 210381); N. Alaska, Prudhoe Bay, Deadhorse, 70°10' N, 148°28' W, alt. 20 m, frost boils in moist non-acidic *Dryas-Eriophorum*-moss tundra, on sterile *Ochrolechia* sp. (thallus) growing on mossy soil, 2 July 2002, D. Walker. — Norway, Svalbard, Spitsbergen, Dickson Land, W coast of Billefjorden, 5 km S of Pyramiden settlement, Garmaksla Mt., alt. 200 m, continuous moss carpet below Ca-rocks with bird perches, on sterile *Ochrolechia* sp. (thallus) growing on moss, 23 July 2003, M. Zhurbenko 03185.

Specimens of *PRONECTRIA ROBERGEI* USED FOR COMPARISON: USA, NW ALASKA, 140 KM E OF KOTZEBUE, KOBUK RIVER BANK NEAR JUNCTION WITH KAVET CREEK, 67°07' N, 159°02' W, ALT. 30 M, GRAMINOID-DWARF SHRUB-MOSS-LICHEN *Betula* shrubs, on *Peltigera rufescens* (Weiss) Humb. (thallus), 11 Aug. 2000, M. Zhurbenko 00391 (LE 210361). — Russia: Komi Republic, Troitsko-Pechorskii Region, Northern Ural, headwaters of the Pechora River, Pechora-Ilych State Reserve, 132 km ESE of Troitsko-Pechorsk, at junction of Pechora River with Shezhim River, Shezhim cabin, 62°05' N, 58°25' E, alt. 200 m, *Picea* forest, on *Peltigera leucophlebia* (Nyl.) Gyelnik (thallus), 7 July 1997, M. Zhurbenko 97279 (LE 210351); S. Siberia, Altai Mts., Kuderli Lake, alt. 1700 m, *Pinus* forest, on *Peltigera* sp. (thallus), 10 June 1987, Zolotukhin (LE 207388).

#### *Pycnothelia papillaria* Dufour var. *papillaria*

#### Figure 4

*Pycnothelia papillaria* (Fig. 4) is an uncommon species growing on acidic soil mostly in the northern hemisphere, although it is also known from South America (Osorio et al. 1981). It occurs in eastern North America mostly from Newfoundland (where it is abundant in highly oceanic conditions; pers. comm. of T. Ahti,) to Arkansas (Brodo et al. 2001, Roy 2002, Thomson 1984). In Europe it ranges from the Mediterranean area to the Finnmark province of Norway (ca. 70° N) at the northern extremity of Scandinavia (Dombrovskaya 1970, Llimona & Hladun 2001, Purvis et al. 1992, Sérusiaux et al. 2004, Trass 1978). In the Alps it ranges from lowlands to the nival vegetation belt (Hafellner & Türk 2001). It is rare within the Ural Mts. (Ryabkova 1998) and eastward of the Urals in Asia, being known in Siberia, for example, only from a few localities at the mountains of Sayan, Altai, and boreal Yakutiya (Poryadina 2001; Sedel'nikova 2001a,b, Zhurbenko 2003). Within the Arctic, this species has been previously recorded

only from Chukotka, where it reaches the typical tundra subzone of tundra zone ( $65^{\circ}30'$  N; Nylander 1888) and the southern extremity of Greenland (ca.  $60^{\circ}$  N; Thomson 1984). NEW TO ALASKA AND AMERICAN ARCTIC.

SPECIMENS EXAMINED: USA: N.W. ALASKA, NEAR KOTZEBUE,  $66^{\circ}53'$  N,  $162^{\circ}31'$  W, ALT 50 M, HILLY LOWLAND, ON GRAMINOID REMNANTS WITH SILTY SOIL IN SPOTTY TUNDRA, 1961, B. NEILAND; INTERIOR ALASKA, ALASKA RANGE, NORTHERN FOOT OF MT HEALY AT NORTH-EASTERN BOUNDARY OF DENALI NATIONAL PARK & PRESERVE NEAR HEALY,  $63^{\circ}50'$  N,  $149^{\circ}00'$  W, ALT 600 M, SHRUB (*Alnus*, *Betula*)-dwarf shrub-moss-lichen mountain tundra, on sandy soil, rather abundant and forming crusts, 29 Aug. 2000, M. Zhurbenko 00330.



Fig. 4. *Pycnothelia papillaria* (Neiland, 1961), habitus. Scale = 0.5 mm.

#### *Steinia geophana* (Nyl.) Stein

This species has been recently reported by Zhurbenko and Laursen (2003) new to Alaska. It was previously known in the Arctic only from the Taimyr Peninsula in Siberia (Piin & Martin 1978). NEW TO AMERICAN ARCTIC.

SPECIMEN EXAMINED: USA, N. ALASKA, NORTH SLOPE, HAPPY VALLEY,  $69^{\circ}09'$  N,  $148^{\circ}51'$  W, MOIST SEDGE-DWARF SHRUB-MOSS TUSSOCK TUNDRA, FROST BOIL BETWEEN TUSSOCKS, ON BARE GLACIAL TILL, 19 JULY 2001, D. WAIKER.

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