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Unpublished myxomycete collection of K. R. Kupffer

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Abstract: The paper deals with myxomycete collection assembled by K. R. Kupfer in 1894–1927 and deposited in the Herbarium of the University of Latvia (RIG). A brief description of the scientific activities of Kupfer is presented. His collection of myxomycetes includes 55 specimens, which are ascribed to 33 species and varieties. Eight taxa are new for Latvia: *Didymium bahiense*, *Enteridium splendens* var. *juranum*, *Fuligo* cf. *leviderma*, *Physarum citrinum*, *P. flavicomum*, *Stemonitopsis hyperopta*, *Symphytocarpus amaurochaetoides*, and *S. flaccidus*. The collection also includes specimens of the species *Lindbladia effusa* and *Physarum globuliferum*, that are rare in the south-eastern Baltic region. Comments on morphology are given for critical specimens and noteworthy species. Collection sites are shown on the map.

Kokkuvõte: K. R. Kupfferi limakute kogu – avaldamata andmeid.

Tutvustatakse K. R. Kupfferi aastatel 1894–1927 moodustunud limakute kogu, mida säilitatakse Läti Ülikooli herbaariumis (RIG). Esitatakse Kupfferi teadusliku tegevuse lühiülevaade. Limakute kogu koosneb 55-st eksemplarist, mis jagunevad 33 liigi ja varieteedi vahel. Kaheksa taksonit on Lätile uued: *Didymium bahiense*, *Enteridium splendens* var. *juranum*, *Fuligo* cf. *leviderma*, *Physarum citrinum*, *P. flavicomum*, *Stemonitopsis hyperopta*, *Symphytocarpus amaurochaetoides* ja *S. flaccidus*. Kogusse kuuluvad ka Baltikumi kaguosas haruldaste liikide *Lindbladia effusa* ja *Physarum globuliferum* eksemplarid. Esitatakse kriitiliste ja märkimisväärsete liikide morfoloogia kommentaarid. Kogumiskohad on näidatud kaardil.

INTRODUCTION

Karl Reinhold Kupffer (1872–1935), a famous Baltic German botanist, was an outstanding personality in the late 19th century and the beginning of the 20th century. In 1889–1893, he studied botany and mathematics at Dorpat (Tartu) University. Kupffer was an assistant for microscopy and descriptive geometry at Riga Polytechnic University in 1894–1896, a docent in 1896–1903, an adjunct professor in 1905–1915, and an extraordinary professor on descriptive geometry in the same institution in 1912–1915. During 1921–1927, he was appointed as a docent for botany at the Herder Institute in Riga and, in 1927–30, he worked there as a professor. Kupffer was also a member of the Naturalists' Society of Riga; he was elected an honorary member in 1920 and the chairman of this Society in 1921.

Kupffer's main scientific interests were plant taxonomy and biogeography. He collected and organised a herbarium of the Baltic flora (Herbarium Balticum), which contained ca. 26 000 sheets. This herbarium was collected mostly in the territory of Latvia, but it also included plants from the territory of Estonia collected from the last decade of the 19th century until the 1930s. In total, the herbarium contained 1200 species, of which 120 species were found by Kupffer for the first time in the region. Among the 170 adventitious species, 130 species were recorded by him for the first time in the region, e.g. *Equisetum telmateja, Hordelymus europaeus, Polystichum braunii, Cnidium dubium*, etc. The Herbarium Balticum is currently located in the Faculty of Biology of the University of Latvia. The herbarium material obtained by Kupffer through exchange comprises the Herbarium Generale. At present, both herbaria constitute the fundamental part of the Herbarium of the Faculty of Biology (RIG). These herbaria are studied not only by botanists of Latvia, but also by specialists from Estonia, Lithuania, Russia, Poland and other countries.

Kupffer investigated the factors determining the distribution of plants and developed ideas about the spatial gradients of their distribution. His monograph "Grundzüge der Pflanzengeographie des Ostbaltischen Gebietes", published in 1925, is a very important source of information for plant biogeography. He divided the

territory of Estonia and Latvia into floristic regions. However, this division has only historical importance in our days. At the beginning of the 20th century, Kupffer studied the development of the flora and its history. The results of these studies were reported at the 1st Meeting of the Baltic Historians in 1908 and published in several articles. He was particularly interested in floristic development after the glaciation and in the immigration of various plant species. Kupffer was also active in a field of nature conservation. On his initiative, the Naturalists' Society of Riga proclaimed the Moricsala island in the Usma lake as a protected area in 1912. Later he carried out a detailed study of the flora and vegetation of this island.

Fungi and myxomycetes also had a certain place among Kuppfer's wide interests. Having studied the Moricsala Nature Reserve (former Moritzholm Nature Reserve) for many years, Kupffer published a comprehensive geobotanical study of this area (Kupffer, 1931). The mycological part of this survey listed 19 species of myxomycetes, presenting *Ceratiomyxa mucida* (Pers.) J. Schröt., *C. porioides* (Alb. & Schwein.) J. Schröt., and *C. pyxidata* (Alb. & Schwein.) J. Schröt. as separate species. After a paper written by Rothert (1890) on myxomycetes collected in the environs of Riga and a paper by Bucholtz (1908) presenting a compilation of Rothert's abovementioned work and some unpublished materials by Mikutowicz and Kupffer, this was the third publication where special attention was given to the myxomycetes of Latvia.

When visiting the Herbarium of the University of Latvia, the first author of this paper had

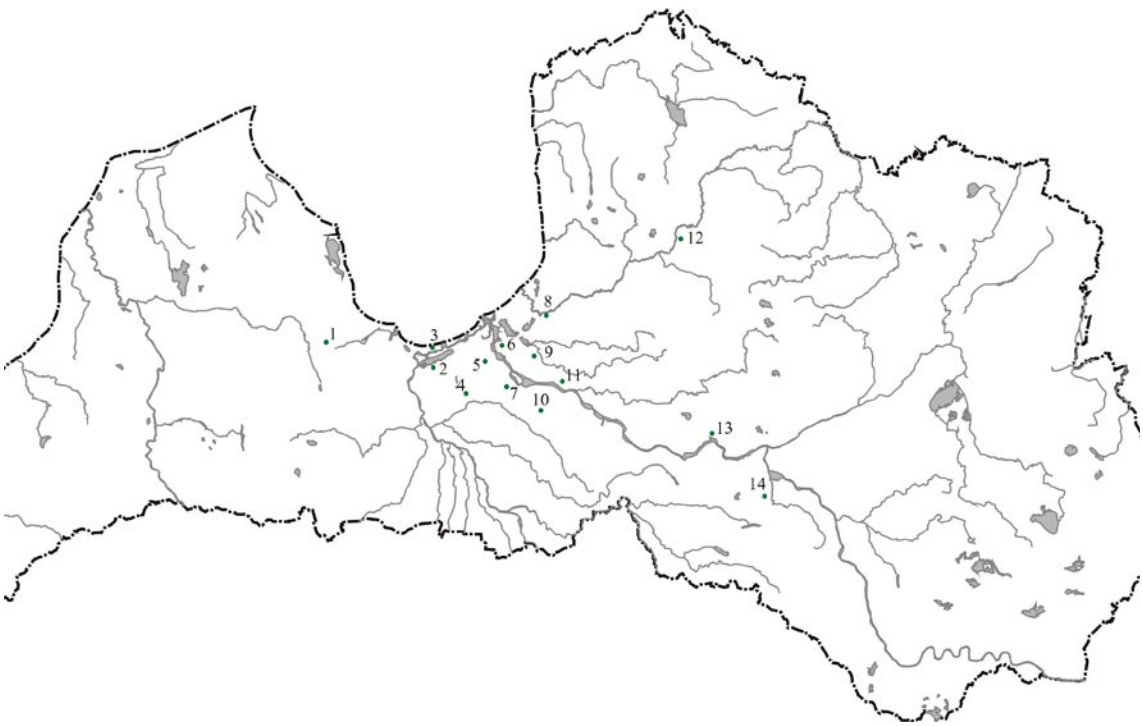

Fig. 1. Collection sites: 1 – Vecmokas (Tukums distr.), 2 – Jurmala (Riga distr.), 3 – Babite (Riga distr.), 4 – Olaine (Riga distr.), 5 – Marupe (Riga distr.), 6 – Riga and its environs (Bisumuiza, Garkalne, Jugla, the hill Luozmetejkalns, Mangali, Mezaparks, Pinki, Vecaki), 7 – Kekava (Riga distr.), 8 – Garkalne (Riga distr.), 9 – Stopini (Riga distr.), 10 – Baldone (Riga distr.), 11 – Ikskile (Ogre distr.), 12 – Cesis (Cesis distr.), 13 – Bilstini (Aizkraukle distr.), 14 – Zasa (Jekabpils distr.).

an opportunity to study the hitherto unpublished collection of myxomycetes by Kupffer, obtained from sites of the country other than the Moricsala Nature Reserve. Along with common species, this collection contains some rare myxomycetes; it presents the additional data on the species diversity, frequency, and distribution of Latvian myxomycetes.

MATERIAL AND METHODS

Specimens were collected and identified by Kupffer. Some specimens were re-identified by the first author of this paper. Myxomycete taxonomy follows Nannenga-Bremekamp (1991); abbreviations of authors' names are used according to Brummitt & Powell (1992). Collections are deposited at the Herbarium of the University of Latvia (RIG).

Specimens are numbered according to Kupffer. If available, species are provided with data on substrate, habitat, and collection date. In case of nomenclatural changes, both old synonym (in brackets) and current name are given. Original label data are presented in angle brackets ["...."]. Comments on morphology follow critical specimens and noteworthy species. Species that are new to Latvia are marked with an asterisk (*). Specimens earlier cited in Bucholtz (1908) are marked with two asterisks (**). Collection sites are indicated on a map and numbered (Fig. 1); the corresponding site numbers (see legend to Fig. 1) are given in brackets in the following list.

RESULTS

AMAUROCHAETE ATRA (Alb. & Schwein.) Rostaf. (*Amaurochaete fuliginosa* (Sowerby) T. Macbr.) – No IV 1684, on a log of *Pinus sylvestris*, Jugla, Riga (6), 11 May 1919. Specimen consists of 3 aethalia which are prematurely dried and demolished by insects. Remaining fragments of capillitium are represented by branching plates with sparse perforations; spores blackish brown in mass, minutely warted, with a somewhat paler side, 12.5–13 µm diam.

ARCYRIA CINEREA (Bull.) Pers. – No IV 1276, on a decaying trunk of *Pinus sylvestris*, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913; No IV 2792, on a decaying timber of a balcony, Riga (6), 15 Aug. 1923.

A. DENUDATA (L.) Wettst. (*A. punicea* Pers.) – No IV 2720, Riga environs (6), 3 Sept. 1922, leg. F. E. Stoll; No IV 2793, on a decaying timber of a balcony, Riga (6), 15 Aug. 1923.

A. OBVELATA (Oeder) Onsberg (*A. nutans* (Bull.) Grev.) – No IV 2794, on decaying timber of a balcony, Riga (6), 15 Aug. 1923; No IV 1275, on a decaying log, at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913.

CERATIOMYXA FRUTICULOSA (O. F. Mül.) T. Macbr. (*C. fruticulosa* var. *hydnoides*) – No IV 1270, on a decaying log in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913.

C. PORIOIDES (Alb. & Schwein.) J. Schröt. (*C. fruticulosa* var. *porioides* (Alb. & Schwein.) Lister) – No IV 1271, on a decaying log in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913; No IV 2788, on decaying timber of a balcony, Riga (6), 15 Aug. 1923.

CRIBRARIA AURANTIACA Schrad. – No IV 2789 (in the same sample as *Physarum flavicomum* Berk.), on decaying timber of a balcony, Riga (6), 15 Aug. 1923.

C. RUFA (Roth.) Rostaf. – No IV 1482, on a decaying log in a young pine forest, Baldone, Riga distr. (10), 9 June 1914.

*DIDYMIUM BAHIENSE Gottsb. – No IV 2941/2942 (identified as *D. melanospermum* (Pers.) T. Macbr. and *D. nigripes* (Link) Fr. by Kupffer; in the same sample as *D. difforme*), on litter, the Institute of Herder, Riga (6), 2 Nov. 1927. Sporocarps long-stalked; stalk dark brown; peridium colourless; pseudocolumella distinctly discoid; spores warted, with groups of more prominent warts, 9 µm diam. Colourless peridium and absence of the true columella exclude both species to which the specimen has been ascribed by Kupffer; discoid pseudocolumella refers to *D. bahiense*.

D. DIFFORME (Pers.) Gray – No IV 2941/2942 (in the same sample as *D. bahiense*), on litter, the Institute of Herder, Riga (6), 2 Nov. 1927. Short plasmodiocarps and sporocarps sitting on a wide base; outer peridium – lime shell, inner one shining, brown by transmitted light; spores black in mass, 11.5–12.5 µm diam. The specimen is deposited under names *D. melanospermum* and *D. nigripes*; *D. difforme* was most probably overlooked

or taken for a malformed specimen of *D. melanospermum* by Kupffer.

Enerthenema papillatum (Pers.) Rostaf. – No IV 1363, ["Auzem, Kiefernstubben im trock. Mengwalde am Südufer d. Sees"], Cesis distr. (12), 26 Aug. 1913.

Enteridium lycoperdon (Bull.) M. L. Farr (*Reticularia lycoperdon* Bull.) – No IV 1895, on a trunk of *Sorbus aucuparia* about 2 m high, Jugla, Riga (6), 11 May 1919. Cortex thin, silvery; pseudocapillitium of typical for the species discrete branching plates that arise from the base of an aethalium.

*E. splendens var. juranum (Meyl.) Härk. – No IV 2785 (identified as *Reticularia lycoperdon* Bull. by Kupffer), on a decaying stump of *Pinus sylvestris*, Ogres Kangari, Ikskile, Ogre distr. (11), 8 Aug. 1923. Cortex of an aethalium is dried prematurely and consists of yellowish granular glassy mass; pseudocapillitium spongy throughout, spores 6.5–7.5 µm diam. Due to the characteristic pseudocapillitium structure, the specimen is ascribed here to *E. splendens* var. *juranum*.

*Fuligo cf. leviderma H. Neubert, Nowotny & K. Baumann – No IV 1620 (identified as *F. septica* (L.) F. H. Wigg. by Kupffer), on the board-road from Bisumuiza to Kukulmuiznieki, Marupe, Riga distr. (5), 18 July 1918. Cortex thick, spongy, brick-red; inner lime pale brown, lemon-yellow by transmitted light; spores minutely warted, 7–8 µm diam. Whereas the specimen, especially the contents of the aethallium, is heavily damaged by insects and some taxonomical traits are therefore lost, we ascribe it to *F. leviderma* with some reservation.

F. septica (L.) F. H. Wigg. – No IV M 71**, on a trunk of *Pinus sylvestris* in a forest, environs of Riga (6), 2 Nov. 1894; No IV M 144, on a trunk of *Betula* sp. in a forest, Makstenieki, Garkalne, Riga distr. (8), 12 May 1895; No IV 1680, on a decaying log of *Pinus sylvestris* in a forest, Vecaki, Riga (6), 13 July 1918; No IV 1981, on a stump of *Pinus sylvestris* in a forest, Vecmokas, Tukums distr. (1), 31 July 1919; No IV 2198, on litter in a forest at the road from Zasa to Daugava, Jekabpils distr. (14), 1 July 1920; No IV 1348, on mosses in a coniferous forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 16 Aug. 1913 (developed from a yellow plasmodium).

Leocarpus fragilis (Dicks.) Rostaf.– No IV 1349, on mosses in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 16 Aug. 1913 (developed from a yellow plasmodium).

Lindbladia effusa (Ehrenb.) Rostaf. – No IV 1640, on decaying remains of timber fortifications, the hill Lozmetejkalns, Babite, Riga distr. (3), 23 July 1913. Habit of the pseudoaethallium strongly refers to *Tubifera ferruginosa* (Batsch) J. F. Gmel. as the specimen has almost lost its characteristic khaki color and shaded to olive-brown; hypothallus thick, spongy; peridum contains small numerous dictydine granules; spores minutely warted, 5–5.5 µm diam.

Lycogala epidendrum (L.) Fr. – No IV M 127**, on a pine trunk in a bog between Riga and Olaine, Olaine, Riga distr. (4), April 1895; No IV M 104**, on a decaying fence, Ozolaine, Riga (6), 11 Nov. 1894; No IV 2795, on decaying timber of a balcony, Riga (6), 15 Aug. 1923.

Metatrichia vesparium (Batsch) Nann.-Bremek. ex G. W. Martin & Alexop. (*Hemitrichia vesparium* (Batsch) T. Macbr.) – No IV M 155**, on a decaying trunk of *Betula* sp. in a forest between Dzintari and Bulduri, Jurmala (2), 26 May 1895; No IV 1678, on a decaying log of *Betula* sp.in a forest, Vecaki, Riga (6), 18 Aug. 1918; No IV 2791, on decaying timber of a balcony, Riga (6), 15 Aug. 1923.

*Physarum citrinum Schumach. – No IV 1274, on a decaying stump in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913. Sporocarps stalked; hypothallus brown; stalks stout, yellow, with pale brown and sometimes constricted base; columella small, conical; peridium covered with rounded lemon-yellow lime scales; capillitium dense with small rounded and short spindle-shaped lemon-yellow nodes; spores warted with groups of more prominent warts, 10–11 µm diam. Specimen is very well preserved, but its duplicate is represented only by several stalks and columellae with scanty fragments of peridium and capilliatial threads.

*P. flavicomum Berk. – No IV 2789 (in the same sample as *Cribraria aurantiaca*), on decaying timber of a balcony, Riga (6), 15 Aug. 1923. The habit resembles *P. nutans* Pers.; stalk shining golden brown; peridium covered with pale yellow lime; capillitium abun-

dant, lime nodes abundant, lemon-yellow, elongated angular or spindle-shaped; spores evenly warted, ca. 9 µm diam.

P. GLOBULIFERUM (Bull.) Pers. – No IV 1273, on a decaying stump in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913. Sporocarps long-stalked; stalks slender, tapering, whitish or creamy, yellowish-brown in transmitted light; columella small conical; peridium covered with whitish rounded lime scales; capillitium dense, retaining globular form of the net after peridium evanescence; lime nodes triangular and spindle-shaped, white under a dissecting microscope, yellow-brown in transmitted light; spores minutely warted with groups of more distinct warts, 8.5–9 µm diam.

P. NUTANS Pers. – No IV 1353, on a stump in a forest at a road, Cesis distr. (12), 25 Aug. 1913.

P. VIRESCENS Ditmar – No IV 1354, on a stump in a forest at a road, Cesis distr. (12), 25 Aug. 1913. Sporocarps heaped on mosses; peridial lime scanty, yellow, spores warted, 10–10.5 µm diam.

STEMONITIS AXIFERA (Bull.) T. Macbr. (*S. ferruginea* Ehrenb.) – No IV 1277, on a decaying log in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913; No IV 1679, on a decaying stump of *Betula* sp. in a forest, Vecaki, Riga (6), 11 Aug. 1918.

S. cf. SMITHII T. Macbr. – No IV 1688 (identified as *Comatricha typhoides* (Bull.) Rostaf. by Kupffer), on a decaying stump of *Betula* sp. in a forest, Vecaki, Riga (6), 18 Aug. 1918. The specimen is damaged by insects and consists of several stalks with fragments of capillitium only; stalks opaque below, red-brown above, hollow; meshes of the peripheral net 7–30 µm diam.; spores light brown in mass, 4.5–5 µm diam. Small amount of material does not allow to ascribe the specimen to *S. smithii* with certainty.

S. FUSCA Roth – No IV 1695, on decaying branches in a forest, Skujenieki, south-east from Riga, Kekava, Riga distr. (7), 23 Aug. 1918.

*STEMONITOPSIS HYPEROPTA (Meyl.) Nann.-Bremek. – No IV 1272 (identified as *Comatricha typhoides* (Bull.) Rostaf. by Kupffer), on a decaying log in a spruce forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913. Sporocarps pale lilac brown; spores reticulated with some more prominent meshes, 5.5–6 µm diam.

*SYMPHYTOCARPUS AMAUROCHAETOIDES Nann.-Bremek. (*Stemonitis fusca* var. *confluens* Lister) – No IV 1278, on a decaying stump in a forest at the river Daugava, Bilstini, Aizkraukle distr. (13), 1 Aug. 1913. Specimen consists of tangled wide-meshed capillitial net detached from hypothallus, discrete sporocarps are difficult to separate; hypothallus brown, glistering anthracite black, at its periphery fragments of membrane are rising up and forming irregular honeycomb-like low borders; portions of irregular columellae can be found in the capillitial net; capillitium expanded at the angles, with numerous long ends; spores covered with warts which form a fine-meshed net, 8–8.5 µm diam.

*S. FLACCIDUS (Lister) Ing & Nann.-Bremek. (*Stemonitis splendens* var. *flaccida* Lister) – No IV 2203 (identified as *Amaurochaete fuliginosa* by Kupffer), Mezaparks, Riga (6), 15 July 1920, developed from yellowish white plasmodium; No IV 1638/1639 (as *A. fuliginosa*), two collections from decaying remains of timber fortifications, the hill Lozmetejkalns, Babite, Riga distr. (3), 23 July 1918; No IV 1673 (as *A. fuliginosa*), on a trunk of *Picea abies*, between Olaine and Mangali, Olaine, Riga distr. (4), 11 Aug. 1918; No IV 1643 (as *A. fuliginosa*), on a log of *Pinus sylvestris*, E from Riga, Stopini ["Flammenhof"], Riga distr. (9), 4 Aug. 1918; No IV 1655, between Pinki and Annas muiza, Babite, Riga distr. (3), 10 Aug. 1918; No IV 1642, on a decaying log in a forest from E from Riga, Stopini ["Flammenhof"], Riga distr. (9), 4 Aug. 1918. Specimens identified as *Amaurocaete fuliginosa* by Kupffer are strongly damaged by insects. While examining them, we succeeded to find fragments of capillitium with characteristic for *Symphytocarpus flaccidus* elongated flakes of peridium; diameter of spores is rather uniform (7.5–8.5 µm).

TRICHIA SCABRA Rostaf. – No IV M 82 (identified as *T. varia* var. *genuina* Rostaf. by Kupffer), on a decaying stump, Ozolaine, Riga (6), 11 Nov. 1894. Elaters ornamented with 3–4 spirals; spores finely reticulated.

TRICHIA VARIA (Pers. ex J. F. Gmel.) Pers. – No IV M 79**, on a log of *Acer platanoides*, Ozolaine, Riga (6), 11 Nov. 1894.

TUBIFERA FERRUGINOSA (Batsch) J. F. Gmel. – No IV 1350, on a stump, Dzintari, Jurmala (2), 23 Aug. 1913; No IV 1351, ["Am Wege von Wenden zum Duckernschem See"] on a decaying stump, surroundings of Cesis (12), 23 Aug. 1913; No IV 2858, Riga environs (6), collected for an exhibition of mushrooms 28–30 Sept. 1924, leg. F. E. Stoll, developed from an orange plasmodium.

Re-examination of the collection of myxomycetes assembled by Kupffer in 1894–1927 and deposited in the Herbarium of the Faculty of Biology the University of Latvia has revealed that it includes 33 species and varieties. Perusal of this material enabled us to uncover 8 taxa reported from the territory of Latvia for the first time. Although the collection is not large and consists of 55 specimens in total, it contains a valuable herbarium material of such rare or uncommon species in the south-eastern Baltic region as *Amaurochaete fuliginosa*, *Lindbladia effusa*, *Symphytocarpus amaurochaetoides*, *Physarum citrinum*, *P. flavicomum*, *P. globuliferum*. Specimens of other, more common myxomycete taxa, from the environs of Riga and other regions of the country serve as reference collections, and therefore, are notable for studies on the distribution of myxomycete species in Latvia.

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The lichen flora and reindeer grazing in the Isortoq area, South West Greenland

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Abstract: A total of 156 taxa of lichens and a few lichenicolous fungi are reported from the surroundings of the Isortoq Reindeer Station in South West Greenland. The area studied is still moderately grazed, but with increased herd (now about 1400) overgrazing could be easily reached.

Kokkuvõte: Edela-Gröönimaa Isortoq'i piirkonna samblikufloora ja põhjapõtrade karjatamine.

Edela-Gröönimaa Isortoq'i piirkonnast teatatakse 156 samblikutaksoni ja mõningate lihhenikoolsete seente leidmisest. Uurimisala on mõõdukalt karjatatav, kuid karja kasvu korral (praegu 1400 looma) võib kergesti tekkida ülekarjatamine.

INTRODUCTION

Dahl (1950) has given an account of the lichenological research work in the southernmost part of South West Greenland up to 1950. As early as in 1828–29 J. Vahl made numerous collections of lichens in Julianehåb District (Branth & Grønlund 1888), but also persons such as A. Kornerup, P. Sylow, P. Eberlin and L. Kolderup Rosenvinge have made important contributions to the lichen flora of the southern districts in the 19th century. These collections consist of both macro- and microlichens. However, although Dahl (1950) published his macrolichen collections, most of his crustose lichens (preserved in Oslo) still remain unpublished.

Since 1950 in particular K. Hansen (1971, 1973), E. S. Hansen (1978, 1983, 1984, 1986, 1993, 1995, 1998a &b, 2000 a&b) and Alstrup (1979, 1981, 1982, 1986, 1987) have treated the lichen flora of South West Greenland. While the first author deals with macrolichens only, the two others include both macro- and microlichens in their investigations. Additional information on the lichen flora occurring in the southernmost part of South West Greenland have been given by Böcher (1954), Moberg & Hansen (1986), Hansen & Poelt (1987), Hansen, Poelt & Vezda (1987), Hansen, Poelt & Søchting (1987), Breuss & Hansen (1988) and Hansen & Obermayer (1999).

The first author of this paper investigated the lichen flora near Isortoq Reindeer Station in the summer of 1998 (Fig. 1). The main purpose of the investigations was to provide a survey of the lichen flora of the surroundings of the station, but it was also the intention to carry out an estimation of the present degrees of reindeer grazing on lichens in the vicinity of the station. The second author investigated the degrees of reindeer grazing in the whole concession area, a total of 1554 square kilometres, during the summer 1996. However, in this paper only the results from the plots situated somewhat south and north of the reindeer station are presented (Fig. 2; II & III). Previously Lund et al. (1996) have mapped the vegetation in the whole reindeer herding area around Isortoq using digital satellite data.

Cuyler (1998), who has outlined the history of reindeer husbandry in southern Greenland, states that the Isortoq herd was established by the Greenlander Ole Kristiansen in 1973 with 48 animals. By 1977 the herd numbered c. 300 reindeer. In 1988 the Icelander, Stefan Magnusson became co-owner of the herd, which now numbered about 800 animals. In 1995 the herd size was about 3000 reindeer. After slaughtering the herd size was reduced to c. 1900 animals in the winter 1997–98. The future winter herd will be kept at c. 1400 animals in order to avoid overgrazing of the available range.

Isortoq (60°59'N, 47°32'W) is located c. 80 km to the west of Narssaq (60°54'W, 46°03'W)

Fig. 1. The western part of the Isortoq Reindeer Station. Well developed lichen heaths occur on the top of the ridges (upper right).

and about 25 km from the outer coast of South West Greenland (Fig. 2). The station is situated close to the Isortoq Fjord. The distance between Isortoq and the inland ice (Søndre Qipisarqo Bræ) is 4 km, only. The landscape around Isortoq is characterised by its many lakes and up to c. 300 m high ridges and hills. Ketilidian Julianehåb granite rich in biotite and hornblende dominates in the investigation area (Escher & Stuart Watt 1976). It is intersected by more resistant dolerite dykes.

According to Feilberg (1984) the Isortoq area is situated in the oceanic, low arctic vegetational zone. Very little meteorological information is available from Isortoq, but its climate presumably is comparable to that of Narssaq. Measurements made by ASIAQ/Grønlands Forundersøgelser show that the mean temperature of July and February is c. 8 °C and –8 °C, respectively, at Narssaq. The normal annual precipitation is 750 mm. The winter is relatively short. The ground is free of snow already in April.

MATERIAL AND METHODS

The first author collected lichens at 25 sample plots in the Isortoq area. He also estimated the degrees of reindeer grazing in 9 plots each measuring one square metre. The collections consist of totally 250 lichen specimens, which are deposited at the Botanical Museum, University of Copenhagen (C). The lichens were studied with Zeiss light microscopes. 32 numbers have been distributed to selected herbaria as part of the "Lichenes Groenlandici Exsiccati" (fasc. 16 & 17). The second author measured the degrees of reindeer grazing in 17 plots, each covering one square metre, in the Isortoq area. All plant species occurring in each plot were noted. At the same time the surroundings of the plots were investigated as regards other signs of reindeer activity such as tracks, pellets and grazing on deciduous shrubs. All lichens were identified in the field. The following, somewhat modified version of the system adopted by Norwegians, Lyftingsmo (1974) and Gaare (1978) were used for estimation of the degrees of reindeer grazing on the lichens occurring at Isortoq:

1. Lichen cover slightly grazed. – The lichens form up to c. 4 cm high, more or less continuous mats in openings in the dwarf shrub heath (the community is here defined as a "lichen heath", if the lichens cover more than 4–5 square metre). One or more spe-

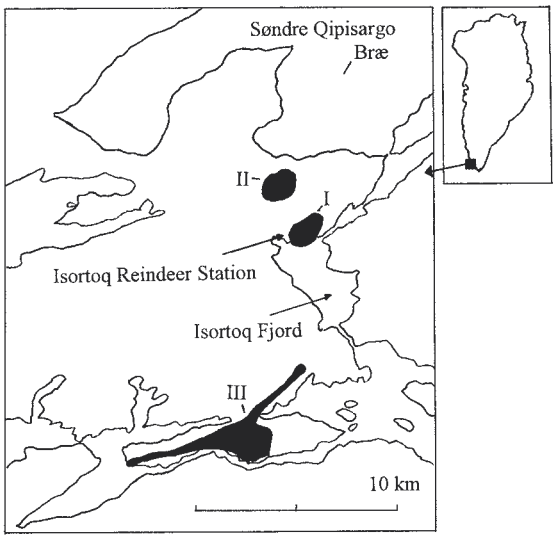

Fig. 2. The location of the Isortoq Reindeer Station in South West Greenland. I = area investigated by the first author, II and III = areas investigated by the second author. The small map to the right shows the situation of the Isortoq area in Greenland.

cies among *Cladonia stellaris*, *C. mitis*, *C. stygia*, *Stereocaulon alpinum* and *S. paschale* are dominant. Other species such as, for example, *Flavocetraria nivalis*, *F. cucullata*, *Cetraria islandica*, *Alectoria ochroleuca*, *Cladonia gracilis* and *C. amaurocraea*, often occur more sparsely among the dominant lichens.

2. Lichen cover moderately grazed. – The composition of the lichen vegetation is similar to that of category No. 1, but the lichens occur more scattered on the ground. Their max. height is about 3 cm, and they are generally more loosely attached to the substratum than those of the first group. Lichen remains due to reindeer trampling occur abundantly among the living lichens.
3. Lichen cover heavily grazed. – The lichens cover below 5 % of the area, and the max. height of the lichens is c. 1 cm, only. *Cladonia stellaris* is replaced by other Cladinae or Stereocaulons. Different cup- and pin-shaped *Cladonia* species, for example, *Cladonia borealis*, *C. chlorophaea*, *C. pyxidata* and *C. phyllophora*, often colonize the bare soil together with species such as *Cetraria muricata* and *Peltigera rufescens*. Most lichens are firmly attached to the soil.
4. Lichen cover almost totally grazed and trampled away. – Intact lichens cover below 3 % of the area, only. The remaining part of the area is covered by lichen fragments often belonging to species of *Cladonia*, *Stereocaulon* or *Cetraria*. Regenerating podetia of *Cladonia stellaris* and other species often occur among the lichen remains.

RESULTS AND DISCUSSION

After a list of lichens (and a few lichenicolous fungi) collected by the first author some important floristic observations are presented. Finally the present state of reindeer grazing on lichens in Isortoq area is discussed.

List of lichens and lichenicolous fungi

The following list of 156 taxa of lichens and lichenicolous fungi is based on the collections of the first author. The lichens are arranged alphabetically. Nomenclature follows mainly Santesson (1993). The following abbreviations are used: ap=apothecia present; pe=perithecia present; st=sterile specimen. 32 numbers of lichens from Isortoq have been distributed previously from herbarium C as "Lichenes Groenlandici Exsiccati" edited by the first author. The relevant exsiccati numbers are included in the list.

Acarospora molybdina (Wahlenb.) A. Massal. ap
Acarospora smaragdula (Wahlenb.) A. Massal.ap
Alectoria nigricans (Ach.) Nyl. st
Alectoria ochroleuca (Hoffm.) A. Massal. st
Alectoria sarmentosa (Ach.) Ach. ssp. vexillifera (Nyl.) D. Hawksw. ap 681
Allantoparmelia alpicola (Th. Fr.) Essl. ap
Amandinea coniops (Wahlenb.) Scheid. ap
Amygdalaria panaeola (Ach.) Hertel & Brodo st
Arctocetraria andrejevii (Oxner) Kärnefelt & A.Thell st 688
Arctoparmelia centrifuga (L.) Hale st
Arctoparmelia incurva (Pers.) Hale st
Arthrorhaphis alpina (Schaer.) R. Sant. ap
Aspicilia mastrucata (Wahlenb.) Th. Fr. ap
Baeomyces rufus (Huds.) Rebent. st
Bellemerea cinereorufescens (Ach.) Clauzade & Cl. Roux ap
Brodoa oroarctica (Krog) Goward st
Bryocaulon divergens (Ach.) Kärnefelt st 702

Bryoria chalybeiformis (L.) Brodo & D. Hawksw. st
Bryoria nitidula (Th. Fr.) Brodo & D. Hawksw. st
Caloplaca alcarum Poelt ap
Caloplaca fraudans (Th. Fr.) H. Olivier ap
Caloplaca nivalis (Körb.) Fr. ap
Caloplaca scopularis (Nyl.) Lettau ap
Candelariella vitellina (Hoffm.) Müll. Arg. ap
Cetraria islandica (L.) Ach. ap 691
Cetraria muricata (Ach.) Eckfeldt st
Cetraria nigricans Nyl. st
Cetraria sepincola (Ehrh.) Ach. ap
Cetrariella delisei (Bory ex Schaer.) Kärnefelt & A.Thell st 689
Cladonia amaurocraea (Flörke) Schaer. ap 697
Cladonia arbuscula (Wallr.) Flot. ssp. mitis (Sandst.) Ruoss st 711
Cladonia bellidiflora (Ach.) Schaer. ap 709
Cladonia borealis S. Stenroos st
Cladonia carneola (Fr.) Fr. ap 703
Cladonia chlorophaea (Flörke ex Sommerf.) Spreng. st
Cladonia coccifera (L.) Willd. ap
Cladonia cornuta (L.) Hoffm. st
Cladonia crispata (Ach.) Flot. st 696, 710
Cladonia cyanipes (Sommerf.) Nyl. st
Cladonia deformis (L.) Hoffm. st
Cladonia ecmocyna Leight. ap 701
Cladonia fimbriata (L.) Fr. st
Cladonia gracilis (L.) Willd. st
Cladonia macrophylla (Schaer.) Stenh. st
Cladonia macrophyllodes Nyl. ap 683
Cladonia phyllophora Hoffm. st
Cladonia pleurota (Flörke) Schaer. st
Cladonia pyxidata (L.) Hoffm. ap
Cladonia squamosa Hoffm. st
Cladonia stellaris (Opiz) Pouzar & Vezda st 692
Cladonia stygia (Fr.) Ruoss st 694
Cladonia subulata (L.) F. H. Wigg. st
Cladonia sulphurina (Michx.) Fr. st
Cladonia trassii Ahti st
Cladonia uncialis (L.) F. H. Wigg. st 690
Ephebe hispidula (Ach.) Horw. st
Euopsis pulvinata (Schaer.) Vain. ap
Flavocetraria cucullata (Bellardi) Kärnefelt & A.Thell st
Flavocetraria nivalis (L.) Kärnefelt & A.Thell st 687
Frutidella caesioatra (Schaer.) Kalb ap
Hymenelia lacustris (With.) M. Choisy ap
Illosporium carneum Fr. (on *Peltigera didactyla*) st
Lecanora atrosulphurea (Wahlenb.) Ach. ap
Lecanora contractula Nyl. ap
Lecanora dispersa (Pers.) Sommerf. ap
Lecanora intricata (Ach.) Ach. ap
Lecanora polytropa (Ehrh. ex Hoffm.) Rabenh. ap
Lecanora straminea Ach. ap
Lecidea auriculata Th. Fr. ap
Lecidea lactea Flörke ap
Lecidea lapicida (Ach.) Ach. ap
Lecidoma demissum (Rutstr.) Gotth. Schneid. & Hertel ap
Lepraria neglecta (Nyl.) Lettau -
Massalongia carnosa (Dicks.) Körb. ap 699
Melanelia commixta (Nyl.) A.Thell ap
Melanelia hepatizon (Ach.) A.Thell. ap
Micarea assimilata (Nyl.) Coppins ap
Miriquidica atrofulva (Sommerf.) A. J. Schwab & Rambold st
Miriquidica nigroleprosa (Vain.) Hertel & Rambold st
Mycoblastus alpinus (Fr.) Th. Fr. ex Hellb. sp 706
Nephroma arcticum (L.) Torss. st 700
Nephroma parile (Ach.) Ach. st 684
Ochrolechia androgyna (Hoffm.) Arnold st
Ochrolechia frigida (Sw.) Lynge ap
Ochrolechia grimmiae Lynge ap 698
Ochrolechia lapuënsis (Räsänen) Räsänen st
Ochrolechia tartarea (L.) A. Massal. ap
Omphalina hudsoniana (H. S. Jenn.) H. E. Bigelow -
Ophioparma ventosa (L.) Norman ap
Orphniospora moriopsis (A. Massal.) D. Hawksw. ap
Pannaria pezizoides (Weber) Trevis. ap
Parmelia omphalodes (L.) Ach. st
Parmelia saxatilis (L.) Ach. st
Parmelia sulcata Taylor st
Parmeliopsis ambigua (Wulfen) Nyl. st
Parmeliopsis hyperopta (Ach.) Arnold st
Peltigera aphthosa (L.) Willd. st
Peltigera didactyla (With.) J. R. Laundon var. extenuata (Nyl. ex Vain) Goffinet & Hastings st
Peltigera kristinssonii Vitik. ap 682
Peltigera leucophlebia (Nyl.) Gyeln. ap
Peltigera malacea (Ach.) Funck st
Peltigera rufescens (Weiss) Humb. ap
Peltigera scabrosa Th. Fr. ap
Pertusaria carneopallida (Nyl.) Anzi ap
Pertusaria dactylina (Ach.) Nyl. st
Pertusaria geminipara (Th. Fr.) C. Knight ex Brodo ap
Pertusaria oculata (Dicks.) Th. Fr. ap 686

Physcia caesia (Hoffm.) Fürnr. st
Physcia dubia (Hoffm.) Lettau st
Placopsis gelida (L.) Linds. st
Platismatia glauca (L.) W. L. Culb. & C. F. Culb. st 693
Porpidia flavicunda (Ach.) Gowan ap
Porpidia melinodes (Körb.) Gowan & Ahti st
Protoparmelia badia (Hoffm.) Hafellner ap
Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D. Hawksw. st
Pseudephebe pubescens (L.) M. Choisy st
Psoroma hypnorum (Vahl) Gray ap
Rhagadostoma lichenicola (De Not.) Keissl. (on *Solorina crocea*). pe
Rhizocarpon badioatrum (Flörke ex Spreng.) Th. Fr. ap
Rhizocarpon copelandii (Körb.) Fr. ap
Rhizocarpon geographicum (L.) DC. ap
Rhizocarpon grande (Flörke) Arnold ap
Rhizocarpon inarense (Vain.) Vain. ap
Rhizocarpon obscuratum (Ach.) A. Massal. ap
Rhizocarpon praebadium (Nyl.) Zahlbr. ap
Rhizocarpon rittokense (Hellb.) Th. Fr. ap
Rinodina cacuminum (Th. Fr.) Malme ap
Solorina crocea (L.) Ach. ap 685
Sphaerophorus fragilis (L.) Pers. ap
Sphaerophorus globosus (Huds.) Vain. ap 704
Sporastatia testudinea (Ach.) A. Massal. ap
Stereocaulon alpinum Laurer st 705
Stereocaulon arcticum Lynge st
Stereocaulon arenarium (Savicz) I. M. Lamb st
Stereocaulon paschale (L.) Hoffm. st 695
Stereocaulon rivulorum H. Magn. st
Stereocaulon vesuvianum Pers. st
Tephromela aglaea (Sommerf.) Hertel & Rambold ap
Tephromela armeniaca (DC.) Hertel & Rambold ap
Thamnolia subuliformis (Ehrh.) Culb.
Tremolecia atrata (Ach.) Hertel ap
Umbilicaria arctica (Ach.) Nyl. ap
Umbilicaria cinereorufescens (Schaer.) Frey st
Umbilicaria deusta (L.) Baumg. st
Umbilicaria havaasii Llano st
Umbilicaria hyperborea (Ach.) Hoffm. ap 707
Umbilicaria polyphylla (L.) Baumg. st 680
Umbilicaria proboscidea (L.) Schrad. ap
Umbilicaria torrefacta (Lightf.) Schrad. ap
Umbilicaria vellea (L.) Hoffm. st
Umbilicaria virginis Schaer. ap
Verrucaria maura Wahlenb. ap
Xanthoparmelia conspersa (Ach.) Hale st
Xanthoria borealis R. Sant. & Poelt ap 708
Xanthoria elegans (Link) Th. Fr. ap

Floristic observations of particular interest

Lichens were collected in the following types of plant communities around Isortoq: willow copses, mixed dwarf shrub heaths, lichen heaths, fell-fields, snow patches and epilithic lichen communities on granite and dolerite, respectively. In the following some selected floristic observations are briefly described:

Frutedella caesioatra grows on *Andreaea* and other mosses together with, for example, *Caloplaca nivalis*. It is an occasional member of a characteristic community associated with moist, vertical rock faces with more or less distinct limonite crusts (Hansen 1999). The species, which was found growing on granite rocks near the reindeer station, occurs scattered in South West and Central West Greenland (Branth & Grønlund 1888; Lynge 1937; Hansen 2000a). It is very rare in East Greenland (Lynge 1932, 1940).

Mycoblastus alpinus (Exs. No. 706) occurs on dead mosses and other plant remains in a fell-field community with, for example, *Flavocetraria nivalis* and *Sphaerophorus globosus* just west of the station. It has previously been reported from a few localities in South West and Central West Greenland (Lynge 1937). Contrary to *Mycoblastus sanguinarius*, *M. alpinus* lacks the red pigment, rhodocladonic acid (Thomson 1997).

Pertusaria carneopallida was found growing on a twig of *Betula glandulosa* in a dwarf shrub heath close to the station. Here it is associated with *Cetraria sepincola* and *Parmeliopsis hyperopta*. Skytte Christiansen and Hansen (2000) previously collected the species on bark of *Alnus*, which is its most important substrate in South West Greenland. In addition Alstrup (1982) reports it from *Betula pubescens* and *Sorbus groenlandica*. The present finds of *Frutidella caesioatra*, *Mycoblastus alpinus* and *Pertusaria carneopallida* are so far the southernmost in Greenland.

Estimation of the degrees of reindeer grazing on lichens in the Isortoq area

The lichen cover in the following three types of plant communities near the Isortoq Reindeer Station (Area I, Fig. 2) has been grazed by reindeer:

1. Lichen heaths dominated by *Cladonia stellaris*, *C. mitis* and *C. stygia* (2 plots). – Such heath patches occur in a few places near the station, for example, on the top of a ridge just west of the station. *Cladonia mitis* and *Flavocetraria nivalis* occur rather abundantly in these heaths, while species such as *Cetraria islandica*, *Flavocetraria cucullata*, *Alectoria ochroleuca* and *Cladonia amaurocraea* cover small areas, only. *Cladonia stellaris* and *C. mitis* show the greatest damages (although partly regenerating podetia of *C. stellaris* are sometimes seen), and these two species accordingly have been preferred by the grazing reindeer (Fig. 3). The lichens cover up to more than 90 % of the area, and the max. height of the lichens varies from 3 to 4 cm. Different dwarf shrub species, for example, *Betula glandulosa* and *Vaccinium uliginosum*, form the remaining part of the plots. The lichen heaths are estimated to be slightly to moderately grazed by reindeer, respectively.
2. Mixed dwarf shrub heaths composed by *Betula glandulosa*, *Empetrum hermaphroditum*, *Vaccinium uliginosum* and *Salix glauca* (3 plots). – *Stereocaulon alpinum* and *S. paschale* are often the dominant lichens in these heaths, but species such as, for example, *Cladonia mitis*, *C. stygia* and *Flavocetraria nivalis* are of great importance, too. The lichen cover in the 3 plots is slightly grazed, only.
3. Willow copses (2 plots). – Openings in *Salix glauca*-scrubs are often covered by lichens such as *Cladonia mitis*, *C. stygia*, *Stereocaulon paschale*, *Cetraria islandica* and *Nephroma arcticum*. The lichen cover is grazed to a small extent in one plot (the reindeer apparently avoid *Nephroma arcticum*), but an open copse with *Cetraria islandica* appears to have been heavily grazed and/or trampled by reindeer. Most thalli of *Cetraria islandica* were very loosely attached to the ground, and the area apparently was strongly disturbed.

Two plant communities, viz. snow patches dominated by *Salix herbacea* and rich in lichens such as *Cladonia mitis*, *C. stygia*, *C. ecmocyna*, *C. bellidiflora* and *Peltigera malacea* (1 plot), and fell-fields dominated by, for example, *Platismatia glauca* and *Alectoria sarmentosa* ssp. *vexillifera* (1 plot), probably also have been grazed by reindeer, but grazing of, in particular, fell-field vegetation is very difficult to estimate, because strong winds often influence and disturb the lichens to a considerable extent.

The lichen cover has been grazed by reindeer in the following plant communities in area II and III (Fig. 2), respectively:

1. Lichen heaths dominated by *Cladonia mitis* and *C. stygia* (3 plots). – The vegetation is also composed by species such as *Flavocetraria nivalis*, *Cetraria islandica*, *Cladonia gracilis* and *C. bellidiflora*. The lichen cover varies from 40 to 60 % of the plots. Dwarf shrub species such as *Betula glandulosa*, *Empetrum hermaphroditum* and *Vaccinium uliginosum* compose the remaining part of the plots. The max. height of the lichens is 6 cm. Two plots have been moderately grazed, and one slightly grazed.
2. Mixed dwarf shrub heaths (7 plots). – Species such as *Betula glandulosa*, *Empetrum hermaphroditum*, *Vaccinium uliginosum*, *Salix glauca* and *Juniperus communis* are of great importance in these heaths, which also contains the following lichens: *Stereocaulon paschale*, *Flavocetraria nivalis*, *Cladonia mitis* and *C. stygia*. The lichen cover varies from 3 to 30 % of the area, and the max. height of the lichens is 5 cm. Five plots have been moderately grazed, and one has been slightly grazed.
3. Willow copses (5 plots). – The bottom layer in the scrubs formed by *Salix glauca* is composed by different dwarf shrubs, mosses, grasses and lichens, for example, *Cladonia stygia*, *C. mitis* and *Flavocetraria nivalis*. The lichen cover varies from 5 to 30 % of the area, and the max. height of the lichens is 4 cm. Four plots have been moderately grazed, and one has been heavily grazed.
4. *Carex bigelowii-Salix herbacea* snow patch (1 plot). – *Cetraria islandica* covers 2 % of the plot. Its max. height is 1 cm. The plot has been slightly grazed.
5. A fen dominated by *Eriophorum angustifolium* appears to have been slightly grazed. However, no lichens occur in this plot.

Fig. 3. Slightly grazed lichen heath dominated by *Cladonia stellaris*, *C. mitis* and *C. stygia*.

CONCLUSION

Most of the investigated plots in Isortoq area appear to have been moderately grazed by reindeer. Somewhat fewer have been slightly grazed, and only one or two plots have been heavily grazed. Evidently a large winter herd may easily overgraze the lichens in the Isortoq area. Monitoring of grazing and range conditions, therefore, will be continued.

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Synopsis of the species of the family Lyophyllaceae (Tricholomatales) in Nordic countries

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Abstract: A checklist of 25 definite species from seven genera of the family Lyophyllaceae (Tricholomatales) in Nordic countries with distribution data is presented.

Kokkuvõte: K. Kalamees. Kobarheinikuliste sugukonna (Lyophyllaceae, Tricholomatales) Põhjamaade liikide konspekt.

Esitatakse kriitiline nimestik koos levikuandmetega kobarheinikuliste sugukonna 7 perekonna 25 liigi esinemise kohta Põhjamaades.

INTRODUCTION

In this synopsis, 25 definite species from seven genera of the family Lyophyllaceae in Denmark (DEN), Iceland (ICE), Norway (NOR), Sweden (SWE) and Finland (FIN) are presented. The genus *Tephrocybe* Donk is not treated in this study. Abbreviations used for biogeographic provinces of Nordic countries are given according to Hansen & Knudsen (1992).

The survey is based on fungus specimens studied critically by the author in herbaria C (Copenhagen), TAA (Tartu), H (Helsinki), JOE (Joensuu), OULU (Oulu), TUR, TURA (Turku), O(Oslo), TRH (Trondheim), UPS (Uppsala), S (Stockholm), LE (St Petersburg) (in the text below denoted by an exclamation mark,!), and on literature data by Gulden (1992, 1993). *Lyophyllum crassifolium* s. Lange, 1935, recorded in Denmark only (cf. Gulden, 1992) is an insufficiently studied species and needs further revision.

LIST OF SPECIES

LYOPHYLLUM P. Karst. (s.str.)

Lyophyllum infumatum (Bres.) Kühner, Bull. Mens. Soc. Linn. Lyon 7: 211. 1938. – Syn.: *L. deliberatum* s. Gulden, 1992. On the ground in forests from temperate to boreal zones, Aug–Sep, rare. – DEN, NOR, SWE (Bl, Gstr, Upl)!, FIN (EH, U)!

Lyophyllum macrosporum Singer, Ann. Mycol. 41: 99. 1943. – On the ground in coniferous and mixed forests in hemiboreal zone, Sep, very rare. – NOR (STr)!, SWE (Upl)!, FIN (A)!

Lyophyllum leucophaeatum (P. Karst.) P. Karst., Acta Soc. Fauna Fl. Fennica 2 (1): 3. 1881. – Syn.: *L. gangraenosum* (Fr.) Gulden, 1991; *L. fumatofoetens* (Secr.) Jul. Schäff., 1947, inval. On the ground in forests from temperate to boreal zones, July–Nov, rare to common. – DEN, NOR, SWE (Mpd, Upl)!, FIN (A, EH, EK, KP, PK, U, VS)!

Lyophyllum semitale (Fr.: Fr.) Kühner, Bull. Mens. Soc. Linn. Lyon 7: 211. 1938. – On the ground in coniferous forests from temperate to boreal zones, Sep–Oct, rare. – NOR, SWE (Srm, Mpd, Upl)!, FIN (EH, PK, St, V)!

Lyophyllum transforme (Britzelm.) Singer, Ann. Mycol. 41: 98. 1943. – Syn.: *L. trigonosporum* (Bres.) Kühner, 1938. On the ground in forests from temperate to boreal zones, Aug, rare. – DEN, NOR (Busk), SWE, FIN (EH)!

Lyophyllum conocephalum (P. Karst.) Clémencon, Sydowia 34: 46. 1981. – Syn.: *Collybia conocephala* P. Karst., 1889. In coniferous forests in boreal zone, Sep, very rare (only 1 locality). – FIN (EH)! Recollected in Switzerland in 1977 (cf. Clémencon, 1981).

Lyophyllum connatum (Schumach.: Fr.) Singer, Schweiz. Z. Pilzk. 17: 54. 1939. – On the ground in parks, lawns, avenues, roadsides, gardens, ruderal places, forests, tundra from temperate to arctic/alpine zones, Aug–Oct, common to occasional. – DEN, ICE, NOR (Nordl, Østf, STr)!, SWE!, FIN (U)!

Lyophyllum decastes (Fr.: Fr.) Singer, Lilloa 22: 165. 1951. – On the ground in parks, lawns, avenues, brushwoods, ruderal places, forests from temperate to boreal zones, Aug–Oct, common to occasional. – DEN, NOR, SWE (Nrk)!, FIN (Ks, PeP, PK, U, V)!

Lyophyllum fumosum (Pers. s. Fr.: Fr.) P.D. Orton, Trans. Brit. Mycol. Soc. 43: 178. 1960. – On the ground, exceptionally on very decayed wood, from temperate to arctic/alpine zones, July–Oct, rare to common. – DEN, ICE, NOR (Finnm)!, SWE (Mdp)!, FIN (EH, EP, ES, InL, KP, Ks, PH, SoL, U)!

Lyophyllum loricatum (Fr.) Kühner, Bull. Mens. Soc. Linn. Lyon 7: 211.1938.– On the ground in parks, roadsides, verdures, deciduous forests in temperate and hemiboreal zones, Oct, rare. – DEN, SWE, FIN (U)!

HYPSIZYGUS Singer

Hypsizygus ulmarius (Bull.: Fr.) Redhead, Trans. mycol. Soc. Japan 25: 3. 1984. – Parasitically or saprotrophically on wood of deciduous trees from temperate to arctic/alpine zones, Aug–Nov, rare to occasional. – DEN, NOR (STr)!, SWE (Vg)!, FIN (EH, InL, Kn, Ks, PK, St, SoL, U, V)!

GERHARDTIA Bon

Gerhardtia borealis (Fr.) Contu & A. Ortega, Bol. Soc. Micol. Madrid 26: 176. 2002. – Syn.: *G. incarnatobrunnea* (Ew. Gerhardt) Bon, 1994; *Calocybe civilis* (Fr.) Gulden, 1993. On the ground in coniferous forests, Sep, rare. – NOR (Akh, Busk), SWE (Sm), FIN (EH)!

CALOCYBE Kühner ex Donk (s. str.)

Calocybe gambosa (Fr.: Fr.) Singer ex Donk, Beih. Nova Hedwigia 5: 43. 1962. – Syn.: *C. georgii* (L.) Kühner ex Kalamees, 1994, nom. superf.; *Tricholoma graveolens* (Pers. s. Fr.: Fr.) P. Kumm., 1871. On the ground, often in fairy rings, in grasslands, meadows, pastures, hayfields, lawns, parks, gardens, deciduous forests from temperate to boreal zones, vernal (May–June), occasionally autumnal (Sep), common to rare. – DEN, NOR, SWE (Uppl)!, FIN.

Calocybe favrei (R. Haller Aar. & R. Haller Suhr) Bon – Syn.: *Lyophyllum favrei* R. Haller Aar. & R. Haller Suhr, Schweiz. Z. Pilzk. 28 (4): 52. 1950. On the ground in deciduous forests in hemiboreal zone, Sep, very rare (only 1 locality). – FIN (V)!

TRICHOLOMELLA Zerova ex Kalamees

Tricholomella constrictum (Fr.) Zerova ex Kalamees, Persoonia 14 (4): 446. 1992. – Syn.: *T. leucocephalum* (Fr.) Zerova, 1974, inval. On the ground in manured lawns, parks and pastures from temperate to boreal zones, July–Nov, rare. – DEN, NOR (Østf, Akh, Vestf), SWE (Mpd, Sm, Srm, Upl)!, FIN (EH, ES, U, V)!

RUGOSOMYCES Raithelh.

Rugosomyces chrysenteron (Bull.: Fr.) Bon, Doc. Mycol. 21 (82): 65. 1991. – Syn.: *Calocybe cerina* s. auct. eur. mult. p.p. On the ground, seldom on very decayed wood in forests from temperate to boreal zones, Aug–Oct, rare. – DEN!, NOR (Akh), SWE (Upl)!, FIN (PS)!

Rugosomyces fallax (Peck ex Sacc.) Bon, Doc. Mycol. 21 (82): 65. 1991. – Syn.: *Calocybe naucoria* (Murrill) Singer, 1962; *C. cerina* s. auct. eur. mult. p.p. On the ground, seldom on very decayed wood in forests and tundra from temperate to arctic/alpine zones, Aug–Nov, rare to common. – DEN, ICE, NOR!, SWE (Mpd, Sm, Upl, Vsm)!, FIN (EH, InL, Kn, KP, KiL, Ks, OP, PH, PK, PS, SoL, V)!

Rugosomyces obscuratus (P. Karst.) Kalamees, Doc. Mycol. 25 (98-100): 235. 1995. – Syn.: *Tricholoma cerinum* subsp. *obscuratum* P. Karst., 1879. On the ground in coniferous and mixed forests in boreal zone, Aug–Nov, very rare (only in type locality in Mustiala, Finland). – FIN (EH)!

Rugosomyces onychinus (Fr.) Raithelh., Metrodiana 9 (2): 47. 1980. – On the ground in coniferous forests in hemiboreal and boreal zones, Aug–Sep, rare. – NOR (Busk), SWE (Mpd)!, FIN (KiL, PeP, PS)!

Rugosomyces carneus (Bull.: Fr.) Bon, Doc. Mycol. 21 (82): 66. 1991. – On the ground in open grasslands, lawns, tundra from temperate to arctic/alpine zones, July–Sep, rare to common. – DEN, ICE, NOR (M&R)!, SWE (Upl)!, FIN (EH, OP)!

Rugosomyces ionides (Bull.: Fr.) Bon, Doc. Mycol. 21 (82): 66. 1991. – On the ground in forests in temperate and hemiboreal zones, Aug, rare. – DEN, SWE, FIN (U)!

RUGOSOMYCES OBSCURISSIMUS (A. Pearson) Bon, Doc. Mycol. 21 (82): 66. 1991. – On the ground in temperate and arctic/alpine zones, Aug–Sep, very rare. – DEN (Sj)!, FIN (InL)!

RUGOSOMYCES PERSICOLOR (Fr.) Bon, Doc. Mycol. 21 (82): 66. 1991. – Syn.: *Calocybe carnea* s. auct. mult. eur. p.p. On the ground in coniferous and mixed forests, grasslands, lawns, parks from hemiboreal to arctic/alpine zones, July–Nov, rather common. – DEN, NOR (Finnm)!, SWE (Dlr, Gtl, Gstr, Sm, Upl, Vg, Vsm)!, FIN (EH, EP, OP, PeP, PH, PS, St, U, V)!

ASTEROPHORA Ditmar ex Link: Fr.

ASTEROPHORA LYCOPERDOIDES (Bull.) Ditmar: Fr., Syst. Mycol. 3: 206. 1829. – Parasitically on basidiocarps of *Russulales* (*Russula, Lactarius*) from temperate to boreal zones, July–Sep, occasional to rare. – DEN, NOR, SWE (Upl)!, FIN (EH, EK, ES, LK, St, U, V)!

ASTEROPHORA PARASITICA (Pers.: Fr.) Singer, Lilloa 22: 171. 1951. – Parasitically on basidiocarps of *Russulales* (*Russula, Lactarius*) in temperate and hemiboreal zones, Aug–Oct, rare to occasional. – DEN, NOR (M&R)!, SWE (Gtl, Vg)!, FIN (A, V, U)!

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Composition and substrata of forest lichens in Estonia: a meta-analysis

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Abstract: Species richness, composition and substratum use of "forest lichens" in Estonia were studied by re-analysing published and unpublished reports (incl. 13 quantitative studies). A total of 481 species of lichenised, lichenicolous and systematically allied fungi were confirmed; their probable number reached 599 species (195 macrolichens, and 404 microlichens and lichenicolous fungi). The eight most frequent species were present in all but 1–2 studies, whereas 47% of species occurred in only 1–2 studies. Calicioid, cetrarioid, cladonioid, parmelioid, pendulous, sorediate crustose and lichenicolous and parasitic species totalled nearly half (46 %) the lichen species in Estonian forests. The highest number of unique species has been recorded on living trees, but different substrata have not been equally researched. Ground and coarse woody debris (e.g., snags with exposed wood) were found to be inhabited by a relatively high number of species. According to species composition, there were five distinct substratum groups for the Estonian "forest lichens" – broad-leaved trees, common deciduous and coniferous trees, branches and undergrowth, windthrows, and other ground-level substrata. Gaps in knowledge and directions for future research are discussed.

Kokkuvõte: Metsasamblike kooseis ja kasvupinnad Eestis: meta-analüüs.

Avaldatud ja avaldamata andmete põhjal (s.h. 13 kvantitatiivset uurimust) analüüsiti Eesti metsade samblike liigilist koosseisu ja kasvupindade kasutust. Tehti kindlaks 481 sambliku-, lihhenikoolse- ja süstemaatiliselt neile lähedaste seeneliigi esinemine, kuid tõenäoline arv võib küündida 599 liigini (nendest 195 suursamblikku ja 404 pisisamblikku ning lihhenikoolset seent). Kõige sagedasemad kaheksa liiki puudusid ühes-kahes töös, seevastu 47% liikidest esines vaid ühes või kahes uurimuses. Eestis esinevatest metsasasamblikest moodustavad ligi poole (46%) jalgsambliku-, käokõrva-, porosambliku- ja lapiksamblikulaadsed, rippuva tallusega suursamblikud, sorediоossed kooriksamblikud ning lihhenikoolsed seened. Suurim unikaalsete liikide arv registreeriti elusatel puudel, kuid kasvupindade uurituse tase on väga erinev. Üsna suur hulk liike kasvab ka maapinnal ja jämedamõõtmelistel surnud puudel (nt. tüügaspuudel). Samblike liigilise koosseisu põhjal eristus viis kasvupinna rühma: laialehised puud, tavalised leht- ja okaspuud, oksad ja põõsad, tuuleheited ning maapinna tasemel olevad kasvupinnad. Artiklis arutletakse ka teadmiste puudujääkide ning edasiste uurimissuundade üle.

INTRODUCTION

Forests cover a large part of Estonian territory (in upper Holocene about 85%, currently 51.5%; Laasimer 1965, Kohava 2001) and probably host more than 20 000 multi-cellular species (Lõhmus et al. 2003). Deforestation in Estonia has increased significantly during the last decade, which underscores the need for preservation of biodiversity. This requires knowledge of species composition and habitat, which is lacking with respect to lichens in Estonia. Knowledge of lichens could also be integrated in forest management (e.g. Kuusinen & Siitonen 1998, Hazell & Gustafsson 1999, Lõhmus & Lõhmus 2001, Hilmo & Såstad 2001) and designation of protected areas (Andersson et al. 2003).

Although Estonian lichen flora is well-documented (Randlane & Saag 1999, Randlane et al. 2003), species richness, composition and substratum habitat in forests remains ambiguous. Before the late 1980s, only a few case studies had been published, notably the monograph by Sõmermaa (1972) on the ecology of epiphytic forest lichens in principal Estonian forest types. Nilson (1993) has monitored a pine forest of the island of Vilsandi since 1981. More intensive investigations began in the 1990s under the auspices of large conservation-aimed projects, such as the Estonian Forest Conservation Areas Network (Lõhmus & Suija 1998, Jüriado et al. 2003), Forest Ecological Monitoring in the Baltic Countries (Martin & Martin 1998, 2000), management planning and research in nature reserves (Lõhmus 1997, Suija 1997, Lõhmus & Lõhmus 2001), and Estonian Science Foundation grants (Trass 1999, Trass et al. 1999). In addition to forest studies, Sander (1984, 1999) conducted comprehensive investigations of lichens in rural parks.

Although some species have been overlooked in earlier studies, the existing data are suitable for general characterisation of "forest lichen" flora in Estonia. In this study, I pooled material from previous studies and the herbarium of TU to 1) estimate the species richness of forest lichens in Estonia, 2) analyse species composition, frequency and substratum use, and 3) discuss the gaps in knowledge and directions of future research.

MATERIAL AND METHODS

This study concerned lichenised fungi (true lichens), fungi that are systematically related to lichens, and lichenicolous fungi, which inhabit or can possibly inhabit forests. These fungi were collectively designated "forest lichens" and identified with the species nomenclature of Randlane et al. (2003). Forests are vegetation unions with trees as edificator species (Masing 1992). Clear cuts and open burnt areas on forestland were disregarded.

The material was collected from published and unpublished reports (mainly dissertations and reports in the library of TU), including — whenever possible — raw data. In general, only studies with validated forest data were considered. For the species list, studies of rural parks and wooded-meadows were also partly included (see below), because these habitats could be refugia for lichens that historically inhabited old boreo-nemoral forests. Such forests are now rare and threatened in Estonia (Paal 1998). Of the 24 studies considered, quantitative data were available from 13 studies (Table 1). The study areas are located throughout mainland Estonia, although fewer investigations concern forests in western Estonia and on the islands (Fig. 1).

To estimate species richness and composition of "forest lichens", species lists were compiled in three steps. First, all species were listed from selected studies during 1969–2000 (Table 1, categories A and B). Second, a list was compiled of all other epiphytic, epixylic, epigeic and epilithic species found in Estonia according to Randlane and Saag (1999) and Randlane et al. (2003). Collection details of these species were verified from TU or original literature sources, and species with at least one recorded forest occurrence were added to the list of certifiable "forest lichens". Finally, species found in rural parks and wooded meadows, and other remaining species likely to inhabit bark, wood or ground in forests were included on a list of probable "forest lichens". The third step was undertaken mainly because investigations of

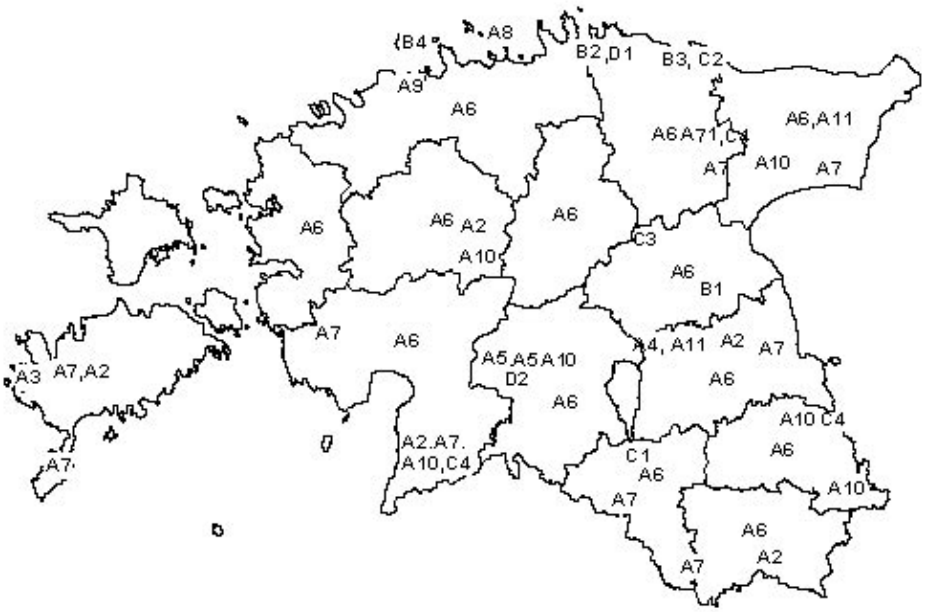

Fig. 1. Areas of forest lichen studies in Estonia. See Table 1 for abbreviations.

Table 1. Lichen studies in Estonian forests, parks and wooded meadows. Studies A1, A6, A11 and B4 treat only macrolichens. Abbreviations: * – raw data available for this analysis, 'all' – all natural substrata, L – living tree, S – snag, G – ground.

Code	Reference	Included lists		Sub-strata
		no.	description	
A. Quantitative studies in forests				
A1	Soe 1969	12	plots in two types of heath forest	G
A2*	Sõmermaa 1972	26	4 tree species of 2 age classes[1] in 7 forest types	L
A3	Nilson 1993	1	one permanent plot in a pine forest	L
A4*	Lõhmus 1997	38	representative forest stands of the reserve	all
A5*	Suija 1997	14	representative forest stands of the reserve	all
A6	Martin & Martin 1998	14	14 tree species in 116 random forest plots	L
A7*	Lõhmus & Suija 1998	55	pre-selected natural forest stands	all
A7*	Jüriado et al. 2003	100	pre-selected natural forest stands	all
A8	Nilson & Piin 1998	3	different forested islands	L
A9*	Lõhmus 1999	4	representative forest stands of the reserve	all
A10*	Trass 1999	15	old-growth and managed forest stands	L
A11	Martin & Martin 2000	29	29 random forest plots	L
A12*	Lõhmus & Lõhmus 2001, Lõhmus et al. 2003	12	4 tree species × 3 tree types in random forest plots	LS
B. Species lists from forests				
B1	Sõmermaa 1979	1	A permanent plot in a spruce forest	L
B2	Sander 1984	1	representative forest stands of the reserve	all
B3	Martin & Nilson 1992	13	plots in pine forests	L
B4	Martin 1999	14	two tree species in permanent forest plot	L
C. Quantitative studies in forests, but no data available for re-analysis				
C1	Senkevitsh 1994		pines in three permanent plots	L
C2	Nilson 1995		pines in forest stand	L
C3	Tääkre 1989		four tree species	L
C4	Trass et al. 1999		preselected natural stands	all
D. Studies in parks and wooded meadows				
D1	Sander 1984	1	representative park stands of the reserve	L
D2*	Suija 1997	1	trees in Tõramaa wooded meadow	L
D3	Sander 1999		random broad-leaved trees in countryside parks	L

[1] Original five age classes were pooled into two (old and young) age classes.

some forest types (e.g., boreo-nemoral forests) have been inadequate and because habitat is often unaddressed in the publications or the herbarium material.

Frequency estimation of Estonian lichens has been based previously on the number of localities, divided into six frequency classes (Randlane & Saag 1999). In this study, three quantitative characteristics were calculated for each species to distinguish between distribution and local abundance, and to obtain a continuous scale of frequency: (1) the number of studies in which a species was identified (max. 17 for macro- and 13 for microlichens); (2) the average abundance and (3) the maximum frequency among the species lists in the studies (only studies with more than ten species lists were included, totalling 12 studies for macro- and 8 for microlichens).

Substratum data were collected from all lichen studies (categories A and B, except B2; see Table 1). Ward's method of cluster analysis (Statistica 6.0 software) was used to group substrata according to species composition. For the cluster analysis, only substrata with more than 40 observations (and additionally, the species-poor windfalls having 15 observations) were considered.

Table 2. True lichens, lichenicolous fungi (#) and non-lichenized fungi (+) species recorded in Estonian forests (macrolichens in bold), the number of studies where they occurred (max. 17 for macro- and 13 for microlichens), and frequency (%) among species lists. The species extinct or probably extinct in Estonia are marked with an asterisk (*).

Abbreviations. Frequency classes in Estonia following Randlane & Saag (1999): rr – very rare (1–2 localities in Estonia), r– rare (3–5), st r – rather rare (6–10) st fq – rather frequent (11–20), fq – frequent (21–50), fqq – very frequent (51 or more localities). Ecological groups: CAL – calicioid lichens and fungi, CYA – cyanobacterial macrolichens, LICH – lichenicolous or parasitic lichens and fungi, SOR – sorediate, crustose lichens. Morphological groups: CET – cetrarioid lichens, CLA – cladonioid lichens, LECI – lecideoid lichens, PAR – parmelioid macrolichens, PEN – pendulous lichens, PHY – physcioid macrolichens.

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
1	#	Abrothallus bertianus				rr	LICH
2	#	Abrothallus peyritschii				r	LICH
3	#	Abrothallus prodiens				rr	LICH
4		Absconditella lignicola				rr	
5		Acrocordia cavata	2	1.0	6.0	st fq	
6		Acrocordia gemmata	4	2.4	10.0	fq	
7		**Alectoria sarmentosa**	2	0.9	7.1	r	PEN
8		Amandinea punctata	4	1.7	11.5	fq	
9		**Anaptychia ciliaris**	7	11.6	40.0	fqq	PHY
10		Anisomeridium biforme	1	0.5	3.8	rr	
11		Anisomeridium polypori				rr	
12		Arthonia apatetica	1	0.1	1.0	r	
13		Arthonia byssacea	3	1.5	5.3	st r	
14		Arthonia didyma	1	0.3	2.0	r	
15		Arthonia dispersa				r	
16		Arthonia incarnata	1	0.5	3.8	rr	
17		Arthonia leucopellaea	5	17.8	50.0	fqq	
18		Arthonia mediella	3	3.3	15.4	st fq	
19		Arthonia punctiformis	1	4.2	33.3	st r	
20		Arthonia radiata	6	5.3	12.7	fq	
21		Arthonia spadicea	3	9.5	57.7	fq	
22		Arthonia vinosa	4	2.9	16.7	fq	
23		Arthopyrenia grisea				rr	
24		Arthopyrenia punctiformis				st r	
		Arthopyrenia sp.	1	0.5	4.0		
25		Arthothelium ruanum	3	2.9	11.0	fq	
26		Arthothelium scandinavicum	1	1.4	11.5	st r	
27		Arthothelium spectabile	1	1.0	7.7	rr	
28	#	Athelia arachnoidea				fq	LICH
29		Bacidia arceutina	3	3.4	17.0	fq	
30		Bacidia bagliettoana	1	0.1	1.0	st fq	
31		Bacidia beckhausii	1	0.4	3.0	st fq	
32		Bacidia biatorina	1	0.3	2.0	rr	
33		Bacidia fraxinea	5	6.9	22.0	fqq	
34		Bacidia globulosa	2	1.1	5.0	st fq	
35		Bacidia incompta	1	0.3	2.0	r	
36		Bacidia laurocerasi	2	0.9	5.0	st r	
37		Bacidia polychroa	3	2.2	8.0	st fq	
38		Bacidia rubella	4	6.5	33.3	fq	
39		Bacidia subincompta	2	2.0	12.0	st fq	
40		Bacidina arnoldiana	1	0.1	1.0	r	
41		Bacidina phacodes	2	0.6	3.8	st r	

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
42		Bactrospora dryina				rr	
43		**Baeomyces carneus**				r	
44		**Baeomyces rufus**				fq	
45		Biatora chrysantha	1	0.1	1.0	rr	LECI/SOR
46		Biatora efflorescens	4	10.2	33.3	fq	LECI
47		Biatora helvola	5	11.5	38.5	fq	LECI
48		Biatora ocelliformis	2	2.0	9.1	st fq	LECI
49		Biatora vernalis	1	0.5	3.8	st r	LECI
50		Biatoridium monasteriense	1	0.1	1.0	rr	
51	#	Biatoropsis usnearum				st r	LICH
52		**Bryoria capillaris**	10	15.6	53.3	fqq	PEN
53		**Bryoria chalybeiformis**	1			r	PEN
54		**Bryoria furcellata**	3	3.3	21.4	rr	
55		**Bryoria fuscescens**	13	17.8	60.0	fqq	PEN
56		**Bryoria implexa**	3	0.3	3.4	st fq	PEN
57		**Bryoria intricans**				st r	PEN
58		**Bryoria nadvornikiana**	8	5.2	21.4	st fq	PEN
59		**Bryoria subcana**	4	2.0	14.3	st fq	PEN
60		Buellia arnoldii	1	0.3	2.6	st r	
61		Buellia disciformis	8	12.3	33.3	fqq	
62		Buellia erubescens	3	2.1	9.1	st fq	
63		Buellia griseovirens	5	12.7	34.0	fqq	SOR
64		Buellia schaereri	3	1.9	15.4	st r	
65		Calicium abietinum	7	17.3	50.0	fqq	CAL
66		Calicium adspersum	3	1.8	11.5	st r	CAL
67		Calicium glaucellum	5	14.2	41.7	fqq	CAL
68		Calicium parvum	3	3.2	16.7	st fq	CAL
69		Calicium pinastri				rr	CAL
70		Calicium quercinum	2	1.5	6.7	st fq	CAL
71		Calicium salicinum	7	5.4	12.7	fq	CAL
72		Calicium trabinellum	5	5.1	16.7	fq	CAL
73		Calicium viride	9	13.5	60.0	fqq	CAL
74		Caloplaca cerina	5	1.9	6.7	fqq	
75		Caloplaca ferruginea	1			r	
76		Caloplaca flavorubescens	6	14.7	28.9	fqq	
77		Caloplaca holocarpa	5	9.2	46.2	fq	
78		Caloplaca lucifuga				rr	
79		**Candelaria concolor**	1	1.1	13.3	fqq	
80		Candelariella aurella	2	0.5	2.6	fq	
81	#	Candelariella superdistans				rr	LICH
82		Candelariella vitellina	1	0.6	5.0	fq	
83		Candelariella xanthostigma	2	0.8	3.6	fq	
84		Catillaria nigroclavata	2	0.5	3.8	st r	
85		Catinaria atropurpurea	1	0.5	3.8	rr	
86		**Cetraria aculeata**	2	0.4	2.6	fqq	CET
87		**Cetraria ericetorum**	2	0.2	1.8	fqq	CET
88		**Cetraria islandica**	5	8.4	75.0	fqq	CET
89		**Cetraria muricata**				st fq	CET
90		**Cetraria sepincola**	11	6.9	21.4	fqq	CET
91		**Cetrelia cetrarioides**	1	0.1	1.0	r	CET
92		**Cetrelia olivetorum**				rr	CET
93		Chaenotheca brachypoda	4	9.5	25.0	fq	CAL
94		Chaenotheca brunneola	5	8.1	25.0	fq	CAL
95		Chaenotheca chlorella	4	8.7	41.7	fq	CAL

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
96		Chaenotheca chrysocephala	9	52.0	83.3	fqq	CAL
97		Chaenotheca cinerea	1	0.3	2.6	rr	CAL
98		Chaenotheca ferruginea	12	45.4	91.7	fqq	CAL
99		Chaenotheca furfuracea	6	19.7	40.0	fqq	CAL
100		Chaenotheca gracillima	2	0.6	2.6	r	CAL
101		Chaenotheca hispidula	1	1.0	8.3	r	CAL
102		Chaenotheca laevigata	1	0.3	2.6	r	CAL
103		Chaenotheca phaeocephala				fq	CAL
104		Chaenotheca stemonea	5	14.0	75.0	fq	CAL
105		Chaenotheca subroscida	1	1.0	8.3	st fq	CAL
106		Chaenotheca trichialis	7	20.6	75.0	fqq	CAL
107		Chaenotheca xyloxena	4	11.0	41.7	fqq	CAL
108	#	Chaenothecopsis consociata	4	2.9	8.3	st fq	CAL
109	+	Chaenothecopsis debilis				rr	CAL
110	#	Chaenothecopsis epithallina	2	1.3	8.3	r	CAL
111	+	Chaenothecopsis haematopus	2	2.2	16.7	r	CAL
112	#	Chaenothecopsis hospitans	1	0.3	2.6	rr	CAL
113	+	Chaenothecopsis nana	1	0.3	2.6	r	CAL
114	+	Chaenothecopsis pusilla	5	10.0	41.7	fq	CAL
115	+	Chaenothecopsis pusiola	3	4.6	33.3	st fq	CAL
116	+	Chaenothecopsis rubescens	2	0.6	2.6	r	CAL
117	+	Chaenothecopsis savonica	3	5.1	33.3	fq	CAL
118	#	Chaenothecopsis subparoica				rr	CAL
119	#	Chaenothecopsis vainioana	1	0.2	1.8	r	CAL
120		Chrysotrix candelaris	8	9.9	33.3	fq	SOR
121		Chrysotrix chrysophthalma				rr	SOR
122		**Cladina arbuscula**	5	8.0	66.7	fqq	CLA
123		**Cladina ciliata**	1	0.2	1.8	fq	CLA
124		**Cladina mitis**	4	3.6	25.0	fqq	CLA
125		**Cladina portentosa**				st fq	CLA
126		**Cladina rangiferina**	5	11.3	83.3	fqq	CLA
127		**Cladina stellaris**	5	8.9	66.7	fqq	CLA
128		**Cladina stygia**	2	1.7	18.4	fq	CLA
129		**Cladonia bacillaris**	3	0.4	5.3	fq	CLA
130		**Cladonia bacilliformis**	1	0.6	6.7	fq	CLA
131		**Cladonia borealis**				st fq	CLA
132		**Cladonia botrytes**	6	1.6	7.1	fqq	CLA
133		**Cladonia brevis**				rr	CLA
134	*	**Cladonia caespiticia**	1	0.6	6.7	rr	CLA
135		**Cladonia cariosa**	1	0.7	8.3	fqq	CLA
136		**Cladonia carneola**	1	0.6	6.7	st fq	CLA
137		**Cladonia cenotea**	10	18.4	42.1	fqq	CLA
138		**Cladonia cervicornis**	2	2.0	16.7	fq	CLA
139		**Cladonia chlorophaea**	8	11.1	73.1	fqq	CLA
140		**Cladonia coccifera**				st fq	CLA
141		**Cladonia coniocraea**	10	40.0	96.2	fqq	CLA
142		**Cladonia cornuta**	7	5.8	33.3	fqq	CLA
143		**Cladonia crispata**	4	3.6	33.3	fqq	CLA
144		**Cladonia cyanipes**				fq	CLA
145		**Cladonia deformis**	4	3.6	25.0	fqq	CLA
146		**Cladonia digitata**	10	36.3	100.0	fqq	CLA
147		**Cladonia fimbriata**	10	25.6	86.8	fqq	CLA
148		**Cladonia floerkeana**				fqq	CLA
149		**Cladonia foliacea**				st fq	CLA

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
150		**Cladonia furcata**	4	1.5	8.3	fqq	CLA
151		**Cladonia glauca**				fqq	CLA
152		**Cladonia gracilis**	4	4.1	33.3	fq	CLA
153		**Cladonia grayi**	1			rr	CLA
154		**Cladonia incrassata**	1	0.2	2.6	st r	CLA
155		**Cladonia macilenta**	4	1.8	8.3	fqq	CLA
156		**Cladonia macrophylla**				r	CLA
157		**Cladonia norvegica**				rr	CLA
158	*	**Cladonia novochlorophaea**				rr	CLA
159		**Cladonia ochrochlora**	3	0.4	3.6	fq	CLA
160		**Cladonia phyllophora**	1	0.1	1.0	fq	CLA
161		**Cladonia pleurota**	1	0.3	3.8	st r	CLA
162		**Cladonia polydactyla**				rr	CLA
163		**Cladonia pyxidata**	3	3.0	25.0	fqq	CLA
164		**Cladonia rangiformis**	1	0.2	1.8	fq	CLA
165		**Cladonia rei**	1			st r	CLA
166		**Cladonia scabriuscula**	1	0.7	8.3	st fq	CLA
167		**Cladonia squamosa**	2	2.7	25.0	fqq	CLA
168		**Cladonia subulata**	3	1.8	16.7	fqq	CLA
169		**Cladonia sulphurina**	4	1.5	13.3	fq	CLA
170		**Cladonia symphycarpa**	1	0.6	7.3	fq	CLA
171		**Cladonia turgida**				fq	CLA
172		**Cladonia uncialis**	4	2.3	16.7	fqq	CLA
173		Cliostomum corrugatum				r	
174		Cliostomum griffithii	4	1.2	7.7	st fq	
175		Cliostomum leprosum				st fq	
176	#	Clypeococcum hypocenomycis				rr	LICH
177		**Collema nigrescens**	1	0.1	1.0	rr	CYA
		Collema sp.	1	0.1	1.0		CYA
178		**Collema subnigrescens**	1	0.1	1.0	r	CYA
179	#	Corticifraga fuckelii				r	LICH
180		Cybebe gracilenta	1			r	CAL
181		Cyphelium inquinans				st r	CAL
182		Cyphelium lucidum	1			r	CAL
183	#	Dactylospora homoclinella				rr	LICH
184	#	Dactylospora lobariella				rr	LICH
185		Dermatocarpon luridum	1	0.1	1.0	rr	
186		Dibaeis baeomyces				st r	
187		Dimerella lutea	1	0.1	1.0	rr	
188		Dimerella pineti	3	2.5	8.3	fq	
189		Diploschistes muscorum				st fq	
190		Diplotomma alboatrum	1	0.8	6.7	st fq	
191		Diplotomma pharcidium	1	0.1	1.0	r	
192		Eopyrenula leucoplaca				rr	
193		**Evernia divaricata**	3	1.1	6.7	st fq	PEN
194		**Evernia mesomorpha**	3	1.1	6.7	st fq	
195		**Evernia prunastri**	15	41.8	73.1	fqq	
196		Fellhanera subtilis				rr	
197		**Flavoparmelia caperata**	1	0.2	1.8	r	PAR
198		Fuscidea arboricola	2	0.4	1.8	r	LECI/SOR
199		Fuscidea praeruptorum	1	1.0	8.3	rr	LECI/SOR
200		Fuscidea pusilla	4	7.4	41.7	st r	SOR
201		Graphis scripta	9	29.7	53.0	fqq	
202		Gyalecta flotowii				rr	

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
203		Gyalecta truncigena	2	0.5	2.0	st r	
204		Gyalecta ulmi				st fq	
205		Haematomma ochroleucum	5	5.2	16.7	st r	SOR
206	*	**Heterodermia speciosa**				rr	PHY
207		**Hypocenomyce anthracophila**	4	0.9	3.8	r	
208		**Hypocenomyce caradocensis**	2	0.4	3.0	st r	
209		**Hypocenomyce friesii**	5	5.2	25.0	st fq	
210		**Hypocenomyce scalaris**	12	20.5	57.1	fqq	
211		**Hypocenomyce sorophora**	3	9.7	58.3	fq	SOR
212		**Hypogymnia farinacea**	6	4.0	14.3	fq	
213		**Hypogymnia physodes**	17	83.6	100.0	fqq	
214		**Hypogymnia tubulosa**	12	26.4	50.0	fqq	
215		Icmadophila ericetorum				fq	
216	#	Illosporiopsis christiansenii				rr	LICH
217		**Imshaugia aleurites**	12	33.3	100.0	fqq	
218		Japewia subaurifera				rr	SOR
219	#	Laeviomyces pertusariicola				rr	LICH
220		Lecanactis abietina	8	16.6	47.0	fqq	
221		Lecania cyrtella	3	3.0	13.3	fq	
222		Lecania dubitans				rr	
223		Lecania fuscella	1	0.1	1.0	st r	
224		Lecania koerberiana				rr	
225		Lecania naegelii	2	0.6	3.6	fq	
226		Lecanora albella	6	11.0	50.0	fq	
227		Lecanora allophana	6	11.6	33.3	fqq	
228		Lecanora argentata	8	11.9	31.0	fqq	
229		Lecanora cadubriae	2	1.1	7.7	st r	
230		Lecanora carpinea	9	14.7	46.7	fqq	
231		Lecanora chlarotera	8	13.8	39.0	fqq	
232		Lecanora circumborealis	1			r	
233		Lecanora conizaeoides	1	2.1	16.7	st fq	SOR
234		Lecanora dispersa	1	6.7	53.8	fqq	
235		Lecanora expallens	9	25.2	69.2	fq	SOR
236		Lecanora hagenii	3	1.0	4.0	fqq	
237		Lecanora impudens				rr	SOR
238		Lecanora intumescens				st r	
239		Lecanora leptyrodes	5	1.7	5.5	fqq	
240		Lecanora muralis				fqq	
241		Lecanora norvegica	3	3.7	25.0	st fq	SOR
242		Lecanora phaeostigma	3	4.3	16.7	st fq	
243		Lecanora piniperda				rr	
244		Lecanora populicola	3	1.4	6.7	fq	
245		Lecanora pulicaris	11	38.1	83.3	fqq	
246		Lecanora rugosella	4	2.0	7.9	fqq	
247		Lecanora saligna	2	3.3	25.0	fq	
248		Lecanora sambuci	2	1.0	6.7	st fq	
249		Lecanora strobilina	1	0.2	1.8	st fq	
250		Lecanora symmicta	10	18.2	38.5	fqq	
251		Lecanora varia	7	4.5	13.3	fqq	
252		Lecidea botryosa				rr	LECI
253		Lecidea erythrophaea	1	0.8	6.0	st r	LECI
254		Lecidea nylanderi	4	16.2	91.7	fqq	LECI/SOR
255		Lecidea turgidula	6	14.6	57.7	fqq	LECI
256		Lecidella elaeochroma	6	21.1	57.1	fqq	LECI

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
257		Lecidella euphorea	8	10.6	19.0	fqq	LECI
258		Lecidella subviridis				rr	LECI/SOR
259		Lepraria atlantica	1	1.0	8.3	rr	SOR
260		Lepraria borealis	1	1.0	8.3	r	SOR
261		Lepraria crassissima				r	SOR
262		Lepraria eburnea	2	2.5	16.7	st r	SOR
263		Lepraria elobata	2	6.0	41.7	st r	SOR
264		Lepraria frigida	1	0.1	1.0	r	SOR
265		Lepraria incana	8	26.7	93.3	fqq	SOR
266		Lepraria jackii	2	6.8	41.7	fq	SOR
267		Lepraria lobificans	3	7.5	50.0	fq	SOR
268		Lepraria neglecta				st fq	SOR
		Lepraria sp.	7	46.7	100.0		SOR
269		Lepraria umbricola	2	1.2	8.3	st fq	SOR
270		Leproloma vouauxii	1	0.4	3.0	rr	SOR
271		**Leptogium lichenoides**	1			fq	CYA
272		**Leptogium saturninum**	3	3.2	26.7	st fq	CYA
273		**Leptogium teretiusculum**				rr	CYA
274	+	Leptorhaphis epidermidis	2	3.6	15.4	st fq	
275	#	Libertiella curvispora				rr	LICH
276	#	Lichenoconium erodens				st r	LICH
277	#	Lichenoconium lecanorae				r	LICH
278	#	Lichenoconium pyxidatae				rr	LICH
279	#	Lichenoconium xanthoriae				r	LICH
280	#	Lichenodiplis lecanorae				rr	LICH
281	#	Lichenosticta alcicornaria				r	LICH
282		**Lobaria pulmonaria**	7	6.8	35.0	fqq	CYA
283		**Lobaria scrobiculata**				rr	CYA
284		Lopadium disciforme	2	3.6	25.0	r	
285		Loxospora elatina	5	12.6	75.0	fq	SOR
286		Megalaria grossa	3	2.2	8.0	st fq	
287		**Melanelia exasperata**	3	1.2	7.1	fq	PAR
288		**Melanelia exasperatula**	10	11.1	35.7	fqq	PAR
289		**Melanelia fuliginosa**	14	17.1	57.1	fqq	PAR
290		**Melanelia glabra**				rr	PAR
291		**Melanelia olivacea**	11	14.0	38.5	fqq	PAR
292		**Melanelia septentrionalis**	2	0.2	2.6	r	PAR
293		**Melanelia subargentifera**	4	3.3	26.7	fq	PAR
294		**Melanelia subaurifera**	10	16.2	50.0	fqq	PAR
295	#	Melaspilea gibberulosa	1	0.3	2.0	rr	LICH
296		**Menegazzia terebrata**	6	8.0	33.3	st fq	
297		Micarea cinerea	1	0.5	3.8	rr	
298		Micarea denigrata	2	6.1	41.7	st fq	
299		Micarea elachista	1	0.3	2.0	rr	
300		Micarea hedlundii	1	0.1	1.0	r	
301		Micarea melaena	4	9.2	25.0	fq	
302		Micarea melanobola	1	0.1	1.0	rr	
303		Micarea misella				st r	
304		Micarea nitschkeana	1	1.0	7.7	st r	
305		Micarea peliocarpa	2	2.2	16.7	st fq	
306		Micarea prasina	6	12.0	61.5	fqq	
307	+	Microcalicium ahlneri	2	2.4	16.7	rr	CAL
308	+	Microcalicium arenarium	1	0.3	2.6	rr	CAL
309	#	Microcalicium disseminatum	4	4.6	25.0	st fq	CAL

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
310	#	Muellerella hospitans				st r	LICH
311		**Multiclavula mucida**				st r	
312		**Multiclavula vernalis**				rr	
313		Mycobilimbia carneoalbida	3	5.7	21.4	st fq	
314		Mycobilimbia epixanthoides	2	3.0	16.7	st r	
315		Mycoblastus alpinus				rr	SOR
316		Mycoblastus fucatus	2	5.8	41.7	st fq	SOR
317		Mycoblastus sanguinarius	5	9.1	46.7	fq	
318	+	Mycocalicium subtile	4	24.3	83.3	fqq	CAL
319	+	Mycomicrothelia confusa				r	
320	+	Mycomicrothelia wallrothii				st r	
321		**Neofuscelia loxodes**	1	0.2	1.8	fqq	PAR
322	*	**Nephroma articum**				rr	CYA
323		**Nephroma bellum**				rr	CYA
324		**Nephroma laevigatum**	1	0.1	1.0	st fq	CYA
325		**Nephroma parile**	1	0.6	6.7	st fq	CYA
326		**Nephroma resupinatum**				r	CYA
327		Normandina acroglypta	1	0.1	1.0	r	
328		Ochrolechia alboflavescens	2	4.7	30.8	fq	SOR
329		Ochrolechia androgyna	6	15.0	40.0	fqq	SOR
330		Ochrolechia arborea	5	9.5	26.9	st fq	SOR
331		Ochrolechia microstictoides	4	9.1	58.3	fq	SOR
332		Ochrolechia pallescens	1	0.8	6.7	st r	
333		Ochrolechia subviridis				st r	SOR
334		Ochrolechia szatalaensis	1	0.4	3.0	r	
335		Ochrolechia turneri	2	1.0	8.3	rr	SOR
336		**Omphalina umbellifera**				st fq	
337		Opegrapha atra				st r	
338		Opegrapha ochrocheila				rr	
339		Opegrapha rufescens	6	6.7	16.0	fq	
340		Opegrapha sorediifera				rr	
341		Opegrapha varia	6	5.7	14.0	fq	
342		Opegrapha viridis	2	1.1	7.1	st r	
343		Opegrapha vulgata	5	9.2	33.3	st fq	
344		Pachyphiale fagicola	1	0.4	3.0	st r	
345		**Pannaria pezizoides**	1	0.6	6.7	r	CYA
346		**Parmelia saxatilis**	6	5.7	19.2	fqq	PAR
347		**Parmelia sulcata**	16	64.0	96.2	fqq	PAR
348		**Parmeliella triptophylla**				st r	CYA
349		**Parmelina tiliacea**				st fq	PAR
350		**Parmeliopsis ambigua**	14	55.4	100.0	fqq	
351		**Parmeliopsis hyperopta**	6	7.3	42.3	fq	
352		**Peltigera aphthosa**	1	0.1	1.0	fqq	CYA
353		**Peltigera canina**	5	2.4	12.0	fqq	CYA
354		**Peltigera collina**				r	CYA
355		**Peltigera degenii**				r	CYA
356		**Peltigera didactyla**	3	1.7	10.5	fqq	CYA
357		**Peltigera horizontalis**				st fq	CYA
358		**Peltigera hymenina**				st fq	CYA
359		**Peltigera leucophlebia**	1	0.1	1.0	fq	CYA
360		**Peltigera malacea**	1	0.7	8.3	fq	CYA
361		**Peltigera membranacea**				st fq	CYA
362		**Peltigera neckeri**	3	0.8	7.1	fq	CYA
363		**Peltigera neopolydactyla**	1	0.1	1.0	st r	CYA

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
364		**Peltigera polydactyla**	4	2.3	10.5	fqq	CYA
365		**Peltigera praetextata**	6	8.1	32.0	fqq	CYA
366		**Peltigera rufescens**	1	0.2	2.6	fqq	CYA
367		**Peltigera scabrosa**				rr	CYA
368		Pertusaria albescens	5	4.6	13.3	fqq	
369		Pertusaria amara	10	51.3	76.0	fqq	SOR
370		Pertusaria carneopallida				rr	
371		Pertusaria coccodes	7	9.5	40.0	fqq	SOR
372		Pertusaria flavida	1	1.7	13.3	r	SOR
373		Pertusaria hemisphaerica	2	0.6	5.0	st fq	SOR
374		Pertusaria leioplaca	6	4.4	15.0	fq	
375		Pertusaria ophthalmiza				rr	SOR
376		Pertusaria pertusa	3	2.7	13.3	st fq	
377		Pertusaria pupillaris	1	0.1	1.0	r	SOR
378		Pertusaria raesaenenii	1			rr	
379	+	Phaeocalicium praecedens				rr	CAL
380		**Phaeophyscia ciliata**	4	2.5	21.4	fq	PHY
381		**Phaeophyscia nigricans**	1	0.6	7.1	fq	PHY
382		**Phaeophyscia orbicularis**	7	5.5	23.1	fqq	PHY
383	#	Phaeopyxis punctum				rr	LICH
384	#	Phaeosporobolus usneae				rr	LICH
385		Phlyctis agelaea	3	2.3	9.0	fq	SOR
386		Phlyctis argena	12	74.0	91.7	fqq	SOR
387		**Physcia adscendens**	7	8.3	35.7	fqq	PHY
388		**Physcia aipolia**	7	5.0	14.3	fqq	PHY
389		**Physcia dubia**	1			fqq	PHY
390		**Physcia semipinnata**	2	1.2	14.3	st fq	PHY
391		**Physcia stellaris**	7	4.0	14.3	fqq	PHY
392		**Physcia tenella**	9	19.9	71.4	fqq	PHY
393		**Physconia detersa**				r	PHY
394		**Physconia distorta**	10	7.3	21.4	fqq	PHY
395		**Physconia enteroxantha**	5	3.7	28.6	fqq	PHY
396		**Physconia perisidiosa**	4	1.5	7.1	fq	PHY
397		Placynthiella icmalea	2	2.0	13.3	fqq	LECI
398		Placynthiella oligotropha				st fq	LECI
399		Placynthiella uliginosa	2	0.6	2.6	fq	LECI
400		**Platismatia glauca**	13	58.3	91.7	fqq	CET
401	#	Plectocarpon lichenum				r	LICH
402		**Pleurosticta acetabulum**				fq	PAR
403	#	Polycoccum squamarioides				rr	LICH
404		Porina aenea				rr	
		Porina sp.	1	0.1	1.0		
405		**Pseudevernia furfuracea**	15	54.1	71.4	fqq	
406		Psilolechia clavulifera	1	0.1	1.0	rr	LECI/SOR
407		Psilolechia lucida	3	0.7	2.6	st fq	LECI/SOR
408	*	**Punctelia subrudecta**				rr	PAR
409		**Pycnothelia papillaria**				st fq	
410		Pyrenula coryli				rr	
411		Pyrenula laevigata	1	0.4	3.0	r	
412		Pyrenula nitidella	1	0.4	3.0	r	
413		Pyrrhospora quernea	5	2.5	8.3	fq	LECI/SOR
414		**Ramalina baltica**	3	1.5	14.3	fq	
415		**Ramalina calicaris**				st fq	PEN
416		**Ramalina dilacerata**	2	0.3	3.8	st r	

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
417		**Ramalina farinacea**	15	43.7	85.7	fqq	PEN
418		**Ramalina fastigiata**	7	3.2	21.4	fqq	
419		**Ramalina fraxinea**	7	2.5	9.1	fqq	PEN
420		**Ramalina pollinaria**	4	1.4	7.1	fqq	
421		**Ramalina sinensis**				r	
422		**Ramalina thrausta**				fq	PEN
423	#	Refractohilum peltigerae				r	LICH
424		Rhizocarpon lavatum				rr	
425		Rinodina efflorescens	1	0.4	3.0	st r	SOR
426		Rinodina exigua	1	0.8	6.7	fq	
427		Rinodina pyrina	4	4.9	30.8	fq	
428		Rinodina sophodes	3	0.1	1.0	fq	
429		Ropalospora viridis	1	0.1	1.0	rr	SOR
430	+	Sarea diformis				rr	
431	+	Sarea resinae	3	4.5	19.2	st r	
432		Schismatomma pericleum	3	2.5	11.5	st fq	
433		Sclerophora coniophaea	2	0.5	2.6	st r	CAL
434		Sclerophora farinacea	1	0.7	5.3	r	CAL
435		Sclerophora nivea	2	1.1	5.3	st fq	CAL
436		Scoliciosporum chlorococcum	6	14.6	50.0	st fq	
437		Scoliciosporum pruinosum				rr	
438		Scoliciosporum sarothamni	1	0.2	1.8	r	
439	#	Scutula miliaris				st r	LICH
440	#	Skyttea nitschkei				rr	LICH
441	#	Sphaerellothecium araneosum				rr	LICH
442	#	Sphinctrina turbinata				rr	CAL
443		Steinia geophana				rr	
444	+	Stenocybe pullatula	6	4.8	10.5	fq	CAL
445		**Stereocaulon paschale**	1	0.7	8.3	fqq	
446		**Stereocaulon tomentosum**				fqq	
447	#	Stigmidium lecidellae				rr	LICH
448	#	Stigmidium microspilum				r	LICH
449		Strangospora moriformis				rr	
450		Strangospora pinicola				rr	
451	#	Taniolella punctata				rr	LICH
452		Tephromela atra	1	0.3	2.0	fqq	
453	#	Thelocarpon epibolum				rr	LICH
454		Thelotrema lepadinum	4	3.8	11.5	st fq	
455		Trapeliopsis flexuosa	3	2.3	6.7	fq	LECI
456		Trapeliopsis granulosa	3	1.4	7.1	fqq	LECI/SOR
457	#	Tremella cladoniae				rr	LICH
458	#	Tremella hypogymniae				rr	LICH
459	#	Tremella lichenicola				rr	LICH
460		**Tuckermannopsis chlorophylla**	14	21.2	57.1	fqq	CET
461		**Usnea filipendula**	11	13.1	46.7	fqq	PEN
462		**Usnea fulvoreagens**	1	0.6	7.1	st r	
463		**Usnea glabrata**	1			r	
464		**Usnea glabrescens**	4	4.0	34.6	r	
465		**Usnea hirta**	12	31.9	66.7	fqq	
466		**Usnea lapponica**	1			st r	
467		**Usnea scabrata**	6	1.8	7.1	fq	PEN
468		**Usnea subfloridana**	13	19.9	42.9	fqq	PEN
469		**Usnea substerilis**				st fq	
470		**Usnea wasmuthii**				st r	PEN

Table 2 (continued)

No.		Species	No. of studies	Frequency among lists		Frequency in Estonia	Group
				Average	Max		
471		Verrucaria muralis	1	0.3	2.6	fq	
472	#	Vouauxiella lichenicola				fq	LICH
473	#	Vouauxiomyces santessonii				st r	LICH
474		**Vulpicida juniperina**				fq	CET
475		**Vulpicida pinastri**	13	44.5	96.2	fqq	CET
476		**Xanthoparmelia conspersa**	1	0.2	1.8	fqq	PAR
477		**Xanthoria candelaria**	2	0.2	2.6	fqq	
478		**Xanthoria fulva**	2	0.9	7.1	st r	
479		**Xanthoria parietina**	12	19.9	38.5	fqq	
480		**Xanthoria polycarpa**	10	9.4	42.9	fqq	
481		Xylographa vitiligo				st r	SOR

Table 3. True lichens, lichenicolous fungi (#) and non-lichenized fungi (+) species which possibly can inhabit forests in Estonia (macrolichens in bold) and their frequency in Estonia. Species extinct in Estonia are marked with an asterisk (*) and species with doubtful occurrence with a question mark (?).

Abbreviations: P – found in parks, cemeteries, avenues; W – found in wooded meadows, S – suitable substrata for colonization (i.e., bark, wood, ground); for abbreviations of frequency and ecological and morphological groups, see Table 2.

No.		Species	Explanation	Frequency	Group
1	#	Abrothallus parmeliarum	S	rr	LICH
2	#	Abrothallus suecicus	PWS	r	LICH
3		Arthonia lapidicola	S	rr	
4	#	Arthonia apotheciorum	S	rr	LICH
5		Arthonia cinnabarina	S	rr	
6	#	Arthonia intexta	PS	rr	LICH
7		Arthonia muscigena	S	rr	
8		Arthonia patellulata	S	rr	
9		Arthopyrenia antecellens	S	rr	
10		Arthopyrenia cerasi	S	rr	
11	*	Arthopyrenia cinereopruinosa	S	rr	
12		Arthopyrenia lapponina	S	rr	
13	*	Arthopyrenia rhyponta	S	rr	
14	?#	Arthrorhaphis citrinella	S	rr	LICH
15		Arthrosporum populorum	PS	r	
16	*	Aspicilia xyloxena	S	rr	
17	#	Bachmanniomyces uncialicola	S	rr	LICH
18		Bacidia circumspecta	S	rr	
19	?	**Bryoria bicolor**	S	rr	PEN
20		Buellia violaceofusca	WS	rr	
21		Byssoloma subdiscordans	S	rr	
22		Caloplaca cerinella	S	rr	
23		Caloplaca cerinelloides	P	st r	
24		Caloplaca chrysophthalma	WS	r	
25		Caloplaca citrina	PS	fq	

Table 3 (continued)

No.		Species	Explanation	Frequency	Group
26		Caloplaca herbidella	WS	rr	
27		Caloplaca obscurella	S	rr	
28		Caloplaca ulcerosa	PS	rr	
29		Candelariella kuusamoënsis	S	rr	
30		Candelariella reflexa	PS	st r	
31		Chaenothecopsis viridireagens	S	rr	CAL
32		Chrysotrix chlorina	S	rr	SOR
33		**Cladonia merochlorophaea**	S	rr	CLA
34	*	**Cladonia parasitica**	S	r	CLA
35		Cliostomum flavidulum	WS	rr	
36		**Collema flaccidum**	S	rr	CYA
37	*	**Collema occultatum**	S	rr	CYA
38		Cyphelium sessile	WS	r	CAL
39		Cyphelium tigillare	S	r	CAL
40	#	Endococcus nanellus	S	r	LICH
41	?	Fellhanera bouteillei	S	rr	
42	#	Graphium aphthosae	S	rr	LICH
43	*#	Homostegia piggotii	SWS	rr	LICH
44	?	**Hyperphyscia adglutinata**	S	rr	PHY
45		Hypocenomyce praestabilis	S	rr	
46	#	Illosporium carneum	S	rr	LICH
47	#	Intralichen christiansenii	S	st r	LICH
48	#	Intralichen lichenum	S	rr	LICH
49	#	Karsteniomyces peltigerae	S	r	LICH
50	#	Karsteniomyces tuberculosus	S	rr	LICH
51	?	Lecanora cateilea	S	r	LEC
52	?	Lecanora glabrata	S	rr	LEC
53		Lecanora hypoptoides	S	rr	LEC
54		Lecanora subintricata	S	r	LEC
55	?	Lecidea albofuscescens	S	rr	LECI
56	?	Lecidea hypopta	S	rr	LECI
57		Lecidea symmictella	S	rr	LECI
58		Lepraria cacuminum	S	rr	SOR
59	+	Leptorhaphis tremulae	S	rr	
60	#	Lichenochora obscuroides	S	rr	LICH
61	#	Lichenoconium usneae	S	rr	LICH
62	#	Lichenopeltella cetrariicola	S	rr	LICH
63	#	Lichenopeltella peltigericola	S	rr	LICH
64	#	Lichenostigma rugosum	S	rr	LICH

Table 3 (continued)

No.		Species	Explanation	Frequency	Group
65	?	**Melanelia elegantula**	S	rr	PAR
66		Micarea lignaria	S	rr	
67	#	Monodictys cellulosa	WS	rr	LICH
68		Mycobilimbia berengeriana	WS	st r	
69		Opegrapha herbarum	WS	rr	
70	#	Opegrapha zwackhii	S	rr	LICH
71		Pertusaria borealis	S	rr	SOR
72		Pertusaria coronata	WS	st r	
73	*	Pertusaria multipunctata	S	rr	SOR
74	#	Pezizella epithallina	S	rr	LICH
75	#	Phacopsis oxyspora	S	rr	LICH
76	+	Phaeocalicium populneum	S	rr	CAL
77	*	**Phaeophyscia chloantha**	S	rr	PHY
78		**Phaeophyscia endophoenicea**	PS	rr	PHY
79	#	Phaeosporobolus alpinus	SW	rr	LICH
80	#	Phoma peltigerae	S	rr	LICH
81		**Physconia grisea**	PS	st r	PHY
82		Placynthiella dasaea	S	rr	LECI SOR
83	#	Polycoccum peltigerae	S	rr	LICH
84	#	Pronectria erythrinella	S	rr	LICH
85		Ptychographa flexella	S	rr	
86	?	Pyrenula nitida	S	rr	
87	?	Pyrrhospora cinnabarina	S	rr	LECI
88	*	**Ramalina elegans**	S	rr	
89		**Ramalina obtusata**	PS	st fq	
90	#	Ramboldia insidiosa	S	st r	LECI LICH
91		Rinodina archaea	S	r	
92	#	Rinodina parasitica	S	rr	LICH
93		Rinodina septentrionalis	S	rr	
94		Rinodina turfacea	S	rr	
95	#	Roselliniella cladoniae	S	rr	LICH
96		Sclerophora peronella	PS	rr	CAL
97	#	Scutula epiblastemica	S	rr	LICH
98	#	Sphaerellothecium propinquellum	S	st fq	LICH
99	#	Stigmidium xanthoparmeliarum	S	rr	LICH
100	#	Syzygospora physciacearum	S	r	LICH
101	#	Taniolella beschiana	S	rr	LICH
102	#	Taniolella cladinicola	S	rr	LICH
103	#	Taniolella delicata	PS	rr	LICH
104	#	Taniolella phaeophysciae	S	rr	LICH
105	#	Tremella cetrariicola	PS	rr	LICH
106	#	Tremella coppinsii	S	rr	LICH
107	#	Tremella phaeophysciae	S	rr	LICH
108	#	Tremella ramalinae	S	rr	LICH
109	?	**Usnea articulata**	S	rr	
110	?	**Usnea longissima**	S	rr	PEN
111	?	Varicellaria rhodocarpa	S	rr	SOR
112		Vezdaea aestivalis	S	rr	
113	#	Vouauxiomyces ramalinae	PS	st fq	LICH
114		**Xanthoria fallax**	PS	st r	
115	#	Xanthoriicola physciae	S	rr	LICH
116		Xylographa trunciseda	S	rr	
117	#	Zwackiomyces coepulonous	S	rr	LICH
118	#	Zwackiomyces lecanorae	S	rr	LICH

RESULTS

According to the current list (Tables 2–3), 481 confirmed (180 macrolichens, and 301 microlichens and lichenicolous fungi) and at least 118 probable (15 macrolichens, and 103 microlichens and lichenicolous fungi) "forest lichen" species inhabit Estonia. However, the occurrence of 26 listed species is problematic; 13 species are extinct or probably extinct in Estonia and the occurrence of 13 species is questionable (mentioned in literature but without herbarium material).

Frequency estimates were computed for 337 "forest lichen" species (70% of the confirmed species). The eight most abundant species were absent from only one (*Hypogymnia physodes*, *Parmelia sulcata*, *Chaenotheca ferruginea*, *Phlyctis argena*) or two studies (*Evernia prunastri*, *Pseudevernia furfuracea*, *Ramalina farinacea*, *Lecanora pulicaris*). About half (47%) of the species (48 macrolichens, and 106 microlichens and lichenicolous fungi) occurred only in one or two studies.

Only 68 species occurred on average in more than 10% of species lists. The most frequent species was *Hypogymnia physodes*, with 84% mean occurrence among species lists. All these lichens are rather to very frequent in Estonia (sensu Randlane & Saag 1999). In contrast, the average frequency of more than half (215) of the species was less than 5% with 90 of these species being rather to very rare, and 83 species frequent to very frequent in Estonia (sensu Randlane & Saag 1999). In addition, some species with low average abundance were locally quite common. For example, the macrolichens *Cetraria islandica* (occurring on average in 8.4% of the species lists, but in 75% of lists in one study), *Cladina arbuscula* (8.0% and 66.7%), *Cladina stellaris* (8.9% and 66.7%) and microlichens *Arthonia spadicea* (9.5% and 57.7%), *Hypocenomyce sorophora* (9.7% and 58.3%), *Lepraria lobificans* (7.5% and 50.0%), *Lecanora dispersa* (6.7% and 53.8%) and *Ochrolechia microstictoides* (9.1% and 58.3%, respectively).

To describe the species composition and richness of "forest lichens", ecological, morphological, and taxonomical groups were distinguished (Table 4). Forest is the main habitat for calicioid lichens and fungi, cetrarioid, cladonioid, parmelioid pendulous and sorediate crustose lichens, and

possibly also for the poorly studied lichenicolous and parasitic fungi. These ecological and morphological groups totalled nearly half (46%) of the lichen species in Estonian forests, whereas some species-rich genera, such as *Rhizocarpon*, *Verrucaria* and *Umbilicaria*, were represented with only one or no species in forests.

Lichens in Estonian forests have been studied in almost all substrata types, but the coverage is uneven (Table 5, Appendix). Living trees have been most commonly investigated, particularly the trunks of common forest trees (*Pinus sylvestris*, *Picea abies*, *Betula* spp., *Alnus glutinosa*, *Populus tremula*), but also trunks of other deciduous trees, undergrowth and branches of *Picea abies*. Less attention has been paid to fine and coarse woody debris, the ground and stones. Among coarse woody debris, snags with exposed wood of common tree species have been investigated more intensively (334 records; Appendix) compared with logs (99 records), windthrows (15 records) or burnt wood (9 records).

The highest number of unique species was recorded on living trees, but a relatively high number of species inhabited the ground and coarse woody debris (e.g., snags with exposed wood; Table 5). Cluster analysis of species composition (Fig. 2) distinguished five large groups of substrata: broad-leaved trees, common deciduous and coniferous trees, branches and undergrowth, windthrows, and other ground-level substrata. Comparison of living and dead trunks (snags) was possible only for common tree species, differentiating deciduous and coniferous trees (Fig. 2).

DISCUSSION

The role of forests for the natural lichen flora has seldom been quantified. According to this study, 52–64% of the 930 known species of lichenised and lichenicolous fungi in Estonia (Randlane et al. 2003) occur in forests. Hallingbäck (1995) counted 800 forest species that comprise 34%

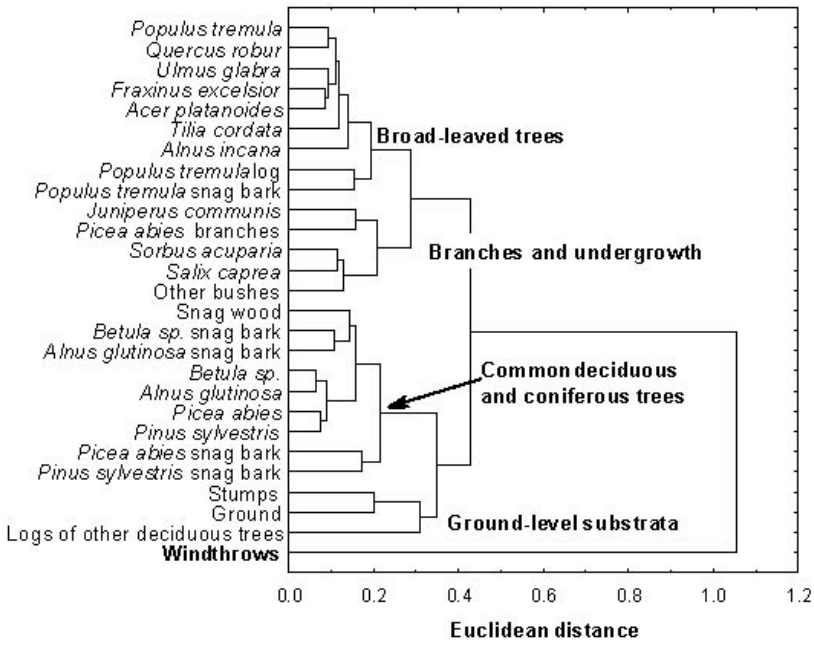

Fig. 2. Similarity of lichen composition of different substrata in Estonian forests according to cluster analysis (Ward's method). The data matrix included relative occurrence of species on substrata with over 40 records (except windthrows with 15 records) of 16 lichen studies.

Table 4. Species richness of different groups of lichens in Estonian forests. Taxonomical groups comprise genera with at least 10 species in Estonia. The groups have been listed in decreasing order of their number of forest species.

Group [source [a]]	No. of species in Estonia		Number (%) of forest species (min–max)
	total[b]	in forests (min–max)[c]	
Taxonomical groups [1]			
Chaenotheca	15	15	100
Chaenothecopsis	13	12–13	92–100
Lepraria	12	11–12	92–100
Usnea	12	10–12	83–100
Cladonia	54	44–46	81–85
Peltigera	20	16	80
Bryoria	10	8–9	80–90
Ochrolechia	10	8	80
Pertusaria	14	11–14	79–100
Micarea	13	10–11	77–85
Bacidia	14	10–11	71–79
Melanelia	14	9–10	64–71
Arthonia	18	11–17	61–94
Ramalina	15	9–10	60–73
Lecanora	51	26–30	51–59
Lecania	10	5	50
Lecidea	14	4–7	29–50
Rinodina	16	4–8	25–50
Leptogium	13	3	23
Stereocaulon	10	2	20
Caloplaca	40	5–12	13–30
Rhizocarpon	17	1	6
Verrucaria	20	1	5
Umbilicaria	12	0	0
Acarospora	11	0	0
Aspicilia	11	0	0
Ecological groups			
Sorediate crustose lichens [2]	51	46–49	90–96
Calicioid lichens and fungi [3]	56	49–54	88–96
Cyanobacterial macrolichens [1,4]	63	30–33	48–52
Lichenicolous and parasitic lichens and fungi [4,5]	106	40–87	38–82
Morphological groups			
Pendulous lichens [1, 4]	21	17–19	81–91
Cetrarioid lichens [6]	14	11	79
Cladonioid lichens [3, 4]	71	53–55	76–79
Parmelioid lichens [7]	30	17–18	57–60
Physcioid macrolichens [1, 4]	28	15–19	54–68
Lecideoid lichens [8]	41	13–17	32–42
Macrolichens total	314	182–197	58–63
Microlichens total	617	306–409	50–66

[a] sources: 1 – Randlane et al. 2003; 2 – Saag 2002; 3 – Lõhmus 1998, Tibell 1999; 4 – Trass & Randlane 1994; 5 – A. Suija, unpublished reports; 6 – Randlane & Saag 2003; 7 – Hale & DePriest 1999; 8 – Suija 1998

[b] according to Randlane et al. 2003

[c] min – no. of proven species, max – proven and probable species (according to Table 2 and 3)

Table 5. Number of lichen species and unique species (found only on given substrata) recorded on different substratum types in Estonian forests.

Substrata type	No. of studies	No. of records*	No. of species	Share of species, %**	No. of unique species
Living trees	15	3766	305	86	125
trunks of living trees	*15*	*3489*	*294*	*83*	*107*
bases of trunks of living trees	*4*	*172*	*73*	*21*	*3*
branches of living trees	*5*	*105*	*32*	*9*	*24*
Fine and coarse woody debris	6	1102	207	58	24
snags with exposed wood	*6*	*415*	*106*	*30*	*12*
Logs	*4*	*114*	*70*	*20*	*1*
Ground	4	85	42	12	18
Stones	3	7	7	2	3

* no. of species registrations (species × substratum × study)
** from a total of 355 species recorded in the 16 studies

of Swedish lichen flora (2388 species, Santesson 2003). The higher share of "forest lichens" in Estonia is probably due to the scarcity of rocky outcrops, which are the most diverse habitats for lichens in Sweden (hosting about 1000 species, Hallingbäck 1995). Only limited data is available for other countries. For example, 50 unique lichen species have been recognised on coarse woody debris in Finland (Siitonen 2001), which is twice as many as in Estonia (24 species). Throughout the boreal forest zone, the ground floor includes about 25–40 species of lichens (Ahti 1977). In Estonian forests, 42 epigeic species have been reported, of which only 18 are unique to this substratum (Table 5).

Although 24 species were limited to parks and wooded meadows (Table 3), the role of these habitats for "forest lichens" in Estonia remains unknown. If only the availability of substrata (broad-leaved trees) is crucial, these species probably inhabit forests as well (having been simply overlooked). However, this may not be the case if specific microclimatic conditions (e.g., more light) are also needed.

Frequency patterns of different species in Estonian forests were characterised by a high share of rare species. About half of the species with low (<5%) average frequency among species lists (Table 2), are actually frequent in Estonia. Most of these species occupy the ground (e.g. *Cetraria ericetorum*, *Cladina mitis*, *Cladonia furcata*, *Peltigera didactyla*), decaying wood (*Placynthiella icmalea*, *Trapeliopsis granulosa*), stones (*Verrucaria muralis*) or bark of deciduous trees (*Acrocordia gemmata*, *Lecanora rugosella*, *Phlyctis agelaea*), i.e., on quantitatively poorly studied substrata. The remaining forest species are generally rare in Estonia. Some of them probably occur naturally at low frequencies (for example, the old-growth forest species of *Collema* and *Nephroma*), as noted also in Finland (Vitikainen et al. 1997) and Sweden (Thor 1998). Other species show narrow niches but may be abundant where their habitat is prevalent (e.g., ground-floor macrolichens in heath forest), as indicated by large differences between average and maximum frequencies. A more detailed analysis of the causes of rarity among "forest lichens" should be possible after additional research of inadequately studied forest types and substrata.

The taxa most common to forests in Estonia (Table 4) are generally well-known inhabitants of (hemi)boreal forests (Ahti 1977). Some of these taxa, for example calicioid, pendulous and cyanobacterial macrolichens, have been also recognised as indicators of forest continuity (Tibell 1992, Kuusinen 1996a, Thor 1998). Cyanobacterial macrolichens, as nitrogen-fixing organisms, are also ecologically important components of forest vegetation (Kallio & Kallio 1978). The high species richness of lichenicolous and parasitic fungi in forests is obviously related to the increasing knowledge of these inconspicuous organisms in Estonia (Suija 2002 and unpublished reports). Additionally, some taxonomical groups

naturally harbour high numbers of host-specific lichenicolous fungi (Lawrey & Diederich 2003). The most species rich habitat for lichenicolous fungi in Estonia are Cladonia and Peltigera (A. Suija pers. com.), i.e. genera of "forest species" in high abundance.

The uneven coverage of lichen substrata is a general problem. Epiphytic communities on trees have been intensively studied globally for over 50 years (e.g., Barkman 1958, Rose 1976, Coppins 1984, Kuusinen 1996b, McCune et al. 2000), whereas lichens on dead wood only during the last decade (e.g., Forsslund & Koffmann 1998, McAlister 1997, Kruys et al. 1999, Lõhmus & Lõhmus 2001, Humphrey et al. 2002). These works, supported also by this study, have generally shown the most diverse and unique species composition of lichens on broad-leaved trees and on snags. Given that intensive deforestation usually degrades these substrata, their availability in forest landscapes is an important issue in future forest management in Estonia (cf. Kuuba 2001).

Until now, almost no attention has been paid to stones as habitats for "forest lichens". This is probably because stones are usually covered by bryophytes, and only uncovered or shaded sides of stones are available for lichens. For example, shaded and lower parts are usually covered with *Lepraria* crusts (personal experience). However, the numerous boulders in forests of northern and western Estonia could provide high-quality habitats for epilithic lichens.

In future research, compilation of a list of obligate "forest lichens" could be valuable for practical purposes in conservation management. In addition, comparative studies of natural broad-leaved forests versus rural parks and wooded meadows should be carried out to assess the value of the latter for lichens. More attention should be paid to quantitatively less-studied forest substrata, such as old broad-leaved trees, windthrows, burnt bark and wood, well-decayed large logs and boulders. In addition, suitability of aspen (*Populus tremula*) as surrogate for other broad-leaved trees could be considered, given the similarity of their species composition (Jüriado et al. 2003; see also Fig. 2 and Appendix) and the current abundance of aspen stands in Estonian forests (Kohava 2001).

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Appendix. Coverage of main substrata in 16 lichen studies in Estonian forests.

Substratum	studies	No. of: records*	species
Pinus sylvestris **	12	708	136
Picea abies **	11	648	140
Betula spp. **	10	512	119
Alnus glutinosa **	10	474	147
Populus tremula **	9	335	148
Fraxinus excelsior **	7	180	99
Quercus robur	7	161	89
Salix caprea	7	97	60
Sorbus aucuparia	7	84	57
Alnus incana **	6	115	57
Undergrowth	6	59	34
Ulmus glabra	5	113	68
Acer platanoides	5	97	62
Picea abies branches	5	92	36
Tilia cordata	5	76	56
Populus tremula log	4	66	50
Juniperus communis	4	58	41
Stumps	4	45	33
Picea abies snags with wood	3	93	50
Pinus sylvestris snags with wood	3	92	50
Alnus glutinosa snags with wood	3	64	52
Betula spp. snags with wood	3	63	51
Populus tremula base	3	22	17
Populus tremula snags with wood	3	22	17
Betula spp. bases	3	21	12
Picea abies bases	3	15	13
Windthrows	3	15	7
Pinus sylvestris bases	3	11	6
Pinus sylvestris branches	3	10	10
Betula spp. branches	3	10	8
Fraxinus excelsior snag with wood	3	9	7
Logs of deciduous trees (except *Populus*)	2	33	25
Populus tremula branches	2	24	22
Quercus robur branches	2	11	10
Burned substrata	2	9	9
Alnus glutinosa base	2	6	5
undet. deciduous tree snags with wood	1	10	10
undet. coniferous tree snags with wood	1	7	7

* no. of species registrations (species × substratum × study)
** living and dead trunk with bark

Erast Parmasto – 75

Erast Parmasto in the Institute of Botany and Ecology, University of Tartu, on March 22, 2002 (photo by Jaan Liira)

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Two new species of Hymenochaete (Hymenomycetes, Basidiomycota) from India

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Abstract: Two new species, *Hymenochaete gigasetosa* Parmasto and *H. indica* Parmasto are described.

Kokkuvõte: E. Parmasto. Kaks uut liiki perekonnast *Hymenochaete* (Hymenomycetes, Basidiomycota) Indiast.

Kirjeldatakse kaks uut liiki, *Hymenochaete gigasetosa* ja *H. indica*.

METHODS

Basidiomata are described using the colour names by Rayner (1970); colour notations are given using the Munsell Book of Color (1942; abbreviation: M) and Kornerup & Wanscher's handbook (1973; abbreviation: K & W). For spore statistics, 25 randomly taken spores were measured in a specimen with the aid of a Sony CCD Video Camera attached to a Nikon Labophot 2 microscope and analysed by Global Lab Image (Data Translation Inc.) software. Herbarium acronyms are after Holmgren, Holmgren & Barnett (1990).

DESCRIPTIONS

Hymenochaete gigasetosa Parmasto sp. nova

Basidiomata effusa, adnata, molle cottonea, ad 1(–3) mm crassa; hymenium laeve, Sienna color; tomentum et cortex desunt, stratum hypharum bene evoluta. Systema hypharum subdimiticum; hyphae sceletoideae tunicis crassis, brunneae, hyphae setales ad 200 µm longae. Setae hymeniales rarae, 100–200(–250) × 15–20(–25) µm, apicis obtusis vel rotundis granulatis; apices hypharum sceletoidearum tunicis incrassatis hyphidiis similes in hymenio numerosi.

Holotype: India, Uppar Pradesh, Mundali, Chakrata Forest Division, on dead twigs of *Picea morinda,* 8 Nov 1957 P.S. Rehill (K DD94/Ch.57; isotypes DD 7204, LY 4479). Paratype: same locality, on a dead branch of a deciduous tree, 5 Nov 1953 P.S. Rehill (K DD90/Ch.57).

Etymology: *gigantea,* gigantic; *setosa,* setose.

Basidiomata effused, adnate, soft cottony, 1–2 cm in diam, then confluent, up to 1000 µm thick, sometimes up to 4-layered and then 2–3 mm thick, uneven, at margins irregularly thickened, sometimes low and cushion-shaped; hymenium smooth, dark Sienna (M: 5 YR 5/7; K & W: 6 D 6–7(–8), Cinnamon Brown or Raw Sienna), in older parts darker (M: 5 YR 4/6; K & W: 6 E 7, Cognac); margin up to 1.5(–3) mm broad, pubescent, indistinctly delimited, more lightly coloured (M: 5 YR 7/6; K & W: 6 C 5, Sahara) than the hymenium.

Tomentum and cortex absent; hyphal layer composed of more or less loosely interwined, near the base more parallel hyphae and rare horizontal or downwards curved context setae (setal hyphae).

Hyphal system subdimitic; skeletoids with thickened or thick walls, brown, (2.5)3–5 µm diam; generative hyphae subhyaline, thin-walled, sparsely branched, septate, 3.5–6 µm. Setal hyphae (embedded setae) few, 100–200 µm long, 8–15(–20) µm diam. Hymenial setae scattered or rare, 100–200(–250) × 15–20(–25) µm, with very thick walls, with blunt or rounded tip, encrusted with small granules, emerging up to 120 µm above the hymenium, some setae with setal hypha-like base and bending downwards. In hymenium numerous hyphidia-like parallel tips of skeletoid hyphae with thin or thickened walls, 2.5–3.5 µm in diam.

Causes white fibrose rot of wood.

Remarks. Spores described by the collector of the specimens (Rehill) as "hyaline, ellipsoid,

6.1–8.4 × 1.75–2.1 µm" (DD 7204) or "5.25–8.75 × 1.75–2.2 µm, suballantoid" (DD 7203). I did not see any spores in the specimens except some few (extraneous?) allantoid spores 12–16 × 3.2–3.5 µm. The basidiomata are externally similar to those in *H. cinnamomea.* Very long and broad setae similar to these in the new species are present only in two other species of *Hymenochaete;* both have acute tips and a hyphal layer without setal hyphae. In *H. agathicola* P. Henn. the setae are 65–100(–130) × 9–16 µm, encrusted with fine granules in the uppermost part; basidiomata are thin (up to 170 µm) and with a cortex. This species has been found only once in New Zealand. *H. gladiola* G. Cunn. (isotypes in BPI, DAOM and K studied by me) has setae (75–)90–200 × (7–)10–16 µm; these are without incrustation; basidiomata are up to 450 µm thick, coriaceous, with elevated margins, effuso-reflexed or umbonate-sessile, with cortex and tomentum. This species has been found only in New Zealand.

Hymenochaete indica Parmasto, sp. nova

Basidiomata effusa, adnata, coriacea, ad 100 µm crassa; hymenium laeve, vinaceo-cremeum; tomentum, cortex atque stratum hypharum desunt. Systema hypharum monomiticum; hyphae tunicis incrassatis brunneae dense agglutinatae. Setae numerosae, 25–45 × 5–8 µm, acutae, sine incrustatione; hyphidia non numerosi, tunicis crassis brunneis, 2.5–3(–4) µm diam., hyphidia nonnulli leviter ramosi. Sporae minutae, late ellipsoideae, 3.5–4.3 × (2.2–)2.4–3.1 µm.

Holotype: India, Tamil Nadu, Tirunelveli Distr., Mundanthurai Sanctuary, on a fallen twig of a creeper, 16 Feb 1979 E. Parmasto (TAA 103329).

Etymology: *indica*, growing in India.

Basidiomata effused, adnate, coriaceous, 50–100 µm thick; hymenium smooth, Vinaceous Buff (M: 7.5 YR 7/3; K & W: 6 D 3, café-au-lait); margin distinctly delimited, brownish, later indistinct and concolorous with the hymenium. Tomentum, cortex and hyphal layer absent. Hyphal system monomitic; setal hyphae absent; hyphae 1.5–2.5 µm in diam, brown, with thickened walls, densely glued together; at base of setae a node of shortly branched hyphae about 1 µm diam.; crystals in setal layer absent. Setae numerous, 25–45 × 5–8 µm, subfusiform, with acute tip, straight or some slightly curved, naked or some enmeshed in thin hyphal sheaths, without incrustation. Hyphidia not numerous, embedded in hymenium, thick-walled, brownish, 2.5–3(–4) µm diam.; some few hyphidia forked or as dendrohyphidia with a few sidebranches. Basidia subcylindrical or clavate, 10–12 × 3.5–4 µm, with 4 thin sterigmata; spores broadly ellipsoid, 3.5–4.3 × (2.2–)2.4–3.1 µm; mean size 3.09 × 2.74 µm and mean *Q* value 1.43.

Remarks. There are three species of the *Gymnochaete* group of the genus *Hymenochaete* somewhat similar to *H. indica. H. innexa* G. Cunn. differs in bigger setae 50–70(–75) × 7–12(–15) µm and spores 4.5–6.3(–7.0) × 2–3 µm; the next two species have no hyphidia. *H. vallata* G. Cunn. has abundant crystals in the setal layer and cylindric slightly curved spores 3–4.2(–4.5) × (1.2–)1.5–1.8(–2.0) µm; *H. tenuis* Peck has setae (25–)30–60 × (5–)6–10(–12) µm, suballantoid spores 4.5–5.5 × 2–2.5 µm and has been only found in Europe and Americas.

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A revised list of Estonian Dermateaceae

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Abstract: Eighty five species belonging to 22 genera of the Ascomycete family Dermateaceae are listed. Two genera and 26 species are reported as new for Estonia.

Kokkuvõte: A. Raitviir. Sugukonna Dermateaceae Eestis esinevate liikide nimestik.

Nimestikus tuuakse ära 85 liiki sugukonna Dermateaceae 22 perekonnast. 2 perekonda ja 26 liiki on esmasleiud Eestist.

INTRODUCTION

The Dermateaceae is a long neglected family of the Helotiales in Estonia. Forty two species were included in a list of Estonian fungi (Järva & Parmasto, 1980; Järva & al., 1998). Recent studies by the author (Raitviir & Leenurm, 2000, 2001; Raitviir, 2002) have added 19 species. Now the author has critically revised the previously published data on the Dermateaceae found in Estonia and has examined here to for unidentified herbarium material deposited in the Mycological Herbarium of the Institute of Zoology and Botany (TAA). As a result of this study 22 genera and 85 species of Dermateaceae are listed from Estonia. Two genera, *Calloria* Fr. and *Hysteronaevia* Nannf., and 26 species marked with asterisk (*) are reported first time for Estonia. Nomenclature of earlier published species is updated and teleomorph-anamorph connections, if present, are indicated. The new records are identified by the author, if not stated otherwise.

LIST OF SPECIES

BELONIUM Sacc.

Belonium graminis (Desm.) Sacc. – Syn.: *Beloniella graminis* (Desm.) Rehm. Common dead culms of various grasses, reported on *Agrostis gigantea*, *Anthoxanthum odoratum*, *Calamagrostis epigeios*, *Deschampsia flexuosa*, *Festuca arundinacea*, *F. pratensis*, *F. rubra*, *Phalaris arundinacea*, *Poa palustris* and *Sesleria coerulea* (Soobik, 1988).

BELONOPSIS (Sacc.) Rehm

*Belonopsis hydrophila (P. Karst.) Nannf. – Known from a single locality on dead culms of *Deschampsia caespitosa*, Läänemaa Co., Kullamaa, 08.07.1981, coll. P. Põldmaa (TAA 129316).

*Belonopsis mediella (P. Karst.) Aebi – Known from a single locality on dead culms of *Phragmites australis*, Läänemaa Co., Valgevälja, 17.07.1981, coll. P. Põldmaa (TAA 129427).

Belonopsis obscura (Rehm) Aebi – This species has been recorded only once on dead stems of *Calluna vulgaris* (Raitviir & Leenurm, 2001).

Belonopsis retincola (Rabenh.) LeGal & F. Mangenot – Syn.: *Tapesia retincola* (Rabenh.) P. Karst. It is a common species on dead culms of *Phragmites australis*, particularly in the western coast of Estonia. (Kalamees & al., 1976; Kalamees & Raitviir, 1982; Raitviir & Leenurm, 2001).

BLUMERIELLA Arx

Blumeriella jaapii (Rehm) Arx – Syn: *Coccomyces hiemalis* B. B. Higgins, *Coccomyces prunophorae* B. B. Higgins. Anamorph: *Cylindrosporium hiemale* B. B. Higgins. Syn.: *Phleosporella hiemale* (B. B. Higgins) Põldmaa. Very common on *Cerasus vulgaris* and more rarely on *Prunus domestica,* but reported usally in its anamorph state (Pärtel, 1962, 1974**;** Sooväli, 1962; Zherbele, 1961; Põldmaa, 1967; Jaama & al., 1979). In older studies placed into Phacidiales (Järva & Parmasto, 1980).

CALLORIA Fr.

*Calloria neglecta (Lib.) B. Hein – Anamorph: *Cylindrocolla urticae* (Fr.) Bonord. Syn.:

Dacrymyces urticae Fr. On decaying last-year stems of *Urtica dioica*, Tartumaa Co., Puhja Comm., Mõisanurme, 23.05.2003 (TAA 182262). It is the first record of teleomorph state of this fungus, which is common but rarely reported on dead stems of *Urtica dioica* in its anamorph state (Dietrich, 1856; Lepik, 1938).

CATINELLA Boud.

Catinella olivacea (Pers.) Boud. – There is only a single old record on decaying wood of *Picea abies* (Dietrich, 1856).

CORONELLARIA (P. Karst.) P. Karst.

Coronellaria pulicaris (P. Karst.) Sacc. – This rare species, usually growing on *Carex* spp. has been recorded on *Scirpus tabernaemontani* in a single locality (Raitviir & Leenurm, 2001).

DERMEA Fr.

Dermea ariae (Pers.: Fr.) Tul. – This species has been recorded only once on *Sorbus aucuparia* (Kalamees & Raitviir, 1979).

Dermea cerasi (Pers.) Fr. – There is only a single old record on decaying wood of *Cerasus vulgaris* (Dietrich, 1856).

Dermea prunastri (Pers.: Fr.) Fr. – There is only a single old record on decaying wood of *Prunus domestica* (Dietrich, 1856).

DIPLOCARPON F.A. Wolf

Diplocarpon earlianum (Ell. & Everh.) F.A. Wolf
Anamorph: *Marssonina potentillae* (Desm.) Magnus – This species is mentioned only once as teleomorph (Pärtel, 1965**),** but it is widespread on various hosts (*Comarum palustre, Fragaria ananassa, Potentilla anserina* and *Rubus saxatilis*) as anamorph (Kikas & Pärtel, 1968; Pärtel, 1974; Ülevaade..., 1968; Põldmaa, 1967).

Diplocarpon rosae F.A. Wolf – Anamorph: *Marssonina rosae* (Lib.) Died. Common on *Rosa* spp., found mainly as anamorph (Grinfeld & Rumberg, 1986; Karis & Normet, 1986; Rumberg, 1975, 1983; Vardja, 1988; Kokovkin, 1986; Normet, 1986; Põldmaa, 1967).

DIPLONAEVIA Sacc.

*Diplonaevia emergens (P. Karst.) B. Hein – Only one known locality on dead stems of *Juncus conglomeratus*, Lahemaa National Park, Pärispea peninsula, Viinistu, 27.07.1974, coll. L. Viljasoo (TAA 182356).

Diplonaevia exigua (Desm.) B. Hein – Syn.: *Hysteropezizella exigua* (Desm.) Nannf. This species is reported twice growing on dead stems of *Juncus* sp. (Põldmaa & Raitviir, 1966; Kalamees & Raitviir 1982). It was also discovered on dead parts of *Juncus articulatus* in TAA herbarium of phanerogams: Tartu, Tähtvere forest, 24.07.1935, coll. A. Vaga.

DREPANOPEZIZA (Kleb.) Höhn.

Drepanopeziza ribis (Kleb.) Höhn. – Syn.: *Pseudopeziza ribis* Kleb. Anamorph: *Gloeosporium ribis* (Lib.) Mont. & Desm. Syn.: *Gloeosporidiella ribis* (Lib.) Höhn. Reported on *Ribes* spp. (Kivi & Ojamets 1973; Jaaska & al., 1975) Teleomorph is very rare and this common species is known mainly in anamorph state (Koitjärv 1973, 1973a, 1974; Pärtel, 1974.; Ülevaade..., 1968; Põldmaa, 1967).

HYSTERONAEVIA Nannf.

*Hysteronaevia scirpina (Peck) Nannf. – This fungus is found on dead stems and leaves of *Trichophorum alpinum* in two localities: Pärnumaa Co., Tõstamaa, west bank of lake Ermistu, 27.07.1962, coll. S. Pärn & S. Talts (TAA 182354); Ida-Virumaa Co. North of Tarumaa, 28.06.1961, coll H. Tamm (TAA 182355). Both collections were identified by Ch. Scheuer (Graz).

HYSTEROPEZIZELLA Höhn.

Hysteropezizella pusilla (Speg. & Roum.) Nannf. – Syn.: *Naevia pusilla* (Lib.) Rehm. This fungus is known from a single locality in Saaremaa Co., on coastal dunes between Kuressaare and Anseküla, on dead stems of *Juncus balticus* (Vestergren, 1903; Buchgolz, 1916).

LEPTOTROCHILA P. Karst.

Leptotrochila cerastiorum (Wallr.) Schüepp – Syn.: *Fabraea cerastiorum* (Wallr.) Rehm. This fungus is rather rare but sometimes very abundant on leaves of *Cerastium caespitosum* (Lepik, 1935; Põldmaa & Raitviir, 1966; Põldmaa, 1967).

Leptotrochila jasionis (Romell) Schüepp – Syn.: *Pyrenopeziza. jasionis* Romell. This fungus is known from a single locality in Saaremaa Co., Rootsiküla, on dead basal leaves of *Jasione montana* (Vestergren, 1903; Buchgolz, 1916). The material was distributed in Vestergren, Micromycetes Rariores Selecti 9: 224b.

Leptotrochila medicaginis (Fuckel) Schüepp – Common and abundant on living leaves of *Medicago falcata, M. lupulina* and *M. sativa* (Põldmaa & Raitviir, 1966; Põldmaa, 1967).

Leptotrochila ranunculi (Fr.) Schüepp – Syn.: *Fabraea ranunculi* (Fr.) P. Karst. Very common on leaves of *Ranunculus acer, R. auricomus, R. cassubicus* and *R. repens* (Buchgolz, 1916; Karis & Normet, 1988; Lepik, 1935, 1939,1939a; Põldmaa, 1967; Põldmaa & Raitviir, 1966; Vestergren, 1903).

*Leptotrochila repanda (Fr.) P. Karst. – This species has been collected twice on living stems and leaves of *Potentilla norvecia*, Põlvamaa Co., Räpina, in the collection garden of Räpina Gardening School, 19.06. & 06.10.1957, coll. & det. P. Põldmaa (TAA 24986, 25635).

Leptotrochila verrucosa (Wallr.) Schüepp – Common on dead leaves of *Galium boreale* (Põldmaa, 1967).

MICROPEZIZA Fuckel

Micropeziza cornea (Berk. & Broome) Nannf. – Fairly common on dead leaves of *Carex* spp. and. *Eriophorum* spp. (Raitviir, 2002).

*Micropeziza poae Fuckel – Known from a single locality on dead culms of *Deschampsia caespitosa*, Tartumaa Co., Haaslava Comm., Alaküla, 21.10.1997, coll. A. Raitviir (TAA 182357).

MOLLISIA (Fr.) P. Karst.

*Mollisia alcalireagens Svrèek – This fungus is known from a single locality on dead canes of *Rubus idaeus*, Valgamaa Co., Koobassaare, 09.09.1957, coll. E.Parmasto (TAA 8445).

Mollisia amenticola (Sacc.) Rehm – Not rare on fallen female inflorescens of *Alnus incana* (Raitviir & Leenurm, 2001).

*Mollisia artemisiae (Lasch) Gremmen – Found only once on fallen dead stems of *Artemisia vulgaris*, Saaremaa Co., Ruhnu Island, SW of Ruhnu Village, 09.08.2001, coll. E. & I. Parmasto (TAA 10538).

Mollisia arundinacea (DC.) W. Phillips – Syn: *Pyrenopeziza arundinacea* (Fr.) Gremmen. Common on dead culms and leaves of *Calamagrostis epigeios* and *Phragmites communis* (Raitviir, 1965; Soobik, 1988).

Mollisia benesuada (Tul.) W. Phillips – Not uncommon on bark of dead branches of *Salix* spp. (Raitviir & Leenurm, 2001).

*Mollisia caespitica (P. Karst.) P. Karst. – There are two known localities: On dead branches of *Quercus robur*, Saaremaa Co., Muhumaa, Piiri, 26.07.1971, coll. P. Põldmaa (TAA 39250). On a fallen dead branch of *Corylus avellana*, Läänemaa Co., Kullamaa, 04.07.1980, coll. P. Põldmaa (TAA 129271).

Mollisia caricina Fautrey – Common on dead stems and leaves of *Carex* spp. (Raitviir & Leenurm, 2001).

Mollisia cinerea (Batsch: Fr.) P. Karst. – Very common on decorticated decaying wood of coniferous and deciduous trees (Dietrich, 1856; Kalamees & Raitviir, 1979; Kalamees & Vaasma, 1989).

Mollisia clavata Gremmen – Common on dead stems of *Filipendula ulmaria* and dead canes of *Rubus idaeus* (Raitviir, 2002).

*Mollisia dilutella (Fr.) Gillet – Syn.: *Niptera dilutella* (Fr.) Rehm. Known from a single locality on dead canes of *Rubus idaeus*, Hiiumaa Co., Emmaste Comm., Jausa, 26.12.1998, coll. K. Leenurm, det. H.-O. Baral (TAA 165468).

*Mollisia discolor (Mont. & Fr.) W. Phillips – There is a single known locality on bark of a fallen dead branch of *Sorbus aucuparia*, Ida-Virumaa Co., Kohtla-Järve, Smolnitsa, 30.07.1971, coll. P. Põldmaa (TAA 39279).

*Mollisia discolor (Mont. & Fr.) W. Phillips var. longispora LeGal – There is a single known locality on decaying wood of *Tilia cordata*, Jõgevamaa Co., Puurmanni Comm., Alam-Pedja Nature Reserve, Võiviku zone, 27.09.1997, coll. A. Raitviir (TAA 137512).

*Mollisia escharodes (Berk. & Broome) Gremmen – There is a single known locality on dead culms of *Rubus idaeus*, Lääne-Virumaa Co., Käsmu, 22.09.1964, coll. A. Raitviir (TAA 43521).

*Mollisia fuscostriata Graddon – Known from a single locality on a dead herbaceous

stem, Viljandimaa Co., Karksi Village, in swamp. 28.06.1980, coll. P. Põldmaa (TAA 129228).

Mollisia juncina (Pers.) Rehm – This species has been reported growing on dead stems of *Juncus effusus* and *J. conglomeratus* (Dietrich, 1859).

Mollisia ligni (Desm.) P. Karst. – Not uncommon on dead decorticated wood of coniferous and deciduous wood (Kalamees & Raitviir, 1979).

*Mollisia macrosperma (Sacc.) LeGal & F. Mangenot – Known from a single locality on a fallen twig of *Alnus incana*, Valgamaa Co., Puka Comm., Aakre Forestry, sq. 119/11, 06.08.1998, coll. K. Leenurm (TAA 165371).

Mollisia melaleuca (Fr.) Sacc. – Common on dead wood of coniferous and deciduous trees (Kalamees & Raitviir, 1979).

Mollisia palustris (Roberge) P. Karst. – Common on dead stems of *Juncus* spp. (Kalamees & Raitviir, 1982).

Mollisia pastinacae Nannf. – Syn.: *Pyrenopeziza pastinacae* (Nannf.) Gremmen. Common on dead stems of *Angelica sylvestris* (Raitviir & Leenurm, 2001).

Mollisia perparvula P. Karst. – Rarely on bark of *Betula* spp. (Raitviir, 2002).

*Mollisia pteridina (Nyl.) P. Karst. – On dead fronds of *Pteridium aquilinum*, Harjumaa Co., Riisipere, 05.07.1965, coll. A. Raitviir (TAA 43751).

*Mollisia ramealis (P. Karst.) P. Karst. – Very common, but surprisingly there are no published records of this conspicuous species growing on fallen thin branches of *Betula* spp. and other deciduous trees. Some representative collections in TAA are: On a fallen branch of a deciduous tree, Läänemaa Co., Kulli, 14.08.1960, coll. A. Raitviir (TAA 40910). On fallen thin branches of *Betula* sp., Ida-Virumaa Co., Boroni Nature Reserve, 04.10.1967, coll. A. Raitviir (TAA 44918, 44922). On a fallen thin branch of *Salix* sp., Jõgevamaa Co., Alam-Pedja Nature Reserve, Umbusi-Epruraba zone, Kursi Forestry, sq. 300, 27.08.1997, coll. & det. K. Leenurm (TAA 164066). On a fallen small twig of a deciduous tree, Valga Co., Taheva Comm., Koiva meadow forest, 09.10.1999, coll. K. Leenurm (TAA 165556).

Mollisia revincta (P. Karst.) Rehm – Common on dead stems of *Filipendula ulmaria* and dead canes of *Rubus idaeus* (Raitviir & Leenurm, 2001).

Mollisia umbonata (Pers.) Sacc. – This species has been reported growing on dead wood of *Alnus* sp. (Dietrich, 1859).

*Mollisia ventosa (P. Karst.) P. Karst. – This species is known from a single locality growing on dead wood of a deciduous tree, Viljandi Co., Heimtali, 18.06.1959, coll. U. & K. Kalamees (TAA 71245).

NEOFABRAEA Jackson

Neofabraea alba (E.J. Guthrie) Verkley – Anamorph: *Phlyctema vagabunda* Desm. Syn.: *Gloeosporium album* Osterw. This species is common and widespread on fruits and dead bark of *Malus* spp. cult. It has been found only as anamorph (Kivilaan, 1936; Lamp, 1967; Lepist, 1972; Pärtel, 1974).

Neofabraea malicorticis H.S. Jacks. – Anamorph: *Cryptosporiopsis curvispora* (Peck) Gremmen. Common and widespread on bark and fruits of *Malus domestica* and *Pyrus communis*. Found mainly as anamorph (Leius & al., 1939; Lepist, 1972; Randalu, 1954; Pärtel, 1959).

PEZICULA Tul. & C. Tul.

*Pezicula acericola (Peck) Peck – There is a single known locality on dead wood of *Acer platanoides*, Jõgevamaa Co., Reola, 29.09.1969, coll. K. Kalamees (TAA 78181).

Pezicula aescula Kirschst. – Rarely on dead branches of *Corylus avellana* (Raitviir & Leenurm, 2001).

Pezicula cinnamomea (Pers.) Sacc. – Widely distributed but not abundant on dead bark of *Pinus sylvestris* and *Acer platanoides* (Kalamees & Raitviir, 1979).

Pezicula corticola (C.A. Jørg.) Nannf. – Common on bark of *Malus domestica* and *Pyrus communis* (Leius & al., 1939; Lepik, 1938, 1940; Randalu, 1954).

*Pezicula eucrita (P. Karst.) P. Karst. – Known from a single locality on bark of dead branches of *Pinus sylvestris*, Tartumaa Co., Järvselja, Apnasaar, 30.09.1970, coll. B. Kullman (TAA 60832).

Pezicula frangulae (Fr.) Fuckel – Common on dead branches of *Frangula alnus* (Põldmaa & Raitviir, 1966).

Pezicula rubi (Lib.) Niessl. – Rarely on dead canes of *Rubus idaeus* (Raitviir & Leenurm, 2000).

PIROTTAEA Sacc.

Pirottaea astragali Nannf. – Rarely on dead stems of *Filipendula ulmaria* (Raitviir & Leenurm, 2001).

Pirottaea nigromarginata Graddon – Rarely on dead stems of *Heracleum* sp. (Raitviir & Leenurm, 2001).

Pirottaea pilosissima Nannf. – Rarely on dead stems of *Veronica longifolia* (Raitviir & Leenurm, 2001).

*Pirottaea senecionis Nannf. – Known from a single collection on dead stems of *Centaurea jacea*, Viljandimaa Co., on the bank of lake Viljandi, 22.04.1981, coll. P. Põldmaa (TAA 129634).

PODOPHACIDIUM Niessl.

Podophacidium xanthomelum (Pers.) Kavina – Rarely on the ground (Kalamees & Raitviir, 1979; Raitviir, 1981).

PSEUDOPEZIZA Fuckel

Pseudopeziza calthae (W. Phillips) Massee – Syn.: *Fabraea rousseauana* Sacc. & E. Bommer. Common on leaves of *Caltha palustris* (Vestergren, 1903**;** Buchgolz, 1916; Kalamees & Raitviir, 1982**).**

Pseudopeziza medicaginis (Lib.) Sacc. – Very common on leaves of *Medicago falcata, M. sativa* and *M.* x *varia* (Laats, 1960; Lepik, 1943; Liblikõieliste..., 1964; Jaama & al., 1979; Ülevaade..., 1976).

Pseudopeziza meliloti Syd. – Fairly common on *Melilotus albus* (Liblikõieliste..., 1964).

Pseudopeziza trifolii (Biv.) Fuckel – Very common on leaves of *Melilotus albus, Trifolium arvense, T. hybridum, T. medium, T. pratense, T. repens, T. sativum* and *T. sp.* (Kivi, 1959, 1960, 1962, 1963, 1963a, 1963b, 1970; Kivi & Kivi, 1968; Koitjärv, 1969; Lepik, 1939; Põldmaa & Raitviir, 1966; Tomson, 1934; Põldmaa, 1967; Jaama & al., 1979).

PYRENOPEZIZA Fuckel

*Pyrenopeziza arctii (W. Phillips) Nannf. – Known from a single locality on dead stems of *Arctium* sp., Viljandimaa Co., Võhma, 22.04.1981, coll. P. Põldmaa (TAA 129680).

*Pyrenopeziza artemisiae (Lasch) Rehm – Known from a single locality on dead stems of *Artemisia vulgaris*, Läänemaa Co., Kullamaa, 05.07.1980, coll. P. Põldmaa (TAA 129283).

Pyrenopeziza compressula Rehm – Rarely on dead stems of *Potentilla norvegica* (Lepik, 1939a).

Pyrenopeziza galii-veri (P. Karst.) Sacc. – Common on dead stems of *Galium mollugo* (Raitviir & Leenurm, 2001).

Pyrenopeziza euphrasiae (Fuckel) Kunze – Syn.: *Beloniella euphrasiae* (Fuckel) Rehm. Rarely on dead stems of *Euphrasia* sp. (Vestergren, 1903**;** Buchgolz, 1916).

Pyrenopeziza lycopi Rehm – Rarely on dead stems of *Lythrum salicaria* (Vestergren, 1903; Buchgolz, 1916).

Pyrenopeziza millegrana Boud. – Rarely on dead stems of *Filipendula ulmaria* (Raitviir & Leenurm, 2001).

Pyrenopeziza pulveracea (Fuckel) Gremmen – Rarely on dead stems of *Filipendula ulmaria* (Raitviir & Leenurm, 2001).

Pyrenopeziza rubi (Fr.) Rehm – Common on dead canes of *Rubus idaeus* (Kalamees & Raitviir, 1979).

Pyrenopeziza thalictri (Peck) Sacc. – Syn.: *Beloniella osiliensis* Vestergren. Fairly common on dead stems of *Thalictrum* sp. (Lepik, 1928; Vestergren, 1903; Buchgolz, 1916).

TAPESIA (Pers.: Fr.) Fuckel

Tapesia fusca (Fr.) Fuckel – Very common on dead wood of deciduous and coniferous trees (Põldmaa & Raitviir, 1966; Kalamees & Raitviir, 1979; Prokhorov & Raitviir, 1985).

*Tapesia livido-fusca (Fr.) Rehm – Known from a single locality on decaying log of *Populus tremula*, Tartumaa Co., Tähtvere forest, 07.05.1958, coll. K. Kalamees (TAA 70276).

Tapesia prunorum (Fr.) Fuckel – Rarely on dead wood of deciduous trees (Raitviir, 2002).

Excluded taxa

BELONIELLA (Sacc.) Boud. should be excluded from the *Dermateaceae* as a synonym of *Odontura* Clem. This genus belongs to *Odontotremataceae* (Ostropales), fide Sherwood-Pike (1987).

BELONIELLA DECIPIENS Rehm – Reported on *Galium mollugo* (Vestergren, 1903; Buchgolz, 1916). The taxonomic position of this species is unclear.

BELONIELLA NUDA Gucevic – Reported on *Festuca rubra* (Soobik, 1988). The identity of this species and its true taxonomic position remain unknown.

PYRENOPEZIZA POLYMORPHA Rehm – Reported to grow on various grasses (Soobik, 1988). It is an evident misidentification, because this species is described growing on *Galium mollugo*. Its identity cannot be traced because no description is given and no herbarium material is preserved.

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The bryological collection in the herbarium of the Institute of Zoology and Botany

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Abstract: The bryological collections included in the herbarium of the Institute of Zoology and Botany (TAA) contain more than 25 000 specimens. Collected material is arranged into four sections: Estonian herbarium (ca 15 000), geographical collections (ca 2 800 specimens), historical collections (ca 7 200 specimens) and herbarium of exsiccatae (715 specimens). The type specimens and exciccatae deposited in herbarium are listed.

Kokkuvõte: K. Vellak. Zooloogia ja Botaanika Instituudi brüoloogilised kollektsioonid.

Zooloogia ja Botaanika Instituudi herbariumis (TAA) paikneb sammalde kogu, mis sisaldab enam kui 25 000 eksemplari. Kogu on jaotatud neljaks sektsiooniks: Eesti herbarium (ca. 15 000 eksemplari), geograafilised kollektsioonid (ca. 2 800 eksemplari), ajaloolised kollektsioonid (ca. 7 200 eksemplari) ja eksikaatide kogu (715 eksemplari). Loetletud on kogus paiknevad tüüpeksemplarid ja eksikaadid.

INTRODUCTION

Herbaria preserve genetic and historical information of plant and fungal species, give us evidence about the previous occurrence of species already disappeared from the region, and about changes in the flora of the region. Herbarium collections are therefore an essential part of every botanical research institution (Kull 1999).

In Estonia the importance of herbarium collections has been discussed thoroughly by T. Kukk (1997). Although his arguments are based on vascular plant collections, they are also valid for other herbaria in general. The majority of published articles concerning herbaria are based on vascular plants (Vilberg 1933; Eichwald & Trass 1960, Laasimer 1970 etc.), and less attention has been paid to cryptogam collections. Only a survey about TU lichenological collections (Saag et al. 1998) and short description of the bryological collection in the Estonian Museum of Natural History (Kannukene 2001) have been published recently.

Estonian bryological collections are located in four main herbaria, which contain ca 100 000 specimens in all. However, the total number of bryophyte specimens in all Estonian bryological collections together is not high and is comparable with the size of a single lichenological collection at TU.

The bryological collections included in the herbarium of the Institute of Zoology and Botany (TAA) with more than 25 000 specimens constitute Estonia's largest bryophyte herbarium at the moment. The bryophyte herbarium at the University of Tartu (TU) includes around 20 000 specimens (M. Leis's personal comments), among which the most presentable specimens are deposited in the historical collections. About the same number of specimens are included in the herbarium of the Estonian Museum of Natural History (TAM; Kannukene 2001), and somewhat less in the herbarium of Tallinn Botanical Garden (TALL; T. Piin's personal comments).

Besides the herbaria mentioned above there are also some private collections of bryophytes and smaller herbaria at some nature protection areas (Endla, Nigula etc). Despite the small size of Estonian bryological collections, they have provided good scientific material for compiling several lists and distribution maps of Estonian bryophytes (latest: Kannukene 1986; Ingerpuu et al. 1994, 1998; Söderström et al. 1996, 1998, 2002).

RESULTS AND DISCUSSION

The history of the bryological herbarium began in 1947, when first bryological collections were donated from the Estonian Naturalist's Society to the newly established Institute of Zoology and Botany. This donation included nine different collections in 18 packages altogether (Kongo 1980). The largest collection of them was the Estonian Naturalist's Society's (ENS) own col-

lection. Some collections have been lost during several relocations of the herbarium. Hence, the present location of the following three collections is unknown: M. zur Mühlen's "Musci Estonici", the moss-collection of N. Seidlitz and "Cryptogamae Lapponiae".

In September 2003 the bryological collection of the TAA herbarium consisted of more than 25 000 specimens of ca 1 200 species.

Collected material is arranged into four sections:

Estonian herbarium – ca 13 000 identified specimens and ca 2000 unidentified specimens

Geographical collections – ca 1800 identified specimens and ca 1000 unidentified specimens

Historical collections – ca 7200 specimens

Herbarium of exsiccatae – 715 specimens.

Within each collection the divisions are arranged in a phylogenetic system so that hornworts, hepatics and mosses are separated. . The taxonomy of Grolle & Long (2000) is followed for hepatics and hornworts, and that of Corley et al. (1981, 1991) for mosses. Within a division the genera and species are arranged alphabetically.

At present, only three type specimens are deposited in the herbarium:

Myriocolepis riparia Reine & Grandst. (paratype, located in the geographical collections section);

Sphagnum girgensohnii Russ. (syntype, located in the historical collections section);

Sphagnum majus (Russ.) C. Jens. (lectotype, located in the historical collections section).

However, the herbarium contains potential type-specimens for several species described by E. Russow and G. K. Girgensohn. At their time, it was not customary to point out a type specimen, and therefore, specimens of *S. wulfianum* Girg., *S. balticum* (Russ.) C. Jens., *S. angustifolium* (Russ.) C. Jens. and *S. warnstorfii* Russ. are waiting for typification. Also the potential type-material for *Sphagnum fallax* (Klinggr.) Klinggr. is deposited in TAA herbarium, since this species was first described by E. Russow as *Sphagnum recurvum* ssp. *mucronatum.* The material on which the description is based occurs in Russow's collection.

The Estonian herbarium

constitutes the largest part of the TAA bryophyte herbarium, containing representatives of 455 species with total of ca 13 000 specimens. This collection is also the most exhaustive in the whole Estonia. Specimens of both Estonian hornwort species are deposited here, and 112 species of the 117 Estonian hepatic species are represented with more than 3 000 specimens. The herbarium includes also voucher material for the majority (341 species) of mosses. If we include Estonian species deposited in the historical collections, 358 (86 %) of the Estonian moss-species are represented in the herbarium of TAA. In addition to the identified specimens mentioned above, ca 2 000 documented and arranged, but still unidentified specimens collected at different times by different Estonian scientists, belong to this herbarium.

For the two missing hepatic species – *Jungermannia subulata* Evans and *Jungermannia gracillima* Sm. – only literature reports are available, and the three other species – *Athalamia hyalina* (Sommerf.) Hatt., *Barbilophozia floerkei* (Web. & Mohr) Loeske, and *Cephalozia catenulata* (Hüb.) Lindb. – have voucher material in the herbarium of TU (Ingerpuu et al. 1994, Vellak et al. 2001).

Geographical collections,

containing material collected outside Estonia, are arranged into the geographical sections: Europe, Asia, Africa, Australia, South– and North–America. The geographical areas nearby Estonia are best represented and the herbarium is rich in material from the European part of Russia and from Scandinavia. In 2001, the herbarium received 291 specimens of European bryophytes as a gift from the Herbarium Schäfer–Verwimp (Germany). Quite remarkable – including more than 700 specimens – is also the collection from Australia. It was received as a gift by H. Streimann, who was a bryologist of Estonian origin living in Canberra. On the other hand, the herbarium has only a few isolated specimens from North–America. The material has been mainly collected during different expeditions by various scientists, and a smaller part has been received as gifts or in exchanges.

Historical collections.

The old material is kept separately, because in these collections bryophytes are usually pasted on paper and put into separate folders. In some cases, even specimens collected from different geographical locations are pasted on the same paper. Changing this arrangement could destroy the cultural value of the collection. The oldest specimen in the herbarium is a specimen labelled as *Ceratodon chlorophus* Brid., collected by B. Fiedler in 1826 from Germany. The oldest specimen from Estonia is identified as *Barbilophozia barbata* (Schreb.) Loeske and it was collected by G. K. Girgensohn from Tartu already in 1843.

The collections of the most famous Estonian bryologists from the 19th century, E. A. F. Russow and G. K. Girgensohn, are included in the historical collections. Their collections have reached the herbarium in different ways. The well-organised and identified collection of Girgnesohn with its 925 sheets was received as a donation from the Estonian Naturalists' Society in 1947 together with others collections. The history of Russow's collection is more exciting. The collection was taken to St. Petersburg during a war and it was brought back to Estonia only at the end of the 1980s. It is unclear to which Estonian herbarium that collection should belong, since there is no exact evidence of its former ownership. We do not even know the exact size of his enormous collection. The collection located in TAA contains 4237 sheets for 25 species and numerous subspecies described by Russow. It seems that part of the collection has been lost, since for some species that he has described, no material can be found in his collection. Still, there is lot of wonderful material for several species described by Russow, some of which are supplied with original drawings. There is also material without any comments. Also potential type-specimens for species described by Russow are kept in his collection.

Herbarium of Estonian Naturalists' Society consists about 1300 herbarium sheets collected mainly by A. A. Bruttan from Estonia and Northern Latvia. His collection contains also specimens from different collectors, which he got from Germany in exchange. On the basis of the collected material Bruttan compiled lists of hepatics and bryophytes of the Baltic region of Russia at the end of 19th century (Bruttan 1891, 1892). The Estonian Naturalists' Society supported several collecting trips of amateur botanists and they donated their collections to the ENS. In this way the ENS received the private herbarium of a schoolteacher, K. E. Nicklasen, which contains 491 sheets for 167 species, collected mainly from the surroundings of Tallinn. This herbarium includes also some specimens of J. Mikutowicz collected from Estonia during 1902-1907. On the basis of that material, he later compiled the exsiccate herbarium of the Baltic region "Bryotheca Baltica".

Herbarium of exsiccatae.

This part of herbarium contains mainly exsiccatae from Europe and the European part of Russia (Table 1), which have been received as gifts or exchange material from different herbaria all over the world. There are: Flora Exsiccata Liv-, Est- und Kurlands (19th century, undated); Musci Frondosi Exsiccati (B. Fridler 1842–1847, from different parts of Europe), Hepaticae et Musci URSS Exsiccati (Savicz-Ljubitzkaja 1957); Bryophyta Murmanica Exsiccata (Konstantinova, Belkina, Likhachev and Shljakov 1989, 1998); Bryophyta Rossica et Civitatum Collimitanearum Exsiccata (Afonina 1995); Bryophyta Karelica Exsiccata (Lantratova, Bakalin and Maksimov 1999). At the middle of the 1990s the herbarium also received part of Musci Australiasiae Exsiccati (Streimann 1992–1997).

Recently we started to compile a web-based database for Estonian bryological herbaria. The linked database will help to find information about species rapidly, regardless of their location. First of all, we are making lists of species occurring in different collections and this will be made available at our bryological web-site: http://moritz.botany.ut.ee/bruoloogia/.

Table 1. Bryological exsiccate material in TAA

Name of collection Series	Numbers in TAA
Flora Exsiccata Liv-, Est- und Kurlands	167 specimens, partly without numbers
Musci Frondosi Exsiccati	
Fasc. 1	1–50
Hepaticae et Musci URSS Exsiccati	
Fasc. 1	1–4, 6–10
Fasc. 2– Fasc. 19	11–190
Bryophyta Murmanica Exsiccata	
Fasc. 1	1–50
Fasc. 3	101–105, 107, 109–150
Bryophyta Rossica et Civitatum Collimitanearum Exsiccata	
Fasc. 1– Fasc. 4	1–100
Bryophyta Karelica Exsiccata	
Fasc. 1	1–50
Musci Australiasiae Exsiccati	
Fasc. 1	2–8, 11,16,18,22
Fasc. 2	28,34–35,37–39,43–45,49–50
Fasc. 3	53,57–58,67,71–72,74
Fasc. 4	76–83,85,92,98–100
Fasc. 5	109,115–116,118–120,124
Fasc. 6	134,136
Fasc. 7	167,172,175
Fasc. 8	177,180,183,190–191
Fasc. 9	205,207,212,214,219,225
Fasc. 10	243,247
Fasc. 11	254,261–262,265
Fasc. 12	268,272,279,285,289–291,293–295, 300
Fasc. 13	305,314,316,325–326,328–330,339
Fasc. 14	347,349–350,358–359,367,373,376,379,383,387,395

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Additional data on Latvian myxomycetes

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Abstract: Based on unpublished collections of myxomycetes deposited in the Herbarium of the University of Latvia (RIG), 38 myxomycete species are reported from various regions of Latvia, among them 10 species registered in the territory for the first time: *Arcyria affinis, A. oerstedii, Badhamia macrocarpa*, *Collaria elegans, Didymium iridis, D. minus, Fuligo candida*, *Lamproderma arcyrioides*, *Metatrichia floriformis,* and *Physarum robustum*. Records include substrate and locality data. Brief morphological descriptions are provided for critical specimens. Collection sites are mapped.

Kokkuvõte: Lisaandmeid Läti limakutest.

Läti Ülikooli (RIG) herbaariumis säilitatavatest avaldamata sisuga kollektsioonidest on leitud 38 erinevatelt Läti aladelt kogutud limaku liiki, milledest 10 on uued antud alale: *Arcyria affinis, A. oerstedii, Badhamia macrocarpa*, *Collaria elegans, Didymium iridis, D. minus, Fuligo candida*, *Lamproderma arcyrioides*, *Metatrichia floriformis* ja *Physarum robustum*. Esitatakse substraatide ja leiukohtade andmed. Kriitiliste eksemplaride puhul on lisatud lühidad morfoloogilised kirjeldused. Levikuandmed on kaardistatud.

INTRODUCTION

Investigations of the Latvian myxomycetes, or acellular slime molds, date back as far as 1890, when Rothert published his material collected near Riga (Rothert, 1890). Later on, when revising and summarising research results on myxomycetes in Latvia and Estonia, Bucholtz reported 43 species of these organisms from Latvia, mostly on the basis of the abovementioned publication by Rothert (Bucholtz, 1908). Having investigated mycobiota in the Moricsala Nature Reserve (in the north-western part of Latvia, in Ventspils distr.), Kupffer presented 22 species of myxomycetes (Kupffer, 1931). More than 50 years later, 40 myxomycete species were reported from the Slitere National Park, Talsi distr., among them 15 species new to Latvia (Ruskule & Vimba, 1987). Recent examination of K. R. Kupfer myxomycete collection kept in the Herbarium of the University of Latvia has added nine new species (Adamonyte & Vimba, 2003). Thus, in total, approximately 80 species of these organisms have been recorded in Latvia, so far. Realising that this group has been underinvestigated in Latvia and that the distribution data of myxomycetes are fragmentary in its territory, we consider it important to make public the unpublished materials kept in the Herbarium of the University of Latvia (RIG).

This paper presents additional records on slime molds maintained by the Latvian mycologists during a considerable period of time and supplements the list of Latvian myxomycetes with ten new species.

MATERIAL AND METHODS

Specimens of myxomycetes mostly came from the first author of the present paper, unless stated differently in the description of the particular species. Part of the collections has been identified by the second author; in other cases, names of the determiners are given. Specimens are deposited in the Herbarium of the University of Latvia (RIG). Myxomycete nomenclature follows Nannenga-Bremekamp (1991), abbreviations of authors' names are used according to Brummitt & Powell (1992).

If available, species are provided with data on specimen substrate, habitat, and collection date. Comments on morphology are given for some species. Species that are new to Latvia are marked with an asterisk (*). Collection sites are mapped and numbered (Fig. 1); the according site numbers (see legend to Fig. 1) are given in brackets in the following list.

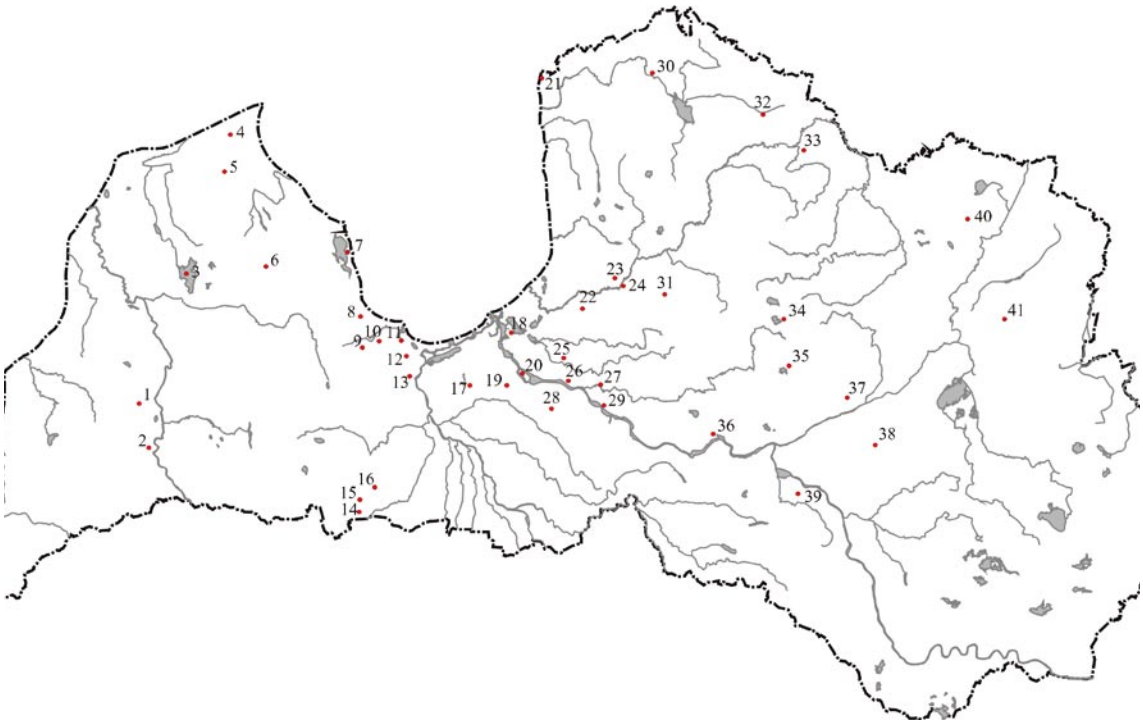

Fig. 1. Collection sites: 1 – Kazdanga (Liepaja distr.), 2 – Lena (Kuldiga distr.), 3 – Moricsala Nature Reserve (Ventspils distr.), 4 – Slitere National Park (Talsi distr.), 5 – Dundaga (Talsi distr.), 6 – Libagi (Talsi distr.), 7 – Engure (Tukums distr.), 8 – Apsuciems (Tukums distr.), 9 – Milzkalne (Tukums distr.), 10 – Smarde (Tukums distr.), 11 – Kemeri National Park (Riga distr.), 12 – Kudra (Riga distr.), 13 – Kalnciems (Jelgava distr.), 14 – Augstkalne (Dobele distr.), 15 – Bukaisi (Dobele distr.), 16 – Tervete (Dobele distr.), 17 – Olaine, Dalbe (Riga distr.), 18 – Riga and its environs, 19 – Baldone (Riga distr.), 20 – Dole (Riga distr.), 21 – Ainazi (Limbazi distr.), 22 – Garkalne (Riga distr.), 23 – Krimulda (Riga distr.), 24 – Sigulda (Riga distr.), 25 – Ropazi (Riga distr.), 26 – Ikskile (Ogre distr.), 27 – Ogresgals (Ogre distr.), 28 – Vecumnieki (Bauska distr.), 29 – Kegums (Ogre distr.), 30 – Mazsalaca (Valmiera distr.), 31 – Nitaure (Cesis distr.), 32 – Evele (Valka distr.), 33 – Vijciems (Valka distr.), 34 – Inesi (Cesis distr.), 35 – Vestiena (Madona distr.), 36 – Koknese (Aizkraukle distr.), 37 – Krustkalns Nature Reserve (Madona distr.), 38 – Teici Nature Reserve (Madona and Jekabpils distr.), 39 – Abeli (Jekabpils distr.), 40 – Anna (Aluksne distr.), 41 – Rugaji (Balvi distr.).

RESULTS

*Arcyria affinis Rostaf. – decaying wood, Moricsala Nature Reserve, the lake Usma, Ventspils distr. (3), 12 Aug. 1981; the forest Irsu, Bukaisi, Dobele distr. (15), 26 Aug 1979.

A. denudata (L.) Wettst. – decaying wood, the ravine Vikmeste, Krimulda, Riga distr. (23), 2 Oct. 1986; *Tilia* sp. decaying wood, a ravine at the farm Zeltsili, Slitere National Park, Talsi distr. (4), 29 Oct. 1983; decaying wood, the right bank of the river Perse at a waterfall, Koknese, Aizkraukle distr. (36), 10 Oct. 1962, leg. A. Piterans, det. T. Sizova; decaying wood, the right bank of the river Venta, Lena, Kuldiga distr. (2), 5 Aug. 1962, det. T. Sizova.

A. incarnata (Pers. ex J. F. Gmel.) Pers. – a log of *Picea abies*, Smarde, Tukums distr. (10), 19 July 1962; decaying wood, Smarde, Tukums distr. (10), 18 July 1962; decaying wood, a forest near Smarde at the farm Katlapji, Tukums distr. (10), 21 July 1962.

A. OBVELATA (Oeder) Onsberg – decaying wood, a forest near Spridisi, Tervete, Dobele distr. (16), 8 Aug. 1955, det. T. Sizova; decaying wood, the right bank of the river Slocene, Smarde, Tukums distr. (10), 19 July 1962, det. T. Sizova.

*A. OERSTEDII Rostaf. – decaying wood, Vecmilgravis, a road to Jaunciems, Riga (18), 25 Oct. 1953, det. T. Sizova.

A. POMIFORMIS (Leers) Rostaf. – developed on bark in a Petri dish within 1 week, Tervete, Dobele distr. (16), 29 April 1979.

*BADHAMIA MACROCARPA (Ces.) Rostaf. – a burned trunk of *Pinus sylvestris*, Slitere National Park, Viskangars, Talsi distr. (4), 22 July 1993. Sporocarps sessile and subsessile on very short, weak, flaccid straw-coloured stalks; hypothallus membranous; spores free, rounded, black in mass, dark brown in transmitted light, densely conspicuously warted, 12.5–13.5 μm diam.

CERATIOMYXA FRUTICULOSA (O. F. Müll.) T. Macbr. – decaying wood, a forest near Mazsalaca, Valmiera distr. (30), 12 Aug. 1964, det. T. Sizova; decaying wood of *Alnus incana*, Krimulda, Riga distr. (23), 15 July 1979, det. T. Sizova; decaying wood, the forest Silmaci, Mazsalaca, Valmiera distr. (30), 20 Aug. 1962, det. T. Sizova.

C. PORIOIDES (Alb. & Schwein.) J. Schröt. – decaying wood, Smarde, Tukums distr. (10), 19 July 1962; decaying wood, near the farm Zeltini, Tervete, Dobele distr. (16), 30 Aug. 1962, det. T. Sizova; a stump of *Pinus sylvestris*, Tervete, Dobele distr. (16), 2 Aug. 1979, det. T. Sizova; decaying wood, Kemeri National park, surroundings of Kemeri (11), 23 July 1962, det. T. Sizova.

*COLLARIA ELEGANS (Racib.) Dhillon & Nann.-Bremek. ex Ing – a decaying log of *Picea abies*, a slope, Slitere National Park, Talsi distr. (4), 29 June 1986. Columella characteristically splits into 2 main branches and then into 5–6 ones in the lower part of the sporotheca; spores minutelly spinulose, ca. 8 μm diam.

CRIBRARIA ARGILLACEA (Pers. ex J. F. Gmel.) Pers. – decaying wood, the right bank of the river Slocene, Smarde, Tukums distr. (10), 19 July 1962.

CRIBRARIA CANCELLATA (Batsch) Nann.-Bremek. – decaying wood, a mixed forest, Slitere National Park, Talsi distr. (4), 29 June 1986; decaying wood, a forest near Spridisi, Tervete, Dobele distr. (16), 22 Sept. 1979, infected by *Verticillium* sp.; decaying wood, Smarde, Tukums distr. (10), 18 July 1962, det. T. Sizova; fine debris at a firewood place, Sautuves Str. 6, Riga (18), 11 Aug. 1979, det. T. Sizova; decaying wood, the island Dole, Riga distr.(20), 25 Feb. 1962, det. T. Sizova; decaying wood, a forest near Smarde, Tukums distr. (10), 18 July 1962, det. T. Sizova.

C. RUFA (Roth) Rostaf. – a coniferous forest, the lake Pakrate, Rugaji, Balvi distr. (41), 28 Sept. 1961.

*DIDYMIUM IRIDIS (Ditmar) Fr. – a dry trunk of *Juniperus communis*, a forest in Celiskalns, Vijciems, Valka distr. (33), 10 Sept. 1979, det. T. Sizova.

D. MELANOSPERMUM (Pers.) T. Macbr. – decaying wood, the forest Baldone, Riga distr. (19), 1 Sept. 1990; the bog Lielie Kangari, Ropazi, Riga distr. (25), 16 Sept. 1984, leg. A. Piterans; a forest at the river Seda, Evele, Valka distr. (32), 24 Sept. 1994.

*D. MINUS (Lister) Morgan – a pine forest, Tervete, Dobele distr. (16), 26 Feb. 1995; a forest near Spridisi, Tervete, Dobele distr. (16), 8 Aug. 1955. Long-stalked sporocarps; stalk black; peridium mottled with small brown patches as seen by transmitted light; capillitium colourless; spores ca. 9 μm diam., minutely warted with groups of more distinct warts.

ENTERIDUM LYCOPERDON (Bull.) Farr – a decaying stump, at the rivulet Kirelite, Mazsalaca, Valmiera distr. (30), 9 March 1961, det. T. Sizova.

*FULIGO CANDIDA Pers. – mosses, the park Kazdanga, Liepaja distr. (1), 27 July 1988. Lime of the cortex and inner structures white; spores 7–7.5 μm diam.

F. SEPTICA (L.) F. H. Wigg. – a forest at the rivulet Niedruska, Krustkalns Nature Reserve, Madona distr. (37), 13 Sept. 1985; a stump of *Picea abies*, the right bank of the river Svete, between Augstkalne and Lithuanian border, Dobele distr. (14), 7 Aug. 1955, det. T. Sizova; coniferous litter, Ainazi, Limbazi distr. (21), 25 Aug. 1962, det. T. Sizova; a decaying stump, Skankalne, near Mazsalaca, Valmiera distr. (30), 7 Aug. 1979, det. T. Sizova; mosses, Dalbe, Riga distr. (17),

24 Aug. 1981; mosses, a forest near Vecumnieki, Bauska distr. (28), 2 Sept. 1979.

Hemitrichia clavata (Pers.) Rostaf. – *Alnus glutinosa* decaying wood, at the road from Kalnciems to Kemeri, Kalnciems, Jelgava distr. (13), 5 May 1992.

*Lamproderma arcyrioides (Sommerf.) Rostaf. – decaying wood of *Fraxinus excelsior*, a mixed forest, Slitere National Park, Talsi distr. (4), 19 Oct. 1985. Short-stalked sporocarps; columella expanded into an oval head; peridium remains as a black shining collar around the stalk; capillitium threads pale in transmitted light; spores conspicuously warted, with a paler germination pore, ca. 8.5 μm diam.

Leocarpus fragilis (Dicks.) Rostaf. – two collections from litter, the forest Baldone, Riga distr. (19), 1 Aug. 1990, leg. B. Vimba; the forest Baldone, Riga distr. (19), 16 Oct. 1988, leg. G. Pospelova; a forest near Anna, Aluksne distr. (40), July 1992, leg. M. Lielkalns, det. T. Sizova; log of *Pinus sylvestris* forest at the Mazsalaca, Valmiera distr. (30), 6 Aug. 1964, det. T. Sizova; an anthill, a forest near Prauliena, Madona distr. (37), 26 Aug. 1978, det. T. Sizova; litter, a forest near Garkalne, Riga distr. (22), 3 Sept. 1978, det. T. Sizova; a living plant of *Polytrichum commune*, Purtilti, near Mazsalaca, Valmiera distr. (30), 11 Aug. 1964, det. T. Sizova; Purtilti, near Mazsalaca, Valmiera distr. (30), 11 Aug. 1964, det. T. Sizova.

Lycogala epidendrum (L.) Fr. – decaying wood, a mixed forest, Slitere National Park, Talsi distr. (4), 13 July 1990; a stump of *Pinus sylvestris*, Suntazi, Ogre distr. (27), 18 June 1955; a decaying log of *Pinus sylvestris*, Zala Kapa, Kemeri National Park (11), 21 Aug. 1994; decaying wood, a forest at the farm Purini, Inesi, Cesis distr. (34), 8 June 2003, leg. N. Petersons, det. E. Vimba; a stump (*Betula pendula*?), a road to Kalnciems, Babite, Riga distr. (18), 2 Sept. 1961, det. T. Sizova; decaying wood, a forest near Bukaisi, Dobele distr. (15), 26 Aug. 1979, det. T. Sizova; coniferous wood, Ikskile, Ogre distr. (26), 24 Sept. 1963, det. T. Sizova; a log of *Pinus sylvestris*, a sandy pit, Apsuciems, Tukums distr. (8), 2 July 1952, det. T. Sizova.

*Metatrichia floriformis (Schwein.) Nann.-Bremek. – decaying wood of *Picea abies*, a mixed forest, Slitere National Park, Talsi distr. (4), 19 Oct. 1985.

M. vesparium (Batsch) Nann.-Bremek. – decaying wood covered with mosses, the lake Salaja, Vestiena, Madona distr. (35), 27 June 1981.

Mucilago crustacea F. H. Wigg. – a living plant of *Calamagrostis epigeios*, the bog Kudra, Riga distr. (12), 27 Sept. 1985; a forest near Spridisi, Tervete, Dobele distr. (16), 8 Aug. 1955, det. T. Sizova.

Physarum nutans Pers. – two collections from firewood, Sautuves Str. 6, Riga (18), 7 Sept. 1986.

*P. robustum (Lister) Nann.-Bremek. – decaying wood of *Populus tremula*, Purtilti near Mazsalaca, Valmiera distr. (30), 11 Aug. 1964, det. T. Sizova. Capillitium radiates from a central plate-lake pseudocolumella.

P. viride (Bull.) Pers. – two collections from coniferous plank, the farm Uplejas, Tervete, Dobele distr. (16), 29 and 30 Aug. 1962, det. T. Sizova; decaying wood of *Betula* sp., Purtilti near Mazsalaca, Valmiera distr. (30), 21 Aug. 1962, det. T. Sizova.

Stemonitis axifera (Bull.) T. Macbr. – a lighthouse at the dike Bakas, Slitere National Park, Talsi distr. (4), 28 June 1986, leg. E. Henina; two collections from decaying logs of *Picea abies*, a slope, Slitere National Park, Talsi distr. (4), 29 June 1986; a decaying log, Slitere National Park, Talsi distr. (4), 21 July 1987, leg. L. Dzerkale; decaying wood, a mixed forest, Slitere National Park, Talsi distr. (4), 13 July 1990.

Stemonitopsis typhina (F. H. Wigg.) Nann.-Bremek. – a fallen branch of *Malus sylvestris*, a wood at the lake Abelu, Libagi, Talsi distr. (6), 18 Aug. 1978, developed in the laboratory from a white plasmodium; dead wood, Ogresgals, Ogre distr. (27), 10 July 1961.

Trichia botrytis (J. F. Gmel.) Pers.– old stump of *Quercus robur*, a park, Dundaga, Talsi distr. (5), 26 Sept. 1979, det. T. Sizova.

T. contorta (Ditmar) Rostaf.– bark of *Malus domestica* in a branch pile, Sautuves Str. 6, Riga (18), 21 May 1994; a stump of *Alnus incana*, Nitaure, Cesis distr. (31), 12 Oct. 1978, det. T. Sizova.

T. decipiens (Pers.) T. Macbr. – decaying wood of *Picea abies*, a mixed forest, Slitere National Park, Talsi distr. (4), 19 Oct. 1985; decaying

wood of *Alnus incana*, Kegums, Ogre distr. (29), 15 Oct. 1988; decaying wood of *Populus tremula*, a spruce forest near Kracu Kalni, between Kalnciems and Kemeri, Kalnciems, Jelgava distr. (13), 16 Oct. 1993; immature specimen on *Sphagnum angustifolium*, a humid pine-spruce forest, Teici Nature Reserve, Madona distr. (38), 24 Sept. 1992, leg. A. Abolina; decaying wood, Olaine, Riga distr. (17), 24 Oct. 1965, det. T. Sizova.

T. FAVOGINEA (Batsch) Pers. – a decaying stump of *Betula pendula*, a wood of *Betula* sp., Tervete, Dobele distr. (16), 20 Feb. 1961, det. T. Sizova; stump covered with mosses, a forest near Tervete, Dobele distr. (16), 18 April 1981, det. T. Sizova.

T. PERSIMILIS P. Karst. – decaying wood, an *Alnus incana* forest, Sigulda, Riga distr. (24), 23 March 1986.

T. VARIA (Pers. ex J. F. Gmel.) Pers. – two collections from decaying wood, a road to the lake Slokas, Kemeri National Park (11), 27 Sept. 1985; bark of dry *Juniperus comunis*, Ikskile, Ogre distr. (26), 9 May 1979; a stump of *Picea abies*, Kemeri National Park (11), 27 Nov. 1960, det. T. Sizova.

TUBIFERA FERRUGINOSA (Batsch) J. F. Gmel. – decaying wood, dunes overgrown with a forest, the Baltic Sea shore, Kolka, Slitere National Park, Talsi distr. (4), 19 July 1996; Abeli, forest q. 64, Jekabpils distr. (39), 22 Sept. 1992; a stump, Milzkalne, Tukums distr. (9), 31 Aug. 1985, leg. U. Susko; a stump of *Pinus sylvestris*, Tervete, Dobele distr. (16), 30 Aug. 1962; decaying wood, Tervete, Dobele distr. (16), 22 Sept. 1979; a stump of *Pinus sylvestris*, Tervete, Dobele distr. (16), 22 Sept. 1979, det. T. Sizova; decaying wood of *Pinus sylvestris*, Tervete, Dobele distr. (16), 30 Aug. 1962, det. T. Sizova; a stump of *Quercus robur*, Engure, Tukums distr. (7), 22 Sept. 1963, det. T. Sizova; a stump, a forest near Vecumnieki, Bauska distr. (28), 2 Sept. 1979, det. T. Sizova.

Thus, 38 myxomycete species are reported from various regions of Latvia, among them 10 species are registered in the territory for the first time. New localities for the great majority of species were revealed while examining this collection. Most of the collected specimens represent species that form macroscopic sporocarps, which are conspicuous due to their bright colours and easy to spot in the field. *Collaria elegans* which reaches no more than 2 mm is an exception here: it was noticed on the same piece of substratum during the re-examination of a specimen of *Stemonitis axifera*. Nearly all species listed here are considered to be cosmopolitans or widely spread on most continents, while *Leocarpus fragilis* and *Trichia* spp. are primarily temperate myxomycetes (Ing, 1999). The great majority of specimens were collected from decaying wood.

The presented records supplement species diversity, distribution, and frequency data on the Latvian myxomycetes.

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NEW ESTONIAN RECORDS

Pezizales (Ascomycetes)

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GEOPYXIS ALPINA Höhn. – Tartumaa Co., Nõo Comm., Vapramäe (58°15.0'N 26°28.0'E), on soil near a road, 29 Aug 2001 B. Kullman (TAA 179666).

GYROMITRA AMBIGUA (P. Karst.) Harmaja – Lääne-Virumaa Co., Tammsalu Comm., Porkuni (59°12.0'N 26°20.0'E), on rotting roots of *Picea abies*, 24 Sept 1987 M. Hanso; Jõgevamaa Co., Pala Comm., Sõõru (58°38.5'N 26°55.0'E), under *Pinus sylvestris*, 12 Oct 2003 M. Hanso; Võrumaa Co., Mõniste Comm., Roosa (57°31.0'N 26°34.5'E), on rotting wood *Picea abies*, 20 Nov 1990 M. Hanso; Antsla Comm. (57°41.2'N 26°30.9'E), on rotting wood, 30 Aug 2003 B. Kullman (TAA 179935); Valgamaa Co., Puka Comm., Purtsi (58°04.5'N 26°04.5'E), under *Pinus sylvestris*, 12 Oct 1994 M. Hanso.

MELASTIZA CORNUBIENSIS (Berk. & Broome) J. Moravec – Tartumaa Co., Nõo Comm., Vapramäe (58°15.0'N 26°28.0'E), on soil near a road, 29 Aug 2001 B. Kullman (TAA 179665).

MELASTIZA FLAVORUBENS (Rehm) Pfister & Korf – Valgamaa Co., Otepää Comm., near the Lake Pühajärv (58°02.5'N 26°27.5'E), on soil, 11 Aug 2001 B. Kullman (179659).

OTIDEA PROPINQUATA (P. Karst.) Harmaja – Hiiumaa Co., Mäeselja (58°57.5'N 22°40'E), on soil, 16 Oct 2001 leg. B. Kullman, det. B. Kullman & A. Jakobson (TAA 179746); Põlvamaa Co., Kollaste Comm., Karilavsi (58°07'N 26°51'E), on soil, 31 Aug 2003 leg. K. Põldmaa, det. B. Kullman (TAA 170821).

PARASCUTELLINIA CARNEOSANGUINEA (Fuckel) T. Schumach. – Põltsamaa Co., Puurmani Comm., Alam-Pedja Nature Reserve, Roka, along the bank of the Pedja River (58°28.4'N 26°09.0'E), on fine-grained sand in the middle of the inundation zone, 8 Oct 2001 B. Kullman (TAA179813).

PEZIZA CELTICA (Boud.) M. M. Moser – Hiiumaa Co., Pühalepa Comm., Hiiesaare Lighthouse (58°59.5'N 22°50'E), on soil, 18 Sept 2001 leg. L. Vaher, det. B. Kullman (TAA 179773); Võrumaa, Antsla Comm. (57°44'N 26°29.5'E), on soil near a forest road, 31 Aug 2003 B. Kullman (TAA 179954).

PEZIZA EMILEIA Cooke – Tartumaa Co., Võnnu Comm., Järvselja Forest, sq no 226/4 (58°16.9'N 27°19.5'E), on ground, 27 Sept 2001 B. Kullman (TAA 179789, 179787).

PEZIZA MEGALOCHONDRA (Le Gal) Donadini – Saaremaa Co., Muhu Comm., Kuivastu (58°35.0'N 23°22.0'E), on one-year and two-month-old burned ground, 21 May 2001. B. Kullman (TAA 179636).

PEZIZA PETERSII Berk. & M. A. Curtis – Tartumaa Co., Kambja Comm., Pikksaare (58°12.0'N 26°35.0'E), on burned ground, 24 Aug 2001 leg. A. Kollom, det. B. Kullman (TAA 179664).

PSEUDOMBROPHILA EARINA (Ellis) Brumm. – Harjumaa Co., Kuusalu Comm., Koonukõrve, Põhja-Kõrvemaa Landscape Reserve, Võhma raised bog (59°22.3'N 25°43'E), at a burned site together with *Tricharina praecox*, 19 May 2001 B. Kullman (TAA 179616a).
Very rare – known earlier only from a single collection in Utah, U.S.A.

SCUTELLINIA MINUTELLA Svrcek & J. Moravec – Tartumaa Co., Nõo Comm., Peedu (58°14.0'N 26°28.5'E), on soil alongside of the rail, 3 Sept 2001 B. Kullman (TAA 179674, 179676).

TRICHARINA PRAECOX (P. Karst.) Dennis – Harjumaa Co., Kuusalu Comm., Koonukõrve, Põhja-Kõrvemaa Landscape Reserve, Võhma raised bog (59°22.3'N 25°43'E), at a burned site, 19 May 2001 B. Kullman (TAA 179616b).

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Macrolichens

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STEREOCAULON ALPINUM VAR. GRACILENTUM (Th. Fr.) H. Magn. – NW*: Harjumaa, Haapse (59°30'N 25°18'E), boreal heath forest, on sandy dunes close to the seashore, 17 Aug. 2003 T. Randlane, det. Laura Kivistö (TU, H). Freq.: rr*.

The taxon is distributed in coastal areas of southern Finland, especially on sandy beaches and dunes (Vitikainen *et al.* 1997). It is rare in Sweden – in Gotland and eastern coast (Carlin & Carlin-Silväng 1982) – and is not found in Norway (Krog *et al.*1994); known also from Canada and Alaska (Lamb 1977).

Stereocaulon alpinum Laurer ex Funck seems to be a complex of taxa and *S. alpinum* var. *gracilentum* should apparently be removed from *S. alpinum*.

* Abbreviations of distribution regions and of frequency classes in Estonia follow Randlane & Saag (1999).

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Microlichens

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Three new species of lichenized fungi are reported here. Abbreviations of distribution regions and frequency classes follow Randlane & Saag (1999). All cited material is deposited in lichenological herbarium of the University of Tartu (TU).

AGONIMIA ALLOBATA (Stizenb.) P. James – NE: Lääne-Virumaa, Vinni comm., former wooded meadow dominated by oaks (59°11'N 26°26'E), on *Quercus robur*, 3 July 2003 leg. & det. A. Suija. Freq.: rr. This species grows on broad-leaved trees (*Quercus*, *Ulmus* etc.) in sheltered old woodlands (Purvis *et al.* 1992).

EOPYRENULA SEPTEMSEPTATA Coppins – NE: Lääne-Virumaa, Väike-Maarja comm., former wooded meadow dominated by oaks (59°20'N 26°25'E), on *Quercus robur*, leg. & det. A. Suija. Freq.: rr. The collected specimen has perithecia only, no pycnidia were found. The ascospores are dark brown (with paler tips), 8-celled, 32–36(–40) × 9–11 µm.

GYALECTA FLOTOWII Körb. – SW: Pärnumaa, Surju forestry, forest square 330/6 (58°14'N 24°37'E), birch dominating eutrophic paludifying forest, on old *Fraxinus excelsior*, 5 July 2003, leg. & det. I. Jüriado. Freq.: rr. This lichen prefers to grow in undistrurbed, ancient forests. Because of forest managment, the species is endangered in some European countries e.g. Sweden (Thor & Arvidsson 1999), Denmark (Søchting & Alstrup 2002) etc.

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HANS TRASS 75 – A BIRTHDAY TRIBUTE

Hans-Voldemar Trass was born on May 2, 1928 in Tallinn, in the family of Hartmut and Olga Trass. Hans' father was a captain in the Estonian military forces and his mother – a housewife of Russian origin. They lived in the outskirts of Tallinn, in Pääsküla, and this was evidently an important factor in further activities of Hans. Trips together with friends (later colleagues professors Harry Ling, Erast Parmasto, Arvo Rõõmusoks) to the forests, bogs and alvars in the surroundings of their home sparked their serious interest in different living organisms. By the way, a small narrow-gauge train (with an engine and two wagons) from Tallinn to Vääna, which was used by Hans and his mates to go to their naturalists' journeys, gave – much later – a nickname to the three corridor-like rooms where the lichen herbarium of the University of Tartu is partly still kept. Five years (1942–1947) in the Nõmme Secondary School were also of great importance in forming the future scientist.

Hans Trass graduated from the University of Tartu in 1952 as a biologist-botanist; three years later he defended the degree of candidate of biology on the plant vegetation of eutrophic fens in western Estonia. The degree of doctor of biology was awarded to him in 1969 for a monographic treatment of the lichen flora of Estonia. Hans has only ever worked in one institution – the Department of Plant Taxonomy and Geo-

botany (now Institute of Botany and Ecology) at the University of Tartu. He was the Head of this institute during more than 30 years, and even now, 10 years after his retirement, one can find several habits and details in the everyday life of our institute that have been initiated by or connected to Hans Trass. The continued existence of an active lichenological team in the University of Tartu is one of them. Since 1994, Hans Trass is a professor emeritus.

Team of former, present and future lichenologists after the seminar dedicated to the jubilee of Hans Trass in the Institute of Botany and Ecology, University of Tartu, on September 25, 2003: Hans Trass (sitting); Maarja Nõmm, Lauri Saag, Piret Lõhmus, Andres Saag, Inga Jüriado, Andi Pärn, Tiina Randlane, Ave Suija, Kristjan Zobel, Leili Järva, Ede Leppik, Avo Roosma and Mari-Liis Rebane (from left, standing).

His scientific productivity is reflected in almost 200 scientific publications which deal with two or three main subjects – lichenology, plant ecology, history of vegetation science. The list of earlier papers by Trass was published in 1988 (Masing, V. 1988. Bibliography of the published papers of professor Hans Trass. Tartu State University, 82 pp.); the last fifteen years have seen several more publications. His lichenological interests have been primarily focussed on the floristics of Estonia, Siberia, Far North (peninsula of Taimyr) and Far East of Russia (peninsula of Kamtchatka, Primorye region), and other "exotic" parts of the former Soviet Union. Hans has been a passionate collector of lichens since his teens and the total contribution of specimens collected by him to the herbarium of TU is significant. Hans Trass has described some species which are new to science (e.g. *Cladonia alinii* Trass, 1978; *Heterodermia intermedia* Trass, 1992; *Asahinea culbersoniorum* Trass, 1992 etc.) but our guess is that quite a few undescribed taxa still lay in the cupboards among the material collected by Trass, and wait for an author.

Hans Trass extensively promoted the study of lichens as pollution monitors. A paper entitled "An index for the utilization of lichen groups to determine air pollution" was published in 1968 (in Estonian, in the journal "Eesti Loodus"), in the same year when De Sloover and LeBlanc presented the first information about IAP. Hans developed his own Index of Poleotolerance (IP) based on lichens, and this was widely used all over the Soviet Union.

Hans Trass also contributed to the Handbook of the Lichens of the USSR by publishing the revisions on three families (Cladoniaceae, Baeomycetaceae and Siphulaceae). There is no doubt that Hans has two favourite lichen genera – *Cladonia* and *Heterodermia*, the former as a "pet" of his younger and latter – of his later days.

Although Hans Trass is a well-known and distinguished botanist and ecologist, his merits are internationally appreciated specifically in the field of lichenology. In 1992, during the Second IAL Symposium in Båstad, one of the first Acharius medals was awarded to him. The following text is from the presentation speech of the Medal by Teuvo Ahti: "... Hans has always kept numerous direct contacts with lichenologists all over the world, also travelling and working abroad, for instance in Canada, Germany, Sweden and Finland. He maintained good relations with Russian and western lichenologists, often acting as a bridge of knowledge between them, to the benefit of lichenology. In the east he was known for his excellent lichen library and to Russian students was regarded as a "western professor". ..."

And last but not least – Hans Trass has been an inspiring and attractive teacher of lichenology students both from Estonia and Russia. More than 20 diploma and bachelor papers on lichenological subjects have been defended under his supervision in the University of Tartu; he has also been an advisor or supervisor of the following theses of the degree of candidate of biology or Ph. D.:

"Formation of lichen synusiae on moraines of glaciers in Polar Urals" by Jüri Martin (1967);

"Ecology and coenology of epiphytic lichens in the main forest types of the Estonian S.S.R." by Anne-Liis Sõmermaa (1970);

"Lichen indication in various conditions of air pollution" by Ludmilla Martin (1984);

"Lichens of the Baical Mountain Range" by Tatyana Makryi (1986);

"Analysis of lichen flora of the western islands of Estonia" by Tiina Randlane (1986);

"Bioindication of air pollution in the northern area of the river Jenisej" by Tatyana Vlasova (1990);

"Air pollution indicator value of epiphytic macrolichens in the boreal mountainous forests of Khamar-Daban (eastern Siberia)" by Kristjan Zobel (1992).

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Trass, H. 2000. The lichen genus *Heterodermia* (Lecanorales, Physciaceae) in Russia and adjacent territories. *Folia Cryptog. Estonica* 37: 93–108.

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