„ 1939: Pflanzensoziologische Untersuchungen in der alpinen Stufe Finnisch-Lapplands. — Ann. Bot. Soc. 'Vanamo' 13: 2, 1—328.
KRECHETOWICH, V. I., 1935: Carex. — Flora U.S.S.R. III, 111—464. Leningrad.
KUJALA, V., 1961: Ivalojoen ja sen varsien kasvistosta. (With a German summary: Über die Flora des Flusses Ivalojoki und seiner Ufer in Finnisch-Lappland.) — Arch. Soc. 'Vanamo' 16: 2, 163—193.
KUKKONEN, I., 1961: The smuts of the genus Cintractia parasiting Kobresia species. — Can. Journ. Bot. 39, 155—164.
„ 1963: Taxonomic studies on the genus Anthracoidea (Ustilaginales). — Ann. Bot. Soc. 'Vanamo' 34: 3, 1—122.
KYYHKYNEN, O., 1919: Suomussalmen kasvisto. — Acta Soc. F. Fl. Fenn. 46: 1, 1—140.
LEHTOLA, V. B., 1940: Untersuchungen über einige Brandpilze der Gattung Cintractia Cornu. — Acta Agr. Fenn. 42, 1—136.
LINDEBERG, B., 1959: Ustilaginales of Sweden. Ed. & augm. by J. A. Nannfeldt. — Symb. Bot. Ups. XVI: 2, 1—175.
LINKOLA, K., 1916: Studien über den Einfluss der Kultur auf die Flora in den Gegenden nördlich vom Ladogasee. I. Allgemeiner Teil. — Acta Soc. F. Fl. Fenn. 45: 1, 1—429.
LIRO, J. I., 1938: Die Ustilagineen Finnlands. II. — Ann. Acad. Sci. Fenn. A: 42, 1—720.
LUMIALA, O. V., 1937: Kasvimaantieteellisiä ja pintamorfologisia suotutkimuksia Luoteis-Karjalassa. — Ann Bot. Soc. 'Vanamo' 10: 1, 1—110.
MEINSHAUSEN, K. F., 1878: Flora Ingrica. — St. Petersburgh. 512 pp.
NANNFELDT, J. A. & LINDEBERG, B., 1957: Taxonomic studies on the ovariicolous species of Cintractia on Swedish Caricoideae. I. — Sv. Bot. Tidskr. 51: 493—520.
NORRLIN, J. P., 1871: Flora Kareliae onegensis. I. — Not. Sällsk. F. Fl. Fenn. Förh. XIII. n. s. X, 1—183.
PAASIO, I., 1933: Über die Vegetation der Hochmoore Finnlands. — Acta Forest. Fenn. 39, 1—210.
„ 1935: Häädetkeitaan, erään länsisuomalaisen kermikeidassuon kasvillisuus. — Ann. Bot. Soc. 'Vanamo' 6: 2, 1—35.
PORSILD, A. E., 1957: Illustrated flora of the Canadian arctic archipelago. — Nat. Mus. Canada Bull. 146, 1—209.
RAMENSKAJA, M. L., 1960: Manual of the higher plants of Russian Karelia. — Petrosavodsk. 485 pp. (Russian.)
ROIVAINEN, H., 1923: Tietoja kasvillisuudesta sekä putkilo- ja lehtisammalkasvistosta keskisen Luttojoen seudulla. — Ann. Soc. 'Vanamo' 1, 229—304.
RUUHIJÄRVI, R., 1960: Über die regionale Einteilung der nordfinnischen Moore. — Ann. Bot. Soc. 'Vanamo' 31: 1, 1—360.
SAVILE, D. B. O., 1952: A study of the species of Cintractia on Carex, Kobresia and Scirpus in North America. — Can. Journ. Bot. 30, 410—435.
SCHELLENBERG, H. C., 1911: Die Brandpilze der Schweiz. — Beiträge zur Kryptogamenflora der Schweiz III: 2, 1—176.
SHISHKIN, B. K., 1955: Flora of the Leningrad area. Leningrad. 285 pp. (Russian.)
SÖYRINKI, N., 1938: Studien über die generative und vegetative Vermehrung der Samenpflanzen in der alpinen Vegetation Petsamo-Lapplands. I. Allgemeiner Teil. — Ann. Soc. 'Vanamo' 11: 1, 1—323.
WARÉN, H., 1926: Untersuchungen über Sphagnumreiche Pflanzengesellschaften der Moore Finnlands. — Acta Soc. F. Fl. Fenn. 55: 8, 1—133.
VIENNOT-BOURGIN, G., 1956: Mildious, Oidiums, Caries, Charbons, Rouilles des plantes de France. Texte. — Encyclopédie Mycologique XXVI, 1—317.

LARGER FUNGI ON DUNES IN FINLAND

MARY ERIKSSON

Department of Botany, University of Turku,
Turku, Finland

The first reports on the fungi of the Scandinavian dunes are from the 18th century, but only in this century have these fungi become objects of extensive geographical and ecological studies. There is also information on sand fungi from other European countries and from North and South Africa, North and South America, Asia, Australia and New Zealand. When O. ANDERSSON studied the vegetation of sand dunes in Sweden in 1944—50, he found some fungi new for that country. He found about twenty species of sand fungi. No special studies of the sand fungi in Finland have been carried out, but there are numerous observations on them. The first observations on fungi of the Finnish dunes are probably those on *Inocybe lacera, I. maritima, Laccaria laccata and Deconia* (*Psilocybe*) *atrorufa* which THESLEFF (1919, p. 77—78) states to be common on the dunes along the Gulf of Finland. After these observations the same and some new species have been found on the Finnish dunes, especially in the 1960's. The new ones are *Corynetes arenarius, Laccaria trullisata* f. *rugulospora, Inocybe lacera* var. *halophila, Scleroderma bovista* and *Tulostoma brumale*. The last-mentioned species was found by STENLID in Kökar and Jurmo (ANDERSSON 1950).

Corynetes arenarius (Rostr.) Dur. The irregularly clubshaped fruit-body is 1—5 cm long and 0.5—2 cm wide. The fertile part amounts to half of the entire black fruit-body. At the base of the stem there is a club- or bag-shaped formation consisting of mycelium strands with attached grains of sand. The fruit-bodies occur isolated or thickly clustered. Eight hyaline ascospores are found in the asci. The spores are straight or somewhat bent without septa. The paraphyses are club-shabed, bent at the tip, brown and septate. ANDDERSSON (1950) found the size of the asci to be 110—160×12—18 μ and that of spores 25—30—35×4—6(—6.5) μ. The aci and spores of one collection (from Yyteri) measured by Miss HEIKKILÄ (KALLIO & HEIKKILÄ 1964) were $124.3 \pm 0.09 \times 12.2 \pm 0.008$ μ (90 asci) and $33.3 \pm 0.3 \times 6.0 \pm 0.09$ μ (100 spores). It was she who found *Corynetes arenarius,* a new species in Finland, on dunes in Yyteri twenty kilometres west of the city of Pori (61°34′ N.). In

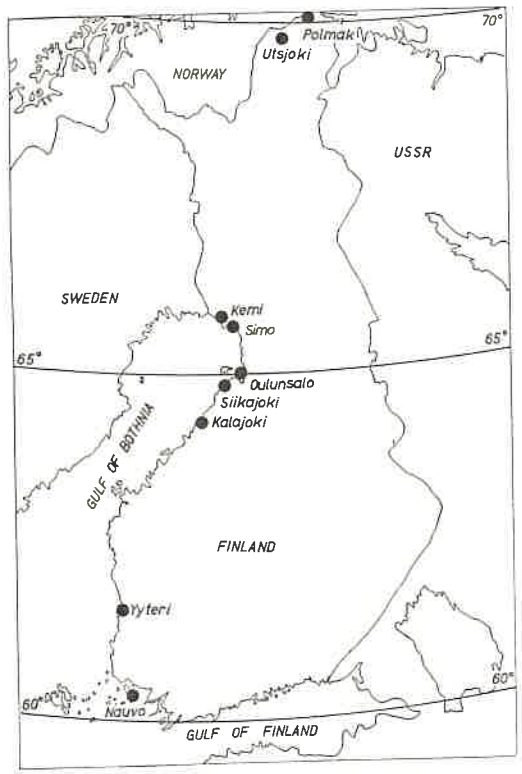

Fig. 1. Map showing the localities mentioned in the text.

the summer of 1963 an expedition of botanists from the University of Turku found *Corynetes arenarius* both on the dunes of the river Polmak in Finnmark in Norway and on the shore of Lake Kevojärvi in Utsjoki (according to an oral communication of Miss ELSA KÄCK it grows also on the shore of Lake Mantojärvi). In September of the same year I found the species on the sand dunes of Kalajoki (64°15′ N.), Haikara in Siikajoki (64°49′ N.) and Hepola in Simo (65°39′ N.), all on the shores of the Gulf of Bothnia.

The fungus occurs in Yyteri in the supralitoral, in Siikajoki in the litoral and in Simo both in the supralitoral and litoral. In Kalajoki *Corynetes arenarius* grew at the bottom of the Tahkokorvanpakka brink-dune. The species grows nearly always at the edge of an *Empetrum nigrum* dune. Very small (5 mm) *Polytrichum juniperinum* or *P. piliferum* form the base vegetation. At Simo some individuals grew also on a *Calluna vulgaris* dune and at Yyteri (1962) among *Lathyrus maritimus* growths. The surrounding vegetation on the Haikara dunes was *Vaccinium uliginosum* and *Arctostaphylos uva-ursi*, in Kalajoki *Festuca rubra*, and in Yyteri *Elymus arenarius, Festuca rubra, Minuartia peploides* and *Botrychium lunaria*.

According to ANDERSSON (1950) *Corynetes arenarius* occurs in Scania on the sheltered side of the high inner dunes, exposed to the north in a sparse vegetation consisting of *Ammophila arenaria, Empetrum nigrum, Corynephorus canescens, Cladonia rangiformis, C. silvatica* and many others. The substratum has a moderately acid reaction. *Calluna vulgaris* and *Arctostaphylos uva-ursi* which were found in Värmland also indicate a relative low soil pH.

According to information from Scandinavia (NANNFELDT 1942, KALLIO & HEIKKILÄ 1964) the species has been found also inland in Swedish Lapland.

These findings and those from Finnish and Norwegian Lapland prove that the species does not have to grow on the seacoast.

Laccaria trullisata (Ellis) Peck f. *rugulospora* M. Lange. The cap of this salmon-coloured fungus is 1—3 cm in diameter, convex or flat. Sometimes it is like a shallow funnel with a thin rough edge. The stem is red and blue but turns white later. It is about 1—5 cm long. The upper part of the stem may sometimes be a little flattened and fibrous. On the lower part of the stem one can find an enlargement to which grains of sand adhere. The spores are cylindrical and smooth. LANGE (1955), who has described f. *rugulospora* growing in Greenland, mentioned the dimensions of the spores to be 12—15.5×7.5—8.5 μ. The dimensions of the spores of a fungus I found at Yyteri were 9.9—(13.5)—16.5×6.6—(7.7)—9.9 μ (302 spores). ANDERSSON (1950) who found *Laccaria trullisata* ssp. *maritima* (Teod.) in Sweden found the spore dimensions to be 16—18×8—10 μ. The above-mentioned species was found for the first time in Finland by Miss HEIKKILÄ in Yyteri in 1961. In September, 1963, I found the fungus on the dunes in Kalajoki, Haikara in Siikajoki, Koppana in Oulunsalo, Ajos in Kemi and Sandö in Nauvo.

The fungus occurs either alone or in groups. Sometimes the species was found at the roots of pines on even driftsand fields, sometimes on the dunes of sandfields. *Elymus arenarius* or *Hieracium umbellatum* or both form the vegetation of the dunes. Among living stems there are stems of dead plants. *Minuartia peploides* grows especially in Yyteri, *Empetrum nigrum* and *Vaccinium uliginosum* grow on the Haikara dunes. I found *Laccaria trullisata* f. *rugulospora* in Yyteri and Siikajoki on *Elymus* dunes in the supralitoral. From quite near the shore the species spreads to the litoral and as far as the edge of the woods. In Kalajoki I found the fungus only in the supralitoral between southern Tuomipakka and the suprasaline.

Inocybe lacera var. *halophila* Heim. The cap which is 1.5—4 cm in diameter is chestnut or ochre brown. It has compressed fluff, often bursting upwards concentrically. The older fungi have their rugged edges turned upwards. The stem is often short, narrow and stiff, somewhat striate. The colour of the stem is brown. On Yyteri dunes the stems of the larger fungi were about 5 cm long, but only 1 cm was above the surface of the sand. The gills are brown with darker edges. The spores are almost cylindrical, smooth and slightly pointed at one end. According to ANDERSSON (1950), their dimensions are 12—16×5.8—6.5 μ. KÜHNER & ROMAGNESI (1953) mention the values 12—19×5.5—7 μ. The mean size of the spores of one *Inocybe lacera* var. *halophila* I found in Yyteri in 1962 was 15.6×6.4 μ (302 spores) and that of another 14.3×6.5 μ (102 spores).

ANDERSSON stated that it is difficult to decide whether THESLEFF's (1919) *Inocybe lacera* found on the dunes along the Gulf of Finland is identical with *Inocybe lacera* var. *halophila,* as no material exists to prove it. It was later reported by EKLUND (1944) that it had been found at Jurmo. In summer, 1961, Miss HEIKKILÄ found the species on Yyteri dunes. In September, 1963, I found the fungus on the dunes of Kalajoki, Haikara in Siikajoki, Koppana in Oulunsalo, Hepola in Simo, Ajos in Kemi and Sandö in Nauvo.

On the dunes of Yyteri, Siikajoki and Nauvo *Inocybe lacera* var. *halophila* grew like *Laccaria trullisata* f. *rugulospora* from the limits of the suprasaline and supralitoral to the litoral and as far as to the edge of the woods. In Kalajoki most of fungi seemed to grow in southern Tuomipakka in the supralitoral and litoral, but some fungi grew also on the sheltered side of Tahkokorvanpakka. In front of Tahkokorvanpakka, on the drifts and in a field which were about 1.5 km long and 150 m broad there were only two *Inocybe* individuals. *Festuca rubra* formed the vegetation on the drift sand but in the neighbourhood, about 40 cm away, grew a young *Salix* individual. The plants surrounding *Inocybe lacera* var. *halophila* are as a rule the same as those surrounding *Laccaria trullisata* f. *rugulospora,* namely *Elymus arenarius, Festuca rubra, Rumex acetosella, Hieracium umbellatum, Deschampsia flexuosa, Arctostaphylos uva-ursi, Lathyrus maritimus, Cladonia rangiferina* and *Polytrichum juniperinum.* On the dunes of Haikara the species grew in holes covered by a dense layer of moss. Other vegetation consisted of *Hieracium umbellatum, Festuca rubra, Vaccinium uliginosum, Empetrum nigrum, Rumex acetosella, Plantago maritima* and *Juncus balticus.*

HEIM (ANDERSSON 1950) states that *Inocybe lacera* var. *halophila* grows together with *Psilocybe ammophila* in its characteristic environment, Beville in France. ANDERSSON found it in Sandhammaren in *Ammophila arenaria* vegetation where also *Psilocybe ammophila* grew. In Finland the species grows in *Elymus arenarius* vegetation.

Scleroderma bovista Fr. Fruit-bodies are formed at the surface of the soil, and when ripe they are only half visible. They are like irregular soft lumps opening irregularly on the top. The fungus has a bunch of white mycelium strands at its bottom. The contents of the fruit-body crumbles like grist. The spores are round and brown, their edges prickled. The length of the spores in the material studied by ANDERSSON (1950) is about 10—14 μ. The mean size of the spores of one *Scleroderma bovista* specimen from Yyteri (1962) was $11.7 \pm 0.09 \times 11.0 \pm 0.04$ μ (160 spores).

ECKBLAD (1955 p. 70—72) has mentioned also *Scleroderma aurantium* and *S. verrucosum.* The difference between *S. bovista* and *S. verrucosum* is in the spores. The former has reticulated spores and the latter only prickled, not

Fig. 2. Scleroderma bovista. 0.70 ×.

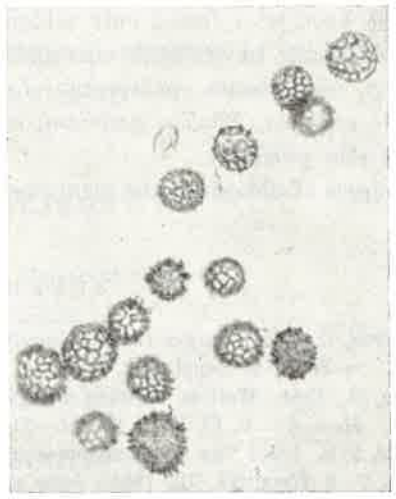

Fig. 3. Spores of *Scleroderma bovista.* 730 ×.

at all reticulated spores. The spores of *S. aurantium* are also reticulated. The mean size of 80 spores of one *S. aurantium* was 10.78×10.12 μ. The size difference between the spores of *S. aurantium* and *S. bovista* is thus not marked. However, the fruit body of *Scleroderma aurantium* is hard, the fruit body of *S. bovista* is typically soft and at the base it has huge mycelium strands. *Scleroderma bovista* is more yellowish than *S. aurantium* which is typically pale.

According to ANDERSSON this species is a facultative sand fungus. He has found it on dunes among *Ammophila arenaria* and *Elymus arenarius.* He thinks its Swedish northern limit coincides with that of the oak. However, in Finland the species has been found by RAUTAVAARA (1953) in Oulunsalo, by Miss HEIKKILÄ in Yyteri (1961) and by Dr. I. KUKKONEN in Ängsö near Korppoo (1962, TUR). I found *Scleroderma bovista* in September, 1963, on the dunes of Kalajoki, Koppana in Oulunsalo, Hepola in Simo, Ajos in Kemi and Sandö near Nauvo. Thus the conclusion of ANDERSSON does not apply in Finland. RAUTAVAARA (1953) thinks the species is a mycorrhiza fungus of pine because it occurs, according to his observations, in the root zones of the outer pines, but never in the *Elymus* zone. In the areas I studied *Scleroderma* also occurred in the root zones of the pines. The surrounding vegetation was formed by *Elymys arenarius, Deschampsia flexuosa, Festuca rubra, Empetrum nigrum, Arctostaphylos uva-ursi, Rumex acetosella* and *Lathyrus maritimus.*

We can say that some dune species found by ANDERSSON (1950) in south Scandinavia are quite common also on Finnish dunes. Some like *Tulostoma*

brumale have been found only seldom and some larger fungi found on the Swedish dunes or grass heaths have not been found in Finland. These are, e.g., *Geoglossum cookeianum, Peziza ammophila, Sepultaria arenicola, Inocybe serotina, Phallus hadriani,* some *Geaster* and *Disciseda* species and *Lycoperdon pusillum.*

Samples of almost all the mentioned fungi are deposited in TUR.

REFERENCES

ANDERSSON, O., 1950: Larger fungi on sandy grass heaths and sand dunes in Scandinavia. — Bot. Not. Suppl. 2: 2, 1—89.

EKLUND, O., 1944: Weitere Beiträge zur Pilzflora des Schärenarchipels SW-Finlands. — Mem. Soc. F. Fl. Fenn. 13, 212—216.

ECKBLAD, F-E., 1955: The Gasteromycetes of Norway. — Nytt Mag. f. Bot. 4, 19—86.

KALLIO, P. & HEIKKILÄ, H., 1964: Some macromycetes from Yyteri sand dunes in SW-Finland. — Karstenia 6—7, 111—112.

KÜHNER, R. & ROMAGNESI, H., 1953: Flore analytique des Champignons supérieurs, 556 p. — Paris.

LANGE, M., 1955: Greenland Agaricales, Macromycetes II. — Medd. om Grønl. 147: 11, 1—69.

NANNFELDT, J., 1942: The Geoglossaceae of Sweden. — Arkiv för Botanik 30, A: 4, 1—67.

RAUTAVAARA, T., 1953: Juuritryffeli (Scleroderma bovista Fr.) lentohiekassa Pohjois-Suomessa. — Karstenia 2, 50.

THESLEFF, A., 1919: Studier öfver basidsvampfloran i sydöstra Finland ... — Bidr. Känned. Finl. Nat. Folk 79: 1, 1—140.

ON FINNISH MICROMYCETES 3. UREDINALES OF INARI LAPLAND

YRJÖ MÄKINEN

Department of Botany, University of Turku,
Turku, Finland

I. INTRODUCTION

Observations on the mycology of Finnish Lapland are very few; this holds true for both macromycetes and micromycetes. RAINIO (1926) studied the rust flora of Finnish Lapland in its earlier very broad sense (including Finnmark in Norway and the Petsamo district in the U.S.S.R.), and KARI (1936) published a list of the micromycetes he collected in various parts of Lapland, mainly in Petsamo and the southern part of Inari Lapland. In addition, HEIKINHEIMO (1932) and LEPIK (1933) made some notes on the mycology of the Petsamo district. This is almost all that has been written on Lappish micromycetes. J. I. LIRO and H. ROIVAINEN gathered large collections in Enontekiö Lapland (a part of these is included in the Mycotheca Fennica), but Inari Lapland has still remained an almost unexplored area.

Since 1954 the Zoological and Botanical Society of Turku has performed floristic inventories in Inari Lapland, and during these excursions I have collected also micromycetes, although not very intensively. Only during the past two years have more systematic collections been made. In 1963, also the following persons took part in this work: Mr. KAARLO SALORANTA (K.S.), Mr. LAURI KORPI, B.Sc. (L.Ko.), and Mr. LAURI KÄRENLAMPI, B.Sc. (L.Kä.). In 1964, Miss MAIJA-LIISA KIVILUOMA (M.K.) collected a number of samples. The Society of Botany Students of Copenhagen University, "Theophrastos", arranged in 1962 an excursion to Kevo Subarctic Research Station. During this, Miss BIRTHE HANSEN, B.Sc. (B.H.) collected a number of rusts (preserved in the herbarium of the Institut for Sporeplanter, Gothersgade 140, Copenhagen K.) which are included in the present list. To all of these I express my sincere thanks for permission to use their material. The list includes also some collections made by Prof. PAAVO KALLIO, Miss NIINA TARÉN, Lic.Phil., Miss ESTER KANKAINEN, B.Sc., Miss RAILI SUOMINEN, B.Sc., Miss