

# Wood-inhabiting Basidiomycetes of Kangerlussuaq and Sisimiut areas, Greenland

Victor A. Mukhin

## Abstract

Mukhin, Victor Andrejevich, 2006. Wood-inhabiting Basidiomycetes of Kangerlussuaq and Sisimiut areas, Greenland. – Meddelelser om Grønland, Bioscience 56, Copenhagen, The Commission for Scientific Research in Greenland, p. 128-132.

The paper is a survey of the wood-inhabiting basidiomycetes developing in an arctic area on trunks, branches and twigs of *Salix glauca* and *Betula nana* in Kangerlussuaq (West Greenland) and Sisimiut (Central West Greenland). Forty species were found, of which 10 are new to Greenland and 10 to the investigated areas. The species similarity ratio between the coastal Sisimiut and the continental Kangerlussuaq was low, 0.49, indicating a strong climatic influence on the distribution of these species. Of the 40 species 29 were corticioid fungi with a crust-like hymenophore, seven were agarics of which many were small and reduced species, two species belong to the jelly fungi and only one was a polypore.

**Keywords:** wood-inhabiting fungi, arctic areas, arctic resupinate fungi, Kangerlussuaq, Sisimiut, Greenland.

Victor A. Mukhin, Institute of Plant and Animal Ecology, Ural Division of Russian Academy of Sciences, 8 Marta St., 620144 Yekaterinburg, Russia. E-mail: Victor.mukhin@ipae.uran.ru

## Introduction

In low arctic areas of Greenland several shrub species

are represented, two of the most important being *Salix glauca* L. coll. and *Betula nana* L. The former of them is a common species in many regions of Greenland and reaches up to 2-3 m height and the latter is distributed mainly in continental parts and it can reach 1 m height (Böcher *et al.* 1968). The wood-inhabiting fungi associated with the shrubs in low arctic Greenland are not sufficiently studied and the preliminary (uncritical) list of basidiomycetes from Kangerlussuaq and Sisimiut area included 56 species of the ecological group (Borgen *et al.* 2000). Therefore, during the Sixth International Symposium on Arctic-Alpine Mycology that took place on 11-21st August 2000 in Kangerlussuaq and Sisimiut, the author investigated biological diversity of wood-inhabiting basidiomycetes developing on twigs of *Salix glauca* and *Betula nana*.

The investigations were part of our research program on studying biological diversity of wood-inhabiting basidiomycetes responsible for the biological decomposition of woody debris in the arctic and subarctic ecosystems of Greenland (Knudsen *et al.* 1993) and Siberia (Mukhin 1991; Kotiranta and Mukhin 2000).

## Material and methods

The research was carried out near Kangerlussuaq (August 12-15) and in the vicinity of Sisimiut (August 17-20). Kangerlussuaq (67° 02' N, 50° 40' W) is located near the head of Søndre Strømfjord in the central part of continental West Greenland. The area is characterized by mountains up to c. 2000 m high, and wide sandy valleys. The climate is low arctic, continental with the mean temperature of the warmest month,

July, 10° C and the coldest month, February, -20° C. The mean annual precipitation is 140 mm. Vegetation is low arctic, continental (Jensen 1999) and consists of dwarf-shrub heath, willow-copses, fens, steppes, fell-field and saxicolous plant communities (Hansen 2000).

Sisimiut (Holsteinsborg, 66° 6' N, 53° 40' W) is located in the northwestern part of Greenland, at the coast of the Atlantic Ocean in a broad valley with a series of lakes extending to sea. The area has an arctic and suboceanic climate. The mean temperature of the warmest month, July, is 7-8° C and coldest month, January, is -15-20° C; the mean annual precipitation is 397 mm (Hansen 1998). Vegetation is low arctic, oceanic (Jensen 1999) and represented by dwarf-shrub heaths, fens, fell-fields, *Salix herbacea*-snowbeds and herb-slopes.

## Collection and identification

Fungi were collected during field excursions in different places of the described areas. The collections, a total of 258 specimens of wood-inhabiting fungi, were studied in a light microscope. The mounting media used were Cotton Blue, Melzer's reagent and 5% KOH. The specimens are deposited at the Institute of Plant and Animal Ecology, Ural Division of Russian Academy of Sciences (SVÉR). The nomenclature follows Hansen and Knudsen (1992, 1997).

The similarity between the wood-inhabiting fungi in the two areas was checked by Chekanovsky-Sørensen's species similarity coefficient (Pesenko 1982) ranging from 0 (no common species under comparison) to 1 (all species are the same). In the list below, species new for Greenland are marked with two stars (\*\*), whereas species new for the area are marked with one star (\*). The number of records for each species is put in parantheses.

## List of fungi

1. \*\* *Aleurodiscus bertii* Lloyd. Sisimiut, 17.08.2000, central part of the main valley (3); 18.08.2000, northern part of the main valley (1); 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
2. \*\* *Athelia acrospora* Jülich. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen on *S. glauca* (1).
3. \* *Athelia bombacina* (Pers.) Jülich. Kangerlussuaq, 12.08. 2000, area between Ice Cap and Sandflugtsdalen, on *S. glauca* (1); 15.08.2000, Qaarsorsuag, on *S. glauca* (2) and *B. nana* (3); Sisimiut, 17.08.2000, central part of the main valley, on *S. glauca* (1), 18.08.2000, northern part of the main valley, on *B. nana* (2) and *S. glauca* (1); 20.08.2000, the foothills of Palasip Qaqqaa, on *S. glauca* (2).
4. \*\* *Athelia decipiens* (Höhn. & Litsch.) J. Erikss. Kangerlussuaq, 13.08. 2000, lake Kløftsøerne (2); Sisimiut, 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
5. \*\* *Amylocorticium laceratum* (Litsch.) Hjortstam & Ryvarden – Sisimiut, 19.08.2000, the foothills of Palasip Qaqqaa, on *S. glauca* (1).
6. \* *Botryobasidium obtusisporum* J. Erikss. Kangerlussuaq, 13.08.2000, lake Kløftsøerne (1); Sisimiut, 18.08.2000, northern part of the main valley (1); both on *S. glauca*.
7. \*\* *Byssocorticium coprophilum* (Wakef.) J. Erikss. & Ryvarden Kangerlussuaq, 13.08.2000, lake Kløftsøerne on *S. glauca* (1).
8. \*\* *Ceraceomyces serpens* (Tode) Ginns. Sisimiut, 19.08.2000, the foothills of Palasip Qaqqaa, on *S. glauca* (1).
9. *Corticium roseum* Pers. Kangerlussuaq, 14.08. 2000, Lake Helen, on *S. glauca* (1).
10. *Crepidotus dishonestus* P. Karst. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen, on *S. glauca* (1); Sisimiut, 20.08. 2000, the foothills of Palasip Qaqqaa, on *S. glauca* (1).
11. *Cytidia salicina* (Fr.) Burt. Kangerlussuaq, 12.08. 2000, area between Ice Cap and Sandflugtsdalen (9), 13.08.2000, lake Kløftsøerne (5), 14.08.2000, lake Helen (10), 15.08.2000, Qaarsorsuag (5); Sisimiut, 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
12. \* *Dacryomyces minor* Peck. Kangerlussuaq, 12.08. 2000, area between Ice Cap and Sandflugtsdalen (3); 13.08.2000, lake Kløftsøerne (2), 14.08.2000, lake Helen (6), 15.08.2000, Qaarsorsuag (1); Sisimiut, 17.08.2000, central part of the main valley (2), 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.

13. *Exidia repanda* Fr. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen, on *S. glauca* (3).
14. \*\* *Flagelloscypha punctiformis* (Fr.) Agerer. Sisimiut, 17.08.2000, central part of the main valley (1), 18.08.2000, northern part of the main valley (2); all on *S. glauca*.
15. *Gloeocystidiellum leucoxanthum* (Bres.) Boidin. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen, on *S. glauca* (1).
16. *Hymenochaete cinnamomea* (Fr.) Bres.. Sisimiut, 18.08.2000, northern part of the main valley, on *S. glauca* (5).
17. \*\* *Hypochnicium lundellii* (Bourdot) J. Erikss. Kangerlussuaq, 14.08.2000, lake Helen, on *S. glauca* (6).
18. \* *Hypochnicium eichleri* (Bres.) J.Erikss. & Ryvarden. Sisimiut, 18.08.2000, northern part of the main valley, on *S. glauca* (1).
19. *Hyphoderma praetermissum* (P. Karst) J. Erikss. & Å. Strid. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen (1), 13.08.2000, lake Kløftsøerne (3), 14.08.2000, lake Helen (3), Sisimiut, 17.08.2000, central part of the main valley (1), 19.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
20. *Hyphoderma roseocremeum* (Bres.) Donk. Kangerlussuaq, 14.08.2000, lake Helen (1), 15.08.2000, Qaarsorsuaq (1); both on *S. glauca*.
21. *Hyphoderma setigerum* (Fr.) Donk. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen, on *S. glauca* (5), 13.08.2000, lake Kløftsøerne, on *S. glauca* (5), 14.08.2000, lake Helen, on *S. glauca* (7), 15.08.2000, Qaarsorsuaq, on *S. glauca* (1); Sisimiut, 17.08.2000, central part of the main valley, on *B. nana* (1), *S. glauca* (3), 19.08.2000, the foothills of Palasip Qaqqaa, on *S. glauca* (1).
22. \* *Hyphodontia aspera* (Fr.) J. Erikss. Kangerlussuaq, 14.08.2000, lake Helen, on *S. glauca* (1).
23. *Hyphodontia sambuci* (Pers.) J. Erikss. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen (1), 14.08.2000, lake Helen (1); Sisimiut, 17.08.2000, central part of the main valley (1), 19.08.2000, the foothills of Palasip Qaqqaa (1), 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
24. *Lentinellus omphalodes* (Fr.) P. Karst. Sisimiut, 18.08.2000, northern part of the main valley, on *S. glauca* (2).
25. *Merismodes anomalus* (Pers.) Sing. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen (4), 13.08.2000, lake Kløftsøerne (3), 14.08.2000, lake Helen (5), 15.08.2000, Qaarsorsuaq (1); Sisimiut, 17.08.2000, central part of the main valley (1), 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
26. \*\* *Myxarium nucleatum* Wallr. Sisimiut, 20.08.2000, the foothills of Palasip Qaqqaa, on *S. glauca* (1).
27. \* *Pellidiscus pallidus* (Berk. & Br.) Donk. Kangerlussuaq, 12.08.2000, area between Ice Cap and Sandflugtsdalen (1); Sisimiut, 20.08.2000, the foothills of Palasip Qaqqaa (2); all on *S. glauca*.
28. *Peniophora laurentii* Lundell. Kangerlussuaq, 15.08.2000, Qaarsorsuaq (3); Sisimiut, 17.08.2000, central part of the main valley (1); all on *B. nana*.
29. *Peniophora polygonia* (Pers.) Bourdot & Galzin. Kangerlussuaq, 13.08.2000, lake Kløftsøerne (2), 14.08.2000, Lake Helen (1); Sisimiut, 20.08.2000, the foothills of Palasip Qaqqaa (1); all on *S. glauca*.
30. *Phaeomarasmium erinaceus* (Fr.) Kühn. Kangerlussuaq, 13.08.2000, lake Kløftsøerne, on *S. glauca* (1).
31. \* *Phlebia albida* H. Post. Kangerlussuaq, 12.08.2000, the area between the Ice Cap and Sandflugtsdalen (5); 14.08.2000, lake Helen (6); all on *S. glauca*.
32. *Polyporus varius* (Pers.) Fr. Kangerlussuaq, 13.08.2000, lake Kløftsøerne, on *S. glauca* (6).
33. \*\* *Scytinostroma galactinum* (Fr.) Donk. Sisimiut, 18.08.2000, northern part of the main valley, on *B. nana* (1).
34. *Sistotrema brinkmannii* (Bres.) J. Erikss. Kangerlussuaq, 14.08.2000, lake Helen, on *S. glauca* (1).
35. \* *Thanatephorus fusisporus* (J. Schröt.) P. Roberts & Hauerslev. Sisimiut, 18.08.2000, northern part of the main valley, on *S. glauca* (4).
36. *Trechispora farinacea* (Pers.) Liberta. Sisimiut, 18.08.2000, northern part of the main valley (1), 19.08.2000, the foothills of Palasip Qaqqaa (2); all on *S. glauca*.

37. \* *Trechispora mollusca* (Pers.) Liberta. Kangerlussuaq, 14.08.2000, Lake Helen, on *S. glauca* (1).
38. *Tubaria furfuracea* (Pers.) Gill. Kangerlussuaq, 14.08.2000, Lake Helen, on *S. glauca* (1).
39. *Tulasnella eichleriana* Bres. Sisimiut, 18.08.2000, northern part of the main valley, on *S. glauca* (1).
40. \* *Vararia investiens* (Schwein.) P. Karst. Sisimiut, 18.08.2000, northern part of the main valley, on *B. nana* (1).

## Discussion and conclusions

In total forty species of basidiomycetes evolving on woody remains of *S. glauca* and *B. nana* have been found in both areas under investigation. Ten species were discovered in Greenland for the first time. Most of them – *Aleurodiscus bertii*, *Amylocorticium laceratum*, *Athelia decipiens*, *Ceraceomyces serpens*, *Flagelloscypha punctiformis*, *Myxarium nucleatum*, *Scytinostroma galactinum* – were found at the coast of the Atlantic Ocean (Sisimiut). Ten other species have been encountered for the first time in the studied areas – *Hyphodontia aspera*, *Phlebia albida*, *Trechispora mollusca* (found in Kangerlussuaq area), *Hypochnicium eichleri*, *Thanatephorus fusisporus*, *Vararia investiens* (found in Sisimiut area), and *Athelia bombacina*, *Botryobasidium obtusisporum*, *Dacryomyces minor* and *Pellidiscus pallidus* that occur in both areas under investigation.

Biological diversity of wood-inhabiting fungi is similar in Kangerlussuaq and Sisimiut areas – 27 and 26 species, respectively. However, their composition is considerably different. The species similarity ratio is 0.49 meaning that only about 50% of the species occur in both Kangerlussuaq and Sisimiut areas. These species are *Athelia bombacina*, *A. decipiens*, *Botryobasidium obtusisporum*, *Crepidotus inhoneustus*, *Cytidia salicina*, *Dacryomyces minor*, *Hyphoderma praetermissum*, *H. setigerum*, *Hyphodontia sambuci*, *Merismodes anomalus*, *Pellidiscus pallidus*, *Peniophora laurentii* and *P. polygonia*.

Large groups of wood-inhabiting fungi are confined either to continental or coastal areas of low arctic Greenland. The continental species (found only in Kangerlussuaq) are *Athelia acrospora*, *Byssocorticium coprophilum*, *Corticium roseum*, *Exidia repanda*, *Gloeocystidiellum leucoxanthum*, *Hypochnicium lundellii*,

*Hyphoderma roseocreum*, *Hyphodontia aspera*, *Phaeomarasmium erinaceus*, *Phlebia albida*, *Polyporus varius*, *Sistotrema brinkmannii*, *Trechispora mollusca* and *Tubaria furfuracea*. The coastal species (found only in Sisimiut) include *Aleurodiscus bertii*, *Amylocorticium laceratum*, *Ceraceomyces serpens*, *Flagelloscypha punctiformis*, *Hymenochaete cinnamomea*, *Hypochnicium eichleri*, *Lentinellus omphalodes*, *Myxarium nucleatum*, *Scytinostroma galactinum*, *Thanatephorus fusisporus*, *Trechispora farinacea*, *Tulasnella eichleriana* and *Vararia investiens*.

Both in Kangerlussuaq and Sisimiut most fungi are associated with *S. glauca* (35 species in total) and just a small number with *B. nana* – *Athelia bombacina*, *Hyphoderma setigerum*, *Peniophora laurentii*, *Scytinostroma galactinum*, *Vararia investiens*. In the studied areas the former two species evolve not only on *Betula*, but also on *Salix*, whereas *Peniophora laurentii*, *Scytinostroma galactinum*, *Vararia investiens* are associated only with *B. nana*. *Peniophora laurentii*, *Hyphoderma setigerum* and *Vararia investiens* we found on *B. nana* also in the subarctic shrub tundras of South Yamal (Mukhin 1991).

All fungi on *B. nana* are represented by single finds, whereas those on *S. glauca* can be divided into a) common, found in a half or more of the sites; b) rare, found only in one site. Most fungi in the studied areas are rare: 63-69%, depending on the area. Common species are: *Cytidia salicina*, *H. roseocreum*, *Merismodes anomalus*, *Peniophora polygonia*, *Phlebia albida* (Kangerlussuaq area), and *Aleurodiscus bertii*, *Flagelloscypha punctiformis*, *Trechispora farinacea* (Sisimiut area). *Athelia bombacina*, *Dacryomyces minor*, *Hyphoderma praetermissum*, *H. setigerum*, *Hyphodontia sambuci* are common in both areas.

In low arctic Greenland fruitbodies of most of the wood-inhabiting basidiomycetes develop on the lower part of twigs connected with litter. Thus, some of these species are able to develop not only on wood but also on other plant remains, e.g. all species of *Athelia* and *Byssocorticium coprophilum*, *Hypochnicium lundellii*, *Trechispora farinacea* and *T. mollusca* (see Hansen and Knudsen 1997). On attached twigs of *S. glauca* fruitbodies are formed of *Cytidia salicina*, *Myxarium nucleatum*, *Dacryomyces minor*, *Exidia repanda*, *Gloeocystidiellum leucoxanthum*, *Phlebia albida*, *Peniophora polygonia* and a few other species, but on twigs of *B. nana* only *Peniophora laurentii*. This group is more typ-

ical for Kangerlussuaq area than for Sisimiut. It is possible that fungi developing fruitbodies in the litter mainly distribute by snow melting and running streams from rain, whereas fungi developing on standing twigs of shrubs are assumed to distribute by wind.

A large part of the wood-inhabiting fungi occurring in low arctic Greenland are distributed also in subarctic areas of the inland – 24 out of 40 species. This was the case for *Botryobasidium obtusisporum*, *Corticium roseum*, *Cytidia salicina*, *Crepidotus inhonestus*, *Dacryomyces minor*, *Exidia repanda*, *Gloeocystidiellum leucoxanthum*, *Hymenochaete cinnamomea*, *Hypochnicium eichleri*, *Hyphoderma praetermissum*, *H. setigerum*, *Hyphodontia aspera*, *H. sambuci*, *Lentinellus omphalodes*, *Merismodes anomalus*, *Peniophora laurentii*, *Phlebia albida*, *Polyporus varius*, *Sistotrema brinkmannii*, *Trechispora farinacea*, *T. mollusca*, *Tubaria furfuracea*, *Tulasnella eichleriana* and *Vararia investiens* (Knudsen *et al.* 1993). Some species were found in subarctic shrub tundras of South Jamal (West Siberia, Russia) – *Botryobasidium obtusisporum*, *Cytidia salicina*, *Exidia repanda*, *Gloeocystidiellum leucoxanthum*, *Hymenochaete cinnamomea*, *Hypochnicium eichleri*, *Hyphoderma praetermissum*, *H. setigerum*, *Peniophora laurentii*, *Vararia investiens* (Mukhin 1991) – and in the zone of arctic tundras of Northeast Siberia on timber – *Ceraceomyces serpens*, *Hyphoderma praetermissum*, *H. setigerum*, *Hyphodontia sambuci*, *Merismodes anomalus*, *Sistotrema brinkmannii* (Kotiranta and Mukhin 2000). One of the new species for Greenland, *Aleurodiscus bertii*, is restricted in its distribution to North America (Jülich and Stalpers 1980). In my opinion this fact shows a close relation between the wood-inhabiting basidiomycetes of low arctic Greenland with the same group in the North American continent supporting the general knowledge that geographically Greenland is part of North America.

The study shows that in low arctic Greenland ecosystems wood-inhabiting basidiomycetes are represented by a relatively small group of species mainly belonging to the corticioid fungi and furthermore that their composition differ markedly in continental and coastal parts of the island. The main substrate for this group of fungi is *S. glauca* and a few species associated with woody debris of *B. nana*. The wood-inhabiting basidiomycetes of low arctic Greenland are widely distributed in Eurasia and North America and most of them occur in South Greenland.

## Acknowledgements

The present paper was accomplished thanks to a grant from NATO and from the Russian Fund for Fundamental Research (NO 02-05-64577).

## References

- Böcher T. W., Holmen, K. and Jakobsen, K. 1968. *The flora of Greenland*. – P. Haase & Søn Publishers, Copenhagen: 312 PP.
- Borgen, T., Elborne, S. A. and Knudsen, H. 2006. A checklist of the Greenland basidiomycetes. – *Meddelelser om Grønland, Bioscience* 56.
- Jensen, D. B. (ed.) 1999. *Grønlands Biodiversitet – et landstudie*. Teknisk rapport nr. 27. – Pinngortitaleriffik, Grønlands Naturinstitut: 220 pp.
- Hansen, L. and Knudsen, H. (eds.) 1992. *Nordic Macromycetes vol. 2. Polyporales, Boletales, Agaricales, Russulales*. – Nordsvamp, Copenhagen: 474 pp.
- Hansen, L. and Knudsen, H. (eds.) 1997. *Nordic Macromycetes vol. 3. Heterobasidioid, aphylloroid and gastromycetoid basidiomycetes*. – Nordsvamp, Copenhagen: 444 pp.
- Hansen, E. S. 1998. The lichen flora near Sisimiut, Kangamiut and Maniitsoq in Central West Greenland. – *Herzogia* 13: 199–206.
- Hansen, E.S. 2000. A contribution to the lichen flora of the Kangerlussuaq area, West Greenland. – *Cryptogamie, Mycologie* 21(1): 53–59.
- Jülich, W. and Stalpers, J. A. 1980. *The resupinate non-poroid Aphyllorales of temperate Northern Hemisphere*. – North-Holland Publishing Company, Amsterdam, N.Y.: 335 pp.
- Knudsen, H., Hallenberg, N. and Mukhin, V. A. 1993. A comparison between the wood-inhabiting basidiomycetes in three valleys in Greenland. In: Petrini, O. and Laursen, G. A. (eds). *Arctic and Alpine Mycology 3-4*. Bibliotheca Mycologica Band 150: 133–146.
- Kotiranta, H. and Mukhin, V. A. 2000. Aphyllorales (Basidiomycetes) of Tiksi, Republic of Sakha (Yakutia), Northeast Siberia. – *Karstenia* 40: 65–69.
- Mukhin, V. A. 1991. Ksilotrofnie basidiomiceti kustarnikovikh tundr Yamala [Xylotrophic basidiomycetes of the shrub tundras of Yamal]. – *Mikologija i Fitopatologija* 25(5): 394–397.
- Pesenko, U. L. 1982. *Prinzipy i metody kolychestvennogo analiza v faunisticheskikh issledovanijach [Principles and methods of quantitative analysis in faunistic researches]*. – Nauka, Moscow: 287 pp.