The Greenland Mountain birch zone, an introduction

BENT FREDSKILD and SØREN ØDUM

Fredskild, B. and Ødum, S. 1990. The Greenland Mountain birch zone, an introduction. – Meddr Grønland, Biosci. 33, 3–7 pp. Copenhagen 1990-9-28.

The immigration and present distribution of the Greenland "trees": *Alnus crispa* (Ait.) Pursh, *Betula pubescens* Ehrh. s.l. and *Sorbus groenlandica* (Schneid.) Löve & Löve is summarized. As a consequence of a very limited knowledge of the ecological conditions in this zone, the Nordic Subarctic Birch Project (SBP) organized a field trip to S Greenland in 1984 followed by a symposium in Copenhagen in 1988. The present volume of Meddr Grønland brings the results of these two events.

Bent Fredskild, Grønlands Botaniske Undersøgelse, Botanisk Museum, Gothersgade 130, DK-1123 København K, Denmark. Søren Ødum, The Royal Vet.- and Agr. Univ., Hørsholm Arboretum, DK-2970 Hørsholm, Denmark.

Several papers, e.g. Rosenvinge (1896) and Böcher (1954, 1979) deal with the phytogeographical position of S Greenland, but not until recently a mapping of the vegetational zones of the area has been presented (Fig. 1, Feilberg 1984). Low forests of *Betula pubescens* with *Sorbus groenlandica* and *Salix glauca* are found in protected valleys in the interior, viz. in the subcontinental, subarctic, and in the suboceanic, low- or subarctic zone. The zonation, reflecting the strong climatic gradient from the cool, hyperoceanic outer coast to the subcontinental interior with fairly warm summers, is based on the distribution maps of 346 phanerogams (Feilberg

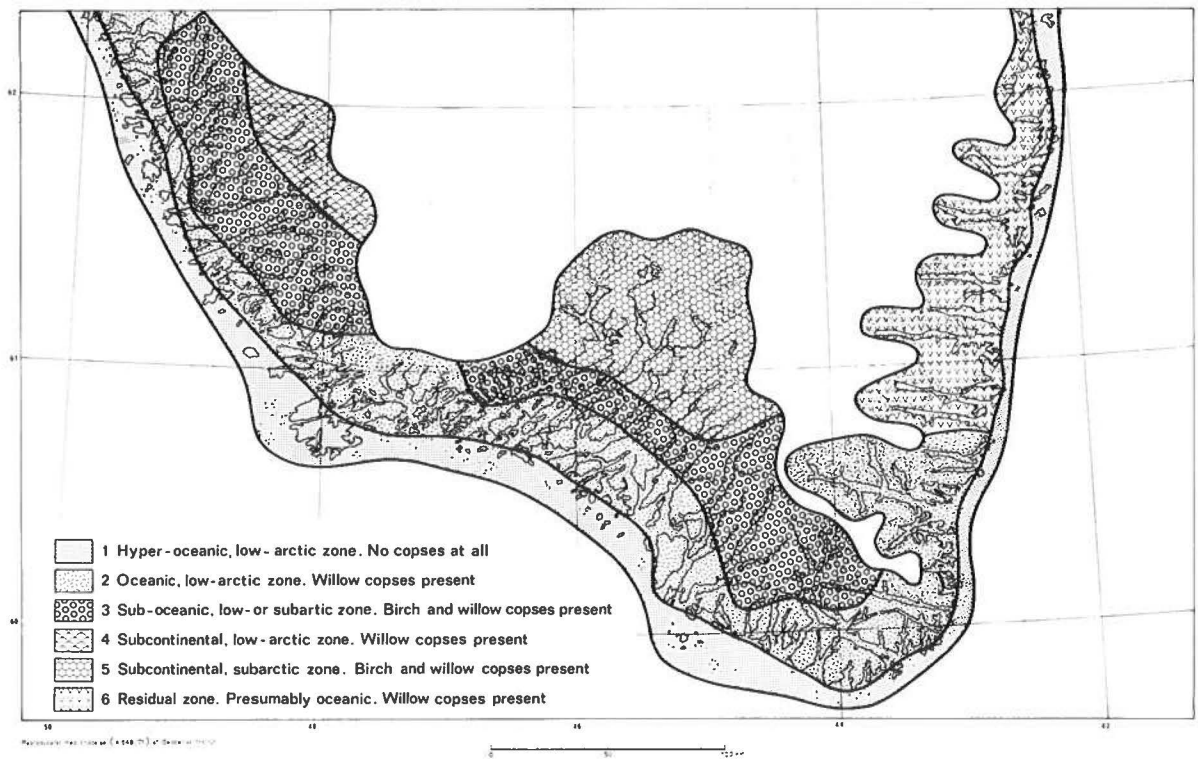

Fig. 1. South Greenland vegetational zones (after Feilberg 1984).

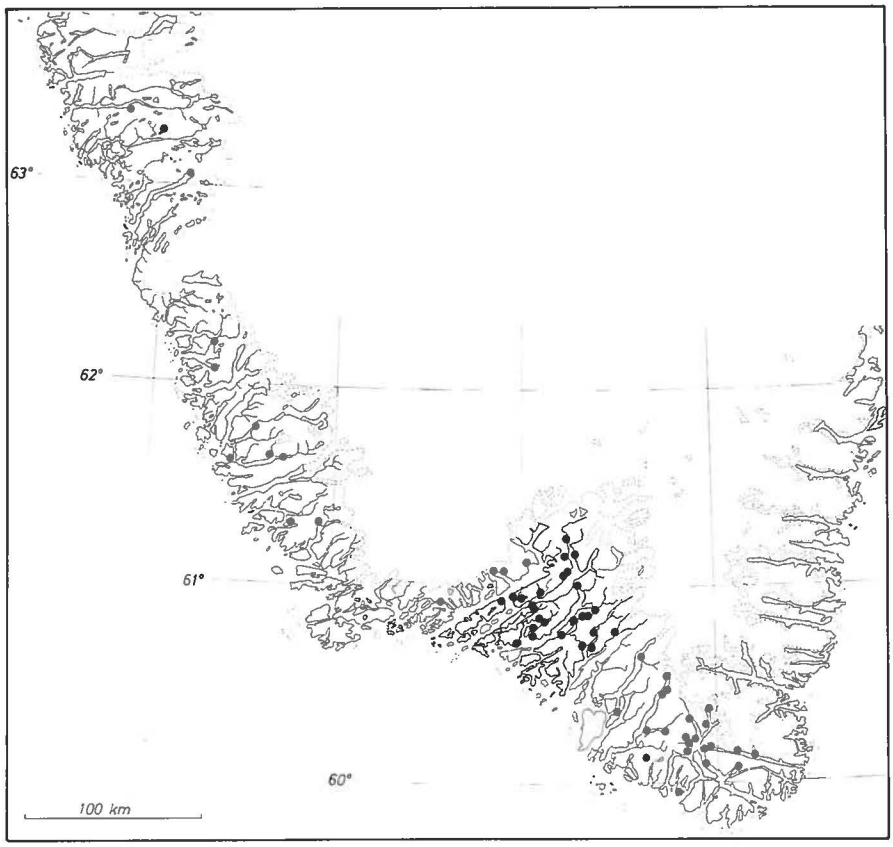

Fig. 2. The Greenland distribution of *Betula pubescens* Ehrh. s.l.

1984). The distribution maps of the three Greenland "trees": the European *Betula pubescens* (Fig. 2) and the American *Sorbus groenlandica* (Fig. 3) and *Alnus crispa* (Fig. 4) especially towards their N limit clearly reflect their preferring the interior with mean July temperature at ca. 10°C against ca. 6°C at the coast.

Alnus reached SW Greenland between 4000 and 3500 ^{14}C years B.P. (Fredskild 1983). Comparing its restricted area in Greenland with that in Canada, where it is a main component in the forest-line scrub zone, it seems odd that with one exception it is not found in S Greenland proper. Böcher (1979) explains this as a

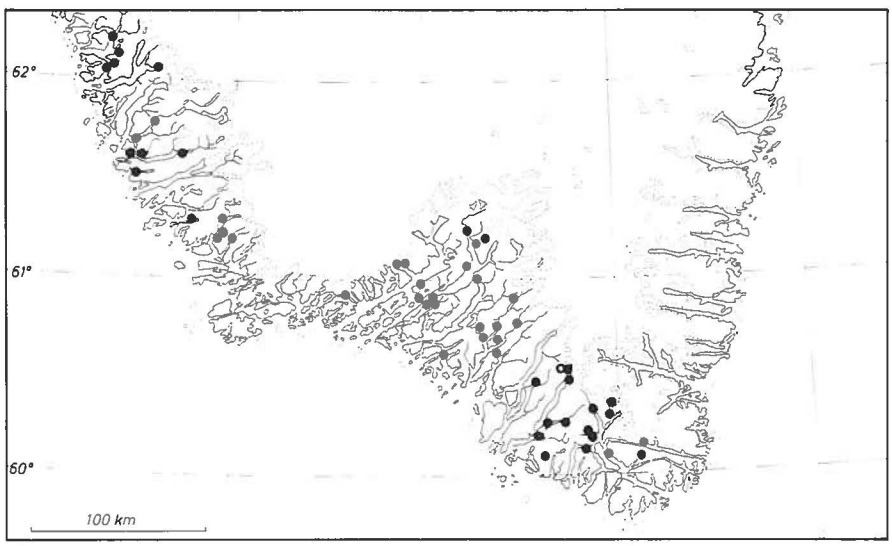

Fig. 3. The Greenland distribution of *Sorbus groenlandica* (Schneid.) Löve and Löve (after Feilberg 1984).

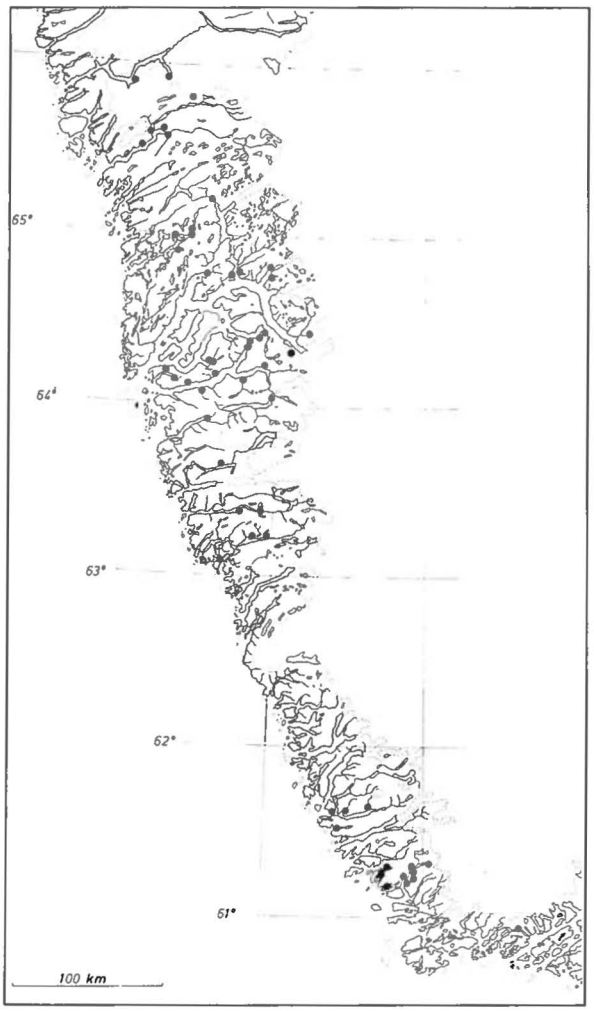

Fig. 4. The Greenland distribution of *Alnus crispa* (Ait.) Pursh.

result of too humid conditions in the south, cfr. the replacement of *Alnus crispa* by *A. sinuata* in the S Alaskan coastal mountains. However, compared with the conditions along the Labrador coast where *Alnus crispa* is growing, the climate in the interior S Greenland should not prevent its growing here, which thus may be caused by lack of dispersal. Difficulties in spreading may also explain the surprisingly big differences in immigration date of *Betula glandulosa* even to nearby localities in S Greenland. Thus, this species immigrated at the head of Tunugdliarfik, vis-à-vis Narssarssuaq, ca. 4400 B.P., while in Igaliko Fjord two fruits were found in a sample dated at 4710 ± 75 B.P. (K–5197), and in the Kap Farvel region its arrival, to three lakes, has been dated between 4000 and 3700 B.P. The only dating of *Betula pubescens* is at the first mentioned place, where it came ca. 3600–3400 B.P. Judging from the pollen size, the two species soon began crossing, resulting in plants with intermediate pollen size. Pollen of the entomophilous *Sorbus groenlandica* has only been found in one loc., viz. Drepanocladus Dam, a tiny pond at the head of a fjord behind Kap Farvel. Here, its pollen was frequent from the beginning of the sedimentation, ca. 2200 B.P., and to the beginning of the Norse era; however when this species immigrated cannot be told.

The Norse landnam in S Greenland, just before A.D. 1000, drastically changed the nature: grazing of sheep, goats, cattle and horses, tree cutting for fuel and timber, peeling of sods for house building, etc. reduced tree growth, broke the thin vegetation cover (Fredskild 1978, 1988) and caused soil erosion in those areas most exposed to the foehn winds (Jacobsen and Jakobsen 1986). However, after 4–5 centuries of utilization of the land, the Norsemen's gradually leaving the stage, resulted in recovery of the forest, at least locally. In recent centuries, the local population of man has been cutting birches for fuel (Fig. 5) mostly on slopes towards the fjords, by which it could be sailed to the settlements, leaving remote valleys less exploited (Oldendow 1935). In 1930, the most well-known forest clad valley, Qingua-dalen, was protected.

The introduction of sheep-breeding, at the beginning of this century, once again locally changed the vegetation severely, and whereas *Salix glauca* can stand biting

Fig. 5. Birch fuel and children (after Oldendow 1935).

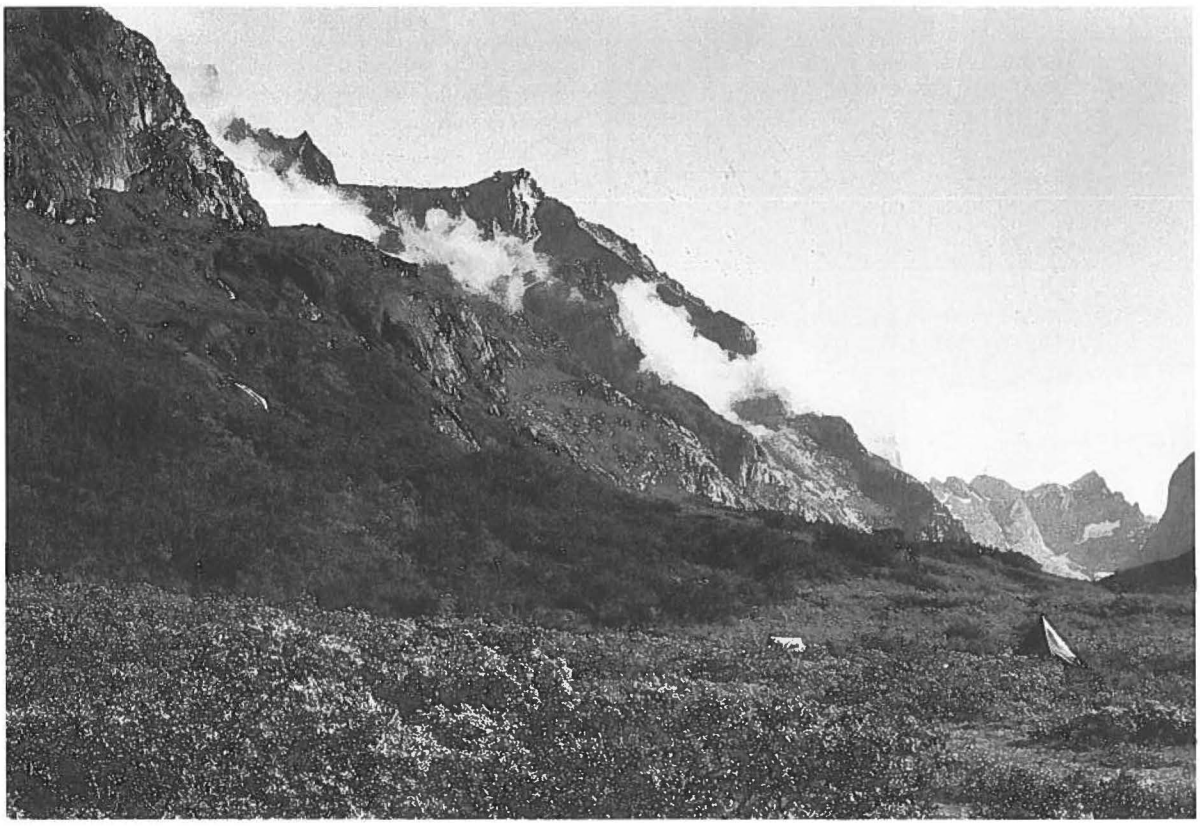

Fig. 6. Birch woodland (dark) and *Salix glauca* copse (foreground) on SE-facing slope in Qingua-dalen (S. Ødum phot.).

to a certain degree, no regrowth of *Betula pubescens* is found where even a few sheep are grazing. Luckily, some of the most vulnerable birch forest areas are now being protected by fencing.

The simultaneous interest in expansion of sheep-farming activities and awareness of the vulnerability of the ecosystem of the birch forest zone has, during the last decade, resulted in more comprehensive investigations (Thorsteinsson 1983, and twelve reports, published 1984–87 by the "Working party concerning environment and sheep-breeding in Greenland"). Only a few recent papers are, however, dealing with the Mountain birch proper and the birch forest (Kuivinen and Lawson 1982, Elkington and Jones 1974).

At The Treeline Symposium, held in Kevo and Abisko 1977 (Kallio and Sonesson 1979), it was evident that the SW Greenland birch forest zone and treeline conditions were less well-known, whereas numerous studies have been carried out along treeline in Fennoscandia, Iceland and in North America. At that symposium, the Nordic Subarctic Birch Project (SBP) was established, and members of the project decided to plan a workshop in Greenland in 1984 with the purpose of carrying out studies here, parallel to corresponding ones in Fennoscandia.

The fieldwork took place in Qingua-dalen (Fig. 6) and in Narssarssuaq during a three-week period in July-August and was supported by the Commission for Scientific Research in Greenland, The Experimental Station in Upernaviarssuk, and by Nordiske Forskersymposier. At a subsequent symposium, at the Botanical Institute, University of Copenhagen and the Arboretum in Hørsholm in June 1988, also supported by Nordiske Forskersymposier, results of the investigations were presented and discussed.

In the present book, these and related studies are published – as a kind of receipt for the economic and other kind of support from the said institutions and others, a help that is highly acknowledged.

References

Böcher, T. W. 1954. Oceanic and continental vegetational complexes in South West Greenland. – Meddr Grønland 148 (1): 1–336.

– 1979. Birch woodlands and tree growth in southern Greenland. – Holarct. Ecol. 2: 218–221.

Elkington, T. T. and Jones, B. M. G. 1974. Biomass and primary productivity of birch (*Betula pubescens* s. lat.) in South-West Greenland. – J. Ecol. 56: 821–830.

Feilberg, J. 1984. A phytogeographical study of South Greenland. Vascular plants. – Meddr Grønland, Biosci. 15: 70 pp.
Fredskild, B. 1978. Palaeobotanical investigations of some peat deposits of Norse age at Qagssiarssuk, South Greenland. – Meddr Grønland 204 (5): 1–41.
– 1983. The Holocene vegetational development of the Godthåbsfjord area, West Greenland. – Meddr Grønland, Geosci. 10: 28 pp.
– 1988. Agriculture in a marginal area – South Greenland from the Norse landnam (985 A.D.) to the present (1985 A.D.). – In: Birks, H. H. et al. (eds). The cultural landscape – past, present and future. Cambridge University Press 1988: 381–393.
Jacobsen, N. K. and Jakobsen, B. H. 1986. ^{14}C datering af en fossil overfladehorisont ved Igaliku Kujalleq, Sydgrønland, set i relation til nordboernes landnam. – Geografisk Tidsskrift 86: 74–77.
Kallio, P. and Sonesson, M. (eds) 1979. Fennoscandian treeline conference at Kevo-Abisko 6–14 September 1977. – Holarct. Ecol. 2: 201–283.
Kuivinen, K. C. and Lawson, M. P. 1982. Dendroclimatic analysis of birch in South Greenland. – Arctic and Alpine Research 14 (3): 243–250.
Oldendow, K. 1935. Naturfredning i Grønland. – Det Grønlandske Selskabs Skrifter IX, 389 pp.
Rosenvinge, L. K. 1896. Det sydligste Grønlands Vegetation. – Meddr Grønland 15: 73–249.
Thorsteinsson, I. 1983. Undersøgelser af de naturlige græsgange i Syd-Grønland 1977–1981. – Landbrugets Forskningsinstitut, Island, Forsøgsstationen Upernaviarsuk, Grønland. 223 pp.