Could Plants survive glacial climatic Conditions in Iceland? – Implications of the Lake Torfadalsvatn Pollen Record

Kundu plantur hóra undan í seinastu ístíð í Íslandi? - Ábendingar av flogsáðskrásetingum úr Torfadalsvatni

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Úrtak

Upplýsingar um flogsáð úr Norðuríslandi sýna, at floran í tí yngra dryastíðarskeiðnum var lutfalsliga fjølbroytt. Av tí at íslendska veðurlagið hetta tíðarskeið líktist veðurlagnum, tá ið tað var kaldast seinastu ístíð, og tá havt verður í huga, hvussu lutfalsliga fjølbroytt plantulívið er í háarktiskum økjum og nunatakum í dag, er tað sannlíkt, at nøkur harðbalin sløg eisini hóraðu undan alla seinastu ístíð í Íslandi.

Extended abstract

Pollen assemblages preserved in lake sediments deposited during the Younger Dryas stadial, a cold event during the last glacial-interglacial transition, reflect the presence of a relatively diverse flora on the Skagi peninsula in northern Iceland, including woody plants like *Betula nana*, *Salix*, and possibly also *Juniperus communis* (Rundgren, 1995). This discovery has implications for the much-debated question of plant survival in Iceland during glacial periods (*e.g.* Buckland and Dugmore, 1991), since palaeoceanographic data suggest that Younger Dryas climatic conditions in northern Iceland were similar to those at the peak of the last (Weichselian) glacial. Summer sea-surface temperatures north of Iceland were no more than 3°C lower during the last glacial maximum than during the Younger Dryas stadial (Sarnthein *et al.*, 1995), and estimates of winter sea-surface temperatures are almost identical for both periods. In addition, recent palaeoclimatic data from ice-cores and deep-sea sediment cores show that the Weichselian was a period of abrupt changes in air temperature and ocean circulation in the North Atlantic region (Johnsen *et al.*, 1995; Dokken and Hald, 1996), with the coldest events of about the same duration as the Younger Dryas stadial.

Taking into account that many plants can endure extreme climatic conditions, as shown by the relative diversity found in high Arctic areas (*e.g.* Edlund and Alt, 1989; Bay, 1992) and in present-day

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nunatak areas in Iceland and Greenland (Einarsson, 1970; Gjærevoll and Ryvarden, 1977), plant survival in Iceland during glacial climatic conditions may well be feasible, given that ice-free areas existed. There are strong geomorphological indications from several coastal mountain areas for ice-free conditions during the last glacial maximum (*e.g.* Sigurvinsson, 1983; Hjort *et al.*, 1985; Norðdahl, 1991), but there are yet no palaebotanical data available from these areas to support glacial plant presence.

The Icelandic fossil plant record reflects a Late Cenozoic cooling and a transition from a flora dominated by American elements to one with more European affinities (Símonarson, 1979; Einarsson, 1994), and many of the taxa important in the present Icelandic flora, *e.g. Betula nana*, *Salix*, *Empetrum nigrum*, Ericaceae, Poaceae, Cyperaceae, *Dryas octopetala*, Caryophyllaceae, *Plantago* and *Lycopodium*, are recorded already in the early Pleistocene. This floral change may be interpreted as the result of increased long-distance dispersal from northwestern Europe and northern Eurasia, due to a gradual change in oceanic circulation in connection with the opening of the North Atlantic, in combination with plant survival in Iceland during cold periods and glaciations. The lack of endemics in the Icelandic flora may be explained by continuous long-distance dispersal by ocean currents, wind and birds, both in the postglacial period and earlier epochs.

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