

Rare Plants from the Angmagssalik District, Southeast Greenland

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Selaginella selaginoides, *Arabis arenicola*, and *Gentiana amarella* are recorded as species new to the Angmagssalik district. Other species, formerly only known from single localities, are reported from new localities. Descriptions are given of the habitats in which the species were found.

In the summer of 1966 the authors made their first expedition to the Angmagssalik district to carry out floristical and ecological investigations (DANIËLS 1968, DE MOLENAAR 1968 a, 1968 b). The fieldwork was continued in 1968 and will be concluded in 1969.

The vascular flora of the district is well known mainly through the intensive collections made by BERLIN and NATHORST in 1883 (BERLIN 1884) and especially those by KRUISE in 1898–1902 (KRUISE 1906, 1912) and BØGVAD & HAMMER in 1933 (BÖCHER 1938). However being very mountainous and intersected by many fjords, the Angmagssalik district is not easily accessible. There are still many localities of which the flora and vegetation are unknown or poorly known. That even a thoroughly investigated area such as Blomsterdalen, the “back garden” of Angmagssalik, may still produce floristic surprises is shown by the recent find of *Arabis arenicola*.

In the course of the fieldwork in 1966 and 1968 a number of floristically interesting finds were made, which are recorded below. Since several of these plants occur here at the limits of their range, special attention is paid to the description of their habitats.

The nomenclature and order in which the species are dealt with are in accordance with the second edition of Grønlands Flora (BÖCHER & al. 1966) and specimens are or will be incorporated in the Botanical Museum and Herbarium, Utrecht, duplicates will be deposited at the Botanical Museum in Copenhagen.

Localities

Angmagssalik: the vicinity of the town including Blomsterdalen and Elvbakker, 65°36' N–37°39' W.

gtumit (Igdlumiut): an old settlement near Angmagssalik, 65°36' N–37°39' W.

Kulusuk island: a station a short distance northeast of the Kap Dan trading post, 65°34,5' N–37°10' W.

Nagtivit (Nadtluit): 65°38' N–38°35' W.

Sermilikvejen and the head of Kong Oscars Havn on the Angmagssalik island: 65°38,5' N–37°41' W.

Tasilaq (Tasissárssik) fjord: the head and the valley of the fjord, 66°04' N–37' W.

Selaginella selaginoides (L.) LINK

Selaginella selaginoides is a rather common species in the southern parts of Greenland. It was found hitherto on the west coast as far north as 65°08' N (Kobbe fjord; BÖCHER 1938) and on the east coast up to 63°36' N. (Trollefjordeidet; DEVOLD & SCHOLANDER 1933) in sheltered places such as open moist willow scrub, heath and herb-rich vegetation.

In 1966 it was found at 66°04' N in sheltered places on the western slopes of the mountain chain bordering the east side of Tasilaq fjord, and in 1968 on Angmagssalik island at Sermilikvejen, at the head of Kong Oscars Havn, 65°38' N.

Selaginella selaginoides is a very inconspicuous plant in the vegetation and this is probably why it has been overlooked in the Angmagssalik district for such a long time.

Sermilikvejen

a. Field plot 68dM 319, south-facing slope, incl. 30°, 320 m, 14 August 1968.

The plant occurs here in a very luxuriant, high, herbaceous vegetation, rich in species, situated along the foot of rocks over which water trickles. Some of the major constituents of the plant cover are *Alchemilla filicaulis*, *Angelica archangelica*, *Carex bigelowii*, *Ranunculus acris*, *Scirpus caespitosus*, *Sedum rosea*, *Taraxacum croceum*, *Thalictrum alpinum*, and *Viola palustris*.

b. Field plot 68Da 235, west-facing slope, incl. 50°, 165 m, 14 August 1968.

A very luxuriant, low, dense *Vaccinium uliginosum*, *Salix glauca* vegetation, rich in herbs, on moist, shallow, gravelly peaty soil, situated at the foot of rocks over which water trickles. Some of the most conspicuous plants in this vegetation are *Taraxacum croceum*, *Carex bigelowii*, *Ranunculus acris*, *Sedum rosea*, *Thalictrum alpinum*, *Viola palustris*, and *Platanthera hyperborea*.

Tasilaq fjord

a. Field plot G 11 a, west-facing slope, incl. 80°, 400 m, 10 August 1966.

An open *Harrimanella hypnoides*, *Empetrum hermaphroditum* snow bed vegetation, on moist, shallow, sandy, rather peaty soil, covering the stony bottom of a rock

cleft. This vegetation is rich in species, including among others *Phyllodoce coerulea*, *Pinguicula vulgaris*, *Tofieldia pusilla*, and *Pedicularis flammea*.

b. Field plot G 7, west-facing slope, incl. 30°, 270 m, 10 August 1966.

Empetrum hermaphroditum, *Vaccinium uliginosum*, *Salix glauca* heath, rich in vascular species (27) as for example *Tofieldia pusilla*, *Pinguicula vulgaris*, and *Huperzia selago*. The vegetation occurs on sandy, rather peaty soil.

c. Field plot G 11b, west-facing slope, incl. 80°, 420 m, 10 August 1966.

Selaginella selaginoides was found here in a luxuriant *Vaccinium uliginosum* heath on moist, peaty soil. *Empetrum hermaphroditum* is subdominant in the vegetation, in which *Cassiope tetragona*, *Dryas integrifolia*, and *Huperzia selago* are conspicuous. In the moss layer *Anthelia* and *Sphagnum* are abundant.

d. Field plot G 15, see *Gentiana amarella*.

Subularia aquatica L.

On the west and south coast of Greenland *Subularia aquatica* has been found near Jakobshavn (FREDSKILD 1961), Frederiksdal (BERLIN 1884), and Tasermiut (HARTZ and PORSILD cited in BÖCHER 1938) and until now at two localities on the east coast, both on the outer coast near Angmagssalik, at Subularia-dammen in the Elvbakker area and on the Åmarqâq peninsula in Kong Oscars Havn (BERLIN 1884, KRUISE 1912).

In 1966 and 1968 the species was observed in a small pond near Angmagssalik, most likely identical with KRUISE's Subularia-dammen. Moreover, it was found in 1968 in Nagtivit, the third station on the east coast.

In West Greenland BERLIN and FREDSKILD observed that submerged Subularia plants flower and fruit abundantly. On the east coast BERLIN and the present authors observed the species flowering and fruiting only on the dried-up bottoms and margins of ponds.

Nagtivit

Field plots 68dM 236 and 68dM 237, 20 m, 18 July 1968. A shallow temporary pond, 20 × 15 m², the bottom of which is dried-up. On the very level bottom an open *Alopecurus aequalis*, *Callitriche verna*, *Subularia aquatica* vegetation occurs, without a moss layer. The soil, which is at least 34 cm deep, is very moist and covered by a thin layer of flaky, fine detritus over a dark amorphous peat.

Arabis arenicola (RICHARDS.) GEL.

Arabis arenicola is a rather rare species in Greenland. It is recorded from the west coast between about 55° N and 72° N; on the east coast the species was known between 70°40' N and 71°58' N on sandy and stony soils (BÖCHER 1938).

We can now add Angmagssalik as a new isolated, station on the east coast, where the plant was collected in 1966 in Blomsterdalen.

BÖCHER (1938) regards the species as low-arctic continental; Blomsterdalen, however, is a coastal station.

Angmagssalik

A few specimens of *Arabis arenicola* were found in an exposed habitat, in a fell-field vegetation on a level hill top, 100 m a.s.l., on dry gravelly, sandy soil between flat weathered rocks together with *Luzula spicata*, *Cardamine bellidifolia*, *Draba norvegica*, and *Salix glauca*.

Gentiana amarella L. (aggr.)

Gentiana amarella was until now only recorded from Igaliko, ca. 61° N–45,5° W, South Greenland (POLUNIN 1942). The specimens collected by POLUNIN are considered to be quite atypical and he regards them as most closely related to var. *uliginosa* (WILLD.) WAHLENB. *G. amarella* is an extremely variable species, preferring grassland on moist or rather wet, sandy, humus rich, basic soils.

In 1966 *G. amarella* was discovered in the Angmagssalik district at the head of Tasilaqfjord, but only one specimen was found.

The plant was identified by Dr. G. HALLIDAY, who compared it with a duplicate of POLUNIN's collection. He could not find any significant difference between the two specimens.

Attention is drawn to the fact that in this sheltered habitat two very rare species, *Selaginella selaginoides* and *Gentiana amarella*, occur together.

Tasilaq fjord

Field plot G 15, west-facing slope, incl. 80°, 520 m, 10 August 1966.

Gentiana amarella grows here in a luxuriant *Vaccinium uliginosum* heath, extremely rich in vascular species (39) on moist, peaty soil, just beneath a ledge of a terrace on a terraced mountain side. *Empetrum hermaphroditum* and *Salix glauca* are subdominant and of the other species *Dryas integrifolia*, *Diapensia lapponica*, *Rhododendron lapponicum*, *Cassiope tetragona*, *Selaginella selaginoides*, and *Carex capillaris* are mentioned as the most interesting ones.

Mertensia maritima (L.) GRAY

Mertensia maritima is not uncommon in West Greenland, though it is known from rather scattered stations, on sandy beaches (BÖCHER 1938). On the east coast it has been reported only from Angmagssalik (KRUUSE 1912, BÖCHER 1938) and Umánaq fjord, 63°07' N (SEIDENFADEN 1933).

To these two stations we can now add three more: Kulusuk island,

Nagtitvit, and the head of Kong Oscars Havn. The fourth locality where *Mertensia* was found by the authors is the same as KRUUSE's and BÖCHER's locality near Angmagssalik at Grønlænderpynten, Igtumit.

KRUUSE (1912) considers that the plant is most probably a recent arrival at Angmagssalik, having been dispersed by means of sea currents. BÖCHER (1938) is inclined to support this view. It is remarkable indeed that KRUUSE did not find this plant anywhere in the district, in spite of his extensive travels there (1898–1902) and considering the attention he paid to beach vegetation, and yet the present authors found it in all four such stations investigated in 1968. As *Mertensia* was observed fruiting (also noted by KRUUSE) it is tempting to support KRUUSE's view and to assume that the species, after its recent arrival, is now spreading in the area.

Igtumit

Field plots 68dM 45, 68dM 46 and 68dM 47, 15, 10 and 8 m, 24 June 1968.

Very open fell-field-like vegetation on gravelly slopes among rocks facing the fjord. Associated with *Mertensia* were species such as *Sedum rosea*, *Silene acaulis*, *Cerastium alpinum*, and *Salix herbacea*. Compared with the other localities, the soil at the Grønlænderpynten sites is very mobile and steadily moving seawards.

Kong Oscars Havn

At the head of the fjord, 1 m, 12 August 1968.

Large individuals of *Mertensia* grow as patches on a small sandy delta in the fjord, forming a zone between that of *Honckenya peploides* following the strand-line and the *Empetrum hermaphroditum*, *Vaccinium uliginosum* heath higher up the slope.

Kulusuk island

1 m, 4 July 1968. *Mertensia* was collected here on the sandy delta of a small stream. The plants occur as very small, scattered individuals in very sparse vegetation, forming a zone directly above the strand-line which is dominated by *Honckenya peploides*.

Nagtitvit

Field plots 68dM 189 and 68dM 191, 1 and 2 m, 15 July 1968, along the shore of the Tasilalik fjord.

Field plot 68dM 189, on very fine sand, is closely comparable with those from Igtumit, being in very sparse beach vegetation. Field plot 68dM 191 was situated in rather luxuriant cliff vegetation dominated by *Mertensia*, with *Plantago maritima* and rich in bryophytes and lichens, growing on dead *Carex glareosa* tussocks. Furthermore, *Mertensia* was observed flourishing in the crevices of cliffs near the fjord.

Galium brandegei A. GRAY

Galium brandegei is a rare plant in Greenland. On the east coast it was known only from one station near Angmagssalik (KRUUSE 1912, as *Galium palustre* var. *minus*).

To this station we can add now a second, Nagtivit. This habitat closely corresponds to the description KRUISE gives of the one near Angmagssalik where he collected the *Galium* in 1902, a high sedge moor surrounding a pond situated in a poorly drained depression.

Nagtivit

Field plots 68dM 194 and 68dM 195, 20 m, 15 July 1968.

Galium brandegei was found in a high, closed and lush mire vegetation, dominated by *Carex saxatilis* and *Carex rariflora* with *Sphagnum teres* dominating the moss layers on a lake shore in an area with poor drainage. The soil consists of a 45 to 65 cm thick *Sphagnum* peat. The watertable is met with at 17 to 21 cm.

Listera cordata (L.) R. BR.

Listera cordata has a southern distribution in Greenland (BÖCHER 1963, Map Fig. 22). It was recorded from the west coast north to the southern part of Disko island (ca. 69°30' N) and from the east coast north to Trollfjordeidet (63°38' N; DEVOLD & SCHOLANDER 1932, BÖCHER 1963) in sheltered places such as willow scrub, luxuriant heath and herb-rich vegetation. However, in 1967 *Listera* was collected by ELSLEY at ca. 65°52' N on the east coast in the neighbourhood of Kûngmiut in the Angmagssalik district "by a stream under a dense cover of *Salix glauca* and *Vaccinium uliginosum* on a south-facing slope" (ELSLEY & HALLIDAY 1970).

To this record of *Listera cordata* from the Angmagssalik district we can add now three from other localities, where it was always found in luxuriant species-rich heaths, on moist, peaty soils in very sheltered places.

Like *Selaginella selaginoides*, *Listera cordata* is, particularly when not in flower, a very inconspicuous plant in the vegetation. Therefore despite the frequency of suitable habitats, it is not surprising that it has not been recorded previously from the Angmagssalik district.

Angmagssalik

Field plot 68Da 198, south-facing slope, incl. 20°, 130 m, 6 August 1968.

Only a few specimens of non-flowering plants were found in luxuriant *Empetrum hermaphroditum*, *Vaccinium uliginosum* heath. Of the other 24 species of vascular plants, *Alchemilla filicaulis*, *Bartsia alpina*, and *Ranunculus acris* are the major constituents of the vegetation.

Nagtivit

a. Field plot 68Da 153, southwest-facing slope, incl. 30°, 50 m, 16 July 1968.

Some hundreds of flowering plants were growing in an *Empetrum hermaphroditum*,

Salix herbacea, *Sphagnum* vegetation, rich in *Hieracium alpinum*, *Sedum rosea*, *Bartsia alpina*, and *Polygonum viviparum*.

b. Field plot 68Da 154, southwest-facing slope, incl. 40°, 60 m, 16 July 1968.

Listera cordata grows here in an *Empetrum hermaphroditum*, *Salix herbacea* vegetation, rich in vascular species (24). *Vaccinium uliginosum*, *Salix glauca*, *Phyllo-doce coerulea*, and *Sedum rosea* are subdominant.

c. Field plot 68Da 175, west-facing slope, incl. 45°, 110 m, 18 July 1968.

A high *Salix glauca*, *Empetrum hermaphroditum*, *Vaccinium uliginosum* heath on peaty soil overlying stones and gravel, rich in *Coptis trifoliata*, *Hieracium alpinum*, and *Hieracium hyparcticum*. The vegetation is situated beneath rocks over which water trickles.

Sermilikvejen

Field plot 68Da 232, southwest-facing slope, incl. 55°, 60 m, 14 August 1968.

Listera cordata occurs here in an *Empetrum hermaphroditum* heath on moist gravelly peaty soil, situated along the foot of rocks over which water trickles. *Vaccinium uliginosum* is subdominant and of the many herbs *Alchemilla alpina*, *Alchemilla flicaulis*, *Viola palustris*, *Leucorchis albida*, *Bartsia alpina*, and *Sedum rosea* are the most frequent.

Juncus arcticus WILLD.

This species, occurring on sandy or clayey shores of rivers and lakes, is known from the west coast as far north as 72°27' N. From the east coast it is known south of 74°24' N, although between 60° N and 70° N it has been reported only from a few scattered stations (BÖCHER 1938).

In the Angmagssalik district it is recorded from two localities. KRUISE (1906) found the plant on a sandy islet in a river delta at a lake at Qingertivaq, ca. 66°16' N. In 1963 GRIBBON (1968) collected the plant in the Tasilaq valley, where it was found independently by the authors in 1966. Besides *Juncus arcticus*, both GRIBBON and the present authors also found *Juncus castaneus* which previously had been recorded for the east coast south of 70° N only from Qingertivaq by KRUISE (BÖCHER 1938). In the course of the fieldwork in 1968, *Juncus arcticus* was found at Nagtivit, the third locality in the Angmagssalik district.

Nagtivit

The species was found here on moist silty loam, which appeared to be frozen below a depth of about 80 cm, close to a vast sedge and moss moor, developed on the poorly drained deposits of silty loam.

a. Field plot 68Da 164, 25 cm, 17 July 1968.

A rather open vegetation with scattered shrubs of *Empetrum hermaphroditum* and *Vaccinium uliginosum*, closely pressed against the soil which is locally covered

by a dark crust of *Anthelia* and other mosses. Interspersed in the vegetation are individuals of, for example, *Loiseleura procumbens*, *Harrimanella hypnoides*, *Tofieldia pusilla*, *Pinguicula vulgaris*, *Equisetum arvense*, *Pedicularis flammea*, and *Sagina saginoides*.

b. Field plot 68Da 170, 25 m, 17 July 1968.

A rather open vegetation of *Vaccinium uliginosum*, *Salix glauca*, and many individuals of *Carex bigelowii*, *Salix herbacea*, *Scirpus caespitosus*, *Carex rariflora*, *Equisetum arvense*, *Pinguicula vulgaris*, *Polygonum viviparum*, *Harrimanella hypnoides*, *Festuca vivipara*, and, most surprisingly, *Carex norvegica*. A moss layer is present as in 68Da 164.

Tasilaq fjord

Field plot 66dM 112, 1 m, 12 August 1966.

Juncus arcticus grows here in an open vegetation with *Salix herbacea*, *Salix glauca*, *Festuca rubra*, *Equisetum variegatum*, *Deschampsia alpina*, *Calamagrostis neglecta*, and *Juncus castaneus*, on the sandy, slightly loamy delta in the inner part of the fjord.

This habitat closely corresponds to the description of the place where the plant was found by KRUSE.

Carex norvegica RETZ.

Carex norvegica (*Carex alpina* LILJEB.) is recorded from scattered stations south of ca. 73° N on the west coast. Its distribution on the east coast is also discontinuous, the plant being known there scattered from ca. 68–73° N and from ca. 62°30' N to 63°40' N (BÖCHER 1938). Later on, however, the species was recorded from a few localities within the intervening area, two of which are situated in the Angmagssalik district. In 1963 GRIBBON (1968) found the plant on the Rytterknægten mountain (at 1510 m) in the inland part of the district and in 1967 it was found by ELSLEY at Tugtilik (ELSLEY & HALLIDAY 1970) in the northern coastal part. We can add now a third locality, Nagtivit, where a few small individuals (5 cm) were found in field plot 68Da 170 (see *Juncus arcticus*), a fell-field-like vegetation on silty loam.

In Grønlands Flora (BÖCHER & al. 1966) *Carex norvegica* is represented by two subspecies: ssp. *norvegica*, recorded from heaths and bogs in the southern part of Greenland, and ssp. *inserrulata* KALELA, occurring in heath, bogs and herb-rich vegetation. The latter does not seem to occur in southeast Greenland. In our opinion the Nagtivit plant belongs to ssp. *norvegica*.

Sparganium angustifolium MICHX.

Sparganium angustifolium is a rare plant in Greenland, occurring in small lakes and ponds at three localities on the south and west coast (BÖCHER

& al. 1966). On the east coast the plant was known only from two localities near Angmagssalik, Āmarqâq peninsula in Kong Oscars Havn (KRUUSE 1912: Amakâ (Kap Hørring) as *S. minimum*) and the "Sparganiumdammen" in the Elvbakker area (KRUUSE 1912, BÖCHER 1933, 1938 as *S. affine* SCHNIZL.). Both localities were visited in 1966 and 1968. *Sparganium* was found flourishing at both, and one sample plot was analyzed in the "Sparganiumdammen". In addition the plant was discovered and its habitat studied at a new locality in the Nagtivit area.

When sorting their collection after returning home, DEVOLD & SCHOLANDER (1933) found a *Sparganium* leaf, overlooked in the field, among material collected in 1932 from a little pond on Myrodden, Igdlovarsuk (c. 63°35' N). On account of its characteristic anatomical structure they readily identified the genus, but found it impossible to determine the species. It could have been either *S. hyperboreum* or *S. angustifolium*. These two species cannot be identified from a leaf fragment only, but the leaf was assumed to belong to *S. angustifolium* (as *S. affine* SCHNIZL.) being the only *Sparganium* known from the east coast. BÖCHER (1938) originally agreed with them, though hesitantly. Judging from Grønlands Flora (BÖCHER & al. 1966) this find is now attributed by BÖCHER to *S. hyperboreum*, though still with some hesitation.

Angmagssalik

Field plot 68dM 321, 80 m, 25 August 1968.

KRUUSE (1912) and BÖCHER (1933, analysis No. 94) describe the vegetation of this pond, "Sparganiumdammen" as KRUUSE called it, which has a submerged layer of *Drepanocladus* through which *Sparganium* and *Hippuris* grow to the water surface.

Nagtivit

Field plot 68dM 197, 20 m, 15 July 1968.

The habitat of *Sparganium* here is a shallow pond, ca. 40 cm deep, in a poorly drained area. Taking into account its floating surface leaves, the plant covers almost 5% of the total surface. In the deepest places the bottom is nearly completely covered by a dense submerged, more or less suspended layer of *Drepanocladus* c.f. *exannulatus*. In places where the pond is less deep and the bottom more stony, the moss layer is less compact and in some places missing. Elsewhere in the Nagtivit area *Hippuris vulgaris* also occurs in this type of vegetation.

Triglochin palustre L.

This species is known from isolated stations on the west coast of Greenland as well as on the northeast coast. South of 71° N it is very rare on the east coast (BÖCHER 1938) where it is known only from Angmagssalik (BERLIN 1884) and Umánaq fjord (DEVOLD & SCHOLANDER 1933).

Igtumit

The plant was collected here on 22 July 1966 in a puddle with *Eriophorum scheuchzeri* and *Cerastium cerastoides*. The locality is in an old, nearly abandoned settlement and the soil is strongly contaminated by litter and debris.

Triglochin palustre was only found in this puddle. Although recorded by BERLIN it has never been found since. It is probable that BERLIN's locality is the same as the one described above. If so, it may be safely assumed that the species is now extinct in this area, because of the building of oil tanks and an accessory road on the very spot. Consequently it proved impossible to rediscover the species in 1968.

Concluding Remarks on the Phytogeography of the Angmagssalik District.

The Sermilik fjord roughly constitutes the physiographical boundary between the roches moutonnées landscape to the west, which was covered by the ice and severely glaciated during the glacial periods, and the alpine landscape to the east. The physiographical conditions of the alpine landscape correlated with the occurrence of localities with very rich floras with northern and southern plant species of isolated occurrence in the Angmagssalik district, strongly suggest, according to BÖCHER (1956), the former existence of unglaciated areas which have been refugia for plant life during the glacial periods.

Potentilla hyperctica, *Pyrola grandiflora*, *Antennaria porsildii*, and *Juncus arcticus* as northern species, and *Ranunculus acris*, *Subularia aquatica*, *Callitriche anceps*, *Mertensia maritima*, *Sparganium angustifolium*, *Juncus subtilis*, *Gentiana aurea*, *Galium brandegei*, and *Alopecurus aequalis* as southern species were up to now only known east of Sermilik fjord. The finds of *Selaginella selaginoides*, *Arabis arenicola*, and *Gentiana amarella* all on the eastern side of Sermilik fjord in 1966 and 1968 reinforce BÖCHER's view but as he rightly says, "we cannot make too sure conclusions from it, the western side of the Sermilik fjord has not been thoroughly investigated".

In 1968 we spend only five days at Nagtivit, a locally sheltered area with a luxuriant, varied and floristically very rich vegetation on the west side of Sermilik fjord. The finds of *Mertensia maritima*, *Subularia aquatica*, *Juncus arcticus*, *Sparganium angustifolium*, *Listera cordata*, and *Carex norvegica* suggest that BÖCHER's interpretation (1956) is not entirely correct. This raises the question whether the region west of Sermilik fjord was completely glaciated. Either the species have survived on nearby refugia or they have spread from refugia on the eastern side of the fjord after the glacial periods. It has already been suggested that *Mertensia*

maritima has spread recently in the area by means of sea currents. Other aquatic plants could have been dispersed at a much earlier time by migratory aquatic birds which are frequent in the Angmagssalik area (IVERSEN 1953). On the other hand high mountains occur west of Sermilik fjord which might have protruded through the ice as nunataks and thus could have offered refugia for several plant species.

More extensive investigations have to be carried out on more localities in this region to answer these questions.

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