# *Salix arctica Pall. and Salix lanata L. in the Faroe Islands and their affinity with the populations in Iceland*

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## Úrtak

Høvundurin hevur kannað pílasløgini í Íslandi og Føroyum. Í Føroyum eru 4 pílasløg, men bert eitt er vanligt, urta-pílur (*Salix herbacea*). Hini sløgini eru sera sjáldsom. Eitt teirra pálma-pílur (*Salix phylicifolia*) er so lætt at kenna, at ikki verður gjørt nakað burtur úr tí í hesi grein. Hini eru grá-pílur (*Salix arctica*) og loð-pílur (*Salix lanata*). Hesi sløgini vaksa einans í homrum, har seyður ikki sleppur til. Høvundurin hevur kannað turkaðar plantur, og eisini hevur hann dyrkað nakrar í urtagarði í Reykjavík. Í eldri bókmentum hevur grá-pílur verið nevndur *Salix glauca*. Nýggjar kanningar vísa, at *Salix glauca* hvørki veksur í Íslandi ella í Føroyum, men at slagið er *Salix arctica*. Hetta hevur russiski plantufrøðingurin Skvortsov kortini víst á longu í 1971 fyri Føroya viðkomandi, og høvundurin váttar hetta úrslitið hjá Skvortsov. Eisini verður víst á, at ein pílur, ið veksur norðan fyri Vestmanna hvørki er *Salix glauca* ella grá-pílur, *Salix arctica*, men loð-pílur (*Salix lanata*). Nakað heilt nýtt er, at høvundurin vísir á fleiri dømi um plantur, sum er blendingar av grá-píli (*Salix arctica*) og urta-píli, (*Salix herbacea*). Av tí at grá-pílur (*Salix arctica*) nú einans veksur á fáum støðum og tí er umgyrdur av stórum mongdum av urta-píli (*Salix herbacea*), ið er sera vanligur, hendir tað, at sáð frá urta-píli stundum verður flutt yvir á grá-píl. Tað er skilligt, at summar plantur av *Salix arctica* hava nøkur eyðkenni frá *Salix herbacea*.


## Introduction

For some years I have been a member of a group who is working with the genus *Salix* for a new Flora of the Nordic countries. The situation about the occurrence and distribution of *Salix arctica* Pall. and *S. lanata* L. in the Faroe Islands has been uncertain and therefore I gratefully accepted an invitation to come to the Faroe Islands during the spring of 1989. There I had an opportunity to observe these species in their natural habitats and collect material. In the Faroe Islands I met extraordinary hospitality and helpfulness and without the guidance of those who best know the circumstances and localities, the visit would have been without any result. It is not possible to name all those who assisted me during the visit but I can not refrain from mentioning especially Tróndur Leivsson, director of the Forestry Service, and Jóhannes Jóhansen, curator of the Museum of Natural History in Tórshavn.

There are four native species of *Salix* in the Faroe Islands but only one of them is common: *Salix herbacea* L. The other three have only been found in very few localities and only one or few individuals at each site. A small population of *Salix phylicifolia* is

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growing on gravel banks near the village Hvalvík on Streymoy and I saw one plant near a brooklet in the village on Kunoy, but it might well have been planted there. *Salix phylicifolia* has been reported from several localities (Hansen, 1966), but as there is no doubt about the determination of this species no material was collected.

*Salix arctica* and *S. lanata* are only growing on inaccessible small ledges in steep cliffs in the mountains. I succeeded in getting samples from three localities. They were collected on May 21 and 22 and at that time in the mountains the willows had not come into leaves. Twigs were collected in all the localities for culture and the cuttings that rooted are being cultivated in Reykjavík. In gardens in Tórshavn I saw cultivated plants of these species of known origin. The leaves and catkins were appearing on the cultivated plants so they were easily determined. Afterwards I examined the herbarium specimens from the Faroe Islands which are conserved in Copenhagen (C) and the specimens in the Museum of Natural History in Tórshavn (T) were lent to me for a while.

As a comparison I also examined the collection of *Salix glauca* L. in the herbarium in Oslo as well as specimens of *Salix arctica* and *S. glauca* from Greenland which are in the herbarium in Copenhagen and the Icelandic collections of *S. arctica* in the museums of Natural History in Reykjavík and Akureyri. I have examined these species in the field in the different regions of Iceland, in several parts of the Scandinavian mountains and in Mestersvig in NE-Greenland. My collections from there are preserved in the museum in Akureyri. A good deal of living plants from my collection have been cultivated in Akureyri and in Reykjavík and also some plants of *Salix glauca* I have received from SW-Greenland.

### *Salix lanata* L.

*Specimens seen in herbarium*

1. Streymoy, gjov mellem Hvalvík og Vestmannahavn; *Patursson, 15 August 1910* (*C*).
2. Streymoy, Vestmanna Móskurðsfjall; *The Botanical Investigation of the Faroe Islands 1960 – 61, no. 8585 and 8586, 14 August 1961* (*C*) and (*T*).
3. Streymoy, Vestmanna, Bjarnardalur, *Jóhs. Jóhansen, 14 August 1961* (*T*).

Samples of *Salix lanata* were collected at the only known locality in the Faroe Islands. From the cuttings I succeeded to grow two clones of different sexes. Both of them are very lowgrowing, almost prostrate and not more than 20–30 cm high with very broad leaves. In the gardens of the Museum of Natural History in Tórshavn and J. Dahl's in Skræddaragöta in Hoyvík there are cultivated plants of the same origin and similar appearance. The herbarium specimens in Copenhagen and Tórshavn all seem to be of same origin, i.e. from Bjarnardalur, south of Móskurðsfjall in Streymoy.

The oldest specimens of this species in the herbarium in Copenhagen are determined by Floderus as *Salix glandulifera* B. Flod. Björn Floderus, is a famous Swedish *Salix*-expert in the former half of this century. *Salix glandulifera* is a species related to *Salix lanata* but distinguished by glandu-

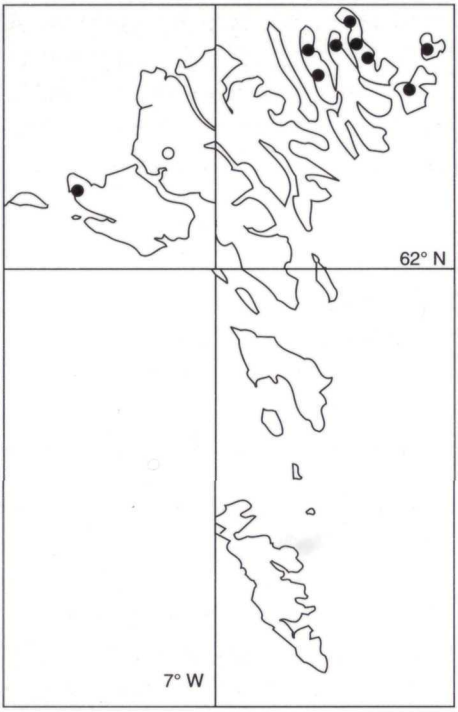


**Figure 1.**
Distribution map over *Salix lanata* L. (open ring) and *Salix arctica* Pall. or putative hybrids (filled dots) in the Faroe Islands. The map is based on specimens in the meseums in Copenhagen and Tórshavn, the authors collections and informations about origin of cultivated specimens in the Faroe Islands.

lar stipules and leaf-margins and mature leaves glabrate. Today that taxon is at the most treated as subspecies (Elven, in prep., Hämet-Ahti *et al.*, 1992) but the author Skvortsov (1968: 447-452; 1971: 230), who has investigated the species on a worldwide scale, regards it only as a form. Some of the Faroese specimens investigated have glanduliferous stipules but the leaf-margins are without any glandules and not glabrate. Plants with glanduliferous stipules are not uncommon in Iceland and such specimens in the herbarium in Reykjavík were by Floderus determined as hybrids, *Salix glandulifera* x *lanata*. I am of the opinion that glanduliferous stipules are only to be regarded as a natural variation within the species *Salix lanata* and it is not possible to find any characteristics within the Faroese population that distinguish them from *Salix lanata* in Iceland or Scandinavia.

Papers about the flora of the Faroe Islands in the beginning of this century (Ostenfeld, 1901; Ostenfeld and Gröntved, 1934) do not include *Salix lanata* and Rasmussen (1936; 1952) mentions a statement by Trevelyan (1835) but consider it as doubtful that this species is found in the islands, and all the specimens in the museum

in Tórshavn are labelled as *Salix glauca*. In Vascular Plants in the Faroes (Hansen, 1966) *Salix lanata* is not mentioned but the locality at Bjarnardalsá in Streymoy is shown as a site for *S. glauca*. In Flora Europaea (Rechinger, 1964) the Faroe Islands are included within the distribution of *Salix lanata* but it is not labelled on the distribution map (Jalas and Suominen, 1976). The specimens in Copenhagen are rightly determined as *Salix lanata* by Skvortsov (1971) and shown in the Atlas of North European Vascular Plants (Hultén and Fries, 1986).

All the Faroese collections seem to be from the same locality near the river Bjarnardalsá where *Salix lanata* is growing in steep cliffs within a range about some hundred square meters. It is difficult to say how many individuals there are, but since there are plants of both sexes they can produce seeds and reproduce normally. Overgrazing everywhere in the islands is the only explanation why the population is so small and all the plants are lingering in unaccessible cliffs.

### *Salix arctica* Pall. and hybrids

*Specimens of Salix arctica seen in herbarium*

1. Fugloy ca 600 m; *Hartz et Ostenfeld, 7 August 1897* L (*C*).
2. Viðoy, Bergsmunni; *Hartz et Ostenfeld, 12 August 1897* (*C*).
3. Viðoy, Malinsfjall; *Hartz et Ostenfeld, 19 August 1897* L K (*C*).
4. Kunoy, í Mittgili í gjáunum á Skarði; *R.Rasmussen, 28 August 1906* L (*T*).
5. Viðoy, Ormadalur; *Elisabeth Taylor, 15 June 1907* L (*C*).
6. Vágar, Gásadalur á Garðsfjöllum; *Mikkjal á Ryggi, 3 October 1926* L (*T*).
7. Svinoy; *Heine Justinussen, 20 July 1928* L (*T*).
8. Vágar; *Mikkjal á Ryggi, 1933* K (C) and (*T*).
9. Viðoy, Villingadalsfjall; *Jóannes Rasmussen, 17 July 1946* L (*T*).
10. Kunoy, Skarð – 300 m; *The Botanical Investigation of the Faroe Islands 1960 – 61, 3 August 1961* L (*T*).
11. Kunoy, Skarð; *Jóhs. Jóhansen, 4 August 1961* (*T*).

*Specimens of the putative hybrids* Salix arctica *x* herbacea *seen in herbarium*

1. Kunoy, nordlige del af öen, ca 300 m; *Hartz et Ostenfeld, 27 August 1897* (*C*).
2. Viðoy, Viðareiði; *R. Rasmussen, August 1932* K (*T*).
3. Viðoy, Viðareyði; *R. Rasmussen, 8 August 1933* (*T*).
4. Vágar, Gásadalur; *Mikkjal á Ryggi, 1933* K (*C*) and (*T*).
5. Kunoy, Skarð, 300 m; *K. Hansen, 3 August 1961* L (*C*).

Cuttings of *Salix arctica* were collected in two places, in Villingadalsfjall on Viðoy and in cliffs of the mountain-slopes east of the village Kunoy, the latter place having newly been discovered. Unfortunately the cuttings from Kunoy did not root, but plants (one clone) from Villingadalsfjall are doing well in the municipal nursery in Reykjavík. In the garden of T. Matras, Frælsið 7 in Tórshavn I saw two cultivated clones originating in Múli near Hvannasund in northern part of Borðoy, collections therefrom have not been reported before. In the same garden and in J. Dahl's garden at Skræddaragöta in Hoyvík there are plants (presumably one clone) originating in Gásadalur in Vágar.

In the paper "On the Vegetation and Temperature of the Faroe Islands" (Trevelyan, 1835), *Salix arctica* is reported found at 1300-1366 feet in Malinsfjall on Viðoy. But the specimens in the herbariums in Copenhagen and Tórshavn were from the

**Figure 2.**
*Salix lanata* L. originating near Bjarnadalsá on Streymoy, cultivated in J. Dahl's garden, Skræddaragøta, Hoyvík.

beginning labelled as *Salix glauca* L. and as such they are reported in the main works about the flora of the Faroe Islands for the most part of this century (Ostenfeld, 1901; Ostenfeld and Gröntved, 1934; Rasmussen 1936, 1952; Hansen, 1966). Floderus determined the specimens in Copenhagen and Tórshavn as hybrids *Salix arctica* x *glauca*, *S. arctica* x *arctophila* x *glauca* or even *S. arctica* x *glauca* x *phylicifolia*. Floderus circumscribed what he called true or non-hybridogene forms of a species in a very narrow sense. The circumscriptions were based on few morphological characters and wherever those characters overlapped he considered the specimens as hybrids (Floderus, 1923: 121-157). He obviously regarded the Faroese specimens as deviating from true *Salix glauca* and containing some characters from *S. arctica*. It is worth mentioning that Floderus determined the Icelandic specimens he saw as similar hybrids. He was of the opinion that in Greenland true *Salix arctica* and *S. glauca* were rare but the main bulk of the population there were hybrids.

In Flora Europaea, Rechinger (1964) notices that *Salix glauca* from Iceland and the Faroe Islands was considered as a distinct species, *Salix callicarpaea* Trautv., but after examining the Faroese specimens in Copenhagen the *Salix*-expert Skvortsov

(1971) determined them all as *Salix arctica* and as such they are shown in the Atlas of Florae Europaea (Jalas and Suominen, 1976), but not in the Atlas of North European Vascular Plants (Hultén and Fries, 1986).

After examining this willow in the Faroe Islands I adhere to the opinion of Skvortsov that it belongs to *Salix arctica*. And as far as I can conclude it is impossible to distinguish it from the Icelandic population of *Salix arctica* as will be discussed later in this paper. A peculiar fact in the Faroese population is the unusually high proportion of plants which I can not interpret otherwhise than either as hybrids of *Salix arctica* x *herbacea* or as indications of strong introgression from *S. herbacea* in the population of *S. arctica*. Morphological traces of hybridization or introgression are very prominent in 5 of the 16 specimens which are known from the Faroe Islands and the plant I collected in Villingadalsfjall is of that type. The main habitus and size is similar to *Salix arctica* but the leaves are broadly obovate or roundish, obtuse or truncate. They are glabrous beneath but glabrescent above. The specimen is a female clone and the catkins are borne on a long peduncle with 3 – 5 smallish leaves. The capsules are pubescent with a short style and rather short stigma lobes. The fertility is low but this clone is not absolutely sterile. I incline to regard it as a hybrid because of the low fertility. Cultivated plants of this clone from Villingadalsfjall seem very similar to a plant I collected some years ago in the vicinity of Reykjavík and has considered a hybrid of *Salix arctica* x *herbaca* and clones from it are now produced in nurseries in Reykjavík as groundcover-plants under the culitvar name "Kálfamóavíðir".

When examining the environmental circumstances where *Salix arctica* grows it becomes easy to understand how frequently the hybrids occur in the Faroe Islands. The sixteen specimens are collected in 12 there are only one individual plant growing and there are several kilometres between the localities, and all around *Salix herbacea* is common. It is almost inevitable that the dioecious *Salix arctica* changes pollen with the neighbouring *S. herbacea*.

The flora of the Faroe Islands changed markedly when man arrived to the islands with grazing creatures (Jóhansen, 1985; 1989). It is known that e.g. *Salix phylicifolia* which today is extremely rare (Hansen, 1966) was common in many communities but disappeared almost totally after settlement. The sites of *Salix arctica* I visited were all on small ledges on steep cliffs hardly accessible for grazing creatures. Not all of the localities where *Salix arctica* has been collected have been rediscovered, but I have been told that the circumstances are the same in the other localities. This indicates that the plants growing in the Faroe Islands today are relicts of a much larger population. If these relicts have lingered as more or less isolated individuals since the settlement it is understandable that a good deal of the new generations consists of hybrids.

**Figure 3.**
*Salix arctica* Pall. originating in Múli on Borðoy, cultivated in T. Matras' garden, Frælsið 7, Tórshavn.

## The affinity with the populations in Iceland and North-America

Previously it has been mentioned that it is impossible to distinguish *Salix arctica* in Faroe Islands from the population of the same species in Iceland. As in the case of the Faroese material, botanists had doubts about the determination of this species in Iceland. Most of the times it was treated as *Salix glauca* (Grönlund, 1881; Stefánsson, 1901; 1924; 1948; Ostenfeld and Gröntved, 1934; Löve, 1945) and as previously mentioned Floderus determined the Icelandic specimens he examined as double- or triplehybrids like the Faroese samples.

Áskell Löve (1950: 37-38) points out that what until then had been named *Salix glauca* in Iceland clearly differed from that species in Sweden. He had been told that it was a species from arctic North America named *Salix callicarpaea* Trautv. Since that the Icelandic population has been considered to be connected to some North American representative of the *Salix glauca*-complex and either named *S. callicarpaea* Trautv. (Löve and Löve, 1956; Rechinger, 1964; Hylander, 1966; Bjarnason, 1983; Kristinsson, 1986), *S. cordifolia* Pursh. (Löve, 1970; 1983), *S. cordifolia* subsp. *callicarpaea* (Trautv.) Löve (1950)

or *S. glauca* subsp. *callicarpaea* (Trautv.) Böch. (Jalas and Suominen, 1976; Hultén and Fries, 1986). Argus (1965: 64-72 and p. 92) includes all these names in what he calls "the eastern phase" of *Salix glauca* in North America. In a field-handbook of the Icelandic flora Löve (1970) took up both *Salix cordifolia* and *Salix arctica* and at about the same time Skvortsov (1971) published a paper about the *Salices* in Greenland, Iceland and the Faroe Islands. There he asserted that among the about 100 specimens he had examined from Iceland two were specimens of *Salix arctica*, two of them were possibly hybrids, but all the rest were *S. glauca*. That statement was followed in an Icelandic Flora by Bjarnason (1983) and in two works about distribution of plants (Jalas and Suominen, 1976; Hultén and Fries, 1986).

Different from the situation in the Faroe Islands the Icelandic population of *Salix arctica* is very large. The species is almost ubiquitous in the mountains and in the northern districts of the country and are to be found there in most plant communities. At lower altitudes in the southern parts it is only to be found near streams or wet places. The habitats are very different and both the morphological as well as the genetical variation within the population is enormous. It is not always sufficient to draw conclusions from several morphological characters on herbarium specimens when distinguishing related species within the genus *Salix*. Often it is necessary to compare whole populations and a good familiarity with plants in their natural habitats is important. For several years I have been studying the Icelandic population in field and cultivated experimentally pretty many individuals but have never succeeded to find an aggregate of morphological characters that makes it possible to separate the population in different taxa. Notwithstanding an internal variation the main appearance of the population is quite definite.

The population of *Salix arctica* in Iceland is similar to the population of that species which I have studied at Mestersvig in NE-Greenland. Comparing the Icelandic population with the population in NE-Greenland and herbarium specimens from Arctic Eurasia and North America the same morphological characteristics are to be found although in different combinations within the different specimens. On the whole the high-arctic population from NE-Greenland has not as tomentose leaves as the Icelandic one, especially ecotypes from wet habitats in the lowland. It is also necessary to keep in mind that some of the characters frequently used to distinguish *Salix arctica* from *S. glauca* incline to change depending on the environment. The blackish-brown anthocyan-color that characterises many plants growing in the high-arctic or at high altitudes on northern latitudes is only to be traced as faint reddish hue when the plants are cultivated where ultraviolet radiation is not so strong. Plants growing in warmer and more humid climate produce less waxcoat and whether the procumbent branches are rooting or not depends highly on edaphic conditions. What first of all characterizes *Salix arctica* is procumbent habitat with the branches trailing adpressed to the ground where *S. glauca* is more or

less ascending shrub, but can be almost prostrate in difficult conditions. Mature leaves on *Salix arctica* are glabrescent although there are often exceptions, and the short wavy trichomes on the leaves of "the eastern phase" of *Salix glauca* are never found in the Icelandic material. The catkins on *Salix arctica* are usually much longer, with looser inflorescènces and longer capsules with reddish hue.

After studies in field and examining cultivated samples it is clear how much the populations in Iceland and the Faroe Islands differs from *Salix glauca*, whether compared with the populations in Scandinavia and Central Europe (The Central European population is often considered as a species, *Salix glaucosericea* B. Flod.) or "the eastern phase" in North America and Southeast Greenland. Nevertheless it is not to be overlooked that *Salix arctica* and *S. glauca* are related species. In North America and Greenland populations of intermediate character have since long mused those who have tried to separate these species (Simmons, 1913: 69-72; Floderus, 1923: 97-99 and pp. 121-157; Böcher, 1938: 63-66; Polunin, 1940: 157-159 and pp. 162-166; Scoggan, 1978: 263; Argus, 1965: 96). Whether the problems are due to hybridswarm, introgression or to the fact that the distinction between the species is not sufficiently analysed is uncertain, but more extensive studies are needed and most likely there are different conditions at the various places where the species meet or overlap.

In Iceland however the population has been geographically isolated for such a long time that possible hybridisation or introgression in primeval times or before the species colonized the country should since long have coalesced, and today it is impossible to regard the population otherwise than one species. The population in the Faroe Islands is of the same origin and similar, except the peculiar hybridization with *Salix herbacea* in historic time.

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