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# Field course on peat mosses and plant biogeography in Iceland

## Rahkasammal- ja kasvimaantieteen kenttäkurssi Islannissa

Harri Vasander, Kari Minkkinen & Hlynur Oskarsson

Field course on Sphagnum mosses and plant biogeography were held in Iceland in June 2022. This was a joint effort of the Department of Forest Sciences University of Helsinki, and the Agricultural University of Iceland. Totally there were 15 students of which 10 were from Finland, three from Iceland, one from Italy, and one from Scotland. In this introductory article the contents, schedule, and participants are described while more of the findings are given in the five following articles written by the Finnish students.

*Pidimme rahkasammal- ja kasvimaantieteen kenttäkurssin Islannissa kesällä 2022. Kurssi pidettiin yhdessä Helsingin yliopiston metsätieteiden osaston sekä Islannin maatalousyliopiston kanssa. Kurssille osallistui yhteensä 15 opiskelijaa, joista 10 oli Suomesta, kolme Islannista yksi Italiasta ja yksi Skotlannista. Tässä johdantoartikkelissa kuvaamme lyhyesti matkamme sisällön, kohteet ja aikataulun. Perusteellisempi katsaus Islannin rahkasammaliin ja kasvimaantieteeseen tulee viidessä artikkelissa, jonka ovat kirjoittaneet matkalla olleet suomalaiset opiskelijat.*

## Introduction

All this began in the beginning of November 2021 when Hlynur Oskarsson (HO) contacted Kari Minkkinen (KM) by e-mail asking if two of his students could attend some course at Hyytiälä next summer to learn peat mosses. Harri Vasander (HV) was at Kari's office when the e-mail came, and the options were discussed immediately. KM and HV answered straight away that the summer field course at Hyytiälä would be too short to concentrate on *Sphagna*. They proposed that instead of students coming to Finland, KM and HV could come to Iceland, as it would always be good to teach and learn in the field. They also proposed that some of their own students might be interested to join this course. After some days' thinking and planning, HO replied that ten students from Finland would be the maximum number because of limitations with transportation and accommodation at the student dormitories.

Now began the planning of the course as well as looking for its budget. The student Anna Isotalo was asked to be the fourth member of the coordination group as secretary general. She accepted this important post and the coordination group started working immediately in November 2021. The first steps were planning of the course timing, and its contents together with the budgeting. Only after these steps it was possible to start looking for sponsors.

When the course was announced, there was quite an interest among students. We received 27 very good applications. After selecting 10 out of 27 we got quite many e-mails from those not selected. We emphasize also here that two persons, KM and HV without any discussions with students or department staff, did the selection.

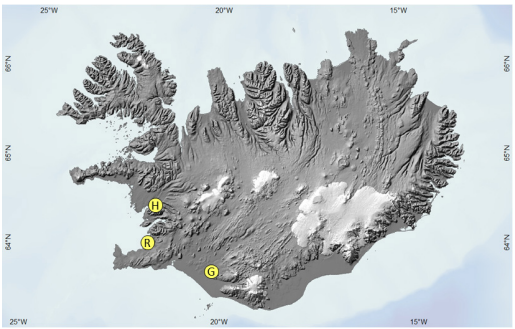


Fig. 1. Map of Iceland showing our base camps Hvanneyri (H) and Gunnarsholt (G) and the capital Reykjavik. Map based on data from: https://gatt.lmi.is/geonetwork/srv/eng/catalog.search#/metadata/6dc71751-5fbe-4464-9743-231700e09e48.

*Kuva 1. Islannin kartta, jossa majapaikkamme Hvanneyri (H) ja Gunnarsholt (G) sekä pääkaupunki Reykjavik (R) on merkitty.*

Fig. 2. Field lecturing by HV during the Sphagnum course. Each participant received his/her own copy of European *Sphagnum* mosses guide (Laine et al. 2018), which was the main reading material during the course. Photo Johanna Tuviala.

*Kuva 2. HV luennoi maastossa kädessään kaikille osallistujille jaettu Euroopan rahkasammalopas (Laine ym. 2018).*

## The contents of the course

The course was held during 11. – 19. June 2022 and it had two parts. The first three days we concentrated on different *Sphagnum* species and the following four days were spent making acquaintance with the biogeography of Iceland (App. 1). In addition to the 10 students from Finland, five other students attended the course. All 15 students took part in the *Sphagnum* course while only the Finnish students also attended the second half of the course. Besides Finland and Iceland, we had one student from Scotland and one from Italy (Table 1). Dr. Fia Bengtsson (University of Lund, Sweden, now NINA, Norway) was a visiting teacher during the *Sphagnum* course.

The first overnights, lessons and microscopic analyses were in Hvanneyri where the main campus of the Agricultural University of Iceland is situated. The base camp during the biogeography field excursion was in Gunnarsholt where the Headquarters of the Soil Conservation Service of Iceland is situated (Fig. 1). The course included lectures inside and outside (Fig. 2) as well as laboratory work. During excursions we were acquainted with many research projects and even local animals (Fig. 3).

Fig. 3. Sometimes there were more horses than students attending the course. Photo: Kari Minkkinen.

*Kuva 3. Joskus maastokohteilla oli enemmän hevosia kuin opiskelijoita.*

Table 1. Persons attending the courses. *Kurssin osanottajat*.

| | |
|---|---|
| **Teachers:** | Harri Vasander, Hlynur Óskarsson, Kari Minkkinen |
| **Visiting teacher:** | Fia Bengtsson |
| **Finnish students:** | Anna Isotalo, Axel Öhman, Belinda Mäki, Gobal Adhikari, Jaana Kulmala, Jemina Djupsjöbacka, Johanna Tuviala, Otto Liutu, Roosa Hautala, Saija Papuoja |
| **Icelandic and international students:** | Ágústa Helgadóttir, Eyrún Gyða Gunnlaugsdóttir, Lorenzo Vegliò, Sahra Karin Ingrid Gibson, Ölvir Styrmisson |

## Sphagna in Iceland

In Iceland 27 species of the genus *Sphagnum* are mentioned by Jóhannsson (1989). In App. 2, 29 species are mentioned. There is one extra species, *S. angermanicum*, in comparison to Jóhannsson's book and *S. inundatun* is added while there still is *S. denticulatum* (= *S. auriculatum*?). Besides that, Fia Bengtsson wrote an e-mail to HV where she told: "I did see *S. rubellum* and *S. fuscum* in 2019 when I went with Gustaf Granath and Jon Shaw. *S. Rubellum* I have recorded from these coordinates: 64.68591, -21.40502. *S. fuscum* is not in my list – and I can't find records from our trip in GBIF, but there are 2 records in GBIF from 2014, which matches where we saw it. Is in the same region as the Agricultural university – but not close to hot springs. See screenshot from GBIF!" These two species which are not mentioned by Jóhannsson (1989) would increase the number of *Sphagnum* species in Iceland to 31. During the Sphagnum part of the course, we found 20 species. If the *S. medium* found in Hurðarbak hot spring is true (sample lost), the number of *Sphagnum* species in Iceland would be 32.

One of our ideas, to find new ombrotrophic species (*S. fuscum* and *S. rubellum*) for Iceland, was thus not realized. But we saw very interesting sites, for example close to hot springs. There the common species – *S. teres* – was similar as we find in Finland but without brown color in the stem. This is probably caused by the permanent hot environment without any snow cover during the winter. Shoots are also only about one year old, so no peat is forming near these hot springs. We realized there in the field that the tanning of the stem happens during the winter under snow cover. Also, our group had the opportunity to visit hot spring spas both in the village of Borgarnes and in the field in Husafell (Fig. 4).

The main findings and experiences of the course are told in the five following articles written by the Finnish students. Also, there is a video in you tube with English and Finnish subtitles (Isotalo and Tuviala 2023).

One special thing about the meaning of *Sphagnum* in local languages, Finnish, and Icelandic, is worth mentioning here. In most languages, *Sphagnum* is translated as "peat moss". This is connected to its ecological significance as a peat forming moss. In Finnish *Sphagnum* is called "rahkasammal". The word "sammal" means moss (unknown origin) but the word "rahka" is an old word meaning cheese mass that is separated from sower milk in cooking. It can also mean foam or surface layer or surface dregs and probably originates from old German language (Häkkinen 2004). In Icelandic *Sphagnum* is "barnamosi" where "mosi" is moss and "barna" refers to an old Scandinavian word meaning "child", especially your own child. The use of *Sphagnum* as diapers for children is very old tradition in Iceland.

Fig. 4. One of the highlights of the course were the hot spring spas. Here the Húsafell spa in the middle of mountains. Photo: Jaana Kulmala.

*Kuva 4. Kurssien kohokohtia olivat käynnit kuumissa lähteissä. Tässä olemme Húsafellin kylpylässä, joka on rakennettu vuoristoon maisemaa mukaellen.*

## Birdwatching in Iceland – the puffins' message?

In addition to *Sphagna* and plant biogeography, one common interest during our trip were the birds of Iceland. The number of nesting birds in Iceland is much lower (less than 100 species) than in many other European countries including Finland (about 240 species), but many birds rare to see in Finland are common in Iceland. One common species was rock ptarmigan (*Lagopus muta*), the swearing of which we heard on many occasions on rocky areas. Common snipe (*Gallinago gallinago*) was indeed very common, we saw (and heard) it in almost every mire we stepped into. The beautiful, red-necked phalaropes (*Phalaropus lobatus*), a very northern species

in Finland, were spinning on the pools close to Hvanneyri field station. A real experience was to see the famous harlequin duck (*Histrionicus histrionicus*), which for many birders is the reason to go to Iceland in the first place! And of course, the common puffin (*Fratercula arctica*) - you do not see those in Helsinki! Other interesting species were for example, fulmar (*Fulmarus glacialis*), black-legged kittiwake (*Rissa tridactyla*) and the two notorius nest robbers and gull bullies: arctic skua (*Stercorarius parasiticus*) and pomarine skua (*Stercorarius pomarinus*). The full list of bird species seen during our trip are given in Appendix 3 (in four languages).

On Saturday morning we were birdwatching in Dyrhólaey (Fig. 5) just about the same time when professor Rauno Ruuhijärvi passed away in his own bed in Finland. In Finland there exists the old belief that persons who have passed away may say goodbye or bring a message to their relatives or friends as birds. HV wrote in the 2022 Yearbook of the Finnish Academy of Science and Letters: "*At the time Rauno passed away, we were on the cliffs in central Iceland, watching seabirds with our binoculars. I especially recall a small puffin population made up of a couple dozen birds. It was as if Rauno had said his goodbyes to me as a puffin. Comparing Rauno to a puffin may sound odd at first. But like a puffin, Rauno was at home in different environments: the puffin in the water or up on the cliffs or in its burrow – Rauno in the wilderness in his hiking outfit or giving a statement to the government or attending international meetings. Just as the puffin can carry multiple fish in its beak to feed to its chicks one by one, Rauno, too, had multiple projects on his mind that he worked on whenever he had the chance. The fish were not necessarily eaten in a chronological order, but whenever the opportunity presented itself. He also shared his ideas with his students, just like a puffin feeds fish to its pufflings*".

Fig. 5. A view from Dyrhólaey cliffs. Is it Rauno? Photo: Kari Minkkinen.

*Kuva 5. Näkymä Dyrhólaeyn lintukallioita. Onko se Rauno?*

## Acklowledgements

We want to thank Metsämiesten Säätiö, University of Helsinki, Faculty of Agriculture and Forestry and Department of Forest Sciences, and Landbúnadarháskóli Íslands for financial and mental support. All the participants made this an unforgettable event and experience!

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# Appendix 1. Course program

***Saturday 11th of June 2022***

4:45 PM Arrival in Keflavik Airport in Reykjavik

Pick-up from the airport and drive to the Agricultural University of Iceland's main campus in Hvanneyri. Hvanneyri is a small village of 250 people, and there are no stores there.

Evening program: ornithological night walk in Hvanneyri.

***Sunday 12th of June 2022***

Beginning of the *Sphagnum* course

At each field site we first explored the vegetation together, especially the *Sphagna*. On some sites students made sample plots to record the *Sphagnum* species and their coverage. The students identified species macroscopically in the field and took samples for later identification with microscopes in the lab.

9 AM Start of the day.

Lectures in the morning:
*Sphagnum* ecology, Harri Vasander
*Sphagnum* traits, Fia Bengtsson, University of Lund, Sweden
*Sphagnum* identification, Kari Minkkinen

1 PM Lunch

Field visits in the afternoon. Geothermal sites - *Sphagnum* growing around hot springs in Kleppjárnsreykjum and Hurðarbak.

6:30 PM Dinner
Extra-curricular: swimming pools in Borgarnes. These are regular Icelandic swimming pools that are heated geothermally.

Accommodation of the day: student housing in Hvanneyri

Fig. 6. Studying Sphagna along hot springs in Kleppjárnsreykjum, some 25 km north-east from Hvanneyri. Photo Johanna Tuviala.

*Kuva 6. Rahkasammalia kuumilla lähteillä Kleppjárnsreykjumissa, noin 25 km koilliseen Hvanneyrista.*

***Monday 13th of June 2022***

*Sphagnum* course continues: field day

8 AM Start of the day.

We spent the whole day in the field. Our focus was on peatland sites. We saw the variability from a site that has lot of *Sphagnum* compared to sites that do not have that much. We also saw the difference between sites that have very little deposition from volcanic ash to sites that have a lot of volcanic influence.

Fig. 7. Stangarholt oligotrophic fen. Photo Kari Minkkinen.

*Kuva 7. Oligotrofista saranevaa Stangarholtissa*

12 PM Field lunch, 7 PM Dinner in Borgarnes
Accommodation of the day: student housing in Hvanneyri

***Tuesday 14th of June 2022***

9 AM Start of the day

Final day of the *Sphagnum* course. This day was spent microscoping in the laboratory. Students reported the species they have found, how they identified them macro-/and microscopically, and related them with ecohydrological conditions.

12 PM Lunch, 6 PM Dinner

Accommodation of the day: student housing in Hvanneyri

***Wednesday 15th of June 2022***

Second part of the course began. The first day of the second part of the course was still spent in Hvanneyri. We had lectures in the morning before lunch, and after lunch visit sites that were located near the University.

9 AM Start of the day

Lectures by Hlynur Oskarsson.

Lecture themes: Overview of the Icelandic nature: volcanism, glaciation, erosion, human influence. The aim of the lectures was to give background information, so that the field visits would have been more understandable.

12 PM Lunch

Field visits in the afternoon, theme: forestry in Iceland. Skorradalur forest research site. We also visited one of the few native birch woodlands left in Iceland. Stop at waterfalls on our way.

6 PM Dinner, Bistro at Hotel Husafell.

7 PM Extra-curricular evening program: Visiting the Húsafell hot springs.

Fig. 8. Visiting the arboretum at Skorradalur forest research site, where we were guided by the site manager Jón Auðunn Bogason (left).

*Kuva 8. Vierailulla Skorradalurin arboretumissa.*

Accommodation of the day: student housing in Hvanneyri

***Thursday 16th of June 2022***

Head to South Iceland in a common bus.

8 AM Start of the day
Stops on our way: Highlands, a peatland site influenced by soil dust, Erosion sites. Thingvellir: Earth cracks: ground collapsing (several meters) following volcanic activity.

12 PM Lunch on our way
We continued our way to the lowlands and visited a birch forest, where two PhD students, Sólveig Sanchez, and Anna Mariager Behrend, told us about their study projects. Visit to Haukadalur forestry site.

6 PM Dinner at hotel Stracktar

Accommodation of the day: Headquarters of the Soil Conservation Service of Iceland in Gunnarsholt.

***Friday 17th of June 2022***

Theme of the day: Four forces (eruptions, floods, glaciers, erosion) playing at four different time scales. The same forces that shape the world everywhere - only in Iceland they are especially visible. Heading from Gunnarsholt to East, to look at ice and lava fields, some with *Racomitrium* moss.

Dynamic area of glacier outwash plains. Colonization of birch on the outwash plains.

Accommodation of the day: Headquarters of the Soil Conservation Service of Iceland in Gunnarsholt.

***Saturday 18th of June 2022***

Visiting Hekluskógar restoration site. Stop at Sandlækjarmýri. Visiting the FORHOT research site near Hveragerði, where we met PhD student Ruth Phoebe Tchana Wandji. On the FORHOT site, we saw a stand of trees effected by changing geothermal activity.

This is where we said goodbye to Hlynur, and the bus driver took us to our hostel in Reykjavik.

***Sunday 19th of June 2022***

4:00 AM Pick up by the airport taxi from our hostel

7:30 AM Flight to Helsinki


Fig. 9. Hlynur explaining the ecology of Racomitrium lanuginosum moss on the lava fields in Eldhraun (A), .. and Harri is listening carefully (B). (Photos: Kari Minkkinen).

*Kuva 9. Hlynur kertoo meille kalliotierasammalen ekologiasta Eldhraunin laavakentillä (A) .. ja Harri kuuntelee tarkkaavaisena (B).*

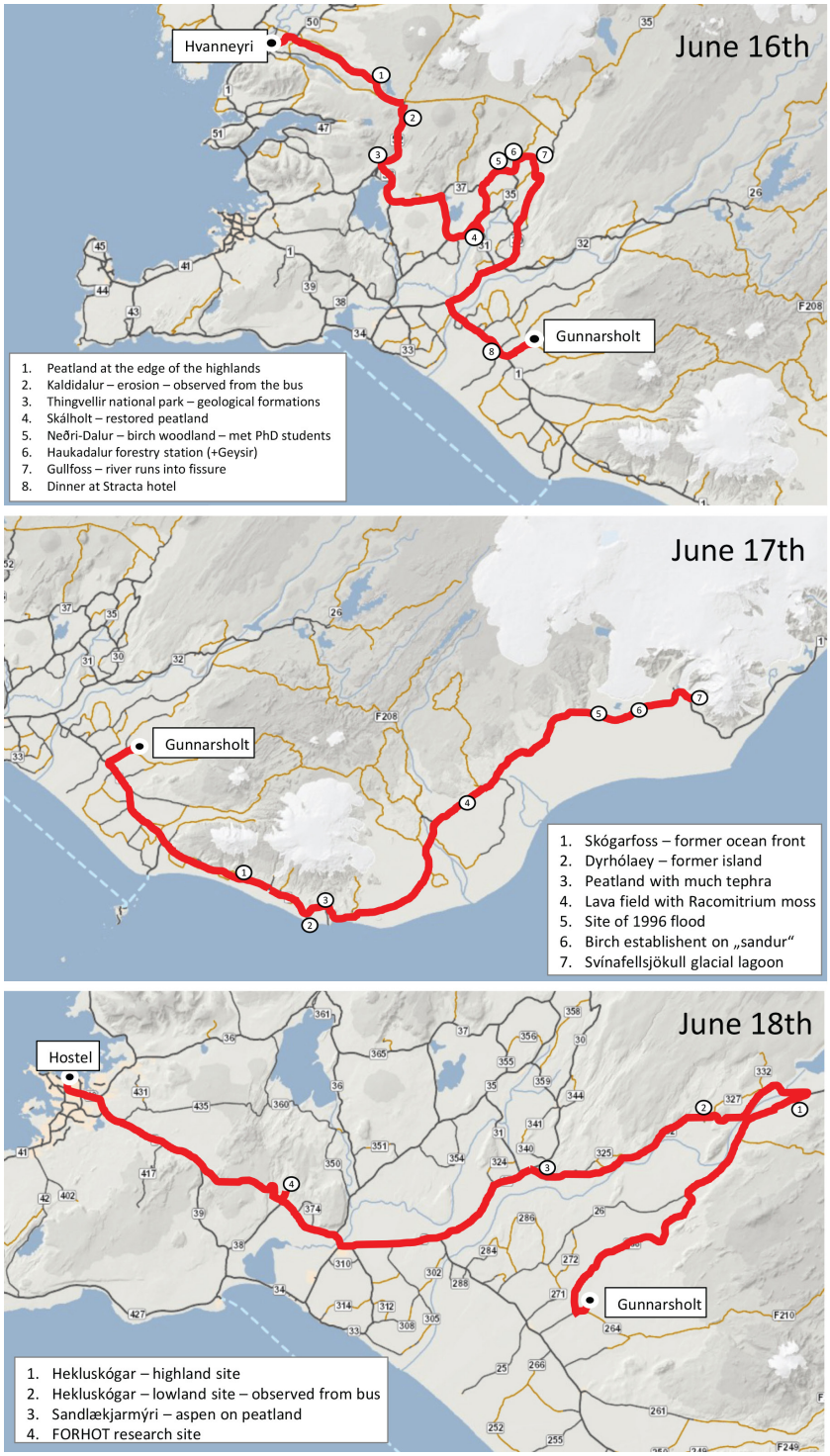


Fig. 10. Maps and travel itirenary of the plant biogeography part of the course (Images: Hlynur Oskarsson).

*Kuva 10. Kurssin kasvimaantieteellisen osan kohteet kartalla.*

Appendix 2. Sphagnum species found in Iceland (compiled by Hlynur Oskarsson from Jóhannsson, B. 1989).

| Species | Icelandic name | Common | Fairly common | Inter-mittent | Scarce | Very scarce | SW | W | NW | N | NA | A | SA | S | Mires | Flatl. Mires | By Ponds | By streams | Peat mining pits | Geo-thermal | Damp shrubl. | Damp Heath | Damp grasl. | Damp mount. sides | "Snjó-dældir" | Damp pits in lava |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sphagnum teres* | Bleytuburi | X | | | | | X | X | X | X | X | X | X | X | X | | X | X | | | X | | | | | |
| *Sphagnum warnstorfii* | Rauðburi | X | | | | | X | X | X | X | X | X | X | X | X | | | X | | X | X | X | | X | X | X |
| *Sphagnum girgensohnii* | Grænburi | | X | | | | X | X | X | X | X | X | X | X | X | | X | X | | X | X | | | X | X | |
| *Sphagnum papillosum* | Vörtuburi | | X | | | | X | X | | X | | X | | | X | | | | | X | | | | | | |
| *Sphagnum subnitens* | Fjóluburi | | X | | | | X | X | X | X | X | X | | | X | | X | X | | X | X | | | | | |
| *Sphagnum contortum* | Brúnburi | | | X | | | | X | X | X | | X | | | X | X | X | | | X | | | | | | |
| *Sphagnum fimbriatum* | Trafburi | | | X | | | X | X | X | X | X | X | | | X | | X | X | | X | X | | X | | | |
| *Sphagnum flexuosum* | Bylgjuburi | | | X | | | X | X | X | X | X | X | X | X | X | | X | | | X | X | | | | | |
| *Sphagnum subsecundum* | Sveigburi | | | X | | | X | X | X | X | X | X | | X | X | | X | X | X | | | | | | | |
| *Sphagnum angustifolium* | Gulburi | | | | X | | X | X | X | X | | X | X | | X | | X | X | | X | X | | | | | |
| *Sphagnum capillifolium* | Flikruburi | | | | X | | X | X | | | | | | | X | | | | | X | | | | | | |
| *Sphagnum centrale* | Fölburi | | | | X | | | X | X | | | X | | X | X | | | | | | | | | | | |
| *Sphagnum denticulatum* | Hornburi | | | | X | | X | X | X | X | | | | | X | | X | | X | X | | | | | | |
| *Sphagnum palustre* | Laugaburi | | | | X | | X | X | X | | | | | | | | | | | X | | | | | | |
| *Sphagnum russowii* | Flekkuburi | | | | X | | | X | X | X | | | | | X | | | X | | | X | | | | | |
| *Sphagnum affine* | Gaddaburi | | | | | X | X | X | | | | | | | X | | | | X | X | | | | | | |
| *Sphagnum angermanicum* | Glæsiburi | | | | | X | | | | X | | | | | | | | | | X | | | | | | |
| *Sphagnum balticum* | Smáburi | | | | | X | X | X | X | | | X | | | X | | X | | | | | | | | | |
| *Sphagnum compactum* | Digurburi | | | | | X | X | X | X | | | | | | | | | | | X | | | | X | | |
| *Sphagnum fallax* | Oddburi | | | | | X | X | X | | | | | | | X | | | | | X | | | | | | X |
| *Sphagnum inundatum* | Mýraburi | | | | | X | | | | | | | | | X | | | | | | | | | | | |
| *Sphagnum lindbergii* | Dökkburi | | | | | X | X | X | X | X | | | | | X | | X | X | | | | | | | | |
| *Sphagnum divinum* | Prúðburi | | | | | X | | X | | | | | | | X | | | | | X | | | | | | |
| *Sphagnum obtusum* | Kollburi | | | | | X | X | X | | X | | | | | X | X | X | X | | | | | | | | |
| *Sphagnum platyphyllum* | Pollaburi | | | | | X | X | X | X | X | | | X | | | X | X | X | | | | | | | | |
| *Sphagnum riparium* | Sýlburi | | | | | X | | X | X | X | | X | | | X | | | X | | | X | | | | | |
| *Sphagnum squarrosum* | Íturburi | | | | | X | | X | X | X | X | X | | | | | X | X | | | X | | | | | |
| *Sphagnum strictum* | Broddaburi | | | | | X | | X | | | | | | | X | | | | | | | | | | | |
| *Sphagnum tenellum* | Perluburi | | | | | X | | X | | | | | | | X | | | | | | | | | | | |

X = Red listed

Snjódældir = small dression areas which have snow throughout the winter and well into spring - the snow is like an "insulation" and protects the vegetation from hard frost in spring

Appendix 3. List of bird species seen during our trip.

| **Scientific name** | **English name** | **Finnish name** | **Icelandic name** |
|---|---|---|---|
| *Anser anser* | Greylag goose | Merihanhi | Grágæs |
| *Aythya fuligula* | Tufted pochard | Tukkasotka | Skúfönd |
| *Branta leucopsis* | Barnacle goose | Valkoposkihanhi | Helsingi |
| *Bucephala islandica* | Barrow's goldeneye | Islannintelkkä | Húsönd |
| *Corvus corax* | Common raven | Korppi | Hrafn |
| *Cygnus cygnus* | Whooper swan | Laulujoutsen | Álft / svanur |
| *Fratercula arctica* | Common puffin | Lunni | Lundi |
| *Fulmarus glacialis* | Fulmar | Myrskylintu | Fýll / múkki |
| *Gallinago gallinago* | Common snipe | Taivaanvuohi | Hrossagaukur / mýrisnípa |
| *Haematopus ostralegus* | Oystercatcher | Meriharakka | Tjaldur |
| *Histrionicus histrionicus* | Harlequin duck | Virta-alli | Straumönd |
| *Lagopus muta* | Rock ptarmigan | Kiiruna | Rjúpa |
| *Larus argentatus* | European herring gull | Harmaalokki | Silfurmáfur |
| *Larus canus* | Common gull | Kalalokki | Stormmáfur |
| *Larus marinus* | Great black-backed gull | Merilokki | Svartbakur |
| *Larus ridibundus* | Black-headed gull | Naurulokki | Hettumáfur |
| *Motacilla alba* | White wagtail | Västäräkki | Maríuerla |
| *Numenius phaeopus* | Common whimbrel | Pikkukuovi | Spói |
| *Phalaropus lobatus* | Red-necked phalarope | Vesipääsky | Óðinshani |
| *Pluvialis apricaria* | Golden plover | Kapustarinta | Heiðlóa |
| *Rissa tridactyla* | Black-legged kittiwake | Pikkukajava | Rita / Skegla |
| *Somateria mollissima* | Common eider | Haahka | Æðarfugl / Æður |
| *Stercorarius parasiticus* | Arctic skua | Merikihu | Kjói |
| *Stercorarius pomarinus* | Pomarine skua | Leveäpyrstökihu | Ískjói |
| *Sterna paradisaea* | Arctic tern | Lapintiira | Kría |
| *Tadorna tadorna* | Common shelduck | Ristisorsa | Brandönd |
| *Tringa totanus* | Redshank | Punajalkaviklo | Stelkur |
| *Turdus iliacus* | Redwing | Punakylkirastas | Skógarþröstur |
| *Turdus merula* | Common blackbird | Mustarastas | Svartþröstur |
| *Uria aalge* | Common murre | Etelänkiisla | Langvía |