

The VIII International Meeting
on *Sphagnum* Biology

Programme and excursion guide



Trondheim, Norway, 9-13 September, 2024

Welcome to the mires of Trøndelag, Norway

Norway, and especially the Trøndelag region (map below), is a global hotspot for *Sphagnum* (peatmoss) biodiversity and research and home to c. 50 species. The Norwegian diversity of mire types is unique and is the foundation that supports the species diversity here, with mires on different latitudes, in varying topography and in a humid climate with varying level of oceanicity.

The high proportion of land covered with peatland (12% of Norway, and 18% in Trøndelag) also supports this biodiversity, and perhaps the research interest as well. Mire and *Sphagnum* research has strong traditions in Trondheim, with research in the forefront on both *Sphagnum* taxonomy (by Kjell Ivar Flatberg) and mire ecology (by Asbjørn Moen) since the 1970's.



Mires in Trøndelag: On the left a location close to Kaldalvatnet, and on the right, a location close to Henningvola, which we will visit on the Thursday and Friday, respectively.

With this brief excursion guide, written by Fia Bengtsson, Magni Olsen Kyrkjeeide and Kristian Hassel, we would like to wish you welcome to the *Sphagnum* of Trøndelag!

Species descriptions mainly follow Kjell Ivar Flatberg's "Norges torvmoser", 2013. Akademika forlag. Oslo Trondheim.

Sphagnum meeting program

Sunday Sep 8th – Short excursion to Gråkallen, in the vicinity of Trondheim. We will take bus 26 towards Skistua from Kongens gate K1 at 12:21. C. 30 mins. We will take the (last!) bus back from Skistua at 16:17.

Monday Sep 9th – *Sphagnum* biology symposium and dinner in Trondheim. Meeting time: 09:00. Dinner starts at 18:00. See Abstract booklet for details.

Tuesday Sep 10th – Field day. Bus from NINA-huset and back. Site: Hitra. Meeting time: 08:30. Back in Trondheim latest 19:00.

Wednesday Sep 11th – Field day. Bus from NINA-huset and back. Site: Samsjøen. Meeting time: 08:30. Back in Trondheim latest 18:00.

Thursday Sep 12th – Field excursion to Kalddal, Namsos. Meeting time: 08:30. Bus from NINA-huset. Dinner and overnight at Steinkjer hotel. Remember to bring everything you need to stay overnight!

Friday Sep 13th – Field excursion to Henning, Steinkjer. Meeting time: 08:30. Drop-off at Trondheim Airport possible at 18:00. Arrival in Trondheim at 19:00.

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Excursions in Central Norway

During the four days of excursions, we will visit some of central Norway's diversity in climate and mires, to see locations both in the strongly oceanic region in the archipelago outside Trondheim, and in the less oceanic parts, the northern boreal parts further inland and at higher elevation.

We will visit one main site per day, sometimes with a few stops on the way. Tuesday, we will visit the island Hitra, west of Trondheim. Here, the climate is strongly oceanic and has one of the country's largest areas of raised bogs. As a contrast, we will go inland on Wednesday, to Samsjøen, where we will reach a higher altitude, close to low alpine zone, where the snow cover lasts long, and the vegetation season is short. On Thursday and Friday we will go to the north of the region, a region of low population density, but high amount of mire! Here we will see the endemic species *Sphagnum*



troendelagicum, and the rarest *Sphagnum* in Norway, *S. venustum*. New localities for both these species were found in this area only last year. These northern areas surely have more to discover!

Norway's mire area has been estimated to 30 000 km², which is around 10% of the land area. However, newer estimates are closer to 12%. The region Trøndelag has more; closer to 20% of its land area is covered by mire.

The region Trøndelag is known for its diversity in mire formation, and this is related to variation in climate and bedrock. In general, we find hard granitic rocks along the coast while more base rich bedrock become increasingly dominant towards the east. However, due to land uplift following the last glaciation we can find base rich (shell sand) marine sediments along the coast where rich fens are formed. The main occurrences of rich fens are in the central and eastern parts of Trøndelag.

The climate oceanicity also changes along a west-east gradient, from mild winters and cool summers along the coast, to colder and longer winters and warmer summers inland. We can find large mires along the coast e.g. on the large island Hitra, but due to human activity, especially agriculture, large areas have been transformed into grass production for livestock. Today, we find the most extensive mire areas in the central part of the oceanicity gradient at an elevation between c. 200-600 m above sea level. At this elevation snow cover is permanent during winter and the snow cover typically lasts from November to May. At this elevation you get as much or more summer rain compared to the coast and the lowland areas surrounding the Trondheim fjord. The mires in this region are often quite complex and typically consist of groundwater influenced fens and rain-fed bogs. Both Samsjøen and Henningvola are located in this region.

If we go further inland the elevation rises and we enter the mountain region, and here we find our most continental climate at Dovrefjell. In this region we mostly find small spring influenced rich fens, but we also still have some palsa mires. We will not visit this region during our excursion.

Tuesday excursion

Hitra (568 km², 63.5258, 8.74585) is the largest island in southern Norway, and the 8th largest in Norway. A large part of the island is characterized by an undulating tree-less landscape consisting of coastal heath hills, rocky out-crops, mires and numerous small lakes and brooks, interrupted by a few landmarks of low mountain peaks. The highest one (Mørkdalstua) reach an altitude of 369 m a.s.l. The lower-lying parts of the island – particularly in the north and south – have forests, mainly of *Pinus sylvestris*. Native forests of *Picea abies* are absent from the island. The most common deciduous trees are *Betula pubescens*, *Populus tremula*, *Prunus padus* and *Salix caprea*, and in more sheltered positions the more warmth-demanding *Corylus avellana* and *Ulmus glabra* occur. *Alnus incana* and *A. glutinosa* are recorded, but not frequent. The scrub willow *Salix aurita* is common everywhere. The dominating bedrock in the island is diorite. The marine limit lies at approximately 45-50 m a.s.l. This implies that the main part of the island is without marine deposits/sediments. The upper tree limit of pine is about 200 m a.s.l., but in NW it is considerably lower in many places. The island houses a large population of deer, and their tracks can be seen everywhere in the pine forests.

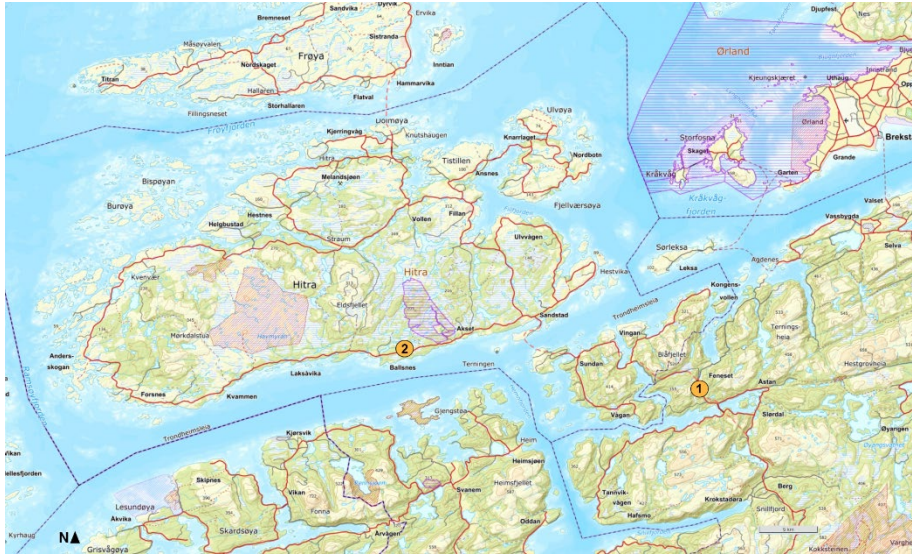
The larger part of the island lies within the highly oceanic section (03) of the southern and middle boreal zones. The flora contains a distinct element of oceanic, humidity-demanding and partly frost sensitive species in heaths, mires and pine forests: *Carex binervis*, *Erica tetralix*, *Hypericum pulchrum*, *Juncus squarrosus*, *Luzula sylvatica*, *Narthecium ossifragum*, *Pedicularis sylvatica*, *Polygala serpyllifolia*, *Trichophorum cespitosum* ssp. *germanicum*, *Leucobryum glaucum*, *Pseudo-scleropodium purum*, *Sphagnum austinii*, *S. molle*, *S. strictum* and the lichen *Siphula ceratites*. The fern *Hymenophyllum peltatum*, demanding high humidity, has its known northern European limit in Hitra (Håvikfjellet), the fern *Asplenium adiantum-nigrum* and the oceanic, freshwater cyperaceous plant *Eleocharis multicaulis* occur here at their northern limit as well. The oceanic moss *Glyphomitrium daviesii* also has its northern limit at the island.

We will visit Garviktjørna by Åstfjorden, 63.4741697, 9.3870689, a fen with small ombrotrophic parts on our way to Hitra (**Stop 1**). On Hitra we will visit a rich fen and a bog between Sanstad and Forsnes at the south side of the

island, 63.48717, 8.88570 (**Stop 2**). Here we will see, among other species, *Sphagnum austinii*, *S. beothuk* and possibly *S. affine*.

Meeting time: 8:30 at NINA

Transportation time: 1 hr 40 mins by bus from Trondheim



Map (artsdatabanken.no) showing the stop on the way to Hitra (1) and the stop on Hitra (2). Protected areas are shown in red, and areas under consideration for protection in purple.

Species presentation

Sphagnum beothuk R.E. Andrus

This small species with dark brown colour and pompom shaped capitula is a close relative to *S. fuscum*. It was collected as the “dark morph” for decades before it was identified to be conspecific with *S. beothuk* in 2015.

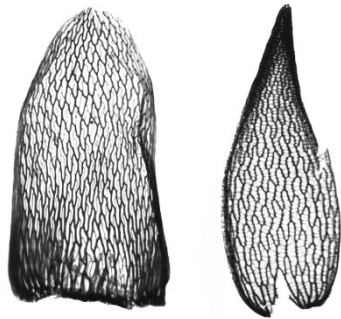
It has an amphi-Atlantic distribution and is only found along the coast of Norway, often at the same sites as *S. austinii*. It grows in hummocks in bogs and poor fens.

The branches are tightly packed in the capitula, and branch leaves are somewhat arranged in 5 ranked rows, usually more than in *S. fuscum*. The fascicles have 2 spreading branches, and 1(-2) paler, pendant branches along the stem. As in *S. fuscum*, the stem is dark brown.

Stem leaves are triangular to lingulate and the tip more or less blunt.



Sphagnum beothuk from Gulmyrarne, Vestlandet. Photo Fia Bengtsson.



Stem and branch leaf. Photo Kjell Ivar Flatberg.

Wednesday Excursion

Samsjøen (63.0934, 10.6679) is a lake and area of, partly protected, forests and mires situated roughly 60 km south of Trondheim. The protected area covers around 60 km². The forests have long continuity and is part *Picea abies* forest and part *Pinus sylvestris* forest.

The mires intersperse these forests. High amount of precipitation means a lot of available water, but also a lot of fairly poor mires. However, the bedrock varies from acidic to sporadically lime rich, meaning that there are richer fens in areas where the groundwater is close enough to the mire surface, and this is often the case in patches on the steeper slopes.

The area is a boreal taiga element, but is still in the weakly oceanic section (O1). The area is mountainous and is the closest to Trondheim we can get to this sort of elevation. We are here up to c. 480 m a.s.l. meaning that we get close to the low alpine zone. The tallest peaks in the area are around 900 m a.s.l. This means there is a long-lasting seasonal snow and ice cover and short vegetation season leading to a high impact of snow and ice disturbance, showing in the mire flora as large patches of colonising communities with *Sphagnum compactum* and *S. tenellum*.

Meeting time: 8:30 at NINA

Transportation time: 1 hr 40 mins by bus from Trondheim

Stop 1: 63.1191, 10.4654 After c. 50 minutes' drive from Trondheim we will make a short 30 mins stop along the road to look at cliffs with *Sphagnum rubiginosum* and *S. girgensohnii*. This is not yet inside the protected area.

Stop 2: 63.0745, 10.6857 We will come from the north and drive along the southwestern side of the lake into the protected area, and stop when we get as far south as we will go today. We will have lunch with a view of the lake, and will then cross the road to a mire with a rich occurrence of *Sphagnum aongstroemii*. This is a poor fen, with clear impact of snow and ice disturbance, sloping down towards the road and lake. *Sphagnum* species here include *S. compactum*, *S. majus*, *S. lindbergii*, *S. pulchrum*, *S. rubellum*, *S. divinum*, *S. papillosum*, *S. fuscum*, *S. flexuosum*, *S. angustifolium*, *S. tenellum*, *S. balticum* and *S. jensenii*.

Down from the forest into the mire flows a small brook bringing more nutrient rich water. Up the slope the mire turns into a swampy forest with e.g. *S. centrale* and *S. russowii*.

Stop 3: 63.1008, 10.6376 Turning back on the same road again, we will stop at a bigger open mire outside the protected area. This is also mainly a poor fen, but there are richer parts further up the slope. At the lower part of the mire there are areas with mainly *S. compactum* and *S. tenellum*, but also well-developed ombrotrophic hummocks with *S. fuscum*. Also *S. rubellum* and occasional *S. balticum* are present. *Sphagnum pulchrum* and *S. lindbergii* are also common, and we can find *S. jensenii* and *S. majus* around the open pools. The richer areas have *S. subnitens*, *S. warnstorffii* and *S. subsecundum*. Furthest up at the edge of the forest it is possible to find *S. molle*. Along the road there are *S. capillifolium* and *S. girgensohnii*.



Map (artsdatabanken.no) showing the stops of the day (numbered) and the protected area (red).

Species presentation

Sphagnum aongstroemii C.Hartm.

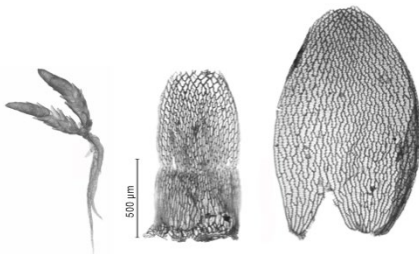
This relatively big, neon green peatmoss occurs in the whole boreal zone, mostly middle-north boreal. In Norway it is also present in the Arctic (Svalbard). It forms loose carpets together with *S. papillosum* and *S. divinum*.

The flat capitulum is not markedly star-like, the branches cylindrical and blunt. The fascicles have 2(-3) thick spreading branches, and 2(-3) thin, pendant branches hugging the stem.

The branch leaves are not arranged in five-ranked rows. They are rounded, a bit concave and have abruptly cut tips with teeth. The lingular stem leaves are rounded and fringed.



Sphagnum aongstroemii at Samsjøen.
Photo Fia Bengtsson.



Fascicle, stem leaf, branch leaf. Photo Kjell Ivar Flatberg.

Thursday Excursion

We will leave Trondheim and go to the north of the region Trøndelag. The main, and probably only, stop of the day will be close to Kaldalvatnet (64.26832, 11.28252) in Namsos municipality.

This is the northernmost site we will visit during the excursion. It is within the middle to southern boreal zone and in between the clearly and weakly oceanic section (O2-O1). The site is a mosaic of forests and mires.

The mires here form flat to sloping complexes with ombrotrophic parts mixed with poor fens. We will hike under the powerline crossing close to Mårhaugen to see *Sphagnum troendelagicum*. The species is endemic to Norway and its distribution is limited to north Trøndelag. In 2019, it was discovered for the first time in this part of Trøndelag. It was found growing under a newly established powerline and has later been discovered at two more sites, including Mårhaugen, under the same powerline. *Sphagnum troendelagicum* is a *priority species*, meaning it is protected by law (Norwegian Biodiversity Act). It is therefore off limits to collect *S. troendelagicum*!

Sphagnum troendelagicum has been found in ombrotrophic mires and poor fens. We will see a lot of *S. pulchrum*, *S. tenellum*, *S. compactum* and also *S. jensenii* and *S. majus* in wetter patches. In the forest across the parking we can see *S. rubiginosum*. The site is otherwise poorly mapped, so please, feel free to discover the *Sphagnum* flora here!

If time allows, we can visit an intermediate to rich fen site (64.31773, 11.41118) close by with *S. subfulvum*, *S. subnites*, but also *S. beothuk*.

Meeting time: 08:30 at NINA. We are staying overnight in Steinkjer so remember to bring what you need!

Transportation time: 2 hrs 30 mins by bus from Trondheim to Kaldalvatnet and 45 min from Kaldalvatnet to Steinkjer.

Species presentation

Sphagnum troendelagicum Flatberg

Classed as **EN** on the Norwegian Red List, this species is endemic to Trøndelag and has been found in c. 25 sites.

Sphagnum troendelagicum is a hybrid species of *S. tenellum* and *S. balticum*, and it is easy to see the parents' characters in it; it looks like an overgrown, orange (yellow-brown to brown-orange) *S. tenellum*.

Capitula are slightly convex and weakly starshaped, the leaves are not arranged in 5-ranked rows. The fascicles have 2 spreading branches and 1-2 thinner and shorter, pendant branches. Spreading branches often have pale tips with the leaves furthest out spreading (like in *S. tenellum*). The stem leaves are large, somewhat concave and often spreading away from the stem.



Stem leaf and branch leaf. Photo Kjell Ivar Flatberg.



Sphagnum troendelagicum, top panel together with *S. rubellum* and *S. papillosum*. Below together with *S. tenellum* e.g. at Kaldalvatnet. Photo Fia Bengtsson.

Friday Excursion

We are going 20 km southeast of Steinkjer to Henningvola c. 320 m above sea level. We will start the day walking along Henningslættbekken (63.9284319, 11.6940203). This is a small stream that feeds the slightly sloping fen surrounding it. However, the water is quite nutrient poor, and the fen has species thriving in intermediate conditions, like *Carex rostrata* and *C. lasiocarpa*. At this stop we will see *Sphagnum venustum* (**CR** in the Norwegian Red List). This was the only known locality of this species until 2023, when we found it in another two sites. *Sphagnum venustum* is a very small species that can easily be overlooked. It grows in poor fens, seemingly close to the edges of brooks. It often grows together with *S. angermannicum*, *S. rubellum*, *S. papillosum*, *S. angustifolium* and even *S. troendelagicum*! The area also has species like *S. balticum*, *S. majus*, *S. medium*, *S. divinum*, *S. beotuk*, *S. compactum*, *S. rubellum*, and others!

Meeting time: 8:30 at Steinkjer hotel. We will leave the hotel in Steinkjer and not come back, so remember to bring all your stuff!

Transportation time: 30 mins to Henningvatnet and 2 hrs from Henningvatnet to Trondheim

Species presentation

Sphagnum venustum Flatberg

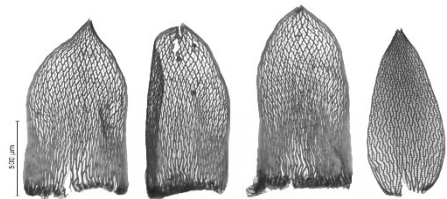
This is a very small species that in Europe has been found only in Norway (**CR** on the national Red List). It was discovered here in 2011, three years after it was described from eastern Canada. In Norway, it is the rarest of the *Sphagnum*, although as it is very small it can easily be overlooked.

Sphagnum venustum is brown-red to salmon-pink subgenus *Acutifolia*-species that usually grows dispersed among other species. It has a flat, starlike capitulum with mostly straight branches and a clearly visible apical bud. The fascicles have 2 spreading branches and usually 1 thinner, pendant branch.

The branch leaves can be somewhat arranged in five-ranked rows. They often have a tip that looks cut off and the tip often has small teeth. The stem leaves vary in shape, are thin and often rip.



Sphagnum venustum, at the top together with *S. papillosum* and *S. rubellum*, at Henningvatnet. Photo Fia Bengtsson.



Stem leaves and a branch leaf. Photo Kjell Ivar Flatberg.

Species presentation

Sphagnum angermannicum Melin

This moderately sized species varies in colour from violet-red to pale green, but has a distinct glassy see through look to the long outer capitulum branches. The inner branches are usually flattened.

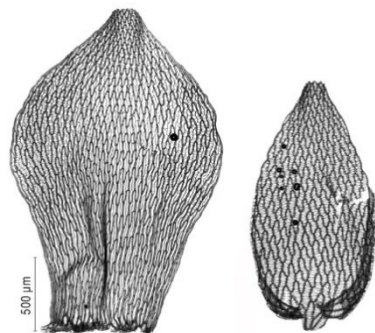
The species has a limited distribution with occurrences on the American east coast, and in Europe the main occurrences lie in the southern half of the Scandinavian peninsula, from northern boreal to boreonemoral zones. It is considered **NT** on the Swedish Red List, but **LC** on the Norwegian. It occurs in low hummocks or lawns, in poor to intermediate fens.

It has slightly starlike capitula with a conical, clearly visible apical bud. The fascicles usually have 2 spreading branches and usually 1(-0) shorter pendant branch.

The branch leaves are tightly arranged around the branch, not in 5-ranked rows, making the branch cylindrical. The branches narrow to a fine tip. The leaves are cut, and toothed. The stem leaves are large, lax and diamond shaped, also with a cut and toothed tip.



Sphagnum angermannicum, here together with *S. venustum*, at Kaldalvatnet. Photo Fia Bengtsson.



Stem leaf (left) and a branch leaf (right). Photo Kjell Ivar Flatberg.