

Morphological observations on *Schistidium maritimum*

Michael Lüth reviews the position of this species within Grimmiaceae, and its infraspecific variation

Defining *Schistidium maritimum*

One of the most important distinguishing features of the genus *Schistidium*, compared to closely related genera such as *Grimmia*, is the uniformity of the nerve cells, viewed in cross section. The nerve cells in *Grimmia* are always clearly differentiated, while in *Schistidium* the nerve cells are usually very uniform, of almost the same size and structure. There is one obvious exception, and that is *Schistidium maritimum*.

The nerve is very strong in this species and occupies the whole of the upper part of the leaf. In cross section, the cells are strongly differentiated. The guide cells form a central band in 1–2 layers. Multi-layered bands of small, thick-walled stereids are present ventrally and dorsally, and there is an epidermis of enlarged cells on both surfaces (Fig. 2). This is reminiscent of the cross sections of the nerve in the Dicranaceae or Pottiaceae. In the Grimmiaceae it is also present in

different species of the genus *Ptychomitrium* (Fig. 3).

Schistidium maritimum also differs from most other species of the genus in its growth form. The leaves lack a hair-point and are crisped when dried. Here again there is a similarity to *Ptychomitrium*. However, there are also obvious differences, as *Ptychomitrium* has capsules with a long seta and filiform peristome teeth, while *S. maritimum* has immersed capsules on a short seta and broadly triangular peristome teeth.

Within the genus *Schistidium* there are several species that at least partially share the peculiar characteristics of *S. maritimum*, for example *S. agassizii*, *S. platyphyllum* and *S. rivulare*. These species also lack a hyaline hair-point (*S. platyphyllum* can sometimes have a small hairpoint) and in the nerve section there are at least a few smaller cells. However, the leaves of these species are not curled. In *Schistidium occidentale*, which also lacks a hair-point, the

<Fig. 1. *Schistidium maritimum* on a coastal rock on the Faeroe Islands. All pictures by M. Lüth.

leaves are slightly curled, but the nerve is hardly differentiated in section.

In some other characters, *Schistidium maritimum* also occupies an isolated position within the genus. For example, the leaf cells are often somewhat rectangular and the exothecial cells have round lumens with the walls thickened at the corners (Fig. 5), features that are otherwise atypical in the genus. In the taxon currently treated as *Schistidium maritimum* subsp. *piliferum* (Fig. 6) a hair-point is present, the leaves are not crisped, the leaf cells have rounded lumens with nodular walls, and the exothecial cells lack thickened corners. The only feature that has some resemblance to *Schistidium maritimum* is the presence of some stereids in the leaf cross section. Despite the external similarity in growth form and the occurrence in coastal habitats, the morphological agreement with subsp. *maritimum* is quite small.

Differentiation within *Schistidium maritimum*

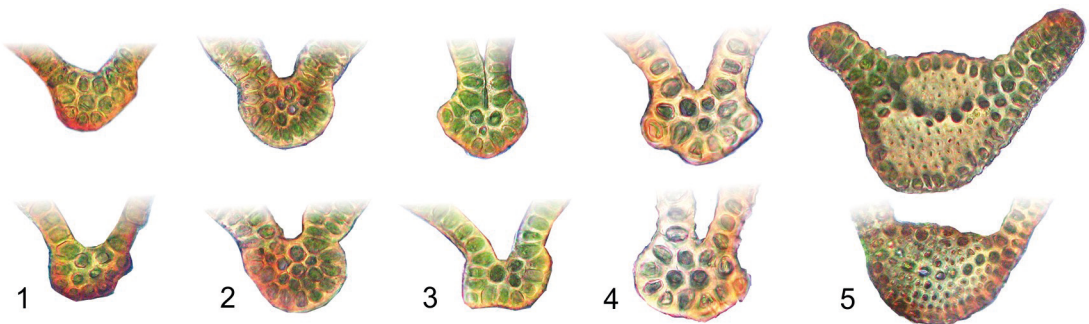
Specimens of *Schistidium maritimum* from different parts of the world show distinct differences. The type of the species comes from Ireland. Plants from there have the characteristically thick nerve that fills the leaf apex and has over 10 rows of stereids. This form can be found widely on the coasts of Western Europe. In Arctic regions, there is another form

that has a much weaker nerve with fewer rows of stereids (Fig. 7). The nerve in this form does not completely fill the apex of the leaf, but the lamina extends almost to the extreme apex, and the ventral side of the nerve is not convex-arcuate, but rather somewhat concave.

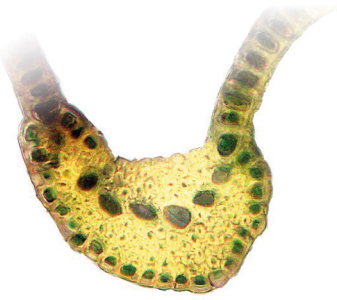
The distributions of the two morphs are interesting. The typical form extends from the Atlantic coast of Europe to the highest latitudes of continental Norway. The northernmost of the studied specimens from Europe was collected at about 68° 41' N, 17° 25' E at Gratanger Fjord at Foldvik in Norway. In contrast, a specimen from a location in the wider vicinity of Hammerfest, Finmark, only about 300 km to the northeast (70° 33' N, 23° 25' E) belongs to the Arctic form. In Russia, all occurrences probably belong to the Arctic form; the typical form is not yet known there (Elena Ignatova, pers. comm.).

From North America, specimens were studied from eastern and western Canada and Oregon, USA. All the studied samples belonged to the typical form, albeit slightly modified. The northernmost of them was from Cape Bonavista on Newfoundland at 48° 42' N, 53° 05' W (a more northerly find at Fox Harbor, Newfoundland, at 52° 21' N, 55° 41' W, turned out to be *Schistidium maritimum* subsp. *piliferum*).

In Iceland, *Schistidium maritimum* occurs in a



△Fig. 2. Comparison of nerve cross sections of different *Schistidium* species. 1) *S. apocarpum*, 2) *S. brunnescens*, 3) *S. confertum*, 4) *S. robustum*, 5) *S. maritimum*.



◁Fig. 3. *Ptychomitrium polyphyllum*.

▽Fig. 4. *Schistidium maritimum*, Scotland.

form that is very similar to the Arctic form from Russia, but it has an even weaker nerve (Fig. 8).

From the Bering region, Ochyra & Afonina (2009) described a new species *Schistidium frahmianum*, which is similar to the Arctic form of *S. maritimum*.

Conclusions

Schistidium maritimum is quite isolated in the genus *Schistidium*. It almost seems as if it does not belong to the genus *Schistidium* at all, except for the similarities in the sporophyte. Molecular studies would be needed to establish whether the separation of *S. maritimum* at generic level might be justified.

Within *Schistidium maritimum* there are at least two forms with differences that might justify the recognition of two separate taxa. *Schistidium frahmianum*, if it is not identical with the Arctic form of *Schistidium maritimum*, is perhaps also a species of this group, and presumably the plants of Iceland could be assigned to a further taxon.

On morphological grounds, at least, it is obvious that *Schistidium maritimum* subsp. *piliferum* cannot be maintained as a subspecies of *S. maritimum* but represents a separate species.

Acknowledgments

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Reference

Ochyra, R. & Afonina, O.M. (2010). *Schistidium frahmianum* (Bryopsida, Grimmiaceae), a new arctic species from Beringia. *Tropical Bryology* 31: 139–143.

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Appendix: List of specimens of *S. maritimum* examined

All specimens are in the herbarium of the author, unless stated.

Typical Form. France: Bretagne, Pointe Croix, Pointe de Brézellec, 40 m alt., 2003, Lüth 4051. UK, Scotland: W. Sutherland, Achnahaird Bay, 5 m alt., 2015, Lüth 8207; Applecross, Bay of Meallabhan, 2 m alt., 2017, Lüth 8715. Faeroe Islands: Torshavn harbour, 0 m alt., 2017, Lüth 8867. Norway: Sognefjord bei Vik, 1970, J.-P. Frahm; Hordaland, Kvinnherad, Löfallstrand, 1990, M. Ahrens; Troms, Gratanger fjord, Foldvik, 1958, A. C. Crundwell & E. Nyholm 169. Canada: Victoria, Oak Bay, 2015, W. Miles 150030; Newfoundland, Bonavista Peninsula, Cape Bonavista, 1979, G. R. Brassard 13021. USA: Oregon, Lincoln County, Cape Perpetua, 1984, D. H. Wagner. **Arctic Form.** Norway: Finnmark, Söröysund, Seiland (Siev'jo), 5–10 m alt., 2001, L. Hedenäs B63120 (S). Russia: Kola Peninsula, Murmansk Province, Belaya Luda, 2006, D. Sukhova (MW); Kommander Islands, Bering Isl. near Nikol'skoe settlement, 2010, V. Fedosov 10-282 (MW). **Icelandic Form:** Iceland: Vopnaförður, Kolbeinstangi, 1 m alt., 2009 Lüth 6157; Nordfjörður, Neskaupstadur, Paskahellir, 1 m alt., 2019, Lüth 6195. **Subsp. piliferum.** Norway: Sör-Trøndelag, Örland, Synnørsfjellet, 5 m alt., 1985, H. H. Blom 2492. Faeroe Islands: Saksun, 100 m alt., 2017, Lüth 8668. Canada: Labrador, Fox Harbour, 5 m alt., 2009, J. Faubert 9633.



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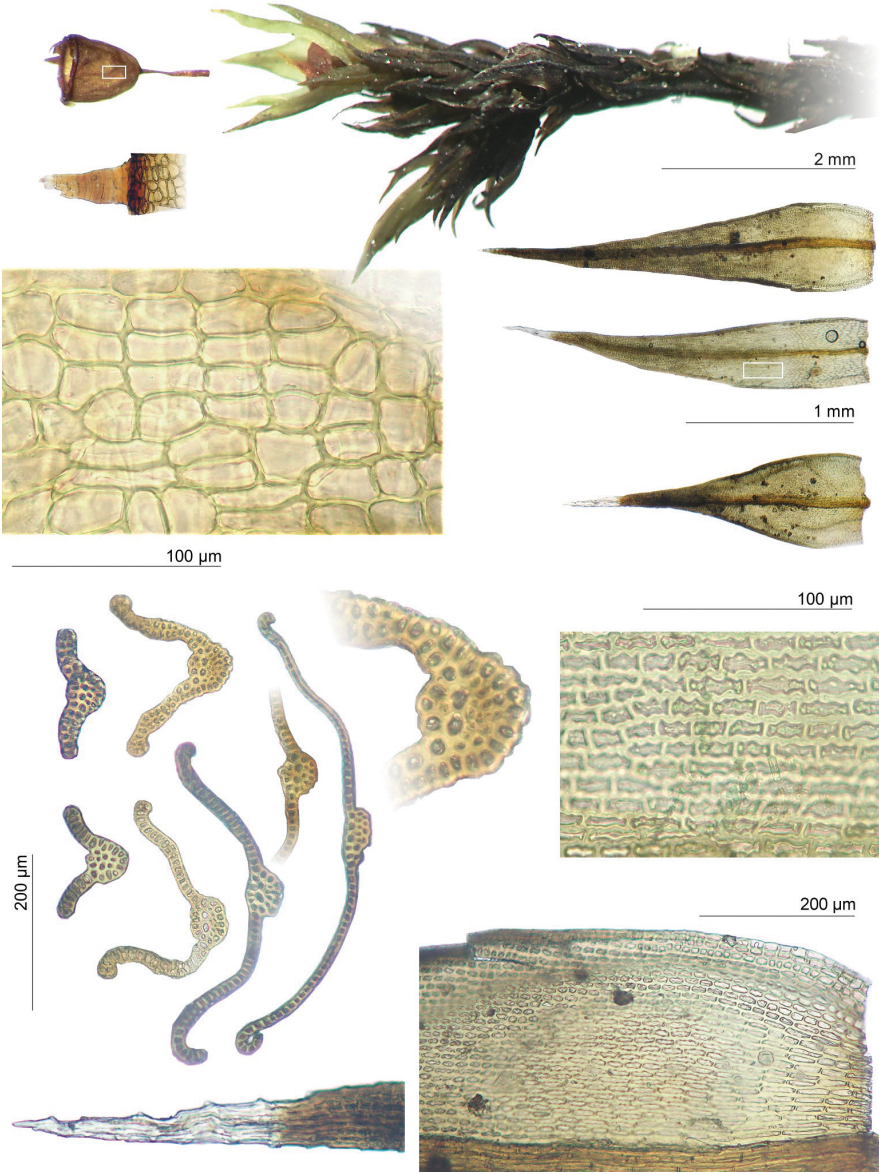


Fig. 6. *Schistidium maritimum* subsp. *piliferum*, Faeroe Islands.

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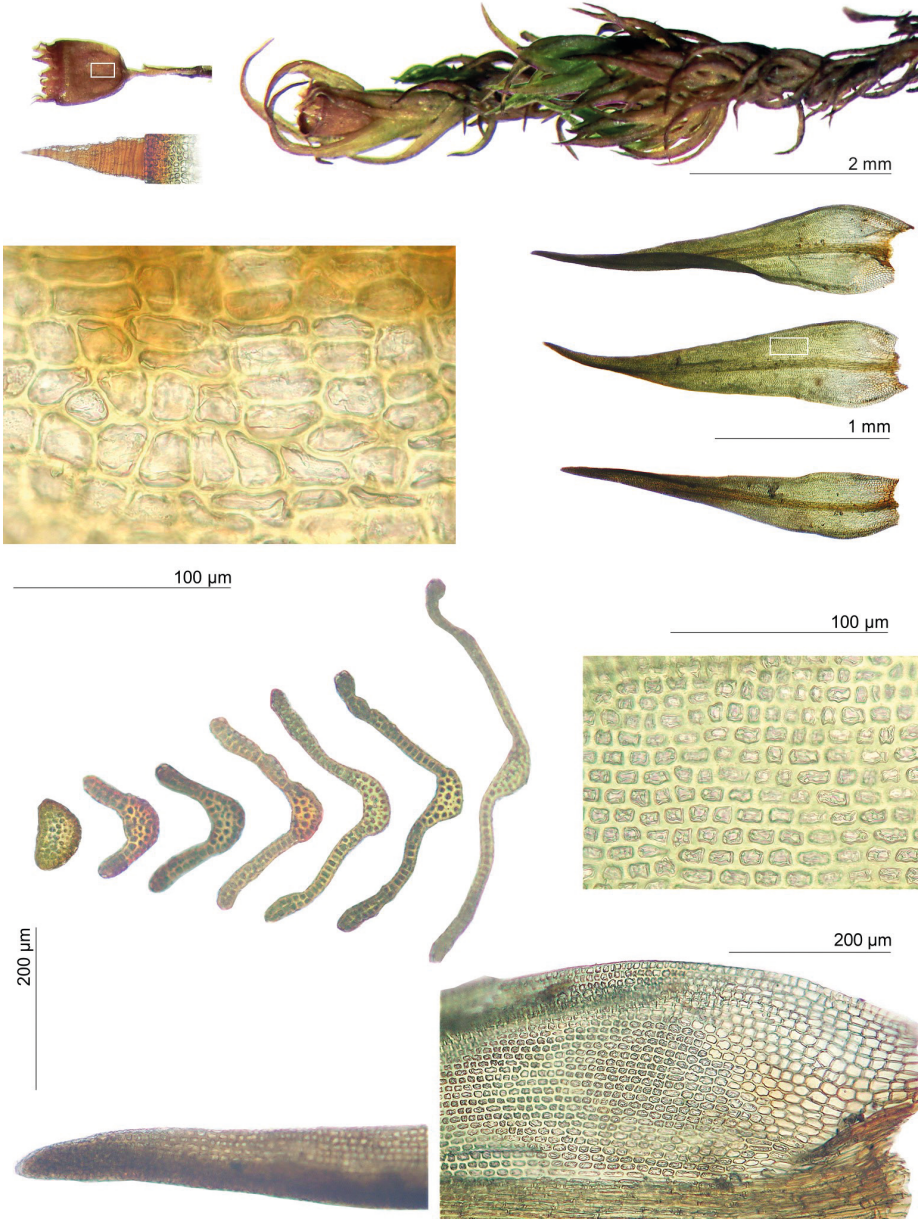


Fig. 8. *Schistidium maritimum*, Iceland.