Schistidium halinae (Grimmiaceae, Bryopsida), a new moss species from the Antarctic

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Schistidium halinae Ochyra (Grimmiaceae, Bryopsida) is described as a new species based on ten collections from the maritime West Antarctic. It differs from the congeners in (1) its piliferous upper leaves giving the plants a hoary appearance, (2) sharply spinulose-denticulate, hyaline, broad, flattened and membraneous hair-points, 0.2–1.0 mm long on the upper leaves, (3) narrowly recurved and partially bistratose margins in the upper half leaf, (4) presence of a large central strand, (5) short-rectangular and sinuose laminal cells in the lower middle, and (6) long-rectangular basal juxtacostal cells with straight incrassate walls and quadrate to short-rectangular basal marginal cells forming a band 4–6 cells wide. Additionally, the capsules are deeply immersed in the ovate perichaetial leaves with a plane or narrowly recurved margin on one side below the apex and terminated with a long, hyaline hair-point (0.6–1.4 mm). The exothecial cells are mostly isodiametric to oblong, thin-walled with distinct corner thickenings and the peristome teeth are erect, lanceolate, perforate to irregularly cracked. The new species is fully described and illustrated and its affinities are discussed. Schistidium halinae is currently known from King George and Livingston Islands in the South Shetland Islands and from Vega and James Ross Islands near Trinity Peninsula on the NE coast of the Antarctic Peninsula. The distribution is mapped.

Key words: Antarctica, Bryopsida, Grimmiaceae, Schistidium, taxonomy

INTRODUCTION

During the IV Polish Antarctic Expedition, in January 1980, I discovered a puzzling species of Schistidium Brid. growing on exposed andesite rock near Ezcurra Inlet on the west side of Admiralty Bay, King George Island, South Shetland Islands. Two months later a large population of this moss was found on Puchalski Peak on the east side of Admiralty Bay. Here, it was the only moss recorded amongst a number of crustose lichens. The moss is a very distinct taxon, easily distinguished from all congeners in Antarctica by its long spinulose-denticulate hyaline hair-points, giving the plants a hoary appearance.

Initially, I was unable to identify this taxon and consulted B. G. Bell, who was then completing the treatment of Grimmia Hedw. and Schisti-
Schistidium halinae Ochyra, sp. nov. (Fig. 1)

Species distinctissima foliis sicce imbricatis, spiraler ter quinquefariis, pilis planis spinuloso-denticulatis, 0.2–1.0 mm longis, marginibus superne irregulariter bistratatos, cellulis sinusosis in medio laminae, basi rectangularibus, parietibus laevissimis incrassatisque, costis in sectione transversali bistratosis, foliis perichatialibus capsula duplo longioribus, peripilosis, pilis 0.6–1.4 mm longis, capsule profunde immersis, breviter oblongo-cylindricis, cellulis exotheciis isodiametricis vel oblongis, leptodermis collenchymatous, medullary cells surrounding 3–4 layers of large, hyaline, thicker-walled medullary cells with distinct collenchymatous thickenings; central strand large and conspicuous; rhizoids scattered in the lower part of the stem, brown and smooth, weakly branched; axillary hairs hyaline throughout, 5–7-celled, composed of short rectangular cells or with elongated upper cells. Leaves densely set in 5 distinct, spiral rows giving the stem a ridged appearance, straight, closely imbricate, erect when dry, erect-spreading when moist, (1.3–)1.5–1.8(–2.0) mm long, 0.4–0.7 mm wide at the widest part, lanceolate to ovate-lanceolate, gradually acuminate, variable on the same shoot as regards the presence and length of the hyaline hair-points, the lower ones acute to obtuse and muticous, the uppermost acute and pilose, sharply keeled in the upper half, obtusely keeled to canaliculate below; hair-points hyaline, 0.2–1.0 mm long, becoming progressively longer up the stem, rather stiff, flattened, membranous, narrow above and becoming widened towards the insertion and embracing a small part of the upper lamina, not or shortly decurrent down the margins, finely and irregularly spinulose-denticulate with short narrow spicules; margins entire, plane in lower half or more of the leaf length on one side and in lower 1/4–1/3 on the other side, narrowly recurved above almost to the apex, at least on one side, irregularly bistratose in upper and central part for 1–2 rows of cells, in the lower half unistratose; costa longly excurrent, channelled above, strongly convex dorsally, 40–65 µm wide above, becoming narrower towards the base, smooth throughout on the dorsal surface, in cross-section hemispherical to subrectangular in outline, bistratose throughout, occasionally with tristratose spots below, composed of uniform, large cells; laminal cells unistratose through-
out with occasional bistratose spots in the upper half, entirely smooth, thick-walled; upper and median cells rounded, rounded-quadrate to oblong, sometimes transversely short-rectangular, (4.5–) 6.0–10.0 µm long, 6–8 µm wide, straight-sided to slightly sinuose, becoming short rectangular in the lower midleaf, 10–14 µm long, 7–8 µm wide; basal cells chlorophyllose to subhyaline, forming a large juxtacostal band of short- to long-rectangular cells with straight and strongly incrassate longitudinal walls, 20–50 µm long, 2.5–4.5 (–5.0) µm wide; basal marginal cells thick-walled with transverse walls thicker than longitudinal walls, 7–8 µm wide, 6–20 µm long, forming a group of 4–6 rows of cells wide, imperceptibly merging into the juxtacostal group. Autoicous. Gynoecea and androecia terminal, but appearing lateral due to subfloral innovations stretching to nearly the same direction as that of the preceding stem. Perichaetal leaves yellowish- to olive-green, about twice as long as sporophytes, 2.0–2.5 (–3.0) mm long, 1.1–1.3 mm wide, concave, sometimes faintly plicate, ovate, gradually acuminate, ending with a very long, 0.6–1.4 mm, hyaline, flat, spinulose-denticate hair-point, non-decurrent down the midrib to subfloral innovations stretching to nearly the upper half; upper cells quadrato to short-rectangular, thick-walled, sinuose; lower cells long-rectangular, thin-walled, lax in the innermost leaves. Setae short, 0.5–0.6 mm long, straight, centrally attached; vaginula very short, with thin and smooth epidermal cells; capsules deeply immersed in perichaetal leaves, pale brown, shortly oblong-cylindrical, thin-walled, 0.9–1.0 mm long, 0.7–0.8 mm wide at mouth; operculum conic, with a straight beak, orange-brown; columella attached to the operculum after dehiscence, 0.7–0.8 mm long; exothecial cells mostly isodiametric, rounded-quadrate to short-oblong, 20–35 µm long, 20–30 µm wide, thin-walled, with clear corner thickenings, becoming transversely rectangular below the mouth, those at the urn rim markedly smaller, 8–15 µm wide, thick-walled, orange-brown, in 2–3 tiers; stomata 7–10 at the extreme base of the urn, biccicular, superficial, round-pored, variously oriented; peristome teeth 280–350 µm long, orange, erect, straight, lanceolate, acute to obtuse, irregularly perforated, often with irregular cracks, usually eroded at margins, densely papillose. Spores spherical, pale brown, smooth to very finely papillose, 10–12 µm wide. Calyptrae conical, smooth, mitriform, lobed at base, not extending to the urn.

Other specimens seen (paratypes).—South Shetland Islands. King George Island. Admiralty Bay, Ezurra Inlet, ridge called Cytadela between Monsimet Cove and Zalewski Glacier, lat. 62°11’S, long. 58°35’W, elev. 20 m, on dry strongly insolated andesite boulders on northern slope of the ridge, 20.I.1980, Ochyra 93780 (KRAM); same locality, elev. 80 m, on dry and exposed andesite rocks on NW-facing slope, 20.I.1980, Ochyra 94780 (KRAM). Livingston Island. South Bay, Hurd Peninsula near Juan Carlos I Station, lat. 62°37’S, long. 60°30’W, 6.II.1992, Schulz 97 (KRAM). East Antarctic Peninsula. Vega Island. W side of Pastorizo Bay, elev. 50 m, lat. 63°54’S, long. 57°18’W, moist gravelly soil and rocks below late snow beds, 4.II.1989, Lewis-Smith 7835 (AAS, KRAM, TRH). James Ross Island. S of Abernethy Flats (5 km SSE from SW corner of Brandy Bay), near Monolith Lake, elev. 100 m, lat. 63°52’S, long. 57°34’W, on blocks of breccia, 30.I.1989, Lewis-Smith 7635 (AAS, KRAM, TRH); Fortress Hill, elev. 150 m, lat. 63°56’S, long. 57°31’W, seepage area below snow patch on plateau, 18.I.1989, Lewis-Smith 7777 (AAS, KRAM, TRH & 7781C (AAS, KRAM)); in valley S of St. Martha Cove, elev. 35 m, lat. 63°56’S, long. 57°49’W, dry soil among large stones at margin of soil stripe, 26.I.1989, Lewis-Smith 7455A (AAS, KRAM, TRH); same locality, elev. 50 m, dry soil and gravel on stony col, 26.I.1989 (AAS, KRAM); same locality, elev. 80 m, on dry rocks, 23.I.1989, Lewis-Smith 7648 (AAS, KRAM); hill top to S side of St. Martha Cove, elev. 150 m, lat. 63°56’S, long. 57°49’W, pocket of soil amongst large block boulder, 6.II.1989, Lewis-Smith 7541A (AAS, KRAM).

DISCUSSION

Species of Schistidium are one of the most important constituents of the impoverished terrestrial vegetation in the Antarctic biome, both in terms of frequency and cover. Also, the genus is still under-investigated taxonomically both in this area as well as in the Southern Hemisphere in general. The only available revision of the genus (Bremer 1980a, 1980b, 1981) is, in practice, not particularly useful because of the exceedingly broad concept of S. apocarpum (Hedw.) Bruch & Schimp. with which many distinct and well defined species have been lumped. My revision of Schistidium for a forthcoming moss flora of Antarctica has revealed that no fewer than ten species are present.
Schistidium halinae can be easily recognized in field by its hoary appearance because of the long, hyaline hair-points on the uppermost vegetative and perichaetial leaves which seem to be the key character of the species, not only in the south, but also in the Northern Hemisphere. They are broad, flattened and membraneous and tend to be very long and pronounced in the upper vegetative leaves, reaching to 1.4 mm in the perichaetial leaves and it is peculiar that the cell wall remnants are clearly visible in them. Such hair-points seem to have evolved in several species growing in dry, often sunny and exposed habitats and they occur in part in remotely related species such as S. flaccidum (De Not.) Ochyra, S. frisvollianum Blom, S. bryhnii I. Hag., S. venetum Blom and S. scandicum Blom. However, the hair-point in S. halinae is much stiffer because of the strong and long-excurrent costa and does not tend to be flexuose as in the aforementioned species. In fact it could slightly remind the hyaline awn is some species of Grimmia, for example G. anodon Bruch & Schimp.

Additionally, the species is recognized by the combination of the following characters: (1) upper and median laminal cells rounded to rounded-quadrate becoming short-rectangular and sinuose in the lower midleaf; (2) long-rectangular and straight-walled basal juxtacostal cells and quadrates to short-rectangular basal marginal cells forming a broad band; (3) central strand present; (4) setae 0.5–0.6 mm long; (5) capsules shortly oblong-cylindric; (6) exothecial cells thin-walled, isodiametric to short-oblong; (7) spores 10–12 µm wide, smooth to minutely roughened.

The only other Antarctic species with long-pilose leaves is Schistidium urnulaceum (C. Müll.) B. G. Bell, endemic to South Georgia (Bell 1984) and King George Island (Ochyra 1990, Chen et al. 1995). It is easily recognized microscopically by a set of characters as follows: laminal cells rectangular and strongly nodulose throughout the leaf except for the extreme base; central strand lacking; very short setae, 0.2–0.3 mm long; globose capsules; exothecial cells with strongly incrassate walls; and smooth, small spores, 7–9 µm in diameter.

Originally, the first collections of Schistidium halinae were compared to S. hyalinocuspidatum. It is considered a South Georgian endemic (Bell 1984) and very closely related to — and probably conspecific with — S. amblyophyllum, a subantarctic-andean species (Ochyra & Hertel 1990). These species differ from S. halinae in their leaf areolation of elongate and strongly sinuose laminal cells extending nearly to the base, epilose leaves and the lack of central strand.

All other Antarctic species have short hyaline hair-points and differ additionally in other structural characters. Some populations of the endemic Schistidium antarcticum (Card.) L. I. Savicz & Smirnova have occasionally leaves with well developed hyaline awns and additionally the leaves are distinctly 5-ranked. However, the peristome teeth are reduced in this species, mostly truncate and rudimentary, the basal juxtacostal cells are short-rectangular and the supra-basal cells are only weakly sinuose. Likewise, S. occultum (C. Müll) Ochyra & Matteri has sometimes a short hyaline hair-point, usually less than 0.1 mm long, but it is distinct in its tristratose costa in transverse section.

Antarctica seems to be a centre of endemism in Schistidium. Apart from S. halinae and S. antarcticum, a third species, S. steerei Ochyra, is known only from two localities on King George Island (Ochyra 1987). However, it is likely that these species occur elsewhere in southern South America or in Subantarctica as floristic exploration is extended in these biomes, but examination of the relevant type collections showed that they have not been described elsewhere under different names. Until new records of these species from more northerly latitudes are available, the hypothesis that they have evolved in the Antarctic must be accepted.

Because the genus Schistidium is still poorly known taxonomically, it is difficult to suggest the relatives of S. halinae, but it seems to show the closest relationship to the above-mentioned Antarctic species, and to S. frigidum Blom and S. cryptocarpum Blom. & Mogensen (and possibly S. venetum) from the Northern Hemisphere. The northern species may be similar to S. halinae in habit, but the hair-points, if not incrusted by calcareous
matter, are much softer. *Schistidium halinae* bears also some similarity to the Scandinavian *S. scandicum* Blom, a species recently described (Blom 1996) from Norway and Sweden. Both species share long-piliferous leaves, the presence of a distinct central strand and areolation in the leaf base, but the Scandinavian species seems to be distinct in its shallowly immersed capsules, red, patent to squarrose peristome teeth, narrowly recurved margins of the perichaetial leaves in the upper half, larger laminal cells and granulose to verucose, somewhat larger spores.

At present *Schistidium halinae* is known from two widely separate centres in the northern West Antarctic (Fig. 2). It occurs on King George and Livingston Islands in the South Shetland Islands archipelago, and on Vega and James Ross Islands near the Trinity Peninsula on the East Antarctic Peninsula. It does not seem to have been collected elsewhere in the maritime Antarctic, and a survey of large collections in the herbarium of the British Antarctic Survey (AAS) has not revealed other specimens of this distinctive moss. *Schistidium halinae* grows in exposed places on stones and gravelly ground, mostly in dry situations, although on James Ross Island it was recorded in a moist site below a late snow patch. These are typical habitats of most *Schistidium* species in Antarctica, which are either saxicolous or epigean plants in this biome.

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