

# THE ANTARCTIC MOSS *Sarconeurum glaciale* (C. Muell.) Card. et Bryhn IN SOUTHERN SOUTH AMERICA

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**ABSTRACT.** *Tortula lithophila* Dus. and *Tortula pygmaea* Dus. are reduced to synonymy with *Sarconeurum glaciale* (C. Muell.) Card. et Bryhn thus extending the known range of the latter into southern South America. Consequently the genus *Sarconeurum* can no longer be considered endemic to the Antarctic botanical zone, it being the only moss genus so far accorded this status. It is argued that *Sarconeurum tortelloides* S.W. Greene is better placed in that genus than *Tortella* until further evidence is available to enable a better evaluation of its position.

The genus *Sarconeurum*, which hitherto has been considered endemic to the Antarctic botanical zone (Greene and others, 1970), was erected by Bryhn (1902) for his new species *S. antarcticum* Bryhn from northern Victoria Land, a species now known as *S. glaciale* (C. Muell.) Card. et Bryhn. Greene and others (1970) have given the reasons for this name change together with details of the specimens concerned and in the same work a description of a second species, *S. tortelloides* S.W. Greene, which Robinson (1972) transferred to *Tortella* as *T. tortelloides* (S.W. Greene) H. Robinson. Of the two species *S. glaciale* is the most widespread, being particularly common and abundant throughout continental Antarctica, with only sporadic occurrences along the west coast of the Antarctic Peninsula and islands of the Scotia Ridge as far north as the South Orkney Islands. A map of its distribution was given by Greene and others (1970) and some other localities have been added by Robinson (1972). The species is so far unknown from the South Sandwich Islands and South Georgia and has never been reported from localities farther north. By contrast, *S. tortelloides* appears to be a rare plant and is only known from five or six sites in the vicinity of the Antarctic Peninsula (Greene and others, 1970).

## CHARACTERS OF *Sarconeurum*

Bryhn (1902) considered the characteristic fleshy and swollen leaf apex to be sufficient justification for the erection of a new genus, a view also shared by Cardot (1907) and Hilpert (1933), the latter suggesting that it should be placed close to *Tortula*. The author also accepted that the external morphology of the leaf apex was sufficiently distinct to be treated as a generic character provided it was taken in conjunction with its internal structure and it was on the basis of this combination of characters that *S. tortelloides* was placed in the genus *Sarconeurum*. Robinson (1972) took the view that the form of the leaf base, particularly its areolation, should be given greater importance than characters of the leaf apex, when considering relationships within the Pottiaceae, and principally for this reason transferred the species to *Tortella*. Under *S. glaciale* he (Robinson, 1972, p. 171) remarked "I believe this character [i.e. leaf base] to be much more reliable phylogenetically than the fragile leaf tips. Similar leaf tips have been noted in a number of Trichostomoid and Barbuloid genera in the Pottiaceae and also in a species presently placed in *Tortula*, i.e. *T. lithophila* Dus. of southern South America."

## *Tortula lithophila* AND *T. pygmaea*

Dusén (1906a) described *Tortula lithophila* under the name of *T. lithopila*, an orthographic error which he corrected elsewhere in the same paper, as a new species characterized by having "nervo haud excurrente vel plerumque lingulata" and covered with gemmae. *T. saxicola* Dus. (Dusén, 1905) was cited as a synonym, this combination being an illegitimate homonym since the epithet *saxicola* had been pre-empted in the genus by *Tortula saxicola* Card. Dusén (1906b†) also described *Tortula pygmaea* Dus., which he considered to be closely related to *T. lithophila* particularly in the form of the excurrent nerve covered with papillose gemmae. Cardot (1908) accepted both species and listed Dusén's specimens but later it was suggested by Cardot and

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† In spite of the bibliographic date of 1906, the paper did not appear until 1907.

Brotherus (1923), while reporting as *T. pygmaea* material collected by C. J. F. Skottsberg in Andine Patagonia, that *T. pygmaea* and *T. lithophila* were identical. In *Index muscorum*, Vol. V, van der Wijk and others (1969, p. 95) cited *T. pygmaea* as a synonym of *T. lithophila*, giving their authority as Cardot and Brotherus (1923).

Dusén (1906a, p. 23) gave "Fuegia septentrionalis prope Porvenir emporium in saxis" as the locality for *T. lithophila* and an examination by the author of a specimen from Stockholm (S-PA) which can be accepted as the type, labelled "Herbarium Forstr. Dr. Georg Roth 1842-1915, *Tortula lithophila* Dus., Fuegia septentrionalis Porvenir in saxis .....\* 22, a. 1895, P. Dusén .....\*" showed it to be *Sarconeurum glaciale*. Fig. 1a, b and e illustrate the characteristic apex and leaf morphology of this specimen which may be compared with the illustrations given by Bryhn (1902, tab. 1 and 2) and fig. 25 of Greene and others (1970, p. 37).† Dusén's interpretation of the apex as a nerve covered with abundant gemmae is quite erroneous, perhaps due to faulty observation, but it has been suggested, for example by Savicz-Ljubitzkaya and Smirnova (1961), that the whole detached apex can act as a propagule.

No specimen labelled *T. saxicola* Dus. has been located but as Dusén (1905, p. 301) gave the habitat as "Fuegia septentrionalis in saxis", and as the description of *T. lithophila* Dus. (Dusén, 1906a, p. 23) appears to be modelled on that of *T. saxicola* Dus. being, in effect, an expanded version of it, it seems likely that both species were based on the same material.

There are also present at Stockholm (S-PA) two specimens of *T. pygmaea* labelled "Plantae Patagonicae e territorio Sta. Cruz reportatae, *Tortula pygmaea* Dus., Lago Argentino in fageto ad truncos putridos, Jan. a. 1905, P. Dusén" and "5722, *Tortula pygmaea* Dus., Patagonia australis Lago Argentino in truncis arb. putridis, Jan. 1905, Patagonium, P. Dusén", either of which could be the type as neither agrees precisely with the details published by Dusén (1906b, p. 8), i.e. "Patagonia australis ad lac. Lago Argentino ad saxa campestris nec non in fageto ad truncos arborum". Duplicates of the first cited of these two specimens are present in the British Museum (Nat. Hist.) (BM) and in the British Antarctic Survey bryophyte herbarium (AAS), at present housed in the Institute of Terrestrial Ecology, and their collecting details differ slightly in that the habitat is given only as "in truncis putridis". All of the specimens show the characteristic leaf morphology of *Sarconeurum glaciale* (Fig. 1c and f-j, from Dusén 5722) and have been so determined by the author.

Unfortunately the material of *T. lithophila* is fragmentary and, while the structure of the leaf, as seen in transverse section, was confirmed, the sections illustrated in Fig. 1 (l, m and n) were taken from the *T. pygmaea* material (Dusén 5722). They compare in all essential details with those illustrated in Greene and others (1970, fig. 25f-h, p. 37) except that the cells on the abaxial side of the nerve from the upper part of the base are larger and more thickened. Examination of Antarctic material of *S. glaciale* indicated that similar thickened large cells occur regularly in many specimens, one of which is illustrated in Fig. 1k (from R. Smith 658, AAS, Signy Island). Fig. 1d illustrates the junction of chlorophyllose and hyaline cells in a leaf from the *T. pygmaea* material (Dusén 5722), the areolation of this part of the leaf of *T. lithophila* being identical in all essential respects.

One of the three Skottsberg specimens, cited by Cardot and Brotherus (1923, p. 24) as *T. pygmaea* Dus., has been examined from Stockholm (S-PA, Expeditio suecica, 1907-1909, 763 *Tortula pygmaea* Dus., Patagonia, ad fontes fluminis Nirehuao, pr. Pampachica ad rupes, 950 m., leg. C. Skottsberg, 15.xi.1908, det. J. Cardot) and is certainly *Sarconeurum glaciale*. There seems no reason to doubt that the other two specimens are also this species but no material was available for examination.

#### DISCUSSION

In view of the accuracy of the illustrations accompanying Dusén's descriptions of *T. lithophila* (Dusén, 1906a, tab. 8, fig. 14, tab. 9, figs. 2-5) and *T. pygmaea* (Dusén, 1906b, tab. 1, figs. 13-17), both of which were cited by Cardot (1908) and, as the latter had determined Skottsberg's Patagonian material as *T. pygmaea*, it is very surprising that the relationship of these taxa to

\* Words illegible.

† The scale for leaves in this figure should have borne the values 0.05 and 1 mm. and not 0, 1 and 2 mm. as shown.

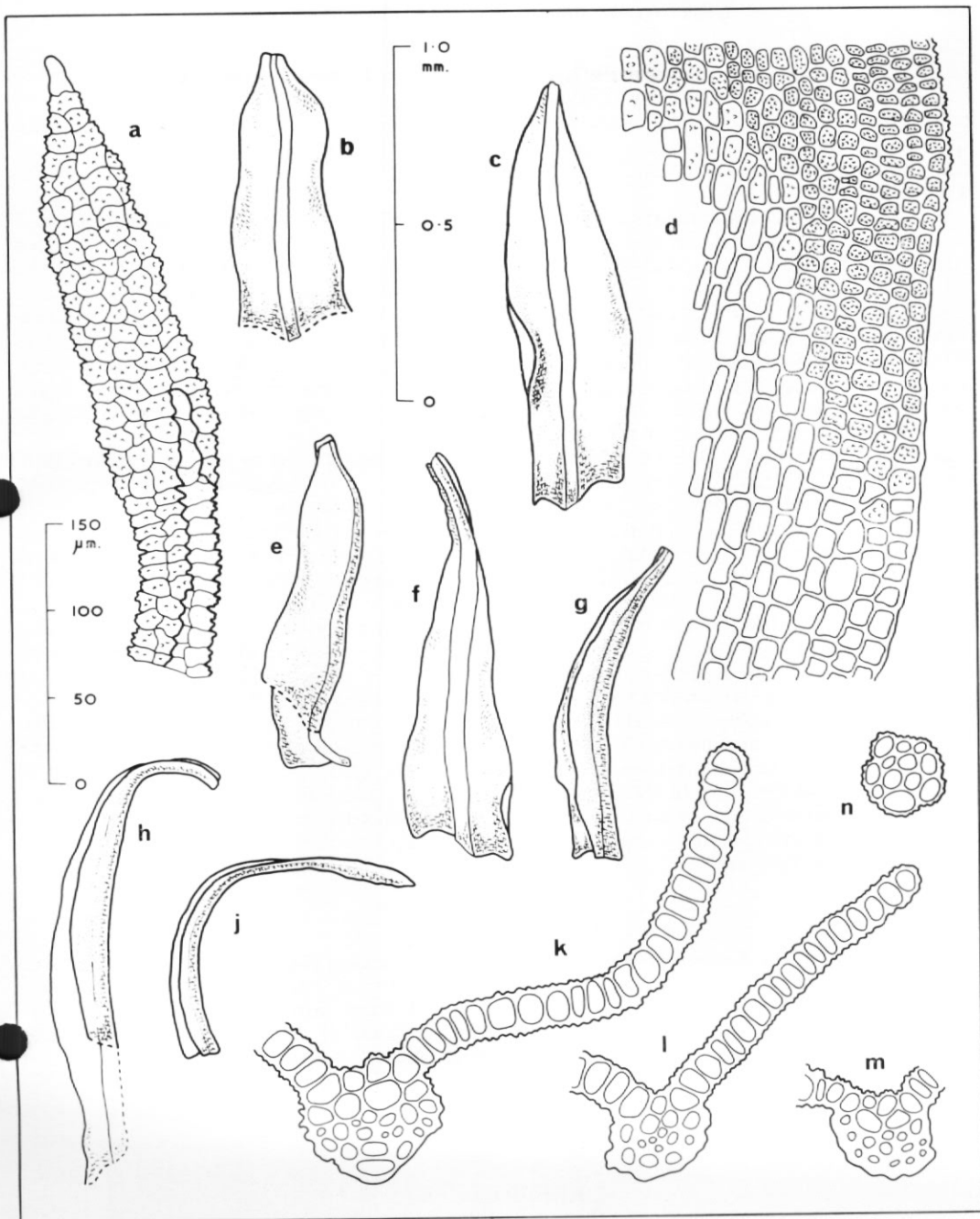


Fig. 1. Leaf morphology of *Tortula lithophila*, *T. pygmaea* and *Sarconeurum glaciale*.

a. Apex of *T. lithophila*.

b and e. Leaves of *T. lithophila*.

c, f, g, h and j. Leaves of *T. pygmaea*.

d. Basal cells of *T. pygmaea*.

k. Transverse section of upper part of base of *S. glaciale*.

l, m and n. Transverse section of upper part of base, near mid leaf and apex respectively of *T. pygmaea*.

Scales: upper for leaves, lower for cells and sections. A pecked line indicates a tear in a leaf.

*Sarconeum glaciale* has not been investigated before. There is no doubt that Cardot was quite familiar with *S. glaciale* (Cardot, 1907, 1908), but it may be that the change in habitat from rock faces and crevices or amongst silt, sand or fine rock detritus in Antarctica to rocks by rivers or woodland tree trunks in southern South America, together with the absence of the species from an intervening area such as South Georgia misled him, as may Dusén's interpretation of the caducous leaf tips of *T. lithophila* and *T. pygmaea* as an excurrent nerve covered with gemmae.

Robinson's (1972) transference of *Sarconeum tortelloides* to *Tortella* also raises a question of interpretation, although in this case the accuracy of the initial observations has not been questioned. So far as can be judged from his text, Robinson did not examine any material of *S. tortelloides* and justified the transference simply by stating that more weight ought to be given to the characters of the leaf base than the leaf apex. While there is no doubt that speculation on the interpretation that should be placed on various characters is valid, and differences in viewpoint can be extremely valuable, particularly where they lead to critical re-evaluation of concepts following careful examination of material, for example, by Newton (1974) in the case of *Cheilothela* and *Dicranella*, little is to be gained by moving a taxon from one genus to another without examining it or adducing new evidence.

It is often extremely difficult to determine the generic limits used by authors, particularly for monotypic genera, and there is no doubt that in the case of *Sarconeum* the peculiar morphology of the leaf of both species does raise serious questions as to their phylogenetic position particularly as sporophytes are unknown. But nothing less than a critical assessment of all the South American and Antarctic taxa of supposedly related genera, and of the views expressed in Hilpert's (1933) monograph, together with an evaluation of new material, where possible with sporophytes, is likely to produce satisfactory evidence to resolve the problem. For the time being, therefore, it is suggested that more may be gained by leaving *S. tortelloides* and *S. glaciale* in the same genus, since it draws attention to the necessity for a satisfactory explanation of both their similarities and differences.

The realization that Antarctica has lost its only endemic moss genus may cause despondency amongst phytogeographers who use concepts such as "percentage endemism" or "taxonomic isolation" to support arguments about origins of floras. But the present case well bears out the remarks made by the author (Greene, 1964) some years ago, when discussing the topic of Antarctic survival: "Owing to the present unsatisfactory taxonomic state of the cryptogams, it seems better to await the results of systematic revisions before serious consideration is given to the origins of the endemic species. Some may turn up elsewhere, and many will probably be relegated to synonymy!"

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