

A SYNOPTIC FLORA OF SOUTH GEORGIAN MOSSES:

VIII. *Calliergon* AND *Brachythecium*

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ABSTRACT. The single species of *Calliergon* and six of *Brachythecium* known from South Georgia are described and illustrated, with notes and keys to assist in their identification. Habitat details and maps of species distribution on the island are also included. The synonymy of the species is considered, as are a number of taxonomic points including the possibility that a seventh species of *Brachythecium*, *B. paradoxum* (Hook. f. et Wils.) Jaeg., is present on South Georgia.

THE pleurocarpous mosses to be considered in this paper form a large and important part of the bryophyte flora of South Georgia. *Brachythecium* has been shown (Newton, 1979) to be represented by six species and these, together with the single species of *Calliergon*, are described in detail. The aims and format throughout follow those adopted in previous parts of this series (Greene, 1973; Matteri, 1977), except that the details of type and historical specimens provided elsewhere (Newton, 1974, 1979) have been omitted.

Neither genus is difficult to recognize but each, in some of its forms, bears a superficial resemblance to the other. There is also some possibility of confusion with genera not included in this paper but, taking these into account, material of *Brachythecium* and *Calliergon* from South Georgia may be distinguished as follows:

Leaf apex either \pm cucullate and rounded, usually with blunt apiculus, or	
gradually tapering and acute, nerve $> \frac{3}{4}$ length of leaf	<i>Calliergon</i>
Leaf apex acuminate, sub-piliferous, nerve $< \frac{3}{4}$ length of leaf	<i>Brachythecium</i>

AMBLYSTEGIACEAE

Calliergon (Sull.) Kindb.

The deeply concave oblong to ovate-lanceolate leaf with percurrent nerve and auricles of inflated cells typifies the single species of *Calliergon* on South Georgia. The leaf apex is characteristically obtuse with a short apiculus but this may be wanting and in some aquatic forms the apex is \pm acute. The linear laminar cells become reduced in length towards the leaf apex where they are irregularly rhomboidal or rounded.

Calliergon sarmentosum (Wahlenb.) Kindb.

Densely to loosely caespitose or forming mats, pale green or yellowish green above, less frequently dark green or tinged with orange, brown or red, usually whitish to light brown below but often blackish brown, glossy. Stems 2.0–12.5 (–16.0) cm., erect or prostrate, \pm simple or with irregular, short spreading branches, rhizoids absent. Stem leaves (1.2–) 1.5–2.7 (–3.6) \times (0.3–) 0.6–1.0 (–1.4) mm., spreading, erecto-patent or loosely imbricate, becoming closely appressed above resulting in julaceous tips to the shoots, oblong to ovate-lanceolate, the apex usually \pm cucullate and obtuse with apiculus but sometimes \pm plane and acute, concave, with well-developed auricles. Margin plane, entire. Branch leaves similar but narrower. Nerve well defined, > 0.75 length of leaf, usually percurrent. Cells of main part of leaf (21.5–) 34.0–74.5 (–105.5) \times 3.5–9.5 μ m., linear, c. 6–11 times as long as broad, uniformly thin-walled or with the longitudinal walls porose and more incrassate than the non-porose transverse and oblique end walls, at apex shortly rhomboidal, quadrate or rounded, in base shorter, wider, porose, incrassate and often coloured, the alar group sharply defined, inflated and hyaline forming decurrent auricles below, small rounded and incrassate above. Dioecious

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with gemmiform inflorescences, the male \pm spherical and the female ovate. Seta 3.5–4.5 cm., reddish orange below, paler above, glabrous throughout. Calyptra unknown on South Georgia. Capsule c. $2.5\text{--}3.2 \times 1.0$ mm., narrowly oval to cylindrical, slightly inclined, light brown; exothelial cells \pm hexagonal, collenchymatous. Operculum shortly conical, exanulate. Peristome double, the 16 outer teeth yellow, paler towards apices, outer surfaces finely papillose, becoming coarser above, inner surfaces transversely striate, basal membrane of two to three rows of cells, the 16 inner processes hyaline, without cilia, with high basal membrane. Spores c. $16\text{--}20$ μm ., \pm spherical, green, finely papillose (Fig. 1).

Habitat and distribution (Fig. 2)

This is a typical lowland species of a wide variety of wet habitats including bogs in association with *Rostkovia magellanica* and *Juncus scheuchzerioides*, as well as flushes in areas dominated by *Festuca contracta*, *Deschampsia antarctica* or species of *Acaena*. It also occurs submerged in streams and lakes to a depth of > 10 m. (Light and Heywood, 1973) and on wet rock faces and boulders. Altitude 0–152 (–381) m.

Notes

C. sarmentosum is frequently associated with *Calliergidium* cf. *austro-stramineum* (C. Muell.) Bartr. and the two are then of similar general appearance. However, they are quite distinct microscopically, the leaf of the latter being ovate, without auricles and with a short nerve which seldom extends beyond the mid-point of the leaf. Other pleurocarpous mosses occurring in similar flushed habitats include species of *Brachythecium*. *B. subplicatum*, the only species with rounded leaf auricles, is more robust than *Calliergon sarmentosum*, is invariably more or less julaceous throughout its length and is distinguishable by the characters given in the generic key above. There is also a likelihood of confusing submerged forms of *C. sarmentosum* with straight-leaved species of *Drepanocladus* but the nerve of the present species extending almost to the leaf apex provides a reliable means of recognition.

Taxonomy

C. sarmentosum was first described from Norway as *Hypnum sarmentosum* Wahlenb. (Wahlenberg, 1812) and was transferred to its present genus by Kindberg (1894). The holotype designated by Karczmarz (1971) (Wahlenberg 2596, S, Norska Nordland på fjället Kronan wid Rörstad, vi. 1807, ex herb. Swartzii) and isotypes (G. Wahlenberg, UPS, Nordland, *H. alpestre*, in saxis irrigatis alpis Kronan ad Rörstad, 17.vi.1807; G. Wahlenberg, UPS, Nordland, Rörstad, ex herb. Hartman) have been examined and the South Georgian specimens have been found to agree with them in all structural details. The only discrepancy is their deep red colour, which is rare in South Georgian material and never as pronounced as that of the type specimens, but this is considered to be without taxonomic significance.

Previous reports of *C. sarmentosum* on South Georgia (Cardot, 1906, 1908; Dixon, 1932) were accepted by Karczmarz (1971) in his monograph of the genus but his recognition of three varieties on the island has not been supported by the present study. Karczmarz' knowledge of sub-Antarctic *C. sarmentosum* was confined to duplicates of three Skottsberg specimens and a single gathering by Larsen, all of which were collected in the Cumberland Bay area of South Georgia and which he placed in three separate varieties, i.e. var. *beringianum* (Card. et Thér.) Grout, var. *fontinaloides* (Berggr.) Roth. and var. *fallaciosum* (Milde) Roth. The two aquatic varieties, *beringianum* and *fontinaloides*, were described as having acute leaf apices, being distinguished from each other by the soft erect stems and lingulate-cordate leaves of the former in contrast to the rigid, apically curved stems and narrowly lingulate leaves with porose basal cells of the latter. Thus, a gathering which Cardot (*in scheda*) ascribed to *C. sarmentosum* var. *patens* (C. Skottsberg 65, LD, Georgia austr., Cumberland Bay, Moraine fjorden in paludosis,

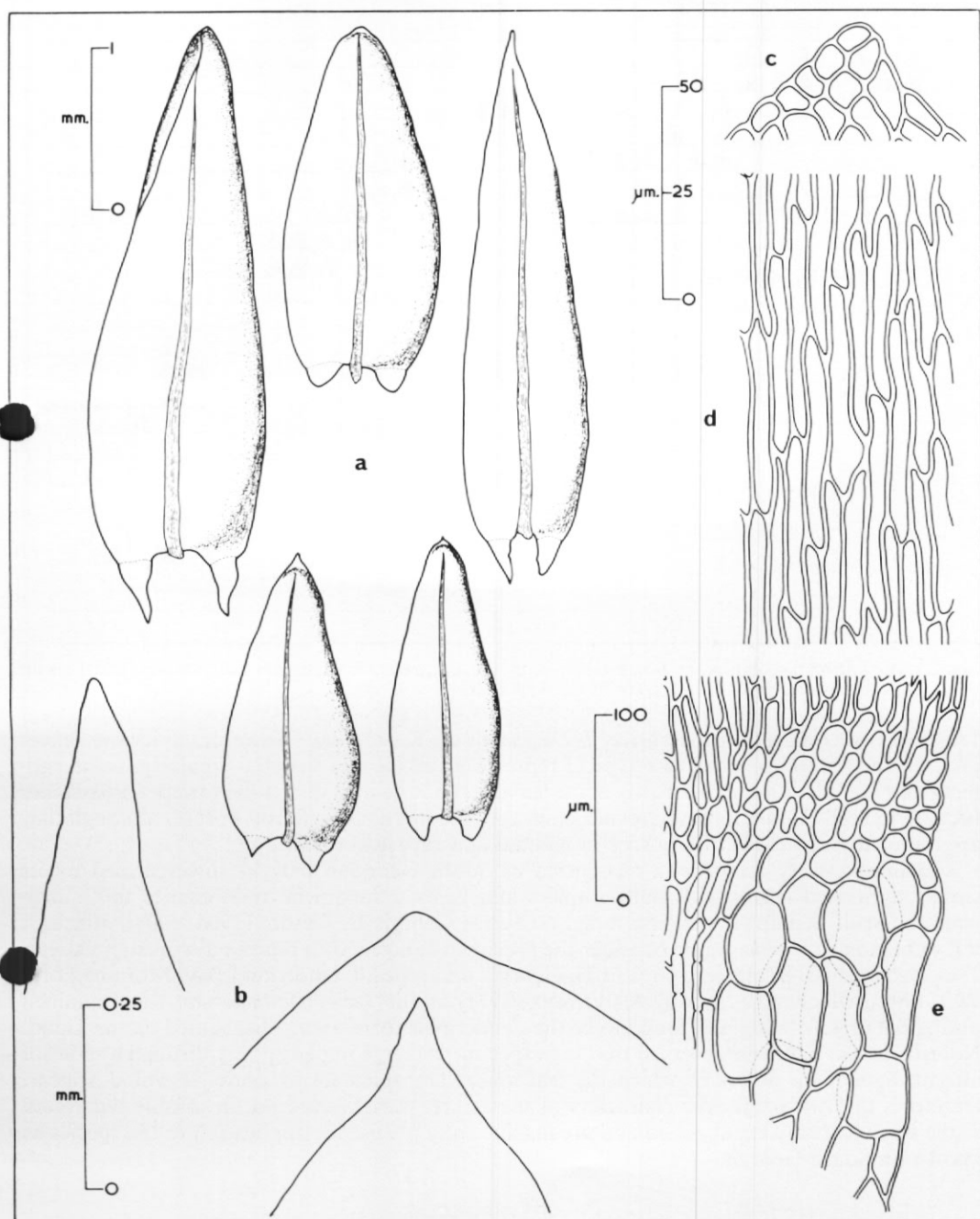


Fig. 1. *Calliergon sarmentosum*.

a. Stem leaves; b. Leaf apices; c. Apical leaf cells; d. Upper leaf cells; e. Alar cells.

Scales: upper left-hand for leaves, upper right-hand for apical cells and upper cells, median for alar cells, lowest for leaf apices.

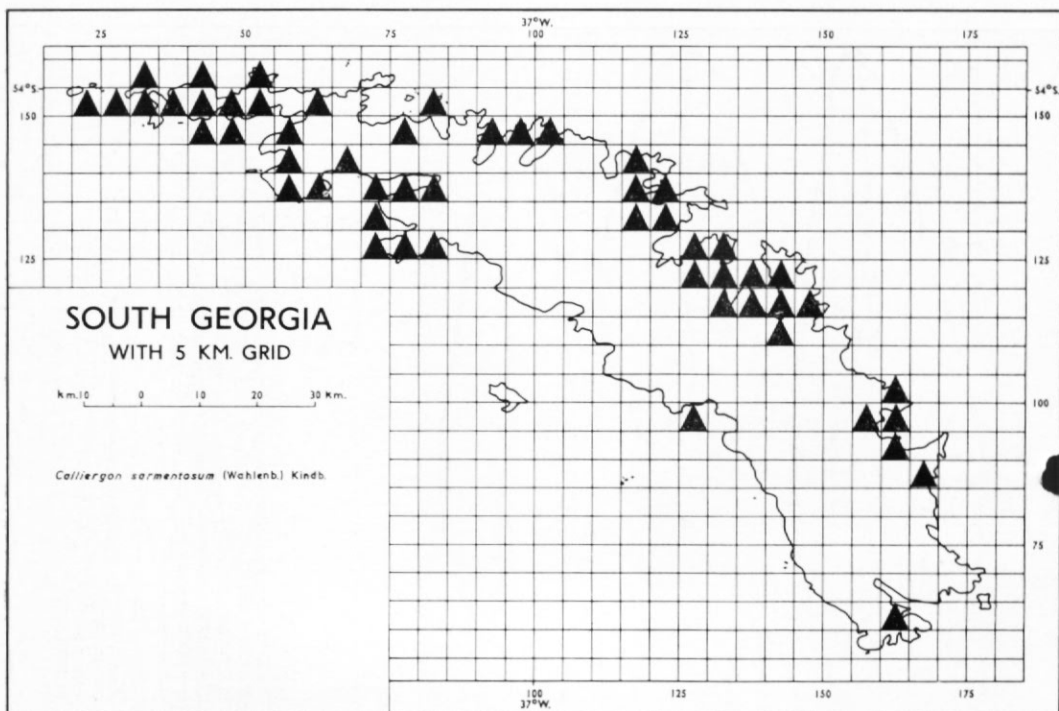


Fig. 2. The known distribution on South Georgia, by 5 km. squares, of *Calliergon sarmentosum*, based on the specimens and field records given in the Appendix.

18.iv.1909) was placed in the variety *beringianum* by Karczmarz. However, apiculate leaves are not uncommon in otherwise typical representatives of this variety. Similarly, some submerged material with long narrowly acute leaves cannot be included in the variety *fontinaloides* because the cells between nerve and auricular cells are not conspicuously porose, although they are frequently incrassate and porose in paludal and rupestral forms.

The third variety Karczmarz recognized as South Georgian may be distinguished by its closely appressed leaves with obtuse apices and bears a superficial resemblance to *C. stramineum* (Brid.) Kindb. It was first noted on South Georgia by Cardot (1906, 1908), although not until later *in scheda* did he consider the specimen concerned to represent a distinct variety. This specimen (*C. Skottsberg 66, L, LD, Georgia antarctica, Cumberland Bay, Moraine fiord* 18.iv.1909), which was cited by Karczmarz (1971) as the variety *fallaciosum*, was examined during the present study and found to be the slender pale form widely distributed on the island. Nevertheless, it has been observed that such specimens merge imperceptibly through a series of intermediates with others in which the leaf apices are apiculate or acute. It would appear, therefore, that the diagnostic characters of these three varieties are not invariably correlated in the ways Karczmarz suggested and are insufficiently precise for application to the species as known on South Georgia.

BRACHYTHECIACEAE

Brachythecium B.S.G.

South Georgian species of the genus *Brachythecium* occur in a wide variety of growth forms including mats, hummocks and extensive turves but they may be recognized by the triangular,

ovate or ovate-lanceolate leaves that are acuminate, sub-piliferous or piliferous with a single nerve to about mid-leaf. The leaves are concave or plicate, at times decurrent, with a margin that is \pm serrulate above and sometimes revolute, particularly towards the base. The revolute margin may be restricted to the lower part of the leaf below the widest point (Fig. 7a) or it may extend to the base of the acumen (Fig. 3a).

The leaf areolation consists of elongated cells with a differentiated alar group in the basal angles of the leaf, the term "alar" being used to include those in the auricles where the leaf is decurrent. The cells in the basal angles of the leaves may all be more or less quadrate or rectangular and regularly arranged in longitudinal rows (Fig. 7e). The size of this type of cell varies considerably between species but, even where they are large (Fig. 9e), they maintain their distinctive shape and arrangement, and are never inflated (cf. Fig. 13e). However, there are other species in which, even if similar alar cells are found, there are also irregular non-seriate cells in at least the decurrent parts of leaves (Fig. 5e) and these cells are sometimes inflated (Fig. 13e). Where leaf decurrency is broad, a further distinction can be made between tapering leaf auricles (Figs. 7a(1) and 9a(1)) and those that are rounded (Fig. 13a(1)).

Five of the six species have been found with fruit on the island although most of them rarely, the capsules, as far as is known, being uniformly shortly oblong, inclined and with a conical operculum. The setae are either scabrous or glabrous.

The South Georgian species of *Brachythecium* may be distinguished as follows:

- | | |
|--|----------------------------------|
| 1. Auricles rounded, of clearly defined, inflated cells | <i>Brachythecium subplicatum</i> |
| Auricles when present not as above | 2 |
| 2. Leaf margin intermittently recurved throughout | <i>B. austro-glareosum</i> |
| Leaf margin recurved only below widest point or plane throughout | 3 |
| 3. Leaf scarcely decurrent, margin plane or narrowly recurved below, seta glabrous or scabrous | 4 |
| Leaf broadly decurrent with tapering auricles, margin broadly recurved below, seta scabrous | 5 |
| 4. Leaf ovate to narrowly triangular with some irregular cells at the base of the alar group, stem \pm erect or ascending, seta glabrous | <i>B. austro-salebrosum</i> |
| Leaf triangular to broadly ovate-cordate without irregular cells at the base of the alar group, stem \pm prostrate, seta scabrous | <i>B. subpilosum</i> |
| 5. Leaf cordate, apex \pm obtuse with acumen, margin serrate at base of acumen only | <i>B. majusculum</i> |
| Leaf ovate, \pm gradually tapering to a fine apex, margin extensively serrulate to serrate above | <i>B. glaciale</i> |

Brachythecium austro-glareosum (C. Muell.) Kindb.

Syn. *Brachythecium austro-glareosum* var. *diffusum* Card.

Brachythecium gramontii Card.

Caespitose, pale green or yellowish above, whitish to light brown below, sericeous. Stems 1.0-4.5 cm., slender, erect, simple or sparingly divided, with short irregular branches, rhizoids in fascicles immediately below leaf insertions, reddish brown. Stem leaves (1.2-) 1.6-2.7 (-3.0) \times (0.4-) 0.5-1.0 (-1.2) mm., erecto-patent when wet, little altered and loosely appressed when dry, ovate-lanceolate, with long, fine, usually twisted apices, concave with single faint longitudinal striation on each side of nerve in lower part, scarcely or not decurrent. Margin intermittently recurved in basal and upper parts of leaf, \pm entire throughout. Branch leaves similar. Nerve well defined to mid-leaf or above, occasionally shorter and forked. Cells in main part of leaf (46.0-) 50.5-88.0 (-96.5) \times 6.5-10.5 μ m., linear, c. 5-12 times as long as broad, only the longitudinal walls incrassate and, particularly beside nerve and towards leaf base,

porose, the basal shorter and broader, the alar group \pm quadrate or rectangular, regularly seriate and incrassate. Female inflorescences gemmiform, narrowly ovate, the perichaetial bracts sericeous with spreading apices. Remainder unknown on South Georgia (Fig. 3).

Habitat and distribution (Fig. 4)

Typically found in dry or moist rock crevices or amongst shingle beside glacial melt streams. *B. austro-glareosum* also occurs on *Poa flabellata* peat and amongst its tussocks. Altitude 0–305 m.

Notes

B. austro-glareosum is similar to *B. austro-salebrosum* in growth form but the present species is slenderer and sericeous with scarcely plicate leaves. The compact seriate quadrate alar cells associated with a pronounced recurvature of the leaf margin are features shared to a greater or lesser extent by *B. glaciale*, *B. majusculum* and *B. subpilosum*. Of these, the closest resemblance is to *B. glaciale*, which may be distinguished by the greater decurrence of its ovate leaves which are usually serrulate to serrate in the upper part and recurved only below the widest point in contrast to the entire intermittently recurved margin throughout the leaf of *B. austro-glareosum*. In *B. majusculum*, a robust julaceous species, the deeply concave leaf which has a suddenly constricted apex and broad auricles is distinctive, whereas the triangular conspicuously plicate leaf with its finely serrulate margin recurved only at the extreme base, as well as the prostrate growth form, will separate *B. subpilosum*.

A gametophytic chromosome number of $n = 13$ has been reported for a South Georgian specimen of *B. austro-glareosum* (Newton, 1979).

Taxonomy

The grounds for separating *B. austro-glareosum* from *B. georgico-glareosum* (C. Muell.) Kindb., a species first described from South Georgia by Müller (1890), were questioned by Robinson (1972) but the latter taxon has since been reduced to synonymy with *B. austro-salebrosum* (Newton, 1979). In spite of broadening the original concept of *B. austro-salebrosum*, the independent status of *B. austro-glareosum* has been demonstrated statistically and its taxonomy and nomenclature have been discussed in detail elsewhere (Newton, 1979).

B. austro-glareosum was unknown from South Georgia prior to the present work (Newton, 1979).

Brachythecium austro-salebrosum (C. Muell.) Kindb.

Syn. *Brachythecium antarcticum* Card.

Brachythecium antarcticum var. *cavifolium* Card.

Brachythecium eurydictyon (C. Muell.) Kindb.

Brachythecium georgico-glareosum (C. Muell.) Kindb.

Brachythecium skottsbergii Card.

Densely caespitose forming extensive cushions, or in loose mats, pale green, yellowish or, more rarely, olive-green above, whitish to reddish or dark brown below, usually \pm glossy. Stems (1.5–) 2.5–9.5 (–14.0) cm., erect with few ascending branches, occasionally decumbent with ascending branches arising from only one side of stems, rhizoids sparse, dark reddish brown. Stem leaves (1.6–) 2.1–3.6 (–4.2) \times (0.7–) 1.0–1.6 (–2.0) mm., erecto-patent, closely imbricate, deeply plicate both wet and dry, ovate to narrowly triangular, gradually tapering to fine acumina, concave, slightly and narrowly decurrent. Margin plane, sometimes slightly revolute at the extreme base, entire or serrulate. Branch leaves similar. Nerve c. 0.50–0.75 length of leaf. Cells in main part of leaf (52.5–) 62.0–104.0 (–130.0) \times 7.0–11.5 μ m., pro-

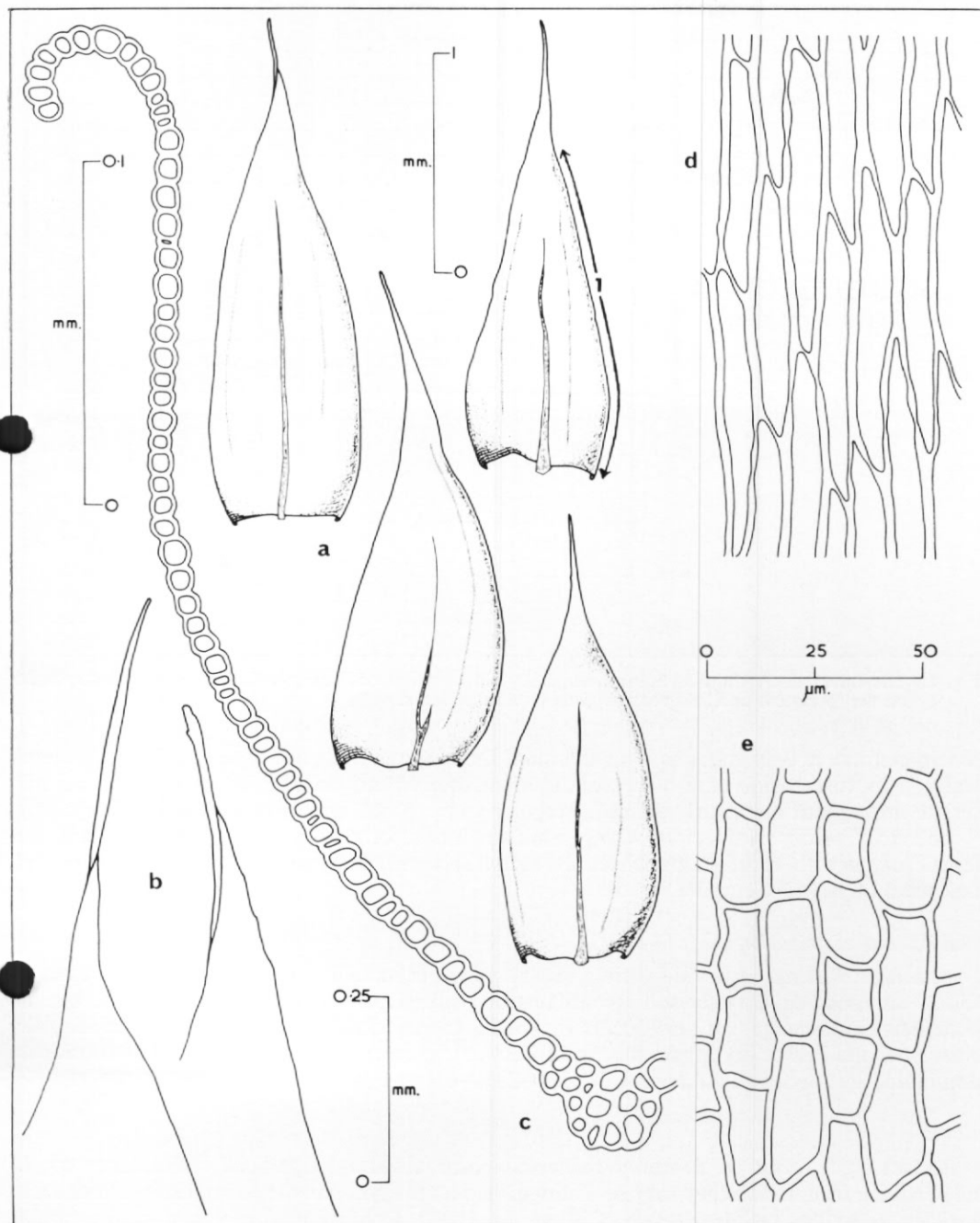


Fig. 3. *Brachythecium austro-glareosum*.
 a. Stem leaves showing (l) margin recurved to base of acumen; b. Leaf apices; c. Transverse section approximately half-way along leaf; d. Upper leaf cells; e. Alar cells.
 Scales: upper left-hand for leaf section, upper right-hand for leaves, median for cells, lowest for leaf apices.

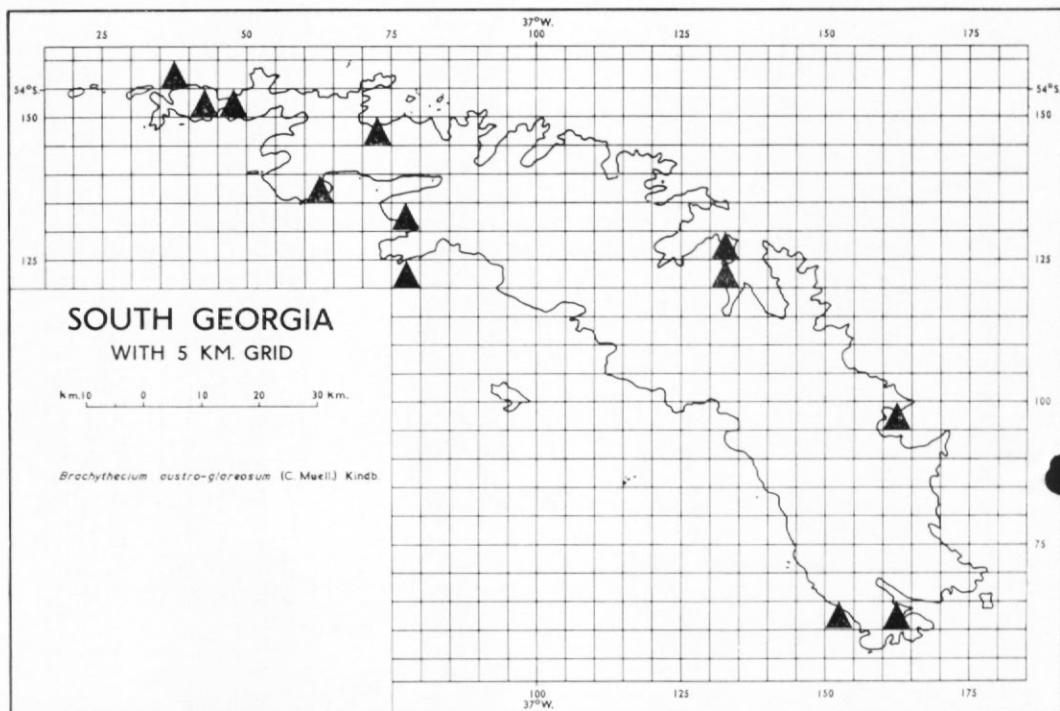


Fig. 4. The known distribution on South Georgia, by 5 km. squares, of *Brachythecium austro-glareosum*, based on the specimens and field records given in the Appendix.

senchymatous, *c.* 8–11 times as long as broad, the longitudinal walls usually thicker than end walls, \pm porose beside base of nerve, the basal shorter and broader, the alar group neither seriate throughout nor clearly defined, irregularly hexagonal, quadrate or rounded, frequently \pm collenchymatous. Autoecious with gemmiform inflorescences, the male \pm spherical and the female ovate with recurved perichaetial bracts. Seta orange, glabrous. Mature sporophytes unknown on South Georgia (Fig. 5).

Habitat and distribution (Fig. 6)

Although existing on a wide variety of wet substrata including peat, this species is usually found on rocks or gravelly soil by streams and lakes, particularly near waterfalls, and is occasionally submerged. It also occurs in *Rostkovia magellanica* bogs, amongst *Deschampsia antarctica* and in wet bryophyte flushes in *Festuca contracta* associations as well as on slopes dominated by species of *Acaena*. Altitude 0–229 (–610) m.

Notes

Robust erect forms of *B. austro-salebrosum* bear a strong superficial resemblance to *B. subplicatum*, from which they may be distinguished by the gradually tapering leaves which lack auricles, as well as by the absence of julaceous shoots. Confusion with *B. majusculum* could occur in the field although that species never forms extensive cushions or hummocks and, moreover, has decurrent leaves with \pm suddenly contracted apices. In very wet or submerged habitats the growth form of *B. austro-salebrosum* is lax with \pm spreading widely spaced leaves giving the appearance of some species of *Drepanocladus*. In these situations the leaf shape

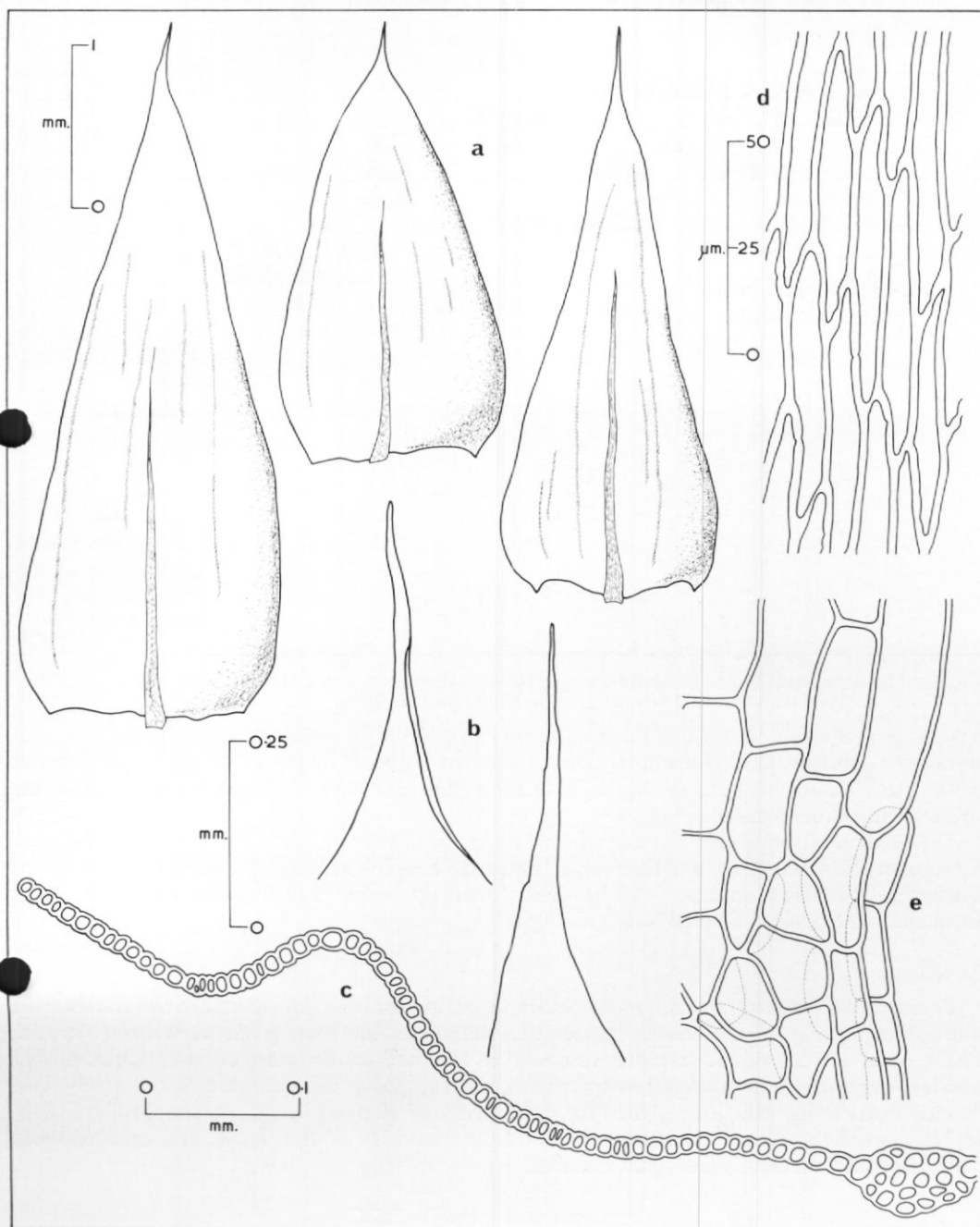


Fig. 5. *Brachythecium austro-salebrosum*.

a. Stem leaves; b. Leaf apices; c. Transverse section approximately half-way along leaf; d. Upper leaf cells; e. Alar cells.

Scales: upper left-hand for leaves, upper right-hand for cells, median for leaf apices, lowest for leaf section.

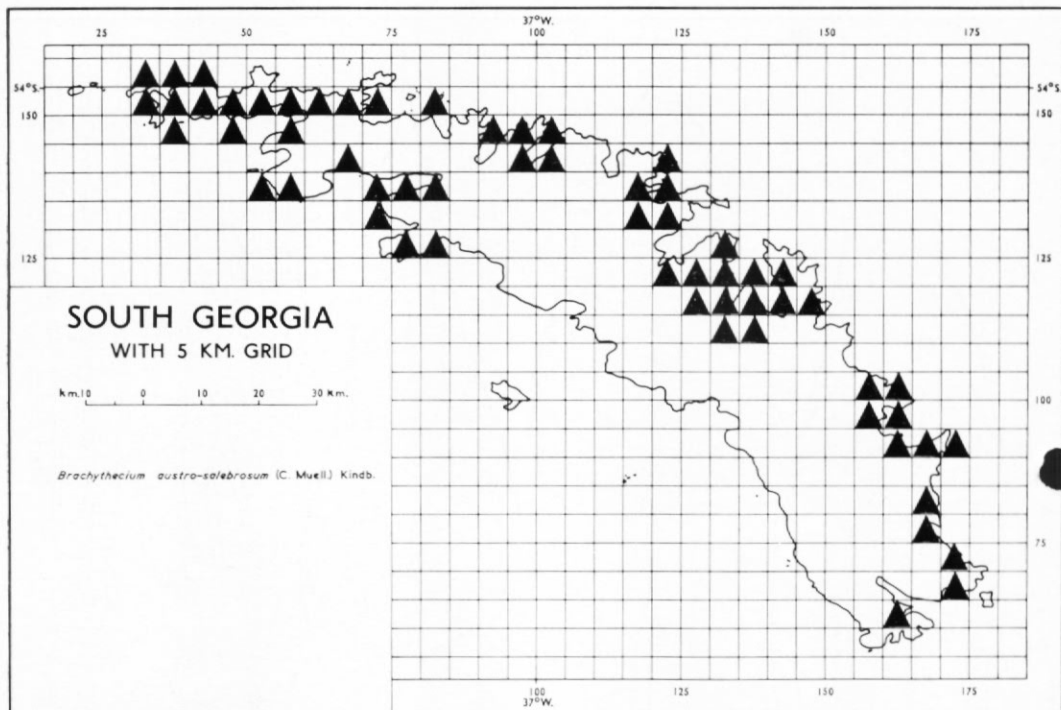


Fig. 6. The known distribution on South Georgia, by 5 km. squares, of *Brachythecium austro-salebrosum*, based on the specimens and field records given in the Appendix.

remains diagnostic, as a \pm abruptly defined acumen is absent from the straight-leaved species of *Drepanocladus* on South Georgia. In addition, the alar cells of *Drepanocladus* species are more clearly differentiated.

The haploid chromosome number of $n = 10$ has been reported for specimens collected near Grytviken (Newton, 1972) and from King Edward Point (Newton, 1979) but the species is not cytologically uniform since $n = 13$ has been found (Newton, 1979) in three other specimens from the same general area of South Georgia.

Taxonomy

B. austro-salebrosum, as it occurs on South Georgia, has been considered in the context of a number of closely related austral species, full details having been given elsewhere (Newton, 1979). Since no taxonomic significance could be attached to the considerable amount of leaf and leaf-cell variation between type specimens, several species were reduced to synonymy with *B. austro-salebrosum*. Of these, the type description of *B. georgico-glareosum* (Müller, 1890) represents the earliest record of the species on the island. *B. skottsbergii* (Cardot, 1906, 1908) was also based on South Georgian material.

Brachythecium glaciale B.S.G.

Intricately matted, rarely caespitose, bright green, brownish or, occasionally, yellowish green above, becoming brown below. Stems 1.0–5.0 (–6.5) cm., prostrate or ascending, irregularly divided or sub-pinnately branched, rhizoids few in fascicles immediately below leaf insertions, brown. Stem leaves (1.0–) 1.2–2.1 (–2.5) \times (0.5–) 0.6–1.1 (–1.5) mm.,

appressed or erecto-patent, little altered on drying, rarely slightly falcate, ovate, gradually tapering to long fine acumina, concave, non-plicate or with two very faint plicae in upper half, longly and broadly decurrent. Margin recurved and entire below widest point of leaf, plane and serrulate to serrate above. Branch leaves similar but narrower. Nerve well defined to about mid-leaf. Cells of main part of leaf $(30.0-40.0-80.0 (-105.0) \times 5.0-11.5 \mu\text{m.})$, elongated rhomboidal, hexagonal or shortly vermicular with rounded ends, *c.* 6-10 times as long as broad, the longitudinal walls incrassate and, particularly towards leaf base, \pm porose, the basal shorter, the alar group numerous, compact, seriate, quadrate or shortly rectangular, evenly thickened but becoming thin-walled and narrowly rectangular in decurrent portion. Autoecious with gemmiform inflorescences, the male broadly ovate and the female shortly cylindrical with reflexed perichaetial bracts. Seta pale orange, scabrous. Mature sporophytes unknown on South Georgia (Fig. 7).

Habitat and distribution (Fig. 8)

Rock crevices, or rock faces in the vicinity of waterfalls, are the commonest habitats for *B. glaciale* but the species is also frequent on a wide variety of stony ground, including crevices on a dry scree and among glacial detritus, as well as on gravel by paths and streams. It occurs only rarely in the absence of a stony or rocky substrate at the edges of peat pools among *Poa flabellata*. Altitude 0-305 (-594) m.

Notes

Robust much-branched forms of *B. glaciale* could be mistaken for *B. subpilosum* but the plicate, scarcely decurrent triangular stem leaves of the latter contrast strongly with the generally non-plicate broadly decurrent ovate stem leaves of *B. glaciale*. Unlike the present species, *B. subpilosum* is also frequently fertile. Some very robust specimens of *B. glaciale* bear a superficial resemblance to *B. majusculum* but differences in leaf shape and the degree of seriation will distinguish between them. Differences from *B. austro-glareosum* have been pointed out in the notes associated with that species' description.

A number of specimens of *B. glaciale* from localities in Echo Pass and Bore Valley, around Grytviken and near Brown Mountain have been reported with the gametophytic chromosome number of $n = 8$ (Newton, 1979).

Taxonomy

A taxonomic revision of South Georgian *Brachythecium* (Newton, 1979) has shown that this clearly defined and generally lowland species is indistinguishable from type material of *B. glaciale*, a widespread species of alpine areas of Europe. Apart from an early South Georgian specimen of *B. glaciale* that was incorrectly determined by Dixon (*in scheda*) as *B. skottsbergii* and one from South America (C. Skottsberg 173, S, Tierra del fuego, Mont Martiae, supra Ushuaia, 1,135 m.s.m., 11.iii.1902) which Cardot (*in scheda*) referred to *B. subpilosum*, it would appear that Southern Hemisphere *B. glaciale* has been overlooked in the past. Possible reasons for this have been discussed in detail elsewhere (Newton, 1979).

Brachythecium majusculum M. E. Newton

Syn. Brachythecium majusculum Dus. nom. nud.

Loosely caespitose or matted, yellowish green or, occasionally, bright green above, highly glossy, whitish to dull brown below. Stems 2.5-8.0 cm., robust, ascending, with branches confined to one side, or irregularly to sub-pinnately branched, rhizoids sparse, dark brown. Stem leaves $(1.8-2.0-3.1 (-3.9) \times (0.9-1.2-1.9 (-2.6) \text{ mm.})$, erecto-patent or imbricate and forming \pm julaceous shoots, ovate-cordate, the apices obtuse with channelled acumina,

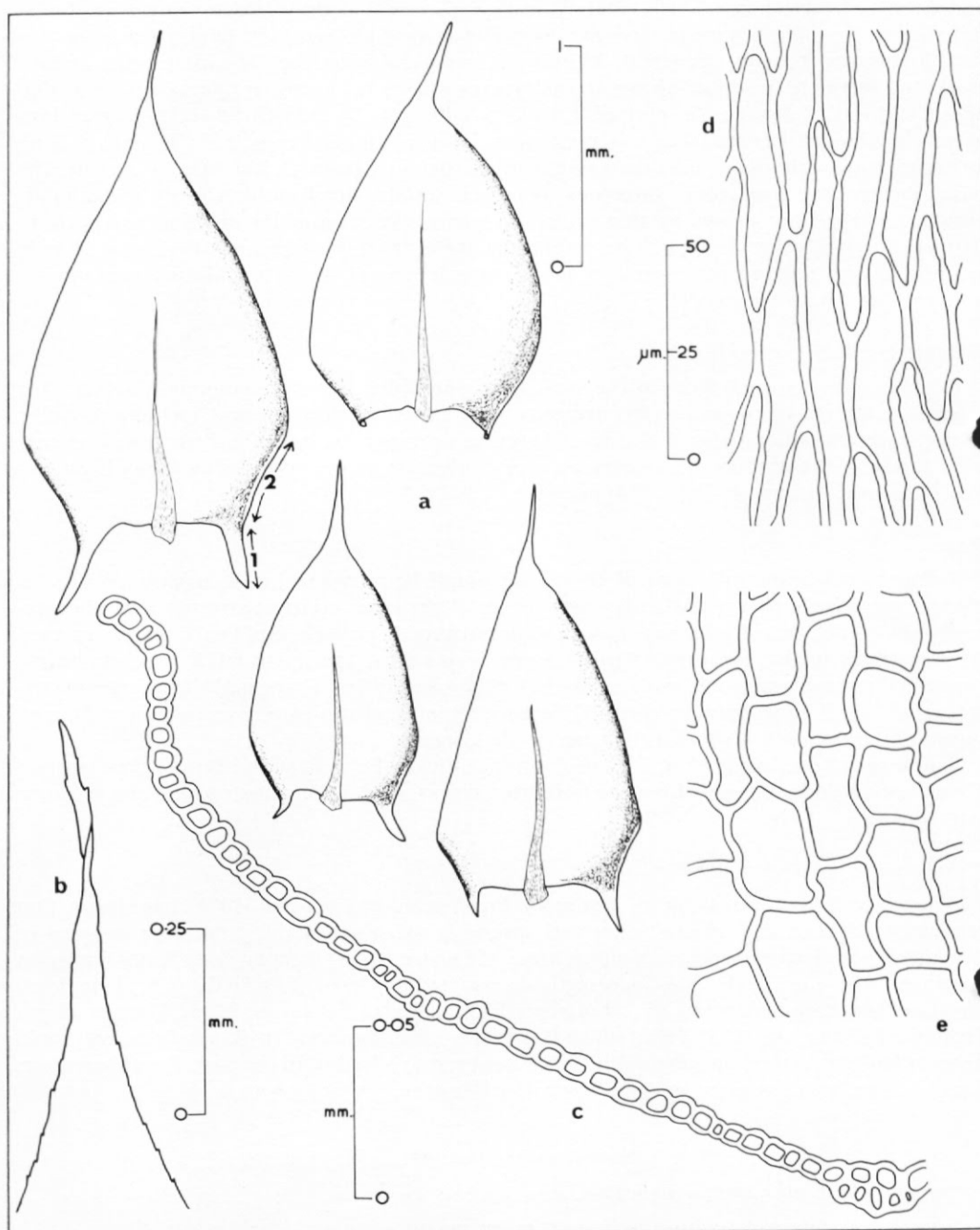


Fig. 7. *Brachythecium glaciale*.

a. Stem leaves showing (1) tapering leaf auricle and (2) recurvature of margin below widest point of leaf; b. Leaf apex; c. Transverse section just below widest point of leaf; d. Upper leaf cells; e. Alar cells. Scales: upper left-hand for leaves, upper right-hand for cells, lower left-hand for leaf apex, lower right-hand for leaf section.

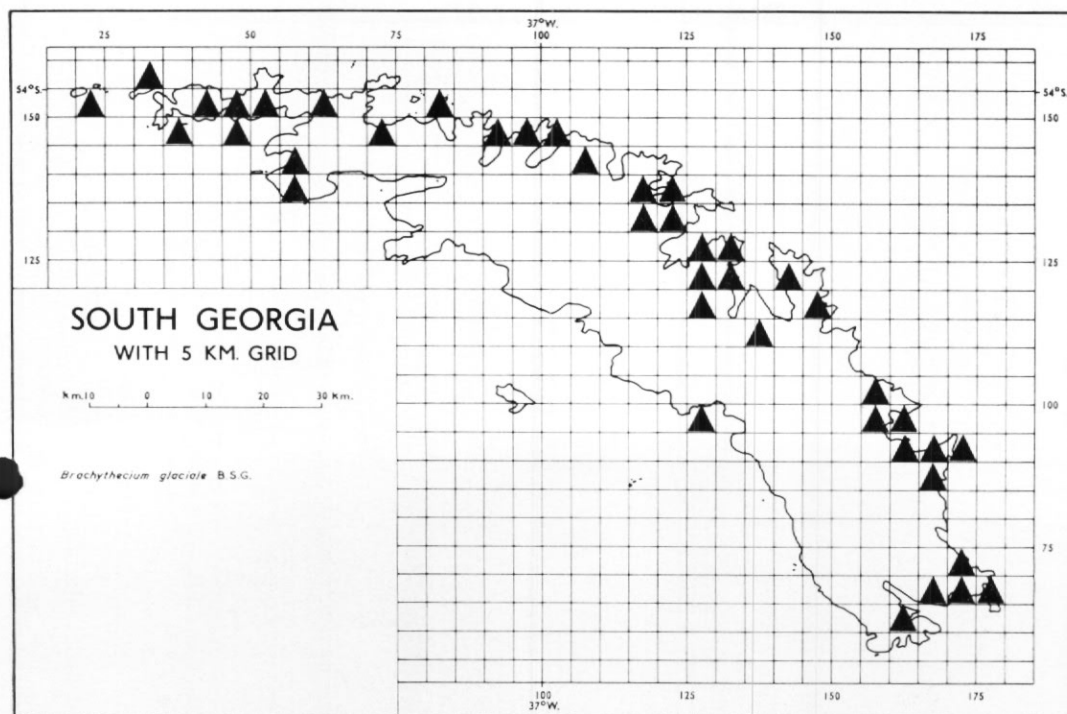


Fig. 8. The known distribution on South Georgia, by 5 km. squares, of *Brachythecium glaciale*, based on the specimens and field records given in the Appendix.

rarely gradually tapering, deeply concave on each side of nerve in both wet and dry states, longly and broadly decurrent with \pm clearly defined triangular auricles. Margin revolute below widest point of leaf, plane above, slightly serrate just below acumen, rarely entire throughout. Branch leaves similar. Nerve short, *c.* 0.25–0.50 length of leaf, sometimes forked. Cells of main part of leaf (40.0–) 65.0–115.0 (–145.0) \times 6.5–12.5 $\mu\text{m.}$, vermicular, *c.* 6–12 times as long as broad, the cell walls of uniform thickness or slightly collenchymatous, the basal shorter and broader, \pm incrassate and porose, the alar group seriate quadrate or shortly rectangular, slightly incrassate, non-porose, sometimes becoming narrowly rectangular and thin-walled in auricles. Autoecious with gemmiform inflorescences, the male broadly ovate and the female narrowly ovate with recurved perichaetial bracts. Seta *c.* 1.0–1.5 cm., orange, scabrous above. Calyptra and operculum unknown on South Georgia. Capsule *c.* 2.3–2.5 \times 0.6–0.9 mm., broadly oblong, inclined, asymmetrical, dark reddish brown to black; exothelial cells irregularly elongate, evenly thickened or with longitudinal walls more incrassate than terminal walls. Peristome double, the 16 outer teeth orange becoming paler in upper one-third, transversely striate below, smooth above, with basal membrane of three to four rows of cells, inner peristome hyaline, \pm perfect, with high basal membrane. Spores *c.* 17–21 $\mu\text{m.}$, spherical, green, almost smooth (Fig. 9).

Habitat and distribution (Fig. 10)

A plant of wet or moist habitats by streams and waterfalls, in rock crevices, amongst *Deschampsia antarctica* and *Poa flabellata* and on banks of *Chorisodontium aciphyllum* (Hook. f. et Wils.) Broth., *B. majusculum* is mainly confined on South Georgia to very low altitudes at the northern and southern ends of the island. Altitude 0–15 (–122) m.

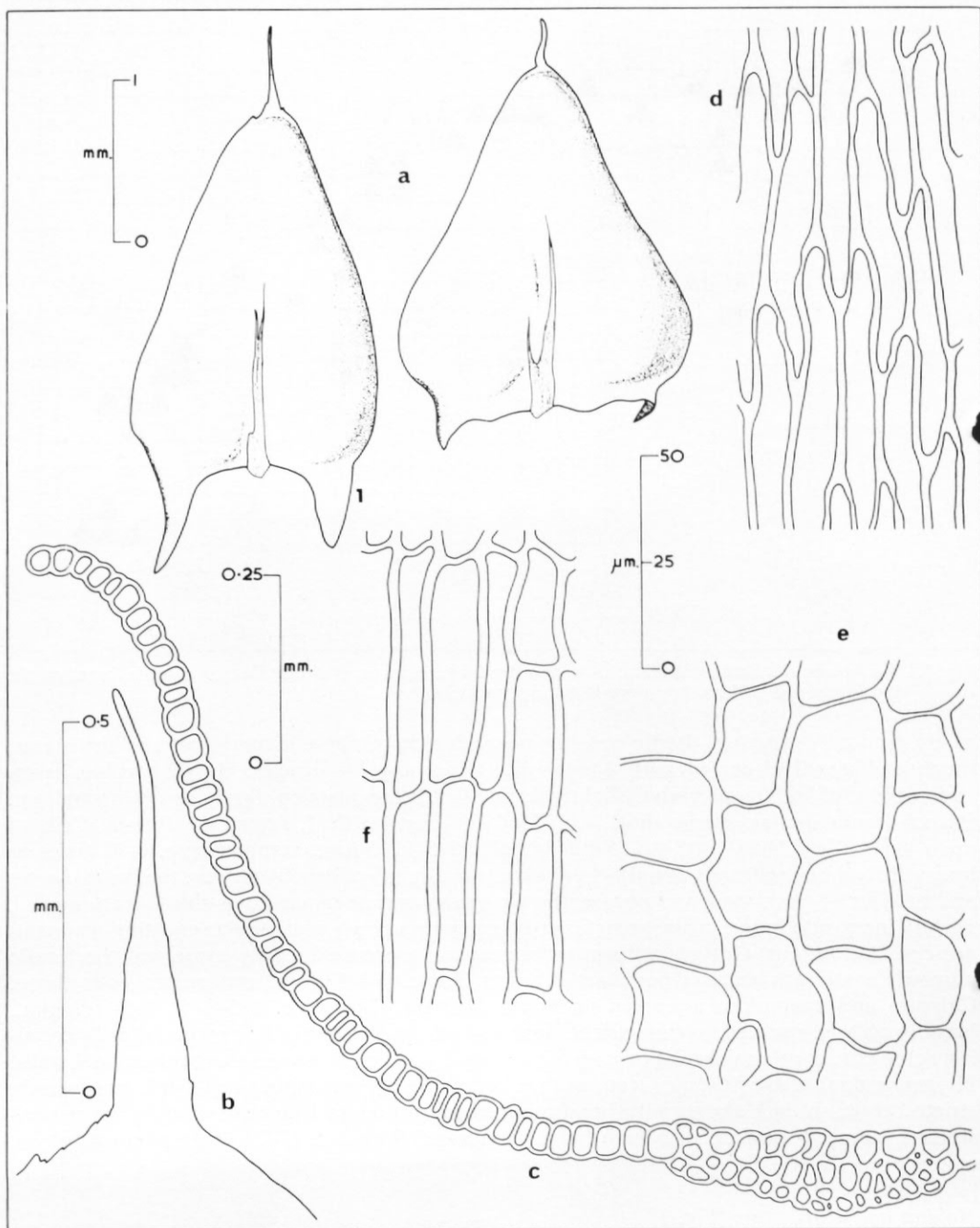


Fig. 9. *Brachythecium majusculum*.

a. Stem leaves showing (1) tapering leaf auricle; b. Leaf apex; c. Transverse section just below widest point of leaf; d. Upper leaf cells; e. Alar cells; f. Cells towards base of leaf auricle.

Scales: uppermost for leaves, median left-hand for leaf section, median right-hand for cells, lowest for leaf apex.

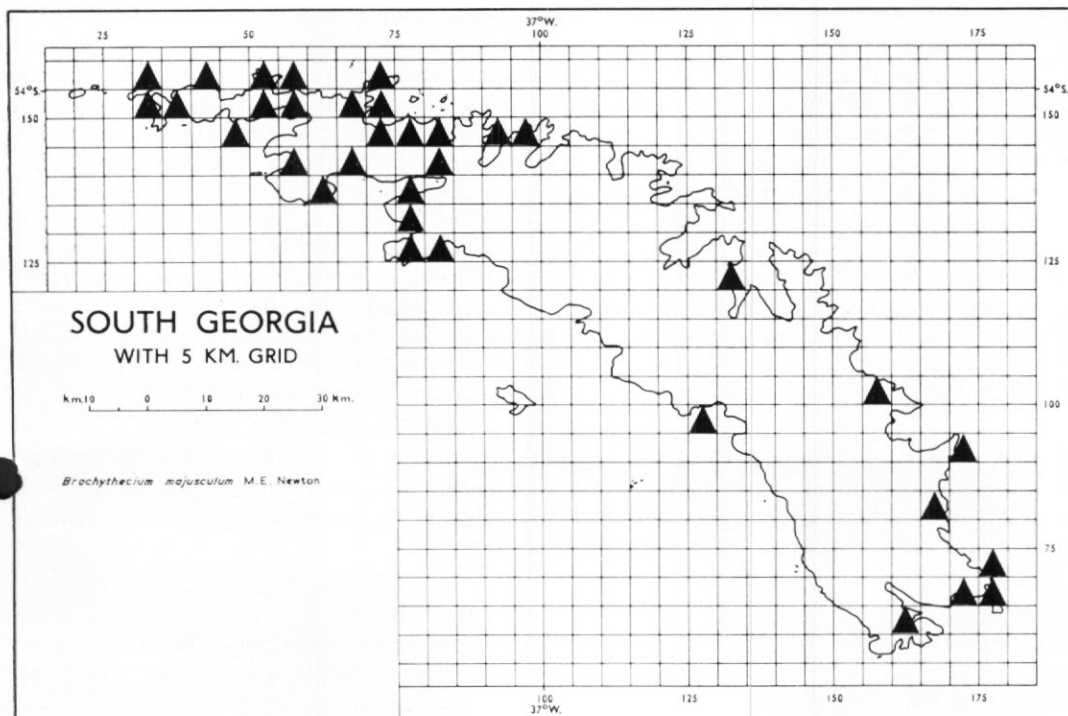


Fig. 10. The known distribution on South Georgia, by 5 km. squares, of *Brachythecium majusculum*, based on the specimens and field records given in the Appendix.

Notes

The characters used to separate *B. majusculum* from *B. austro-salebrosum*, the species with which it is most likely to be confused in the field, have been discussed under *B. austro-salebrosum*. The distinctions between *B. majusculum* and robust forms of *B. glaciale* are considered under the latter species.

Taxonomy

The taxonomic limits of *B. majusculum* were defined during a revision of the genus on South Georgia (Newton, 1979). The species is believed to have been previously undescribed and, since the South Georgian material is identical to one of five South American specimens to which Dusén (1903) applied the *nomen nudum*, *B. majusculum* Dus., this epithet was validated (Newton, 1974).

Brachythecium subpilosum (Hook. f. et Wils.) Jaeg.

Forming dense mats, bright green to yellowish green above, frequently somewhat glossy, whitish to light brown below. Stems (1.0–) 1.5–6.0 (–11.0) cm., rigid, prostrate, with erect, fastigiate or, less frequently, sub-pinnate branches, rhizoids abundant on ventral side of stem, reddish brown to dark brown. Stem leaves (1.1–) 1.5–2.6 (–3.1) × (0.5–) 0.7–1.3 (–1.6) mm., erecto-patent to spreading, little altered on drying, triangular to broadly ovate-cordate, the apices gradually, less commonly ± abruptly, produced into long sub-piliferous points, conspicuously plicate, scarcely or not decurrent. Margin recurved at extreme base of leaf, plane above, finely serrulate throughout, occasionally ± entire. Branch leaves similar but narrower.

Nerve *c.* 0.45–0.65 length of leaf, well defined. Cells of main part of leaf (50.0–) 65.0–125.0 (–160.0) \times 6.0–9.5 (–13.0) $\mu\text{m.}$, linear, straight with oblique end walls or narrowly rounded terminally, *c.* 9–16 times as long as broad, the longitudinal walls thicker than transverse walls but not porose, the basal shorter, a little wider and slightly porose, the alar group seriate, quadrate, rounded or rectangular, regularly incrassate or, more rarely, slightly collenchymatous. Autoecious with gemmiform inflorescences, the male broadly ovate with spreading perigonal bracts, the female cylindrical with apically reflexed perichaetial bracts. Seta *c.* 1.2–2.0 cm., orange, scabrous, rarely almost smooth. Calyptra unknown on South Georgia. Capsule *c.* 1.6–2.4 \times 0.7–1.1 mm., shortly oblong, inclined, asymmetrical, blackish brown; exothecial cells \pm collenchymatous or with longitudinal walls more incrassate than transverse walls. Operculum rounded-conical, exannulate. Peristome double, the 16 outer teeth pale orange, transversely striate below but paler and papillose above, basal membrane of two rows of cells, inner peristome hyaline from high basal membrane, processes filiform, or wider and perforate, cilia absent. Spores *c.* 17–24 $\mu\text{m.}$, spherical, green, smooth (Fig. 11).

Habitat and distribution (Fig. 12)

B. subpilosum is a very common moss in a wide variety of habitats including moist and wet rock crevices, soil and scree slopes, sometimes growing among species of *Acaena*, *Poa flabellata* and, more rarely, *Rostkovia magellanica*. Altitude 0–457 m.

Notes

Confusion is unlikely to occur except with some of the more robust much-branched forms of *B. glaciale* but, as pointed out under that species, differences in shape and decurrence of the leaves will readily separate the two taxa.

South Georgian *B. subpilosum*, in which the haploid chromosome number of $n = 13$ is known (Newton, 1979), was collected from Aniline Island, Dartmouth Point.

Taxonomy

Cardot (1906, 1908) first reported *B. subpilosum* from South Georgia and Dixon (1920) provided a further record. The validity of these records has been confirmed by comparison with type material, a detailed discussion of the taxonomy of the species and related taxa having been provided elsewhere (Newton, 1979).

A single South Georgian gathering exists which, in some ways, resembles *B. subpilosum* and *B. glaciale*. This specimen (Clarke and Greene CG 352, AAS, Echo Pass, leg. S.W. Greene, 2.ii.1968) has strongly falcate leaves with scarcely revolute margins but, because they are only slightly decurrent with few but quadrate alar cells, it will key out to *B. subpilosum*. The cell structure suggests a possible affinity with *B. glaciale* or *B. subpilosum* but all South Georgian specimens of the latter species have invariably been found to have straight leaves. A tendency to falcation has been noted in some undoubted specimens of *B. glaciale* but in all these cases the leaves are strongly decurrent with revolute basal margins. Moreover, the branches of *B. subpilosum* are typically \pm erect, whereas those of Clarke and Greene CG 352 are spreading and \pm prostrate resembling those of *B. glaciale*. In the arrangement of its leaves and branches, as well as in its leaf and cell morphology, this specimen also resembles *B. paradoxum* (Hook. f. et Wils.) Jaeg., a species described from southern South America (Hooker and Wilson, 1844) but also known from Iles Kerguelen and New Zealand. Examination has shown that the South Georgian specimen is similar to the type specimen of *B. paradoxum* (J. D. Hooker 170, BM, Hermite Island, Cape Horn, Antart. Exp. 1839–1843) as well as to four syntypes of *B. kerguelense* Broth. (Brotherus, 1906) (Urbansky, H, Anemometerplatz, Kerguelen, 16.ix.1902; Urbansky, H, Umgebung der Station, Kerguelen, 22.ix.1902; Urbansky, H, Thal zw. Station und Mittelberg, Kerguelen, 18.ix.1902; Werth, H, Felspartie links am Abgang z. Kurtzhaven,

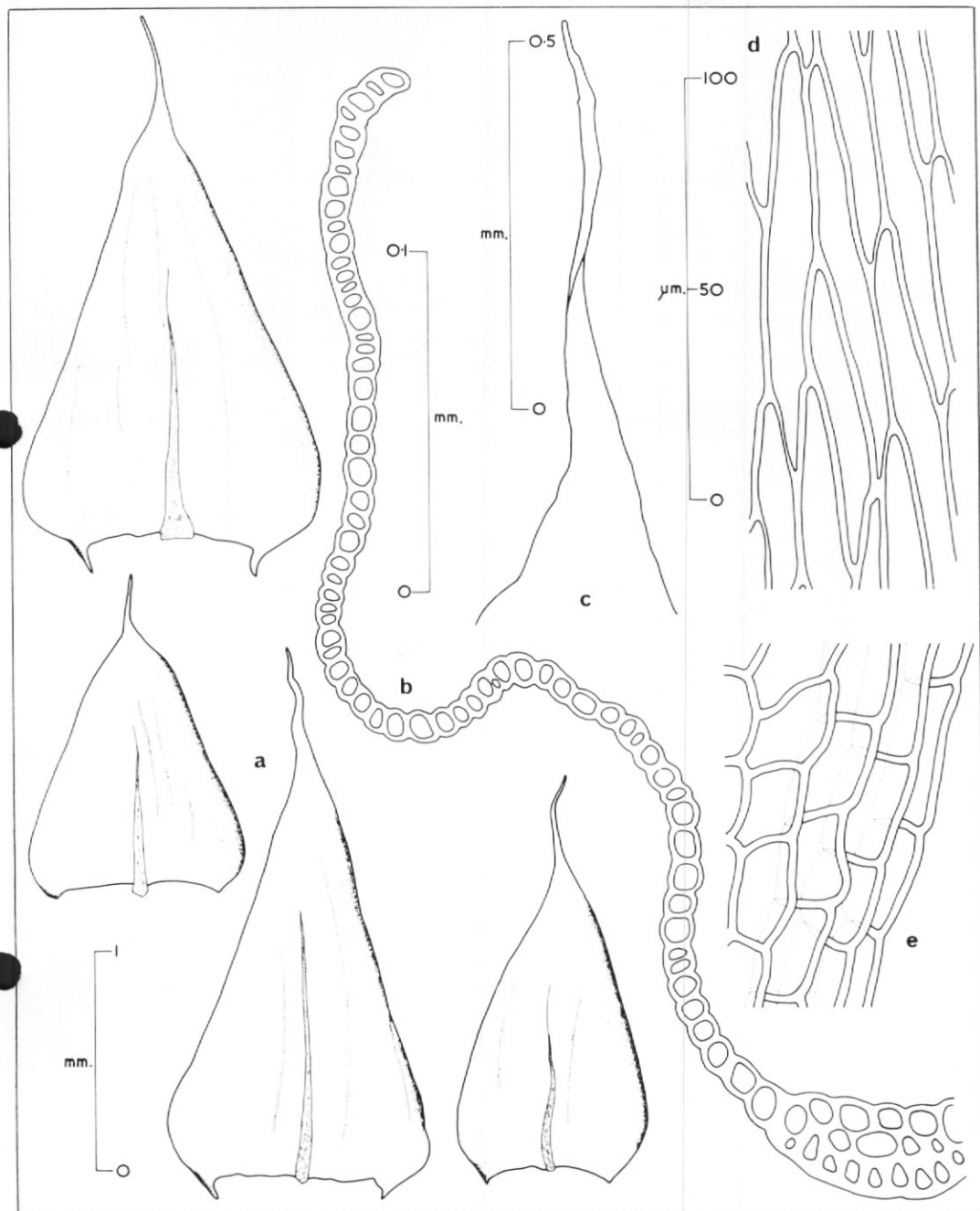


Fig. 11. *Brachythecium subpilosum*.

a. Stem leaves; b. Transverse section approximately at widest point of leaf; c. Leaf apex; d. Upper leaf cells; e. Alar cells.

Scales: upper left-hand for leaf section, upper median for leaf apex, upper right-hand for cells, lowest for leaves.

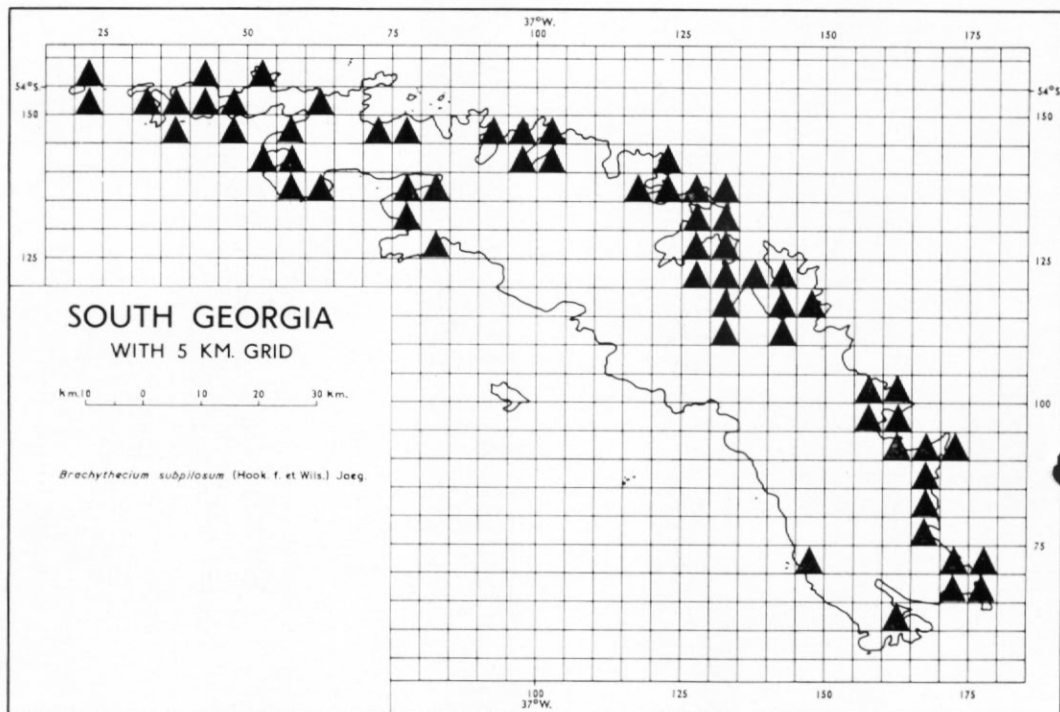


Fig. 12. The known distribution on South Georgia, by 5 km. squares, of *Brachythecium subpilosum*, based on the specimens and field records given in the Appendix.

Kerguelen, 24.ii.1903), a species which van Zanten (1971) reduced to synonymy with *B. paradoxum* although Brotherus (1906) treated them as distinct.

Despite failing to detect significant differences between the Clarke and Greene specimen and type and other material of *B. paradoxum*, insufficient material is available from South Georgia to establish the presence of the species on the island, particularly in view of Dixon's (1929, p. 323) observation that occasional falcate forms are known to occur in otherwise typically straight-leaved species of *Brachythecium*.

The possibility that the South Georgian specimen is not a species of *Brachythecium* has also been considered in view of its superficial similarity to *Drepanocladus uncinatus*, which is common on the island. According to van Zanten (1971), the epidermal cells of the stem in *D. uncinatus* are larger, as seen in cross-section, and have thinner outer walls than those within, whereas in *B. paradoxum* they are scarcely differentiated and have incrassate outer walls. On this basis, the Clarke and Greene specimen is not *D. uncinatus* since the stems lack a clearly defined hyalodermis.

Brachythecium subplicatum (Hamp.) Jaeg.

Syn. Calliergon joveti-asti J. P. Hébrard

Forming deep turves, pale green or yellowish above, whitish or pale brown below, glossy. Stems c. 5–16 cm. long, robust, erect, with few ascending branches, rhizoids sparse, dark reddish brown. Stem leaves (1.9–) 2.5–3.4 (–3.6) × (0.9–) 1.3–1.7 (–2.0) mm., closely imbricate, causing the shoots to become julaceous when wet, becoming irregularly displaced on drying, broadly ovate to elliptical, the apices broad, ± suddenly contracted to short sub-

piliferous points, deeply concave, non-plicate but with faint irregular striae when dry, decurrent with small rounded auricles. Margin plane, entire or slightly serrulate. Branch leaves similar. Nerve *c.* 0.50–0.75 length of leaf, well defined. Cells of main part of leaf (59.0–) 65.0–100.5 (–114.5) \times 7.0–10.0 μ m., vermicular, *c.* 8–12 times as long as broad, with \pm incrassate and porose walls which are thicker terminally, the basal shorter, broader and more porose, the alar inflated and hyaline in the auricles. Autoecious with gemmiform inflorescences, the male broadly ovate and the female cylindrical with apically spreading perichaetial bracts. Seta *c.* 2.0 cm., orange, glabrous. Calyptra and operculum unknown on South Georgia. Capsule *c.* 1.5 \times 1.0 mm., short, inclined, asymmetrical, dark brown; exothecial cells \pm quadrate, regularly incrassate (Fig. 13).

Habitat and distribution (Fig. 14)

A fairly uncommon species on South Georgia, *B. subplicatum* is known mainly from *Juncus scheuchzerioides* flushes and *Rostkovia magellanica* bogs but it also occurs in shallow water by the edges of lakes and streams and, occasionally, on wet rocks by waterfalls. Altitude 0–107 m.

Notes

B. subplicatum is readily distinguished by its leaves with \pm suddenly contracted apices and rounded auricles and is only likely to be mistaken for some of the robust erect forms of *B. austro-salebrosum*. Means of discrimination have been provided in the notes accompanying the description of that species, while points of difference from *Calliergon sarmentosum*, with which it may grow in flushed habitats, will be found under the description of *C. sarmentosum*.

A gametophytic chromosome count of $n = 13$ has been reported for a specimen of *B. subplicatum* from the southern end of Bore Valley above Grytviken (Newton, 1979).

Taxonomy

B. subplicatum is a distinct species, which on South Georgia displays a narrow range of variation discussed in detail elsewhere (Newton, 1979). At an early stage its identity was confused by Mitten (1869), who regarded *B. subplicatum* as no more than a large form of *B. subpilosum*, but Cardot (1908) recognized their separate status and provided the first correct report of *B. subplicatum* from South Georgia (Cardot, 1906, 1908).

ACKNOWLEDGEMENTS

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Assistance in the use of the data bank and in the preparation of the Appendix from Mrs. D. M. Greene is gratefully acknowledged, as are helpful comments on specimens of *B. glaciale* by Mr. A. C. Crundwell. I am also grateful to Dr. S. W. Greene for comments on the manuscript and to Professor J. G. Hawkes, Mason Professor of Botany, University of Birmingham, for facilities in his department.

MS. received 17 February 1976

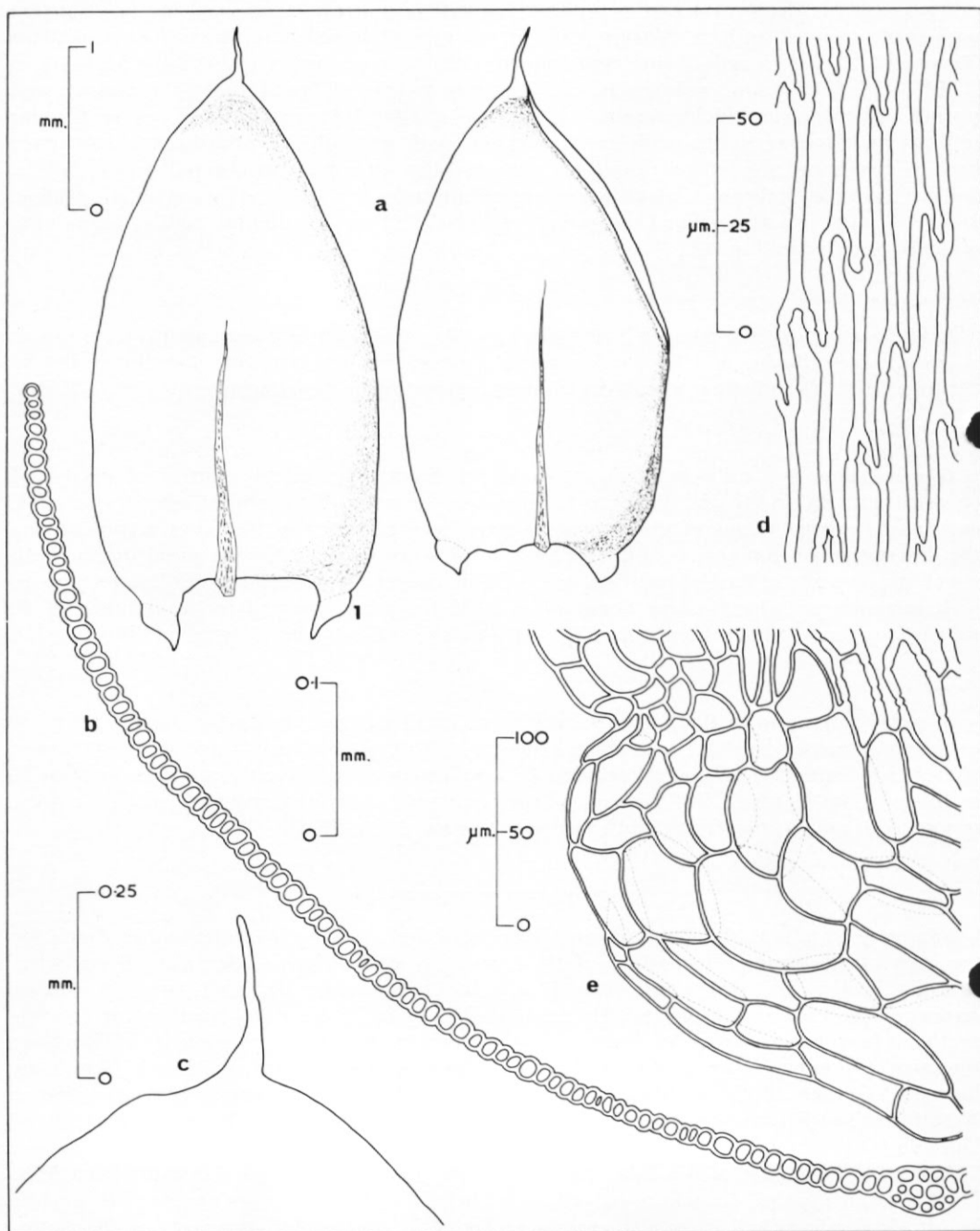


Fig. 13. *Brachythecium subplicatum*.

a. Stem leaves showing (1) rounded leaf auricle; b. Transverse section approximately half-way along leaf; c. Leaf apex; d. Upper leaf cells; e. Alar cells.

Scales: upper left-hand for leaves, upper right-hand for upper cells, lower left-hand for leaf apex, lower median for leaf section, lower right-hand for alar cells.

- MÜLLER, C. 1890. Bryologia austro-georgiae. (In NEUMAYER, G. *Die Internationale Polarforschung 1882-83. Die Deutschen Expeditionen und ihre Ergebnisse*. Berlin, A. Asher and Co., Bd. 2, 279-322.)
- NEWTON, M. E. 1972. Chromosome studies in some South Georgian bryophytes. *British Antarctic Survey Bulletin*, No. 30, 41-49.
- . 1974. Notes on Antarctic bryophytes: V. *Brachythecium majusculum* M. E. Newton, sp. nov. *British Antarctic Survey Bulletin*, No. 39, 45-48.
- . 1979. A taxonomic assessment of *Brachythecium* on South Georgia. *British Antarctic Survey Bulletin*, No. 48, 119-32.
- ROBINSON, H. E. 1972. Observations on the origin and taxonomy of the Antarctic moss flora. (In LLANO, G. A., ed. *Antarctic terrestrial biology*. Washington D.C., American Geophysical Union, 163-77.) [Antarctic Research Series, Vol. 20.]
- VAN ZANTEN, B. O. 1971. Musci. (In VAN ZINDEREN BAKKER, E. M., WINTERBOTTOM, J. M. and R. A. DYER, ed. *Marion and Prince Edward Islands. Report on the South African Biological and Geological Expedition, 1965-1966*. Cape Town, A. A. Balkema, 173-227.)
- WAHLENBERG, G. 1812. Musci. (In *Flora Lapponica exhibens plantas geographicæ et botanice consideratas, in Lapponiis Suecicis scilicet Umensi, Pitensi, Lulensi, Tornensi et Kemensi nec non Lapponiis Norvegicis scilicet Nordlandia et Finmarkia utraque indigenas, et itineribus annorum 1800, 1802, 1807 et 1810 denuo investigatas*. Berolini, Taberna libraria scholae realis, 300-400.)

APPENDIX

DETAILS OF THE SPECIMENS AND FIELD RECORDS FROM WHICH
THE DISTRIBUTION FIGURES WERE COMPILED

The references to the herbaria cited after each specimen follow those recommended by Holmgren and Keuken (1974). It should be noted that the British Antarctic Survey bryophyte herbarium is now housed at the Institute of Terrestrial Ecology's Bush Research Station, Penicuik, Midlothian, Scotland EH26 0QB. The six figures before the specimens or field records refer to the 5 km. squares of the distribution maps, eastings being cited before northings.

Field records have only been cited for those squares from which no permanent specimens exist, their numbers indicating their file order in the data bank associated with the Survey's herbarium. Field records were provided by the following people: B. G. Bell, 1971-72; T. V. Callaghan, 1967-68; C. M. Clapperton, 1967-68; G. C. S. Clarke, 1967-68; N. J. Collins, 1969-70; J. A. Edwards, 1969-70; D. M. Greene, 1967-68; S. W. Greene, 1967-68; R. I. L. Smith, 1969-71; D. W. H. Walton, 1969-70; E. P. Wright, 1969-70.

A print-out from the data bank of the collecting details for the specimens cited in the Appendix is available on request from the British Antarctic Survey, Madingley Road, Cambridge CB3 0ET.

Calliergon sarmentosum (Wahlenb.) Kindb.

- 020 150 Field record 3516.
- 025 150 R. Smith 1635 (AAS). 030 150 Bell 617a (AAS, B, CHR, LE, SGO), Bell 1008 (BM, SGO), Greene 233 (AAS, MEL, NY, PC), Greene 387 (BA, BM, H, MSC, O, PRE, S, TNS). 030 155 Field record 3424. 035 150 Greene 461 (AAS, B, CHR), Greene 693 (AAS, B, H, LE). 040 145 Field record 4233. 040 150 Greene 707 (AAS, LE, MSC, O), Greene 725 (BM, MEL). 040 155 R. Smith 1636 (BM). 045 145 R. Smith 1637 (AAS, TNS), R. Smith 1639 (AAS). 045 150 BAS Misc. 39 (AAS).
- 050 150 Bell 1089 (BM, S). 050 155 Field record 3507. 055 135 R. Smith 1622 (BM, PC, S). 055 140 R. Smith 1627 (AAS). 055 145 R. Smith 1633 (AAS). 060 135 R. Smith 1632 (BM). 060 150 R. Smith 1628 (BM, NY). 065 140 R. Smith 1626 (BM). 070 125 R. Smith 1634 (BM). 070 130 R. Smith 1629 (AAS). 070 135 R. Smith 1630 (BM).
- 075 125 R. Smith 1631 (AAS). 075 135 Field record 4236. 075 145 R. Smith 1623 (AAS). 080 125 Greene 2734 (BA, BM, H, LE, MEL, NY, PRE, TNS). 080 135 R. Smith 1624 (BM). 080 150 R. Smith 1625 (AAS). 090 145 Greene 1716 (BA, BM, H, LE). 095 145 Field record 4234.
- 100 145 R. Smith 1638 (BM). 115 130 Greene 3014 (AAS, MSC, O, PRE, S, TNS), Greene 3096 (BM, TNS). 115 135 Greene 1382 (AAS, B, CHR, MEL, NY, PC, S, SGO), Greene 1416 (AAS, LE), Greene 1417 (BM, MEL, NY, PC, S), Greene 1436 (AAS, MSC, O, PRE), Greene 3236 (AAS, PC, S), Longton 113 (AAS, B, PC, S). 115 140 Longton 93 (BM, MSC). 120 130 Greene 2941 (AAS, MEL, MSC, O), Greene 2989 (BM, MEL), Greene 2995a (BM, CHR, TNS), Longton 215 (BM, LE, MEL), Longton 218 (AAS, SGO). 120 135 Greene 3374 (BM, O, PRE), Longton 83 (AAS, NY), R. Smith 1410 (AAS).
- 125 095 Greene 2547 (AAS, BA, PC). 125 120 Field record 1887. 125 125 Greene 1540 (BA, BM), Greene 1607 (AAS, B, CHR, MEL, NY, SGO). 130 115 Field record 2092. 130 120 BAS Misc. 85 (AAS), BAS Misc. 86 (AAS), Clarke and Greene CG 319 (AAS, SGO), Clarke and Greene CG 367 (BM, LE), Greene 1765 (AAS, MSC, O, PRE, TNS), Greene 2072 (AAS, BM, H, LE, MEL, NY, TNS), R. Smith 1186 (BM, H, MSC, TNS), R. Smith 1292 (AAS, MSC, PRE, SGO). 130 125 Bell 1140 (BM, TNS), Clarke and Greene CG 183 (BA, BM), Greene 1781 (BM, NY, PC, S, SGO), Greene 1948 (AAS, B, BA, CHR), Greene 1949 (BM), Skottsberg 422 (S). 135 115 Clarke and Greene CG 292 (BM, H). 135 120 Bell 1053 (B, BA, BM, CHR, H), Bell 1055 (AAS, LE, MEL, MSC, NY, SGO), Clarke and Greene CG 266 (AAS, B, CHR), R. Smith 1640 (BM). 140 110 Field record 1959. 140 115 Bell 1147 (AAS, BA, H, LE), Longton 296 (BM, CHR). 140 120 Bonner 270 (BM), Greene 568 (BM, MSC, O), Greene 1013 (BA, BM, PC, S, SGO), Greene 1014 (AAS, BA, H).

- Greene 1039 (BM, CHR, SGO). 145 115 Greene 868 (AAS, NY, PC, PRE, S), Greene 869 (B, BM, TNS), Greene 871 (BM, NY), Longton 328 (AAS, BA, CHR, PRE).
 155 095 Bell 877 (BA, BM), Greene 2203 (AAS, O, PC, PRE, S). 160 060 Greene 2849 (AAS, CHR, SGO). 160 090 Field record 5970. 160 095 Bell 943 (AAS, H, MEL, MSC, NY, O, PC, PRE). 160 100 Bell 1134 (AAS, B, O, PC, PRE, S, TNS). 165 085 Field record 5973.

Inadequately localized

Georgia antarctica, Cumberland Bay, Moraine fiord, 18.iv.1909, Skottsberg 66 (LD, 2 specimens as *C. sarmentosum* var. *fallaciosum*); Georgia australis, Cumberland Bay, Moraine fiord, 18.iv.1909, Skottsberg 66 (PC, as *C. sarmentosum* var. *fallaciosum*); Georgia austr., Cumberland Bay, Moraine fjorden in paludosis, 18.iv.1909, Skottsberg 65 (LD, as *C. sarmentosum* var. *acuminatum* f. *aquatica*); Georgie du Sud, baie Cumberland, Moraine fiord, lieu marecageux, 1909, Skottsberg 65 (PC, as *C. sarmentosum* var. *patens*); South Georgia, Cumberland Bay, in parte interiore: West Fiord, Skottsberg 423 (S, as *Hypnum sarmentosum* forma); Isl. of South Georgia, 5.iv.1906, H.M.S. "Sappho", s.n. (BM, as *Hypnum austro-stramineum*); Austro-Georgia, 4.i.1910, Larsen s.n. (PC, as *Calliergon sarmentosum* var. *acuminatum*; South Georgia, 1972-73, Leg. J. Tallowin, BAS. Misc. 87, 88, 89 (AAS).

Brachythecium austro-glareosum (C. Muell.) Kindb.

- 035 155 R. Smith 1719 (BM). 040 150 BAS Misc. 68 (AAS), BAS Misc. 69 (AAS). 045 150 Field record 3551.
 060 135 R. Smith 1723 (BM, S). 070 145 Greene 1180 (AAS, B, BA, CHR, LE, MSC, S, SGO, TNS), Greene 1281 (BM), Greene 1291 (AAS, H, MEL, NY, O, PC).
 075 120 R. Smith 1722 (AAS, CHR). 075 130 R. Smith 1720 (AAS, BA, PC).
 130 120 R. Smith 1724 (AAS). 130 125 Clarke and Greene CG 403 (BM, PRE).
 150 060 Bonner 221 (AAS, S). 160 060 Bell 1405 (BM). 160 095 Greene 2340 (BA, BM, CHR, SGO).

Inadequately localized

South Georgia, 1972-73, leg. J. Tallowin, BAS Misc. 64 (AAS).

Brachythecium austro-salebrosum (C. Muell.) Kindb.

- 030 150 Greene 276 (AAS). 030 155 Bell 1003 (BM), Bell 1012 (AAS), Greene 400 (AAS, BA, H, NY, PC, S, SGO, TNS), Greene 422 (BM, CHR). 035 145 Field record 5911. 035 150 Greene 467 (B, BM, MEL), Greene 488 (AAS, MSC, S, SGO), Greene 522 (BM, O). 035 155 Field record 5917. 040 150 Greene 710 (BM, MSC, S), Greene 768a (AAS, PC, TNS). 040 155 Field record 5914. 045 145 Field record 5916. 045 150 Field record 5920.
 050 135 Field record 5906. 050 150 Bell 1081 (AAS, BA, S), Bell 1084 (AAS, LE, NY, S), Bell 1086 (BM), Bell 1087 (B, BM). 055 135 Field record 5898. 055 145 Field record 5908. 055 150 Bell 1098 (BM), Clarke and Greene CG 40 (AAS, S). 060 150 Field record 5902. 065 140 Field record 5901. 065 150 Field record 2053. 070 130 Field record 5903. 070 135 Field record 5904. 070 150 Field record 2020.
 075 125 Field record 5907. 075 135 Field record 5909. 080 125 Greene 2649 (BM, PC), Greene 2718 (AAS, NY, S), J. Smith M 105 (AAS), J. Smith M 106 (BM). 080 135 Field record 5899. 080 150 Field record 5900. 090 145 Greene 1655 (AAS, H, LE). 095 140 Field record 5943. 095 145 Field record 5913.
 100 140 Field record 5963. 100 145 Field record 5915. 115 130 Bell 1073 (BM, PC), Bell 1074 (AAS, CHR, S), Greene 3016 (B, BM, CHR, H, NY, PRE, S). 115 135 Bell 1396 (AAS, S), Greene 1410 (AAS, B, H), Greene 3283 (AAS, O, S, SGO, TNS). 120 120 Field record 2075. 120 130 Greene 2945 (BM, O). 120 135 Field record 5910. 120 140 Bonner 247 (BM), Greene 3359 (BA, BM, MSC, PC).
 125 115 Field record 5912. 125 120 Greene 1558 (BM, MEL, S). 130 110 Clarke and Greene CG 231 (AAS). 130 115 Bell 1059 (BM, MSC, S), Bell 1060 (BM, H, S). 130 120 BAS Misc. 33 (AAS), BAS Misc. 50 (AAS), BAS Misc. 60 (AAS), BAS Misc. 61 (AAS), Bell 1027 (AAS), Bell 1039 (BM, MEL, NY, S, SGO, TNS), Bell 1042 (AAS, S), Bell 1044 (AAS), Clarke and Greene CG 286 (AAS), Clarke and Greene CG 290 (BM), Clarke and Greene CG 360 (BM, CHR), Greene 132 (BM), Greene 133 (AAS, B, H, MSC, O), Greene 777 (B, BM, SGO), Greene 796 (AAS, BA, LE, S, TNS), Greene 799 (AAS, PC), Greene 1777 (BA, BM, CHR, MSC), Skottsberg 407 *pro parte* (S), Skottsberg 408 (PC, S), J. Smith M 82a (BM), Troim 18a (BM). 130 125 Bell 1139a (BM), Bell 1141a (AAS, BA, H, PC), Bell 1144 (AAS), Bell 1148 (AAS, B), Clarke and Greene CG 182 (BM, S), Clarke and Greene CG 338 (BM, S), Clarke and Greene CG 401 (AAS, PC), Greene 599 (B, BM, NY, PRE), Greene 1788 (B, BA, BM, H, PC, S), Greene 1955 (AAS), Greene 2043 (AAS, S), Greene 3452 (BM, S), Skottsberg 405 (S). 135 110 Field record 1898. 135 115 Bell 1057 (AAS, H, O, PC). 135 120 Bell 1046 (BM, S). 140 115 Bell 1145a (BM), Longton 287 (AAS, NY, SGO), Longton 370a (AAS). 140 120 Greene 565 (BM, H, MSC), Greene 992 (AAS, H, NY, S), Greene 1017 (AAS, BA, H), Greene 1018 (BA, BM, H, LE, MEL, O, S), Greene 1034 (AAS, CHR, PC, S). 145 115 Greene 866 (BM, H, MEL, PRE).
 155 095 Bell 1121 (BM, S), Greene 2149 (BM), Greene 2153 (AAS, B, TNS), Greene 2299 (AAS, S, SGO), Greene 2375 (BM). 155 100 Bell 1111 (AAS, H). 160 060 Greene 2472a (BM), Greene 2856 (AAS, PC). 160 090 Bell 1394 (AAS). 160 095 Greene 2341 (AAS, S), Will 3 (HBG). 160 100 Greene 2435 (AAS, H, SGO). 165 075 Field record 5985. 165 080 Field record 5982. 165 090 Bell 1395

(BA, BM, H, O). 170 065 Field record 5988. 170 070 Field record 5976. 170 090 Field record 5979.

Inadequately localized

Georgia austr., Cumberland Bay, Morainfjorden, 8.iv.1909, Skottsberg 67 (H, as *B. Skottsbergii* fo. *viridis*); Georgi du Sud: Cumberland Bay, 1902, Skottsberg 405 (H, as *B. skottsbergii* Card. sp. nova); Georgie du Sud: Cumberland Bay, 1902, Skottsberg 408 (H, as *B. georgico-glareosum*); Landzunge, nicht häufig, 14.i.1883, Will 3 (HBG, as *Hypnum georgico-glareosum* C. Müll. n. sp.); Landzunge, nicht häufig, Süd-Georgien, 14.i.1883, Will 3 (M, as *Brachythecium georgico-glareosum* C. Müller); South Georgia, 1972-73, leg. J. Tallowin, BAS Misc. 63 (AAS).

Brachythecium glaciale B.S.G.

- 020 150 Field record 5932.
 030 155 Greene 431 (B, BM). 035 145 Field record 5922. 040 150 Greene 735 (BM, CHR, NY, S, SGO, TNS), Greene 744 (AAS, B, H, S). 045 145 Field record 5930. 045 150 Field record 5925.
 050 150 Bell 678 (BM, MEL, NY, S), Bell 1085 (AAS, S). 055 135 Field record 5936. 055 140 Field record 5938. 060 150 Field record 5939. 070 145 Bonner 188 (AAS, S), Greene 1195 (AAS, B, BA, H, LE, O, PRE), Greene 1213 (BM, O), Greene 1243 (AAS, BA, NY, PC), Greene 1314 (AAS, S, SGO, TNS), Greene 1335 (BA, BM, CHR, NY, S).
 080 150 Field record 5937. 090 145 Greene 1660b (AAS, B), Greene 1679a (AAS, BA, CHR, S), Greene 1727 (BM, MSC, S, TNS). 095 145 Field record 5929.
 100 145 Field record 5927. 105 140 Field record 5926. 115 130 Greene 3073 (AAS, CHR, S), Greene 3074 (BA, BM, NY, S), Longton 141 (BM, S). 115 135 Greene 3332 (B, BA, BM, CHR, H, LE, MEL, MSC, O, PC, S, SGO). 120 130 BAS Misc. 58 (AAS), Greene 2954 (BA, BM, H, MSC, PRE). 120 135 Field record 5940.
 125 095 Greene 2527 (B, BA, BM). 125 115 Field record 5923. 125 120 BAS Misc. 53 (AAS), BAS Misc. 59 (AAS), Clarke and Greene CG 336 (AAS), Greene 1556 (BA, BM, CHR, MSC, O, SGO). 125 125 BAS Misc. 62 (AAS). 130 120 BAS Misc. 55 (AAS), BAS Misc. 56 (AAS), BAS Misc. 57 (AAS), Bell 1018 (BM, CHR), Clarke and Greene CG 245 (BM), Greene 1848 (AAS, BA, CHR, MSC, NY, PRE, TNS), R. Smith 1139 (BA, BM). 130 125 BAS Misc. 54 (AAS), Bell 1143 (AAS, BA), Clarke and Greene CG 185 (BA, BM, S, TNS), Clarke and Greene CG 321 (AAS, H, PC, SGO), Clarke and Greene CG 400 (AAS, CHR, H, O), Clarke and Greene CG 412 (BA, BM, CHR), Clarke and Greene CG 417 (AAS, BA, PRE), Greene 87 (BM, MSC, S), Greene 600 (BM, MEL, MSC, PC, S), Greene 1786b (AAS, PC, SGO), Greene 1820 (AAS, CHR, H, MSC, PC, S, SGO), Greene 2046 (AAS, CHR, PC). 135 110 Field record 1896. 140 120 Greene 997 (AAS). 145 115 Greene 896 (AAS, H, MEL).
 155 095 Greene 2108 (BM, SGO), Greene 2172 (BA, BM, CHR, S), Greene 2374 (BM, NY, PC, S). 155 100 Bell 1109 (AAS, CHR), Bell 1113 (AAS, B, O, S). 160 060 Greene 2473 (AAS, CHR), Greene 2826 (BM, MSC). 160 090 Field record 5968. 160 095 Greene 2319 (AAS, H, SGO). 165 065 Field record 2065. 165 085 Field record 5971. 165 090 Field record 5980. 170 065 Field record 5987. 170 070 Field record 5975. 170 090 Bell 1071 (BM).
 175 065 Field record 2033.

Inadequately localized

Hystadhullet, South Georgia, 20.ii.1928, Olstad 24 (BM, as *B. skottsbergii*).

Brachythecium majusculum M. E. Newton

- 030 150 Greene 266 (AAS, BA, CHR, H, NY, S, SGO, TNS), Greene 306 (AAS, H), Greene 326a (AAS, CHR). 030 155 BAS Misc. 66 (BM), Bell 1005 (AAS), R. Smith 1718 (AAS). 035 150 Greene 1086 (BM, H, TNS). 040 155 R. Smith 1708 (BM, S). 045 145 Field record 5945.
 050 150 Bell 1083a (B, BA, BM, CHR, LE, MSC, PRE, S, SGO), Bell 1088 (BM, CHR, MEL, NY, O, S). 050 155 BAS Misc. 67 (AAS), Bell 1101 (AAS, BA, MSC), Bell 1103 (AAS, B, LE, SGO), Bell 1107 (BM, SGO), R. Smith 1714 (BM). 055 150 Bell 1091 (AAS, BA, CHR, H, MSC, PC, S, SGO, TNS), Bell 1094 (AAS, BA, H), Clarke and Greene CG 19 (BM). 055 155 Bell 1105 (BM, S), Greene 648 (BA, BM, MSC, PC), Greene 672 (AAS, CHR, S, SGO). 060 135 R. Smith 1716 (AAS). 065 140 R. Smith 1713 (AAS). 065 150 Bell 1013a (BM, S), Bell 1015 (BM), Bell 1016 (AAS). 070 145 Greene 1261 (AAS, CHR, LE, MEL, MSC, S), Greene 1304 (BA, BM). 070 150 Field record 2019. 070 155 Greene 615 (AAS, BA, S, SGO), Greene 623 (B, BM, CHR, NY).
 075 125 R. Smith 1715 (AAS, CHR, NY). 075 130 R. Smith 1709 (BM, S), R. Smith 1710 (AAS), R. Smith 1711 (AAS). 075 135 R. Smith 1717 (BM). 075 145 R. Smith 1706 (BM). 080 125 Greene 2688a (AAS, BA, S). 080 140 R. Smith 1712 (AAS). 080 145 Clarke and Greene CG 47 (AAS, S). 090 145 Greene 1660a (BM), Greene 1720 (AAS, B, H, PRE, S). 095 145 R. Smith 1707 (BM).
 125 095 Greene 2526 (BM, MEL, O), Greene 2557a (B, BM, CHR, MSC). 130 120 Trøim 71 (BM).
 155 100 Bell 1112 (BM). 160 060 Greene 2472b (AAS, SGO). 165 080 Bell 1401 (BM, MSC). 170 065 Bell 1404 (AAS, B, CHR, S). 170 090 Bell 1400 (BM, H, PC, S, TNS).
 175 065 Bell 1403 (BA, BM, SGO). 175 070 Bell 1402 (AAS).

Brachythecium subpilosum (Hook. f. et Wils.) Jaeg.

- 020 150 Field record 3513. 020 155 Field record 3523.
 030 150 Greene 232 (AAS, CHR, S), Greene 271 (AAS, MSC, O, S), Greene 324b (BM), Greene 325 (AAS, BA,

- CHR, LE), Greene 326b (B, BM, S), Greene 334 (AAS, B, H, MEL). 035 145 R. Smith 1704 (AAS). 035 150 Field record 3430. 040 150 Field record 3438. 040 155 Field record 5956. 045 145 Field record 5958. 045 150 Field record 3546.
- 050 140 Field record 5951. 050 155 Field record 3510. 055 135 Field record 5948. 055 140 Greene 1144 (AAS). 055 145 Field record 5952. 060 135 Field record 5954. 060 150 Field record 5950. 070 145 Bonner 180 (BM), Greene 1252 (AAS, BA, NY, S, SGO).
- 075 130 Field record 5947. 075 135 Field record 5953. 075 145 Field record 5955. 080 125 Greene 2688b (B, BA, BM, PC). 080 135 Field record 5949. 090 145 Greene 1679b (BM, MSC). 095 140 Field record 3534. 095 145 R. Smith 1703 (BM).
- 100 140 Field record 3455. 100 145 R. Smith 1705 (AAS). 115 135 Greene 1411 (AAS, CHR), Longton 210 (AAS). 120 135 Longton 79 (BA, BM), Sladen JB 19/11 (BM), Sladen JB 19/13 (BM). 120 140 Sladen JB 27/2 (BM), Webb 177 (B, BM, CHR, MEL, O, SGO).
- 125 120 BAS Misc. 71 (AAS), Greene 1536 (BM). 125 125 Field record 1779. 125 130 Skottsberg 409 (S). 125 135 Clarke and Greene CG 96 (BM). 130 110 Bell 1061a (AAS), Clarke and Greene CG 232 (BM, MSC). 130 115 J. Smith M23 (AAS, PRE, S). 130 120 Bell 1019 (BA, BM, MEL, O, S, SGO), Bell 1020 (AAS), Bell 1023 (BM), Bell 1024 (AAS), Bell 1025 (BM), Bell 1026 (BM), Bell 1029 (BM), Bell 1031 (AAS, SGO), Bell 1032a (AAS, B), Bell 1036 (AAS), Bell 1037 (AAS, MSC), Clarke and Greene CG 45 (BA, BM, MSC, S), Clarke and Greene CG 54 (BM), Clarke and Greene CG 305 (AAS, BA, MSC), Clarke and Greene CG 370 (BM, S), Greene 126 (AAS, B, MEL), Greene 166 (AAS, BA, S, TNS), Longton 446 (B, BM, CHR, H, PC, SGO), Longton 447 (AAS), Longton 793 (BM, CHR, NY, S), R. Smith 1080 (BA, BM). 130 125 Bell 1035 (BM, PC), Bell 1141b (BM), Bell 1142 (BM, LE, O, PRE), Clarke and Greene CG 313 (BM), Clarke and Greene CG 328 (AAS, CHR), Greene 103a (BA, BM, PC, SGO), Greene 1786a (AAS, LE, NY), Greene 1929 (AAS, B, BA, PC), Greene 2898 (BM, H), Skottsberg 411 (S). 130 130 Clarke and Greene CG 102 (BM). 130 135 Clarke and Greene CG 74 (AAS, BA, S), Clarke and Greene CG 80 (BM), J. Smith M 78 (AAS, H, SGO). 135 120 BAS Misc. 49 (AAS), BAS Misc. 52 (AAS), Bell 1045 (AAS, BA, MEL, NY, S), Bell 1049 (AAS), Bell 1050 (AAS, B, CHR, LE, MEL, PRE, TNS), Bell 1051 (AAS, BA, H, LE, MSC, NY, PRE, S, TNS), Bell 1052 (BA, BM, CHR, H, MSC, PC, S), Bell 1056 (BM, CHR, S), Bell 1399 (AAS, BA, CHR, H, MSC, S), Bonner 242 (BM), Clarke and Greene CG 256 (BM), Clarke and Greene CG 262 (BM), Clarke and Greene CG 273 (BM, CHR, H, MSC, O). 140 110 Field record 1958. 140 115 Bell 1146 (BA, BM, CHR, H, MSC, NY, O, PC, PRE, S, SGO, TNS). 140 120 Greene 536 (AAS, S), Greene 579 (AAS), Greene 918 (AAS, H, PRE, SGO), Greene 919a (AAS, PC), Greene 926 (BM, CHR, PC), Greene 1033 (AAS, CHR, SGO). 145 070 Greene 2772 (AAS, BA, MEL, S). 145 115 Greene 809 (BM, CHR, H, MSC), Greene 867 (B, BM, S, TNS).
- 155 095 Bell 1122 (BM, H, MSC), Greene 2140 (AAS, CHR, H). 155 100 Bell 1120 (B, BM, CHR, MEL, NY, PC, S, SGO). 160 060 Field record 5990. 160 090 Field record 1989. 160 095 Bell 1126 (B, BM). 160 100 Bell 1123 (AAS, BA, S), Bell 1131a (AAS, CHR, PC). 165 075 Field record 5986. 165 080 Field record 5981. 165 085 Bonner 195 (AAS). 165 090 BAS Misc. 70 (BM, S), Bell 1398 (B, BA, BM, CHR, NY, PC, S, SGO). 170 065 Bell 1397 (AAS, BA, CHR, H, LE, NY, O, PC, S, TNS). 170 070 Field record 5974. 170 090 Bell 1070 (AAS, B, BA, H, S).
- 175 065 Field record 2030. 175 070 Field record 5983.

Inadequately localized

South Georgia, Comm. J. Hamilton, 1919, ex herb. Rev. D. Lillie, Hamilton 543 (BM, as *B. seribracteatum* Dix.)

Brachythecium subplicatum (Hamp.) Jaeg.

- 055 135 R. Smith 1517 (AAS). 055 140 R. Smith 1518 (BM).
- 115 130 Bell 1072 (B, BA, BM, TNS). 115 135 Greene 3132 (AAS, B, CHR, MEL, SGO), Greene 3235 (BM, NY, PC, S). 120 130 Greene 2934 (BA, BM, H, LE, MSC, O, PRE). 120 135 R. Smith 1519 (BM, TNS).
- 125 125 Greene 1539 (AAS, MEL, NY, SGO). 125 130 Skottsberg 404 (PC, S). 130 120 Bell 1028 (AAS), Bonner 250 (BM), Clarke and Greene CG 285 (AAS, B, CHR), Longton 448 (AAS, PC), Trøim 77 (BM). 130 125 BAS Misc. 51 (AAS), Clarke and Greene CG 314 (BA, BM, H, LE), Greene 1890 (BM, MSC, O, PRE, S, TNS), Greene 1925 (AAS), Greene 3445 (AAS, CHR, LE, NY, PC, S, TNS). 135 115 Clarke and Greene CG 720 (AAS). 140 110 Longton 264 (BM, H, MEL, SGO).