A SYNOPTIC FLORA OF SOUTH GEORGIAN MOSSES: IV. *Bartramia* AND *Breutelia*

By M. E. NEWTON*

ABSTRACT. Descriptions of the two species of *Bartramia*, *B. patens* Brid. and *B. subsymmetrica* Card., and the single species of *Breutelia*, *B. integrifolia* (Tayl.) Jaeg., known from South Georgia are given and include outlines of their taxonomy, habitats and distribution on the island. Their synonymy is also considered, the most noteworthy change being the transference of *Exodokidium subsymmetricum* (Card.) Card. to *Bartramia*.

THE Bartramiaceae of South Georgia form a prominent part of the bryological flora but specific recognition has long been difficult. The format of the present paper, based on the conclusions of a taxonomic revision of the family on the island (Newton, 1973), follows the principles established in earlier papers of this series (Clarke 1973; Greene, 1973) with the exception that details of type and historical specimens, which have been documented and discussed elsewhere (Newton, 1973), have not been repeated. All South Georgian specimens examined are listed in the Appendix, which includes material from the B. G. Bell collection (1971–72), an addition to the British Antarctic Survey herbarium subsequent to the collections mentioned by Greene (1973).

BARTRAMIACEAE

The South Georgian species of *Bartramia* and *Breutelia* may be distinguished as follows:

1. Leaf base plicate, margin entire, revolute below, nerve narrow throughout .. ***Breutelia integrifolia***
   Leaf base not plicate, margin serrate, plane throughout, nerve occupying most of upper part of leaf 2
2. Leaf usually >4·5 times as long as broad, capsule inclined, always narrowed at mouth, exothecial cells unevenly thickened .. .. ***Bartramia patens***
   Leaf usually <4·5 times as long as broad, capsule sub-erect, urceolate when dry, exothecial cells incrassate .. .. ***Bartramia subsymmetrica***

Bartramia Hedw.

The two species of *Bartramia* known from South Georgia may be recognized by a combination of leaf characters, i.e. non-photosynthetic sheathing bases abruptly constricted to highly mamillose and serrate photosynthetic limbs that taper to acute apices, with plane margins throughout. A leaf mamilla is composed of the raised ends of two adjacent cells and may appear to be single or, when the dividing wall is depressed, double a contribution from only one cell being unusual. The nerve is narrow in the base, < one-fifth the width of the leaf, but wide and indistinct above, occupying most of the limb. In the base, the cells are uniseriate, elongate, rectangular thin-walled and smooth, whereas those of the limb are tri-seriate for most of its width. The capsule is exserted, sub-spherical and deeply sulcate when dry, with a double peristome consisting of 16 outer linear or subulate, occasionally perforated, teeth which are pale yellow to deep orange in colour. The outer surfaces of the outer teeth are finely papillose and/or striate, whereas the inner surfaces are trabeculate. A rudimentary inner peristome adheres to the outer.

Bartramia patens Brid.

Syn. *B. leucocolea* Card.
B. leucocolea var. *brevifolia* Broth. et Card.
B. leucolomacea C. Muell.

* Shaw Bank, 143 Mottram Old Road, Stalybridge, Cheshire SK15 2SZ.

B. oreadella C. Muell.

B. oreadella var. *microphylla* Card.

B. pycnocolea C. Muell.

B. subpatens C. Muell.

Caespitose, (0·5—) 1·0–4·5 (—9·0) cm. high, shoots dark green, glaucous or yellowish, sparingly dichotomously branched, stems dark brown and frequently with brown or reddish brown tomentum. Leaves (2·0—) 2·5—7·5 (—10·5) mm. long (including base), strict and imbricated, erecto-patent or patent, often flexuose or secund, the leaf base (0·6—) 0·8—1·6 (—2·1)×0·5—1·0 (—2·0) mm., square or oblong, limb (1·0—) 2·0—6·0 (—8·5)×(at base) (0·10—) 0·20—0·65 (—1·15) mm., subulate. Diameter of large central (= guide) cells of nerve, as seen in transverse section half way along limb, greatest in mid line of leaf. Surface cells of limb (7·0—) 11·5—37·0 (—57·5)×7·0—10·0 μm., shortly rectangular, the mamillae single or double. Synoecious or rarely apparently dioecious. Seta 5—25 (—30) mm., reddish brown. Capsule inclined, rarely sub-erect, sub-globose, asymmetrical, light brown to reddish brown, the mouth narrow both wet and dry. Exothecial cells (20·5—) 32·0—69·0 (—92·0) ×(13·0—) 20·5—54·0 (—74·5) μm. (*c.* 300 μm. below mouth), collenchymatous or with thicker longitudinal than transverse walls. Calyptra cucullate, operculum conical or shortly apiculate. Spores (23·0—) 27·5—45·0 (—49·5) μm., reniform, brown, usually with slightly prominent, large irregular papillae, occasionally finely papillose. (Figs. 1 and 2.)

Habitat and distribution (Fig. 3)

A very common moss in a wide variety of habitats including boulders, damp rock crevices, on gravel, peat or soil, and in wet bryophyte flushes and *Rostkovia magellanica* bogs. Altitude 0—605 m.

Notes

B. patens is almost invariably recognizable on sight, although specimens occur which closely resemble *B. subsymmetrica* vegetatively. These are plants in which the ratio of total leaf length/base breadth is $<$*c.* 6 : 1 in most of the mature leaves from the middle of the stem but, where doubt exists, specimens can be identified by nerve anatomy or exothecial cell structure. Fruiting specimens are abundant.

The haploid chromosome number of $n = 16$ has been reported for a specimen collected near Grytviken (Newton, 1972).

Taxonomy

A number of the characters considered to be of diagnostic value in the genus *Bartramia*, including peristome structure, the relative position of antheridia and archegonia, leaf dimensions and leaf borders, have been examined in detail in South Georgian material. The results were discussed in greater detail elsewhere (Newton, 1973) and were concluded to have very limited taxonomic significance, so that the taxonomic limits defined above are considerably broader than previous diagnoses. For instance, according to Müller (1849), *B. patens* has "folia caulina maxime patentia laxe disposita longa, e basi elongata" but the present description includes plants with short straight leaves, as well as others with square leaf bases since they contribute to a continuous variation (Newton, 1973).

Cardot (1906, 1908) expressed the opinion that four species of *Bartramia*, *B. diminutiva* C. Muell., *B. oreadella*, *B. pycnocolea* and *B. subpatens*, are very closely related and derived from *B. patens*, considering that "il semble à peu près impossible de tracer des limites précises entre les autres formes" (Cardot, 1908). An examination of type material of the last three, as well as of the two other species reported from South Georgia, *B. leucocolea* and *B. leucolomacea* (Greene, 1973, table III), has confirmed this view allowing the five taxa to be relegated to synonymy (Newton, 1973).

Bartramia diminutiva was described by Müller (1883) from Iles Kerguelen, and a South Georgian specimen determined as that species by Cardot (1906) is unexceptional within the

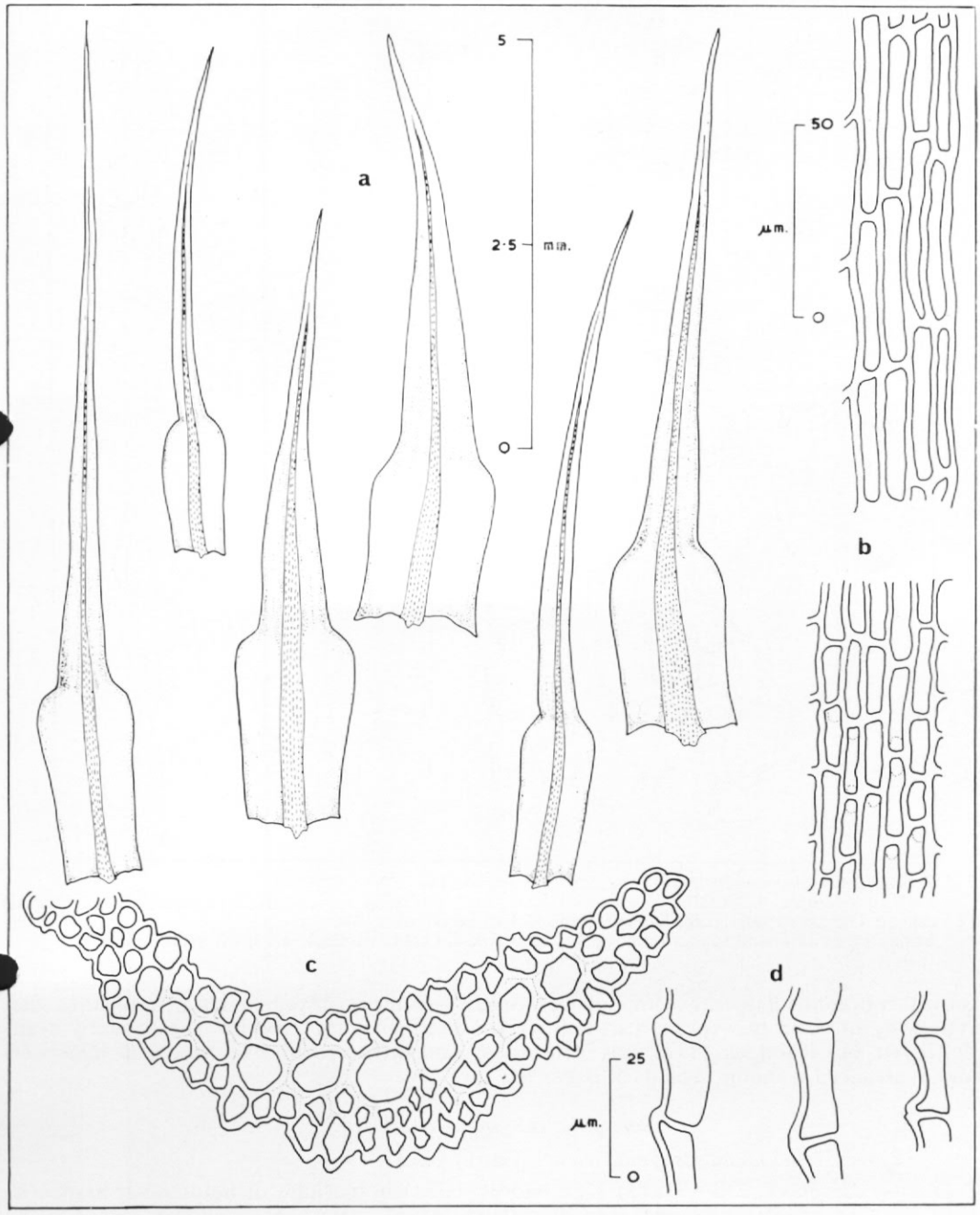

Fig. 1. *Bartramia patens*.
a. Leaves; b. Surface cells of limb, with mamillae indicated by dotted lines; c. Transverse section approximately half-way along limb; d. Mamillae in profile.
Scales: upper left-hand for leaves; upper right-hand for cells and transverse section; lower for mamillae.

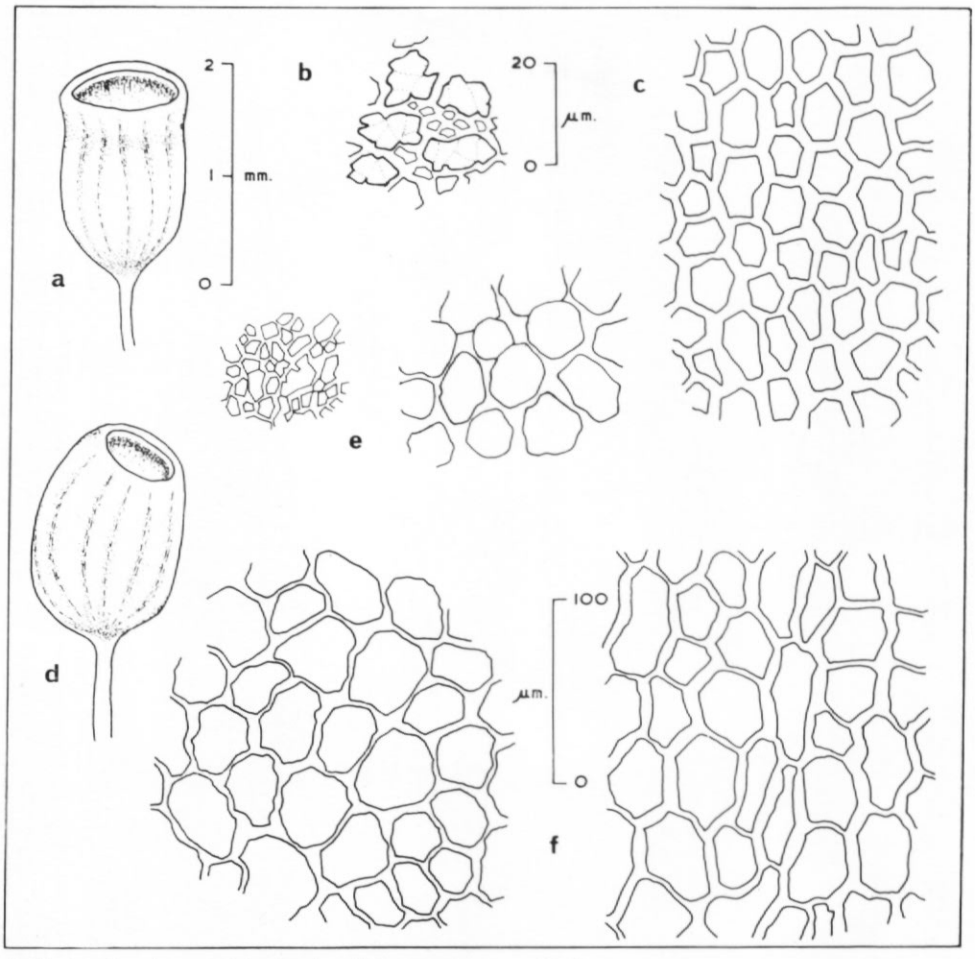

Fig. 2. *Bartramia subsymmetrica* (a–c) and *Bartramia patens* (d–f).
a. Old dry capsule; b. Surface of spore, with dotted lines indicating uneven surface of papillae; c. Exothecial cells; d. Old dry capsule; e. Surfaces of spores; f. Exothecial cells.
Scales: upper left-hand for capsules; upper right-hand for spore surfaces; lower for exothecial cells.

present concept of *B. patens*. Although Cardot had seen the type specimen of *B. diminutiva*, the synonymy of these two species can only be surmised since the type has subsequently been destroyed, but Robinson (1972) has included *B. diminutiva* with *B. pycnocolea*, *B. subpatens* and *B. oreadella* as minor variants of *B. patens*.

Bartramia subsymmetrica Card.

Syn. Exodokidium subsymmetricum (Card.) Card.

Densely caespitose, 2·0—9·5 cm. high, shoots yellowish, sparingly dichotomously branched with erect branches, stems dark brown with abundant reddish brown tomentum. Leaves (2·0—) 2·5—4·5 (—6·0) mm. (including base) erecto-patent, rigid, leaf base (0·7—) 0·9—1·4 (—1·5)×0·5—1·0 (—1·5) mm., approximately square, limb (1·0—) 1·5—3·0 (—4·5)×(at base) (0·25—) 0·45—0·85 (—0·95) mm., triangular. Diameter of large central (= guide) cells of nerve, as seen in transverse section half-way along limb, ± uniform across leaf. Surface

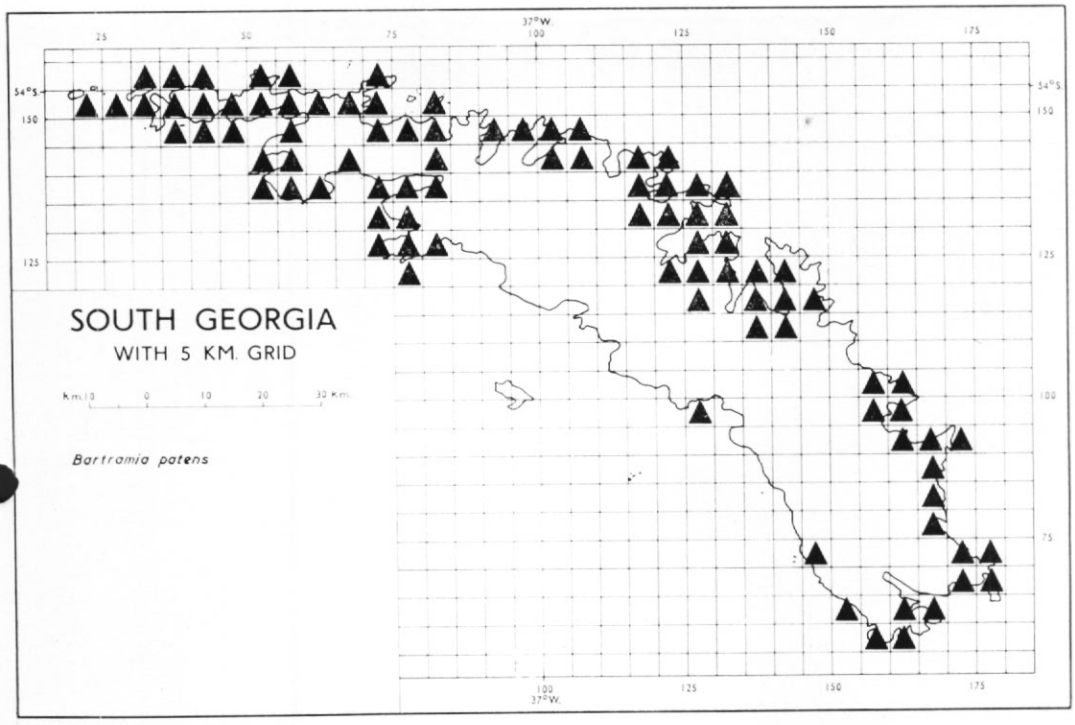

Fig. 3. The known distribution on South Georgia, by 5 km. squares, of *Bartramia patens* based on the specimens and field records given in the Appendix.

cells of limb (9·0—) 11·5—23·0 (—34·5) × 7·0—10·0 μm., shortly rectangular, highly mamillose with double mamillae. Dioecious, male inflorescence discoid. Seta 20—25 mm, reddish brown. Capsule erect or slightly inclined, oval to sub-globose, ± symmetrical, cylindrical and urceolate when dry, reddish brown. Exothecial cells 23·0—33·5 × 12·5—33·5 μm. (*c.* 300 μm. below mouth), incrassate. Calyptra cucullate, operculum shortly apiculate Spores 31·0—38·0 μm., reniform, brown, papillae as in *B. patens* but usually less coarse. (Figs. 2 and 4.)

Habitat and distribution (Fig. 5)

B. subsymmetrica is restricted to wet habitats, including flushed areas, peat banks, wet rocks in the spray zones of waterfalls and the edges of streams. Altitude 3—305 m.

Notes

There is rarely any difficulty in separating this species from *B. patens*, its compact growth form usually being quite distinct. In the few cases where total leaf length is >4·5 times the breadth of the leaf base, the structure of the leaf, as seen in transverse section, and of the capsule wall will serve to identify this species.

Confusion of the leaf of *B. subsymmetrica* with that of *Dicranella cardotii* (R. Brown ter.) Dix. is possible since both species possess prominent double mamillae, and neither size nor shape of the leaves offers a means of identification. However, the serrate leaf margin of *B. subsymmetrica* contrasts with the entire margin of *D. cardotii*, and leaf and stem sections are also dissimilar. Moreover, the midrib of the *Bartramia* is composed of five clearly defined layers (i.e. an E-type midrib as recognized by Kawai (1968)), whereas that of the *Dicranella* is made up of only four layers (Kawai's type D). *D. cardotii* can be further distinguished by the absence of an outer layer of enlarged cortical cells which is typical of the stems of South Georgian species of *Bartramia* and *Breutelia*. Very few fruiting specimens have been seen.

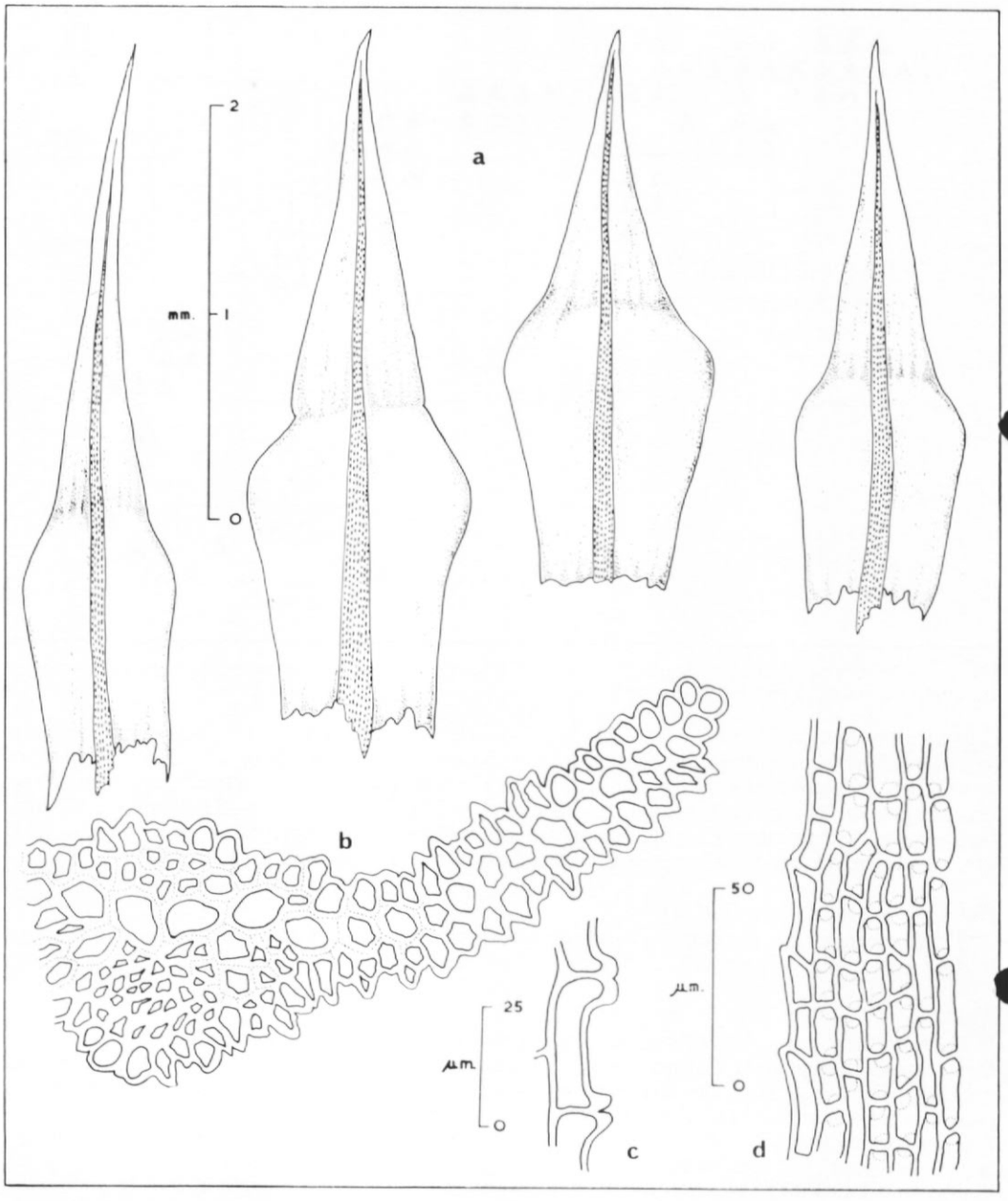

Fig. 4. *Bartramia subsymmetrica*.
a. Leaves; b. Transverse section approximately half-way along limb; c. Mamillae in profile; d. Surface cells of limb, with mamillae indicated by dotted lines.
Scales: upper for leaves; lower left-hand for mamillae; lower right-hand for cells.

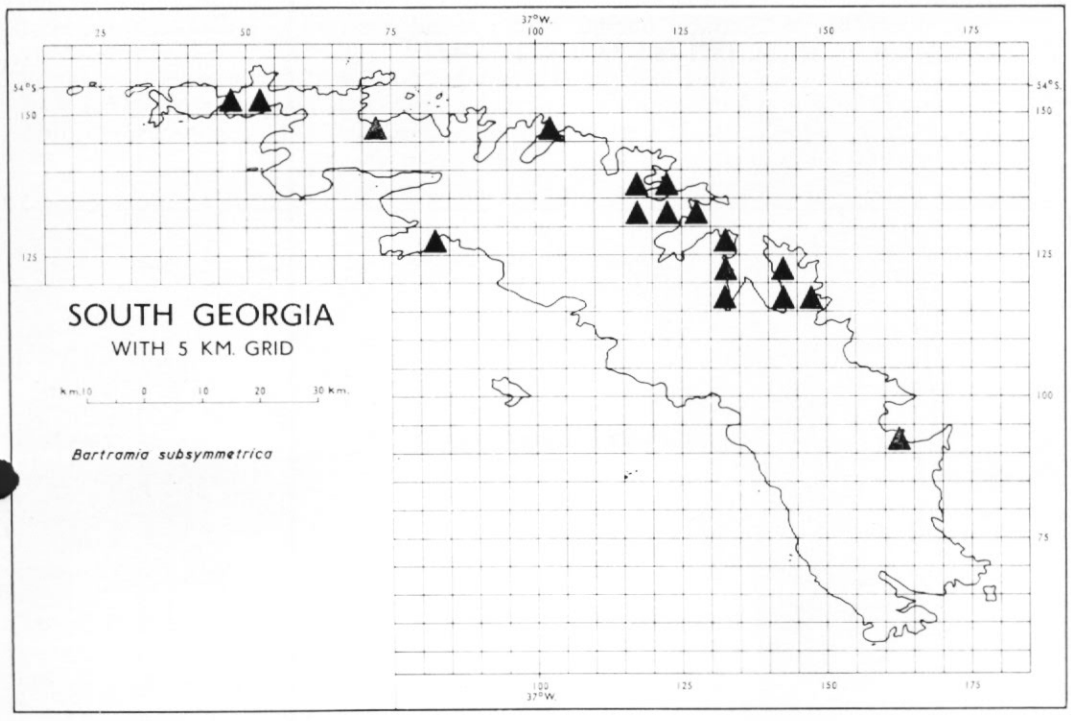

Fig. 5. The known distribution on South Georgia, by 5 km. squares, of *Bartramia subsymmetrica* based on the specimens and field records given in the Appendix.

Taxonomy

Bartramia subsymmetrica, a South Georgian endemic species described by Cardot (1906), was later transferred by Cardot (1908) to the then monotypic genus, *Exodokidium*, the diagnostic characters of the latter being the sub-symmetrical capsule and dorsal thickenings on the outer peristome teeth. Three of the four syntypes have been examined (Newton, 1973), but only in one were dorsal thickenings observed, and they were considerably less pronounced than the illustrations by Cardot (1908, pl. 9) suggest. Similar thickenings occur in *B. patens* and, since other characters show greater resemblances than differences between *Exodokidium* and *Bartramia*, *E. subsymmetricum* was returned to the genus *Bartramia* as *B. subsymmetrica* (Newton, 1973).

Breutelia (B.S.G.) Schimp.

The single species of this genus on South Georgia may be recognized by the presence of leaves lacking limbs but with revolute leaf margins in association with ± plicate leaf bases and narrow nerves that remain distinct throughout their length. The basal end of each leaf cell is slightly prominent, and the cell walls are ± porose.

Breutelia integrifolia (Tayl.) Jaeg.

In loose turves, erect or ± procumbent, 1·5—8·5 (—12·0) cm. high, shoots dark, bright or yellowish green, occasionally golden-brown, dull or glossy, variously branched, stems reddish brown with a dense, brown tomentum that is rarely absent. Leaves (1·5—) 2·0—4·0 × (0·4—) 0·5—0·9 (—1·1) mm., erecto-patent or squarrose, less frequently straight and ± imbricated, ovate to ovate-lanceolate, semi-sheathing up to the widest point, with a few ± indistinct

plicae in leaf base, margin entire or with a few very indistinct serrations towards apex, revolute to about mid-leaf. Nerve narrow, <one-fifth width of leaf insertion, well-defined throughout, usually markedly excurrent. Leaf cells (8·0—) 11·5—33·0 (—77·0)×7·0—10·0 μm. above, vermiform, rectangular, or short and irregular, longitudinal walls often incrassate and ± porose, ± mamillose, the mamillae always single, at least parts of lamina bi-stratose. Dioecious, male inflorescence discoid. Seta 15—20 mm., orange. Capsule exserted, cernuous, pyriform, mature shape and colour unknown. Operculum longly apiculate. (Fig. 6.)

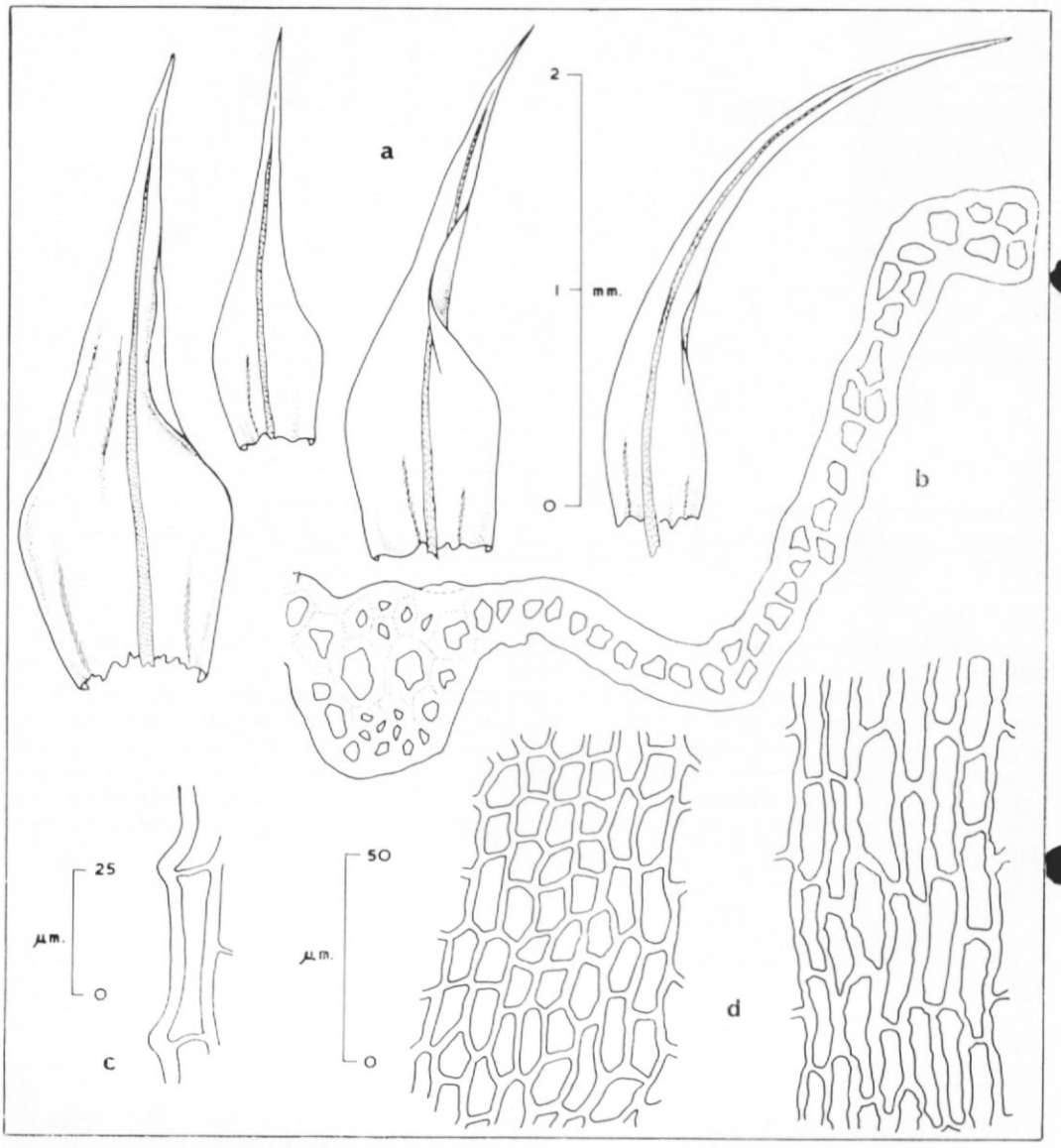

Fig. 6. *Breutelia integrifolia*.
a. Leaves; b. Transverse section approximately half-way along leaf; c. Mamillae in profile; d. Upper leaf cells.
Scales: upper for leaves; lower left-hand for mamillae; lower right-hand for cells.

Habitat and distribution (Fig. 7)

B. integrifolia is frequent in wet places, particularly on a rocky substrate, although it also occurs in flushes and amongst *Poa flabellata*. Altitude 0—380 m.

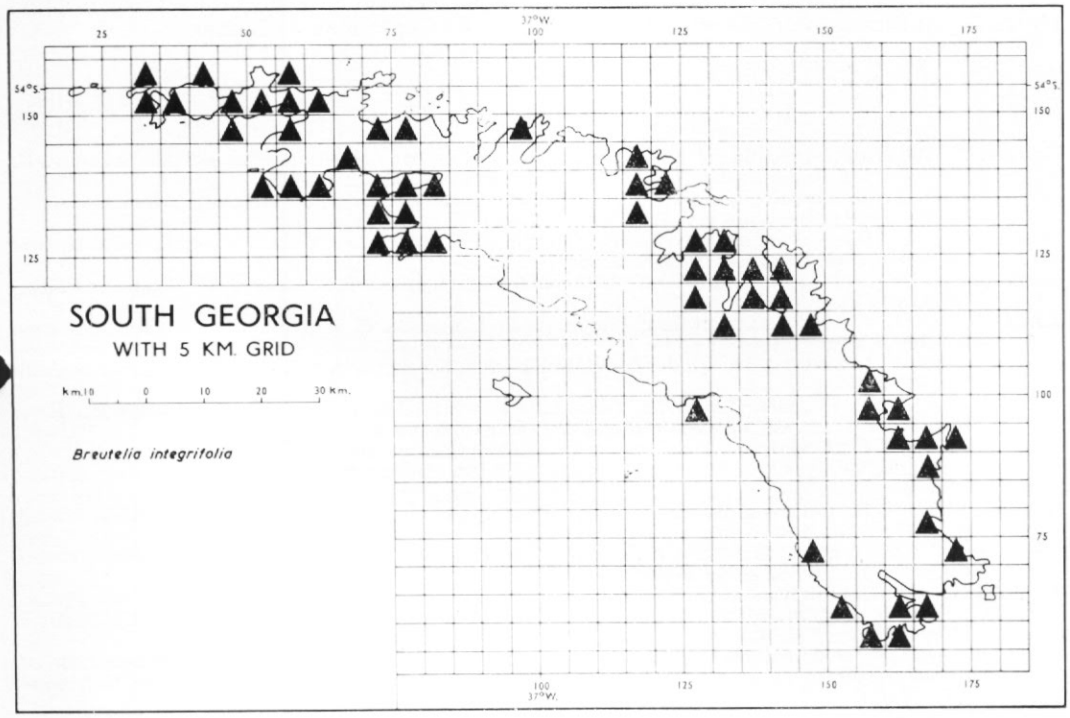

Fig. 7. The known distribution on South Georgia, by 5 km. squares, of *Breutelia integrifolia* based on the specimens and field records given in the Appendix.

Notes

The leaf structure of *Breutelia integrifolia* is sufficiently distinct to prevent confusion with any other species known from the island. Capsules are uncommon and mature fruit has not been seen on South Georgia.

Two specimens from Shallop Cove, Queen Maud Bay, and near Gull Lake have been reported to have the chromosome number $n = 6$ (Newton, 1972).

Taxonomy

The relationship of *Breutelia integrifolia* and *B. kerguelensis* (Par.) Wijk et Marg., the species to which the South Georgian specimens had been previously ascribed as *B. graminicola* (C. Muell.) Broth., has been discussed in detail elsewhere (Newton, 1973). The validity of their separate entities was questioned, paralleling the opinion reached independently by van Zanten (1971), but the reduction of *B. kerguelensis* to synonymy with *B. integrifolia* has only recently been made by Matteri (1973).

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Botanische Staatssammlung, München and the Palaeobotanical Department, Swedish Museum of Natural History, Stockholm.

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APPENDIX

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

The references to herbaria cited after each specimen follow those recommended by Lanjouw and Stafleu (1964) except that AAS has been used for specimens in the British Antarctic Survey herbarium, at present housed in the Department of Botany, University of Birmingham, and INACH has been used for the herbarium of the Instituto Antártico Chileno, Triana 849, Santiago de Chile. 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, 1967–70; D. M. Greene, 1967–68; S. W. Greene, 1967–68; R. I. L. Smith, 1969–71; D. W. H. Walton, 1967–70; R. Webb, 1971–72; E. P. Wright, 1969–70.

A print-out from the data bank of the collecting details for the specimens cited in this Appendix is available on request from the Botanical Section of the British Antarctic Survey.

Bartramia patens Brid.

020 150 Field record 3333.

025 150 Field record 3232. 030 150 Greene 210 (B, BA, BM, H, MEL), Greene 278 (AAS, NY, PC, TNS), Greene 293 (AAS, INACH, PC, S-PA), Greene 313 (BM, LE, NY), Greene 323 (BA, BM, CHR, H, LE), Greene 388 (AAS, B, INACH, LE, NY, PRE), J. Smith M157 (BM), J. Smith M164 (BM, LE). 030 155 Greene 396 (AAS, NY, PC, PRE, S-PA), Greene 412 (BA, BM, CHR, LE, MEL). 035 145 Field record 3236. 035 150 Greene 496 (BM, INACH, S-PA, TNS), Greene 497 (AAS, CHR, H), Greene 694 (AAS, MEL, PC), Greene 1091 (BM, MEL, PC, S-PA), Greene 1122 (BM, CHR, MEL, NY, PC). 035 155 Field record 3412. 040 145 Field record 3351. 040 150 Greene 711 (AAS, H, NY, S-PA), Greene 730 (BA, BM, CHR, PRE, TNS), Greene 745 (BA, BM, CHR, LE, NY, PRE). 040 155 Field record 3291. 045 145 Field record 2721. 045 150 Field record 3299.

050 135 Field record 2853. 050 140 Field record 2867. 050 150 Field record 2088. 050 155 Bell 839 (AAS, H). 055 135 Field record 2798. 055 140 Field record 2825. 055 145 Field record 2881. 055 150 Field record 3571. 055 155 Greene 643 (BM, INACH, PRE, TNS), Greene 668 (BM, NY, PRE). 060 135 Field record 2872. 060 150 Field record 2832. 065 140. Field record 2818. 065 150 Bell 603 (AAS), Bell 604 (BM). 070 125 Field record 2885. 070 130 Field record 2840. 070 135 Field record 2846. 070 145 Greene 1193 (B, BM, MEL, S-PA, TNS), Greene 1225 (AAS, BA, LE, NY, PRE, TNS), Greene 1226 (AAS, B, BA, MEL, NY), Greene 1248 (AAS, H, INACH), Greene 1266 (B, BM, MEL, PRE), Greene 1349 (AAS, BA, CHR, INACH, LE, MEL, NY), Greene 1350 (B, BM, CHR, LE, MEL, PC, PRE), Greene 1351 (BA, BM, INACH, NY). 070 150 Field record 2017. 070 155 Greene 626 (BM, CHR, LE).

075 120 Field record 2861. 075 125 Field record 2854. 075 130 Field record 2786. 075 135 Field record 2887. 075 145 Field record 2782. 080 125 Greene 2658 (AAS, CHR, H, MEL, NY, PC, S-PA, TNS), Greene 2659 (AAS, BA, CHR, LE, NY, PC, PRE), Greene 2660 (AAS, H, LE, TNS), Greene 2686 (BM, INACH, S-PA, TNS). 080 135 Field record 2799. 080 140 Field record 2804. 080 145 Clarke and Greene CG8 (AAS, BA, CHR). 080 150 Field record 2816. 090 145 Greene 1643 (BM, MEL, PC, PRE, S-PA), Greene 1656 (AAS, LE, NY), Greene 1665 (BM, CHR, MEL, PC), Greene 1685 (AAS, BA, LE), Greene 1714 (B, BM, H, MEL). 095 145 Field record 3263.

100 140 Field record 3451. 100 145 Field record 3284. 105 140 Field record 3358. 105 145 Field record 3355. 115 130 Greene 3017 (BM, PC, PRE), Greene 3086 (BM, PC, PRE), Greene 3087 (AAS, LE, MEL). 115 135 Cragg D2b (DHM), Cragg D3c (DHM), Greene 1453 (BA, BM, CHR, H), Greene 1455 (AAS, BA, CHR, TNS), Greene 1458 (B, BM, CHR, H, NY, TNS), Greene 1477 (B, BM, PRE), Greene 3138 (AAS, PRE), Greene 3285 (B, BM, INACH, S-PA, TNS), Greene 3330 (BM, CHR), Longton 71 (AAS, B, TNS), Longton 209 (BM, INACH), J. Smith M120a (AAS, NY, PC, PRE), J. Smith M137b (BM, MEL). 115 140 Clarke and Greene CG163 (BM, PRE), Clarke and Greene CG164 (AAS, PC, PRE). 120 120 Field record 2073. 120 130 Greene 2948 (BM, TNS), Greene 3006 (AAS, BA, CHR, H, INACH, LE, TNS). 120 135 Clarke and Greene CG66 (BM), Clarke and Greene CG111 (BM), Greene 3372 (BM, PC, PRE), Greene 3401 (BM, LE, MEL), Greene 3402 (BM, CHR), Greene 3404 (BM, MEL, NY), Sladen JB19/6c (BM, NY), Sladen JB19/7 (BM), Sladen JB19/15 (BM), Sladen JB19/37 (BM), Sladen JB19/38 (BM), Sladen JB19/47 (BM). 120 140 Bonner 244 (BM), Greene 3352 (AAS), Webb 186 (AAS, PC).

125 095 Greene 2532 (AAS, BA, LE, MEL, NY, PRE, S-PA), Greene 2549 (B, BM, INACH, S-PA), Greene 2550 (AAS, PC, PRE). 125 115 Field record 3242. 125 120 Clarke and Greene CG333 (AAS, CHR), Greene 1529 (AAS, MEL), Longton 470 (AAS, PC, PRE). 125 125 Greene 1570 (AAS, PRE), Greene 1589 (AAS, NY), Greene 2927 (BM, H), Longton 471 (BA, BM, CHR). 125 130 Skottsberg 331 (S-PA, as forma), Skottsberg 332 (S-PA, as f. *chrysocolea*), Skottsberg 371 (S-PA). 125 135 Clarke and Greene CG97 (AAS), Clarke and Greene CG145 (AAS, B, PRE, TNS), Clarke and Greene CG147 (AAS). 130 120 Bonner 280 (BM), Clarke and Greene CG308 (AAS, MEL), Clarke and Greene CG309 (AAS, BA, H), Clarke and Greene CG337 (BM, S-PA), Clarke and Greene CG364 (B, BM, H), Clarke and Greene CG372 (BM, INACH, TNS), Greene 142 (BM, INACH, S-PA), Greene 154 (BM, H, NY, PC), Greene 168 (BA, BM, CHR, LE, MEL, NY), Greene 587 (B, BM, CHR, INACH), Greene 774 (AAS, B, H, TNS), Greene 1846 (AAS, CHR, INACH, PC, PRE, S-PA), Greene 1853 (AAS, INACH, LE, NY, PRE), Greene 3517 (AAS, CHR), Longton 475 (BM, NY, PC), Longton 794 (BA, BM, LE, MEL, TNS), Longton 804 (AAS, BA, H), Skottsberg 334 (S-PA), Skottsberg 339 (S-PA, as forma), Skottsberg 342 (S-PA, as *B. oreadella* var. *microphylla*), Skottsberg 346 (S-PA, as *B. diminutiva*), Skottsberg s.n. (S-PA), R. Smith 1089 (AAS), R. Smith 1167 (AAS, S-PA), R. Smith 1168 (BM), R. Smith 1169 (BM), Trøim 68 (BM, as *B. pycnocoleos*), Trøim 120 (BM). 130 125 Bell 635 (BM), Clarke and Greene CG312 (BM), Clarke and Greene CG325 (AAS, BA), Clarke and Greene CG326 (AAS), Clarke and Greene CG395 (BM), Greene 119 (AAS, BA, INACH, PC), Greene 194 (BM, MEL), Greene 195 (AAS, LE), Greene 594 (AAS, S-PA, TNS), Greene 1790 (AAS, BA, S-PA, TNS), Greene 1794 (AAS, INACH, TNS), Greene 1823 (BM, INACH, S-PA, TNS), Greene 1951 (AAS, B, H, LE, NY), Greene 2020 (AAS, BA, LE, NY), Greene 2896 (AAS, CHR, H, LE, NY, PC, S-PA), Greene 2904 (AAS, MSC, O), Greene 3496 (AAS, B, H, PC), Longton 439 (B, BM, CHR, H, LE, MEL), Longton 805 (AAS, CHR, INACH, LE), Sladen JB26/5 (BM), J. Smith M27 (BM, CHR), J. Smith M68e (AAS), J. Smith M70c (AAS), J. Smith M89a (BM), Trøim s.n. (BM). 130 130 Clarke and Greene CG104 (AAS, PC). 130 135 Clarke and Greene CG69 (BM, LE, NY, PC). 135 110 Field record 1891. 135 115 Clarke and Greene CG218 (AAS, INACH, NY, S-PA), Clarke and Greene CG220 (AAS). 135 120 Bonner 227 (AAS), Clarke and Greene CG267 (B, BM, H), Clarke and Greene CG268 (BM, LE, MEL). 140 110 Longton 256 (BM, PRE, S-PA), Longton 257 (AAS, MEL, NY). 140 115 Longton 284 (BM), Longton 369 (AAS, S-PA), R. Smith 1269 (AAS). 140 120 Greene 562 (AAS, B, BA, INACH, TNS), Greene 930 (B, BM, TNS), Greene 960 (BA, BM, CHR, MEL), Greene 999 (AAS), Greene 1054 (BM, CHR, LE, PC, PRE, S-PA, TNS), Greene 1055 (BM, CHR, PC, S-PA, TNS), Greene 1056 (BM, CHR, H, INACH, PC). 145 070 Greene 2782 (AAS, LE, MEL, NY), Greene 2783 (AAS, INACH, S-PA), Greene 2804 (AAS, PRE). 145 115 Greene 812 (BM, INACH), Greene 850 (AAS, S-PA), Greene 874 (BM, PC, PRE), Greene 891 (AAS, MEL, NY), Greene 906 (AAS, BA, LE, PC, S-PA, TNS), Longton 274 (AAS), Longton 275 (AAS).

150 060 Bonner 212 (AAS, S-PA), 155 055 Field record 3570. 155 095 Greene 2101 (AAS, BA, CHR, INACH, MEL, S-PA), Greene 2102 (BM, S-PA), Greene 2137 (AAS, B, INACH, TNS), Greene 2195

(BM, PC, PRE, S-PA), Greene 2196 (BM, INACH), Greene 2382 (B, BM, S-PA), Will 46 (HBG, 2 specimens as *B. pycnocoleos* and *B. subpatens*), Will s.n. (HBG, M, 3 specimens as *B. oreadella*, *B. pycnocoleos* and *B. subpatens*). 155 100 Bell 859 (AAS, H, S-PA), Bell 866 (BM). 160 055 Field record 3532. 160 060 Greene 2484 (AAS, B, BA, MEL, PC, S-PA), Greene 2825 (AAS, B, BA, H), Greene 2846 (AAS, LE, PC, TNS). 160 090 Field record 1976. 160 095 Greene 2265 (AAS, B, BA, INACH, NY, PRE), Greene 2321 (BM, H, LE, NY), Greene 2342 (AAS, CHR, MEL, PC, S-PA, TNS), Skottsberg 333 (S-PA, as f. *fragilifolia*), Will 46 (HBG, M, as *B. leucolomacea*). 160 100 Bell 1152 (AAS, PC), Greene 2362 (AAS), Greene 2363 (BM, NY). 165 060 Field record 3569. 165 075 Field record 3528. 165 080 Field record 3531. 165 085 Field record 3530. 165 090 Field record 1813. 170 065 Field record 1787. 170 070 Field record 3527. 170 090 Field record 2044.

175 065 Field record 2024. 175 070 Field record 3529.

Inadequately localized

Walls of cave on beach, Royal Bay, 19.x.1957, Bonner 207 (AAS); On snow covered rocks, South Georgia, iii.1916, Dixon s.n. (BM, as *B. pycnocoleos*); South Georgia, 1919, Hamilton 528 (BM, 2 specimens); South Georgia, 1919, Hamilton 535 (BM, as *B. diminutiva*); South Georgia, 1919, Hamilton 540 (BM); Syd-Georgien 1883, Mosthaff s.n. (S-PA); South Georgia, alt. 20 ft., 25.iv.1927, Sanders 7 (BM); Géorgie du Sud; baie Cumberland, Moraine Fiord, prairies, 1909, Skottsberg 50 (S-PA, as *B. leucocolea* var. *brevifolia*); Syd-Georgien, Cumberland Bay, Morainfi aystundra, 18.vii.1909, Skottsberg 52 (S-PA, as f. *austrogeorgica*); South Georgia, Cumberland Bay, interior of West Fiord, 13.v.1902, Skottsberg 335 (S-PA, as B. *leucocolea*); South Georgia, Cumberland Bay, in parte interiore, West Fiord, 13.v.1902, Skottsberg 336 (S-PA, as *B. oreadella*); South Georgia, Cumberland Bay, valley between south and west fiords, 21.v.1902, Skottsberg 338 (S-PA, as forma); Austro-Georgia, 4.i.1910, Larsen s.n. (S-PA, as f. *austrogeorgica*); Süd-Georgien 30.xi.1882, Will s.n. (HBG, as *B. subpatens*); On rocky slopes, 200 ft., Cumberland Bay, South Georgia, 6.i.1922, Wilkins 8 (BM, as *B. leucolomacea*); South Georgia, 1919 (BM).

Bartramia subsymmetrica Card.

045 150 Field record 3545.

050 150 Bell 657 (AAS, PC, S-PA). 070 145 Greene 1352 (AAS, CHR, LE, NY, S-PA).

080 125 Greene 2716 (B, BM, NY, PC, S-PA).

100 145 Field record 3285. 115 130 Greene 3112 (BA, BM, NY, PC, S-PA, TNS). 115 135 Greene 1454 (AAS, INACH), Greene 3239 (AAS, B, CHR, INACH), Greene 3286 (BM, H, TNS). 120 130 Greene 2985 (AAS, CHR, H, INACH, MEL, PRE). 120 135 Greene 3403 (AAS, B).

125 130 Skottsberg 328 (S-PA), Skottsberg 329 (S-PA), Skottsberg 330 (S-PA). 130 115 J. Smith M9 (BM, CHR, MEL, PC, S-PA, TNS). 130 120 Clarke and Greene CG193 (AAS, BA, LE, NY, PRE), Clarke and Greene CG194 (AAS, CHR, NY, PC), Greene 141 (AAS, BA, LE, PC), Greene 783 (BA, BM, H, LE), Greene 1518 (BM, INACH, MEL, PC), J. Smith M85 (AAS, PRE), R. Smith 1166 (AAS, B, BM, H, S-PA). 130 125 Clarke and Greene CG169 (H, S-PA), Clarke and Greene CG317 (AAS), Greene 1950 (AAS, BA, MEL, NY, PRE, TNS). 140 115 Longton 286 (BM, INACH, PRE). 140 120 Greene 1024 (BM, CHR, LE, MEL, PRE). 145 115 Longton 327 (AAS, B, TNS).

160 090 Field record 1978.

Breutelia integrifolia (Tayl.) Jaeg.

030 150 Greene 390 (AAS, BA). 030 155 Greene 405 (B, BA, BM, H, INACH, NY). 035 150 Greene 499 (AAS, BA, CHR), Greene 521 (B, BM, TNS), Greene 1097 (AAS, LE, MEL). 040 155 R. Smith 1207 (AAS), R. Smith 1209 (AAS). 045 145 R. Smith 1208 (BA, BM). 045 150 Field record 2709.

050 135 Field record 2796. 050 150 Bell 649 (AAS, NY, PRE), Bell 677 (B, BM, LE, MEL). 055 135 R. Smith 1201 (BM, CHR). 055 145 Field record 2876. 055 150 Bell 807 (BM). 055 155 Greene 656 (AAS, BA, H). 060 135 Field record 2868. 060 150 Field record 2831. 065 140 R. Smith 1202 (AAS). 070 125 R. Smith 1205 (AAS, INACH, PC, PRE, S-PA, TNS). 070 130 R. Smith 1203 (BM, LE, MEL). 070 135 Field record 2842. 070 145 Greene 1325 (AAS, PC, S-PA), Greene 1343 (B, BM), Greene 1353 (AAS, BA, H).

075 125 R. Smith 1204 (AAS). 075 130 R. Smith 1200 (AAS, BA). 075 135 Field record 2888. 075 145 Field record 2781. 080 125 Greene 2661 (B, BM, PRE, S-PA), Greene 2733 (AAS, BA, LE, NY). 080 135 Field record 2800. 095 145 Field record 2714.

115 130 Greene 3015 (AAS, CHR, LE, NY), Greene 3120 (BA, BM, NY). 115 135 Greene 1412 (AAS, BA, BM, H, PC, S-PA), Greene 3260 (AAS, BA, CHR, INACH, LE, MEL, NY, PC, PRE, S-PA), Longton 109 (B, BM, TNS). 115 140 Clarke and Greene CG167 (AAS, BA). 120 135 Clarke and Greene CG60 (BM, H).

125 095 Greene 2548 (BM, CHR, MEL). 125 115 Field record 2708. 125 120 Field record 1855. 125 125 Greene 1584 (AAS, INACH, PC, TNS). 130 110 Field record 2000. 130 120 Clarke and Greene CG251 (AAS, BA), Clarke and Greene CG449 (AAS), Clarke and Greene CG453 (B, BM, S-PA), R. Smith 1164 (AAS), R. Smith 1210 (AAS, BA, BM). 130 125 Bell 636 (BM, H, NY), Clarke and Greene CG170 (AAS), Greene 1787 (AAS, BA, MEL), Greene 1792 (AAS, BM), Greene 1893

(BM, INACH, NY, PC, PRE, S-PA), Greene 1895 (BM), Greene 2017 (AAS), Greene 2021 (BM, INACH, PRE), Greene 2893 (BM, CHR, TNS), Greene 3576 (AAS, B, BA, H, TNS), Longton 442 (BM, CHR, LE, MEL), R. Smith 1162 (AAS). 135 115 Field record 1906. 135 120 R. Smith 1206 (BM, NY). 140 110 J. Smith M94a (AAS, B, S-PA). 140 115 Longton 224 (AAS, CHR, LE, MEL), Longton 351 (BM, INACH, NY, PC, PRE). 140 120 Greene 1029 (AAS), Greene 1053 (BA, BM, LE, MEL, NY). 145 070 Bonner 199 (AAS), Greene 2808 (AAS, BA, PC, S-PA). 145 110 Longton 396 (BA, BM, CHR, INACH, PC, PRE).

150 060 Bonner 211 (AAS). 155 055 Field record 3577. 155 095 Greene 2200 (AAS, B, BM, H), Greene 2371 (AAS, S-PA, TNS). 155 100 Bell 874 (AAS, S-PA). 160 055 Field record 3575. 160 060 Greene 2476 (AAS), Greene 2486 (AAS, BA, LE, PC), Greene 2848 (BM). 160 090 Field record 1965. 160 095 Greene 2339 (BM, MEL, S-PA). 165 060 Field record 3576. 165 075 Field record 3573. 165 085 Field record 3574. 165 090 Clarke and Greene CG514 (AAS). 170 070 Field record 3572. 170 090 Field record 3578.

Inadequately localized

Géorgie du Sud: Cumberland Bay, Bore Valley, 7.v.1902, Skottsberg 363 (S-PA, as *B. graminicola*).