SHORT NOTES

NOTES ON ANTARCTIC BRYOPHYTES: II. RECORDS OF RACOMITRIA FROM THE ANTARCTIC BOTANICAL ZONE

By B. G. Bell

Abstract. *Racomitrium crispulum* (Hook. f. et Wils.) Hook. f. et Wils. var. *crispulum*, a taxon hitherto unrecorded from within the Antarctic botanical zone, is reported from near persistent fumaroles on Bellingshausen Island, South Sandwich Islands. *Racomitrium austro-georgicum* Par., previously only known from a single locality on the Antarctic Peninsula as *R. substenocladum* Card., is reported from several other localities within the Antarctic botanical zone. A record of *R. lanuginosum* (Hedw.) Brid. from the South Orkney Islands is shown to be almost certainly fallacious.

Although the genus *Racomitrium* is well represented on sub-Antarctic islands, only the following two species have been reported from the Antarctic botanical zone, as understood by Greene (1968): *R. lanuginosum* (Hedw.) Brid., from the South Orkney Islands by Dixon (1935) and *R. substenocladum* Card., by Cardot (1911) from the Antarctic Peninsula. The latter species, which was subsequently reduced to synonymy with *R. austro-georgicum* Par. by Roivainen (1955), can now be reported from a number of scattered localities as far south as Engel Peaks (lat. 69°31′S., long. 63°08′W.). A further taxon *R. crispulum* (Hook. f. et Wils.) Hook. f. et Wils. var. *crispulum* is reported for the first time from within the zone.

The specimens examined, with the exception of type material obtained on loan from other herbaria, are from the British Antarctic Survey's herbarium (AAS), at present housed in the Department of Botany, University of Birmingham. Herbaria holding duplicates are indicated by the contractions recommended by Lanjouw and Stafleu (1964).

Racomitrium austro-georgicum Par.

Syn. Rhacomitrium substenocladum Card.

This species was first described from South Georgia by Müller (1890) as *Grimmia austro-patens* C. Muell. and subsequently transferred to *Racomitrium* by Paris (1895, 1898), who also changed the specific epithet to *austro-georgicum*. *Racomitrium austro-georgicum* is retained as being the most satisfactory name for the species and a full treatment of the nomenclatural problems will be given in the *Synoptic flora of South Georgian mosses* under this genus. Cardot (1911) described *R. substenocladum* for material collected by Gain from Cape Tuxen on the Antarctic Peninsula, a taxon subsequently reduced to synonymy with *R. austro-georgicum* by Roivainen (1955). In retaining the latter epithet, Roivainen disagreed as to the status of the species with Clifford (1955), who considered both *R. substenocladum* and *R. austro-georgicum* to be synonyms of *R. crispulum*. From an examination of the type specimen of *R. substenocladum* Card. (Gain No. 200, BM; *Rhacomitrium substenocladum* Card. sp. nova., Terre de Graham, cap Tuxen, lieux humides, 100 m. environs, 8 Janvier 1909, Exped. Antarct. Française, 1908–10.) and of *R. crispulum* (Hook. f. et Wils.) Hook. f. et Wils. (Hooker No. 3, BM; *Dryptodon crispulus* H. f. et Wils., Campbell's Island, Antart. Exp. 1839–1843, J.D.H.), the author is in no doubt that Gain's Cape Tuxen plant and other Antarctic material examined should be referred to *R. austro-georgicum* and that the latter should retain specific rank.

R. austro-georgicum is a compact cushion-forming species, characterized by the presence of a short crenate hair point on the majority of its vegetative leaves and strongly incrassate border cells towards the leaf apex. It has been found on rock surfaces and ledges and, although sporophytes have not been seen from the Antarctic botanical zone, both male and female inflorescences have been noted on specimens from Signy Island, South Orkney Islands (Webb, 1973).

Distribution in the Antarctic botanical zone (Fig. 1)

South Orkney Islands *Powell Island:* Promontory to west of John Peaks, R. Smith 244 (AAS, BA, PRE, S-PA, TNS). *Coronation Island:* Olivine Point, R. Smith 126 (BM, LE, MEL, NY, PC); nunatak north of Olivine Point, Webb 149 (BM, INACH, PRE). *Signy Island:* Three Lakes Valley, Webb 89 (BM, CHR), Webb 113b (AAS), Webb 144 (AAS, BA, H); Observation Bluff, Holdgate 136b (BM, MEL, MSC, NY, O); Factory Cove, Holdgate 48 (AAS), Longton 1052 (AAS, O, PC, S-PA, TNS), R. Smith 12 (AAS, B, INACH). Ridge east of Spindrift Rocks, Holdgate 765j (AAS).

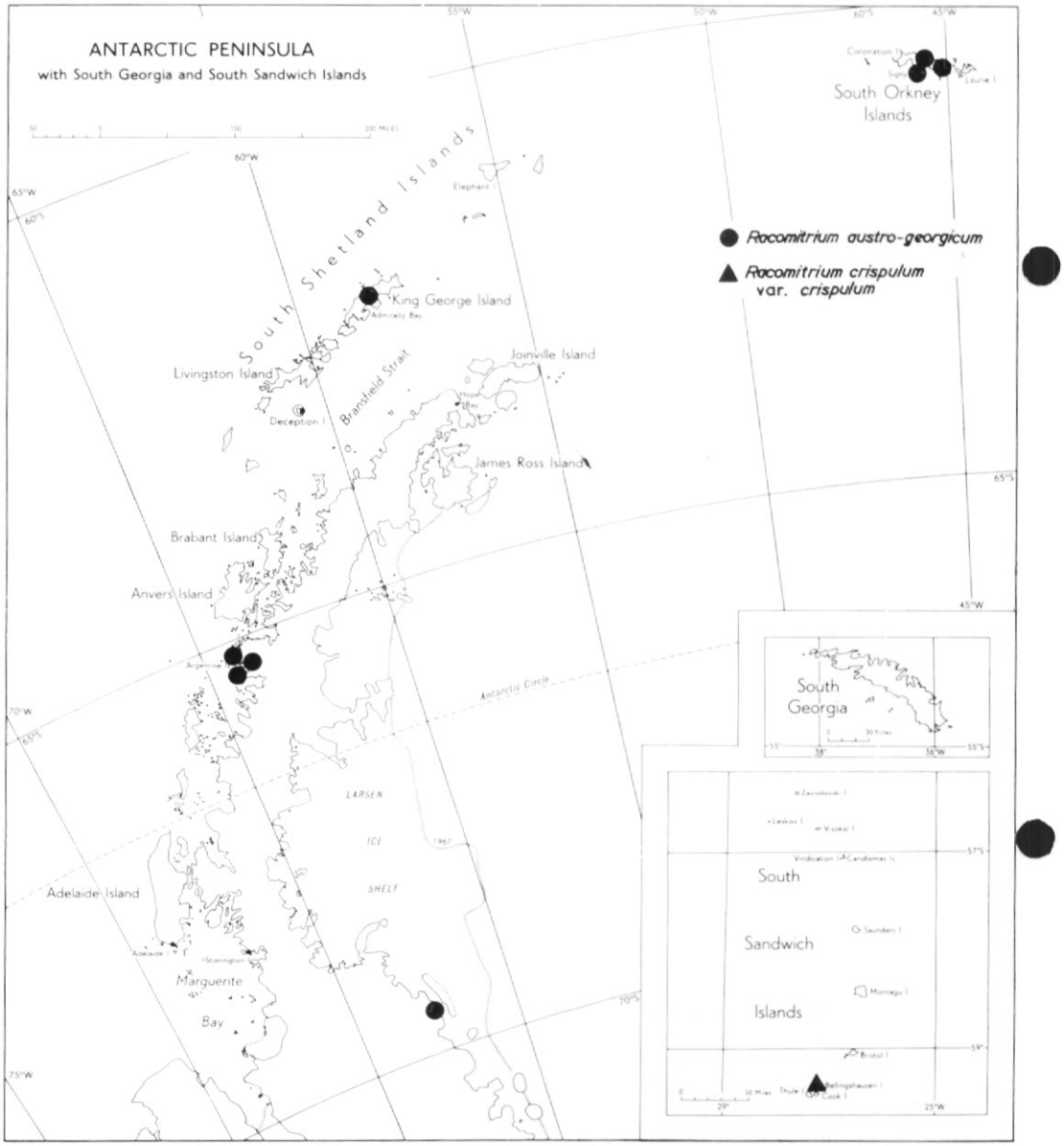

Fig. 1. The known distribution of *Racomitrium austro-georgicum* and *Racomitrium crispulum* var. *crispulum* along the Scotia Ridge and the Antarctic Peninsula excluding South Georgia.

South Shetland Islands *King George Island:* Keller Peninsula, Lindsay 839 (AAS, BA, CHR). **Antarctic Peninsula, Graham Coast** *Argentine Islands:* Galindez Island, Meek Channel, Corner 448 (AAS, B, CHR), Corner 472 (AAS); Stella Creek, Corner 465 (BM, H, LE), Longton 1327 (BA, BM, CHR, H, MSC, PRE). *Cape Tuxen:* Gain 200 (BM, as *Rhacomitrium substenocladum*). *Berthelot Islands:* Largest island in the group, Corner 619f (AAS). **Antarctic Peninsula, Wilkins Coast** *Engel Peaks:* North ridge, Cousins 59 (AAS, BA).

Racomitrium crispulum (Hook. f. et Wils.) Hook. f. et Wils. var. *crispulum*

Syn. Dryptodon crispulus Hook. f. et Wils.

This species, first described by Hooker and Wilson (1844) from Campbell Island, is similar in habit to *R. austro-georgicum* but the stems are more laxly arranged in the cushion and the vegetative leaves rarely possess a hair point which, if present, is quite smooth. It is a species of moist habitats and is only known from sites with a regular and plentiful water supply, conditions not common within the Antarctic botanical zone but prevailing in the vicinity of persistent fumaroles on Bellingshausen Island, South Sandwich Islands. All of the material examined was collected from a single fumarole. One specimen (Holdgate 811e) was dioecious and possessed both male and female inflorescences and a solitary seta.

Distribution in the Antarctic botanical zone (Fig. 1)

South Sandwich Islands *Bellingshausen Island:* Within and surrounding the main fumarolic crater, Holdgate 410b (AAS), Holdgate 811e (AAS), Holdgate 820d (B, BA, BM, CHR), Holdgate 824e (AAS, H, INACH, LE, MEL), Holdgate 825e (BM, NY, PC), Holdgate 829b (AAS, S-PA), Holdgate 839d (BM, TNS).

Racomitrium lanuginosum (Hedw.) Brid.

The record of *R. lanuginosum* from the South Orkney Islands (Dixon, 1935) is based on a single specimen among the material collected during the Discovery Investigations in Antarctic regions. The specimen is preserved in the British Museum (Nat. Hist.) and bears the label " 'Discovery Expedn.' South Orkneys 1933". It has been examined by the author and, while there is no doubt that *R. lanuginosum* constitutes the major component, other species in association with it cast doubt on its origin. S. W. Greene (personal communication) has suggested that as the specimen is similar in its morphology and associates to gatherings made on South Georgia by the same expedition, and to many subsequent collections from that island, it is more likely to have been collected there than on the South Orkney Islands. His conclusion is further supported by the fact that, although many localities in the South Orkney Islands have been visited by botanists including bryologists since the visit by R.R.S. *Discovery II*, *R. lanuginosum* has never been seen and no specimens of the species collected. The author submits therefore that until a specimen is collected within the Antarctic botanical zone, the species is best regarded as being absent from the region.

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REFERENCES

CARDOT, J. 1911. Note sur les mousses rapportées par la seconde expédition antarctique française, sous le commandement du Dr. Jean Charcot. *Rev. bryol. lichen.*, **38**, No. 6, 124–27.

CLIFFORD, H. T. 1955. On the distribution of *Rhacomitrium crispulum* (H. f. et W.) H. f. et W. *Bryologist*, **58**, No. 4, 330–34.

DIXON, H. N. 1935. The mosses. (*In* MARR, J. W. S. The South Orkney Islands. '*Discovery*' *Rep.*, **10**, 381–82.)

GREENE, S. W. 1968. Studies in Antarctic bryology: I. A basic check list for mosses. *Rev. bryol. lichen.*, N.S., **36,** Fasc. 1–2, 132–38.
HOOKER, J. D. *and* W. WILSON. 1844. Musci Antarctici. *Lond. J. Bot.*, **3,** 533–56.
LANJOUW, J. *and* F. A. STAFLEU. 1964. Index herbariorum. Pt. 1. The herbaria of the world. 5th edition. *Regnum veg.*, **31,** 1–251.
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.)
PARIS, E. G. 1895. *Index bryologicus, sive enumeratio muscorum hucusque cognitorum adjunctus synonymia distributioneque geographica locupletissimis.* Parisiis, Paul Klincksieck, Pt. 2, 325–644.
————. 1898. *Index bryologicus, sive enumeratio muscorum hucusque cognitorum adjunctus synonymia distributioneque geographica locupletissimis.* Parisiis, Paul Klincksieck, Pt. 4, 965–1284.
ROIVAINEN, H. 1955. Contribution to the Fuegian species of the genus *Rhacomitrium* Brid. *Suomal. eläin- ja kasvit. Seur. van. Tiedon.*, **9,** No. 2, 85–98.
WEBB, R 1973. Reproductive behaviour of mosses on Signy Island, South Orkney Islands. *British Antarctic Survey Bulletin*, No. 36, 61–77.

THE SIGNY ISLAND TERRESTRIAL REFERENCE SITES: IV. THE NEMATODE FAUNA

By V. W. SPAULL

ABSTRACT. Single samples taken during the summer from the moss-turf (SIRS 1) and moss-carpet (SIRS 2) reference sites at Signy Island were analysed to provide preliminary information on the nematode faunas. SIRS 1 contained 12 species and similar numbers of individuals to other moss-turf communities on the island but at SIRS 2, where eight species were represented, the numbers were much lower than in other Signy Island moss carpets.

THIS paper reports briefly on a preliminary survey of the nematode fauna of the Signy Island reference sites (SIRS) 1 and 2. SIRS 1 is a mixed community of the turf-forming mosses *Chorisodontium aciphyllum* (Hook f. and Wils.) Broth. and *Polytrichum alpestre* Hoppe, the surface of which has been colonized by lichens. SIRS 2 is composed of the carpet-forming mosses *Calliergidium austro-stramineum* (C. Muell.) Bartr., *Calliergon sarmentosum* (Wahlenb.) Kindb. and *Drepanocladus uncinatus* (Hedw.) Warnst. A description of the sites and an introduction to this long-term project have been given by Tilbrook (1973).

METHODS

In February 1970, eight cores, 4·2 cm. in diamter and 6 cm. deep, were taken at random from SIRS 1. The nematodes were extracted using a modified Baermann funnel and counted as previously described (Spaull, 1973*a*). In February 1973, I. B. Collinge collected ten cores, 2·5 cm. in diameter and 6 cm. deep, from SIRS 2 and extracted the nematodes using the modified Baermann funnel. These nematodes from SIRS 2 were fixed in F A 4 : 1 and sent to the United Kingdom for analysis.

The nematode genera have been grouped according to the type of food they take. The biomass and oxygen consumption of the nematodes from the two sites were estimated, as described by Spaull (1973*c*), using the formulae devised by Andrassy (1956) and Klekowski and others (1972), respectively.

RESULTS AND DISCUSSION

The nematode fauna of SIRS 1 was composed of 12 species in nine genera and SIRS 2 had 11 species in eight genera (Table I). *Teratocephalus* was the most abundant genus, constituting over 40 per cent of the total fauna in each site.

Total numbers of nematodes in SIRS 1 are of a similar magnitude to those found in other moss-turf communities at Signy Island but in SIRS 2 there were more than 100 times fewer nematodes than in other comparable moss communities (compare Table I with table VI of

TABLE I. NEMATODE ABUNDANCE, BIOMASS AND OXYGEN CONSUMPTION IN THE SIGNY ISLAND REFERENCE SITES

Feeding group	*Species*	*Number/m.²* ($\times 10^3$)	*Relative abundance of feeding group* (per cent)	*Percentage and total biomass of feeding groups* (mg./m.²)	*Percentage and total oxygen consumption of feeding groups* (μl./hr./m.² at 5° C)
SIRS 1					
Fungal feeders	*Ditylenchus* sp.	9·24	38·8	20·1	26·3
	Aphelenchoides spp. A and B	234·34			
	Tylenchus sp.	145·82			
	Antarctenchus hooperi Spaull, 1972				
Microbial feeders	*Teratocephalus* spp. A and B	445·09	58·2	57·3	59·7
	Plectus antarcticus de Man	102·81			
	Monhysterid genus A sp.	35·21			
	Prismatolaimus sp.	0·29			
Omnivores	*Eudorylaimus* spp. A and B	29·73	3·0	22·6	14·0
TOTAL		1,002·52		155·6	71·6
SIRS 2					
Fungal feeders	*Ditylenchus* sp.	1·68	9·5	3·1	5·0
	Aphelenchoides sp. A	0·33			
Microbial feeders	*Teratocephalus* sp. A	9·31	77·2	40·7	52·3
	Plectus antarcticus (67 per cent)	4·13			
	Plectus parietinus Bastian (33 per cent)				
	Monhystera spp. A and B	1·50			
	Monhysterid genus A sp.	1·35			
Omnivores	*Eudorylaimus* sp. A (90 per cent)	2·61	12·4	38·9	33·6
	Eudorylaimus sp. C (10 per cent)				
Predators	*Clarkus gerlachei* (de Man)	0·20	0·9	17·3	9·1
TOTAL		21·11		11·2	3·4

Spaull (1973*b*)). This large difference may perhaps be related to the water content of the sample sites. In the three other moss-carpet communities previously sampled at Signy Island, the water content during the summer ranged between 960 and 1,030 per cent dry weight (Spaull, 1973*b*), while in SIRS 2 it was approximately 1,400 per cent. Furthermore, the three other moss sites occur on a slight gradient and, although the sites sometimes became waterlogged, the water was replaced by aerated water from rain or run-off from melting snow. SIRS 2, however, lies in a shallow depression and the standing water may have resulted in the development of anaerobic conditions in this moss carpet; such conditions would limit nematode activity.

In both sites, as in other similar moss communities studied at Signy Island (Spaull, 1973*c*), microbial feeders were the dominant group, while fungal feeders were more numerous and ominvores less numerous in the moss turf than in the moss carpet (Table I).

The total biomass and oxygen consumption of the nematodes of SIRS 1 are comparable to those recorded in the other moss-turf communities at Signy Island, but in SIRS 2, as a result of considerably fewer nematodes, the biomass and oxygen consumption are very small (compare Table I with table VI of Spaull (1973*c*)). However, the relative contribution that the different feeding groups make towards the total biomass and oxygen consumption in each of the reference sites is broadly similar to that in other comparable sites.

In one of the cores from SIRS 1, two juvenile *Eudorylaimus* were found with a constricting collar of three cells formed by a nematode predacious fungus; such fungi have been recorded before at Signy Island (Duddington and others, 1973).

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REFERENCES

ANDRASSY, I. 1956. Die Rauminhalts- und Gewichsbestimmung der Fadenwürmer (Nematoden). *Acta zool. hung.*, **2**, Nos. 1–3, 1–15. [English translation: The determination of volume and weight of nematodes. (*In* ZUCKERMAN, B. M., BRZESKI, M. W. *and* K. H. DEUBERT. 1967. *English translation of selected East European papers in nematology*. Massachusetts, University of Massachusetts, 73–84.)]

DUDDINGTON, C. L., WYBORN, C. H. E. *and* R. I. L. SMITH. 1973. Predacious Fungi from the Antarctic. *British Antarctic Survey Bulletin*, No. 35, 87–90.

KLEKOWSKI, R. Z., WASILEWSKA, L. *and* E. PAPLINSKA. 1972. Oxygen consumption by soil-inhabiting nematodes. *Nematologica*, **18**, No. 3, 391–403.

SPAULL, V. W. 1973*a*. Seasonal variation in numbers of soil nematodes at Signy Island, South Orkney Islands. *British Antarctic Survey Bulletin*, Nos. 33 and 34, 47–56.

———. 1973*b*. Qualitative and quantitative distribution of soil nematodes of Signy Island, South Orkney Islands. *British Antarctic Survey Bulletin*, Nos. 33 and 34, 177–84.

———. 1973*c*. Distribution of nematode feeding groups at Signy Island, South Orkney Islands, with an estimate of their biomass and oxygen consumption. *British Antarctic Survey Bulletin*, No. 37, 21–32.

TILBROOK, P. J. 1973. The Signy Island terrestrial reference sites: I. An introduction. *British Antarctic Survey Bulletin*, Nos. 33 and 34, 65–76.

NOTES ON ANTARCTIC BRYOPHYTES: III. THE TYPE SPECIMEN OF *Pohlia inflexa* (C. Muell.) Wijk et Marg.

By G. C. S. CLARKE*

ABSTRACT. A specimen from the Brotherus Herbarium at Helsinki which is labelled as though it were an isotype of *Pohlia inflexa* belongs to *Philonotis acicularis* (C. Muell.) Kindb. The type specimen of *P. inflexa* is still missing, feared destroyed.

DURING the preparation of a taxonomic account of the genus *Pohlia* on South Georgia (Clarke, 1973) an extensive search was made to locate any specimens referable to this genus collected by H. Will while visiting the island as a member of the German International Polar-Year Expedition of 1882–83. Will's specimens were incorporated in the herbarium of the Botanisches Museum, Berlin, which was extensively damaged during 1939–45. Although many duplicates have survived in Hamburg and Munich, the search failed to uncover any specimens of *Pohlia inflexa* (C. Muell.) Wijk et Marg. (*Bryum inflexum* C. Muell.), a species which Müller (1890) described as new to science from Will's South Georgian collections. Since the species has not been reported from outside South Georgia, it was not possible to confirm recent identifications of specimens referred to the taxon by comparison with type or other authenticated material, and these identifications have had to be based on Müller's published description alone. In the past, some of Müller's descriptions have proved inadequate for recognizing and separating critical taxa, as Cardot (1908) has rather forcibly pointed out on a number of occasions, but in this instance his description has sufficient diagnostic characters to allow accurate correlation of the name *P. inflexa* with a well-defined South Georgian taxon.

After the completion of the taxonomic work mentioned above, a specimen labelled "*Bryum inflexum* C.M." was lent by the Cryptogamic Herbarium of the Department of Botany at the University of Helsinki, Finland, to the British Antarctic Survey Botanical Section for examination. The label on this specimen, which is in Brotherus' handwriting, reads:

"Philonotis"
Mniobryum
Bryum inflexum C.M.
Süd Georgien leg. Will.

The collecting data suggest that it is an isotype from Müller's herbarium and Dr. Timo Koponen (personal communication) has commented that Brotherus received many specimens from Müller during the work on the "Musci" section of *Die natürlichen Pflanzenfamilien*. The specimen itself consists merely of two sterile shoots and a number of detached leaves, but there is enough material to allow determination of the specimen as *Philonotis acicularis* (C. Muell.) Kindb. rather than *P. inflexa*.

P. acicularis was also described by Müller from material which Will brought back from South Georgia, but Müller was confused by the variability of this species to such an extent that he referred one specimen of *P. acicularis* to a new species in the genus *Meesia* (Clarke, 1973). Despite such uncertainty, it does not seem possible that Müller could have produced his description of *P. inflexa* from the material at Helsinki, since *P. inflexa* is credited with a number of characters, including decurrent leaf bases, leaves with pronounced keel and the presence of gemmae, which do not occur in *P. acicularis* and are not present in the Helsinki specimen.

The most likely explanation is that Will's original specimen was a mixture, and this is borne out by the habitat data Müller (1890) gave: "streamside amongst *Psilopilum tapes*". This habitat is one in which *P. acicularis* is common on South Georgia and when Müller was selecting a piece from his specimen of *P. inflexa* to send to Brotherus he doubtless picked out the wrong shoots.

Brotherus was probably thinking of the specimen in his herbarium when he listed *Pohlia inflexa* in the genus *Philonotis* (Brotherus, 1904), adding the comment that "*Philonotis inflexa*

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(C. Müll., as *Bryum*) from South Georgia (sterile), of which I have only a very paltry specimen at my disposal, probably belongs to this group". This decision is recorded on the specimen label by the name *Philonotis* in Brotherus' handwriting. Subsequently, Cardot (1908) commented that, although Brotherus included the species in the genus *Philonotis*, examination of the original specimen from the Royal Museum of Botany in Berlin, and of Müller's description, showed it definitely to belong to the genus *Webera* (= *Pohlia*). He suggested that Brotherus' mistake had arisen through a mixed specimen. Brotherus (1909) finally included the species in his list of corrections and additions where he noted that, according to Cardot, *P. inflexa* belonged to *Mniobryum*, which Cardot considered to be a section of *Webera*. This is perhaps why Brotherus wrote the name *Mniobryum* on the packet in his herbarium even though the specimen it contained was a *Philonotis* as he had originally decided.

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REFERENCES

BROTHERUS, V. F. 1904. Bartramiaceae. (*In* ENGLER, A. *and* K. PRANTL, *ed. Die natürlichen Pflanzenfamilien.* Leipzig, Wilhelm Engelmann, Teil 1, Abt. 3, Hälfte 1, 631–60.)

———. 1909. Musci (Laubmoose). Nachträge und Verbesserungen zu Teil 1, Abteilung 3 bis Ende 1908. (*In* ENGLER, A. *and* K. PRANTL., *ed. Die natürlichen Pflanzenfamilien.* Leipzig, Wilhelm Engelmann, Teil 1, Abt. 3, Hälfte 2, 1172–239.)

CARDOT, J. 1908. La flore bryologique des Terres Magellaniques, de la Géorgie du Sud et de l'Antarctide. *Wiss. Ergebn. schwed. Südpolarexped.*, Bd. 4, Lief. 8, 298 pp.

CLARKE, G. C. S. 1973. A synoptic flora of South Georgian mosses: III. *Leptotheca, Philonotis, Mielichhoferia* and *Pohlia*. *British Antarctic Survey Bulletin*, No. 37, 53–79.

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.)