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**The Mosses of Macquarie Island  
and Heard Island**

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## THE MOSSES OF MACQUARIE ISLAND AND HEARD ISLAND

BY H. T. CLIFFORD\*

### MACQUARIE ISLAND

Although Macquarie Island was visited by several scientific expeditions during the Nineteenth Century, the only indigenous mosses recorded during this period were described by Scott (1883) who collected several species during a short visit there in 1880. The Australasian Antarctic Expedition (1911-14) maintained a base on the island for a year, but unfortunately most of its cryptogam collection was subsequently mislaid (Sir D. Mawson in litt.). The British Australian and New Zealand Antarctic Research Expedition (1929-31) collected some material and this is dealt with for the first time in this report. The current Australian National Antarctic Research Expedition maintains a permanent station on the island and has brought back very large collections which have provided the bulk of the material for the present paper.

These A.N.A.R.E. collections include all the species collected by the B.A.N.Z.A.R. Expedition but do not contain several of the species recorded by Scott. However, as some of the phanerogams that he listed were wrongly identified (Cheeseman 1919), it is probable that the same may apply to the mosses. Further research may reveal a few more species, but it is certain that the muscological flora of Macquarie Island is reasonably well established.

Unfortunately, owing to the chaos that exists in bryological nomenclature, some of the names in this report may later have to be altered. It is regrettable but unavoidable, and in order to fix more definitely the identity of the plants a key to them has been prepared. Only the characters of the gametophores have been used since some of the species have not yet been collected with capsules. As a further guide, line drawings of the typical leaves of each species have been prepared.

Macquarie Island (Lat.  $54\frac{1}{2}^{\circ}\text{S}$ , Long.  $159^{\circ}\text{E}$ ) is situated about 800 nautical miles from Tasmania and 600 miles from New Zealand; the Antarctic Continent lies about 900 miles to the south. It is a narrow

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island about 21 miles long and 2 miles wide with its principal axis approximately north-south. It is little more than a plateau, rising abruptly from the sea on all sides to an average elevation of about 1000 feet. The climate is inhospitable, with the sky often cloudy and mists and fogs common. As with most subantarctic islands the annual range of monthly mean temperature is small — approximately 37° to 43°F.

Although such a climate would not seem favourable for plant growth, about 40 species of mosses are known to grow there. Sporophyte production is apparently normal, and those species for which capsules are not yet available belong to genera which are sterile even in more favourable climates, for example *Sphagnum* and *Brachythecium*. However the harsh conditions may have caused the dwarfing of several species, which are more robust further north. Some of these forms may be worthy of varietal or specific rank, but until the subantarctic floras are better known, it is perhaps safer to be conservative in naming them.

The mosses now known from Macquarie Island are arranged systematically (Brotherus 1924-25) in Table 1 and a key to them is given in Table 2. The collections of the Australian National Antarctic Research Expedition have been deposited at the National Herbarium, Melbourne.

TABLE 1

## MOSSES OF MACQUARIE ISLAND

First collected by Scott<sup>(1)</sup>; B.A.N.Z.A.R.E.<sup>(2)</sup>; A.N.A.R.E.<sup>(3)</sup>

## SPHAGNALES

*Sphagnaceae**Sphagnum falcatum* Besch. <sup>(3)</sup>

## ANDREAEALES

*Andreaeaceae**Andreaea acutifolia* H.f. et W. <sup>(3)</sup>*Andreaea mutabilis* H.f. et W. <sup>(1)</sup>

This species now regarded as *A. rupestris* Hedw. is recorded by Scott but has not been collected again. It is probable that his plant was what is here called *A. acutifolia* H.f. et W.

## DICRANALES

*Seligeraceae**Blindia tortifolia* (H.f. et W.) C.M. <sup>(2)</sup>*Ditrichaceae**Distichium capillaceum* (S.) B. et S. <sup>(3)</sup>*Ditrichum strictum* Hpe. <sup>(2)</sup>*Ceratodon purpureus* Brid. <sup>(3)</sup>*Dicranaceae**Campylopus introflexus* (Hedw.) Mitt. <sup>(1)</sup>

Recorded by Scott but not collected again. It is probable that the plant so named was *C. clavatus* (R.Br.) H.f. et W.

*Campylopus clavatus* (R.Br.) H.f. et W. <sup>(3)</sup>*Trematodon flexipes* Mitt. <sup>(1)</sup>

Recorded by Scott but not collected again.

*Dicranoloma menziesii* (H.f. et W.) Par. <sup>(1)</sup>

Recorded by Scott but not collected again.

*Dicranoloma robustum* (H.f. et W.) Par. <sup>(1)</sup>

This species is represented principally by the variety *setosum* (H.f. et W.) Sains.

*Tridontium tasmanicum* Hk. <sup>(2)</sup>*Dicranoweisia antarctica* (C.M.) Par. <sup>(3)</sup>

## POTTIALES

*Pottiaceae**Pottia c.f. heimii* (Hedw.) B. et S. (3)

Probably a new species with the affinities suggested.

## GRIMMIALES

*Grimmiaceae**Rhacomitrium crispulum* (H.f. et W.) H.f. et W. (2)*Rhacomitrium lanuginosum* (Hedw.) Brid. (1)*Grimmia apocarpa* Hedw. (3)

## FUNARIALES

*Splachnaceae**Tayloria octoblepharis* (Hk.) Mitt. (3)

## EUBRYALES

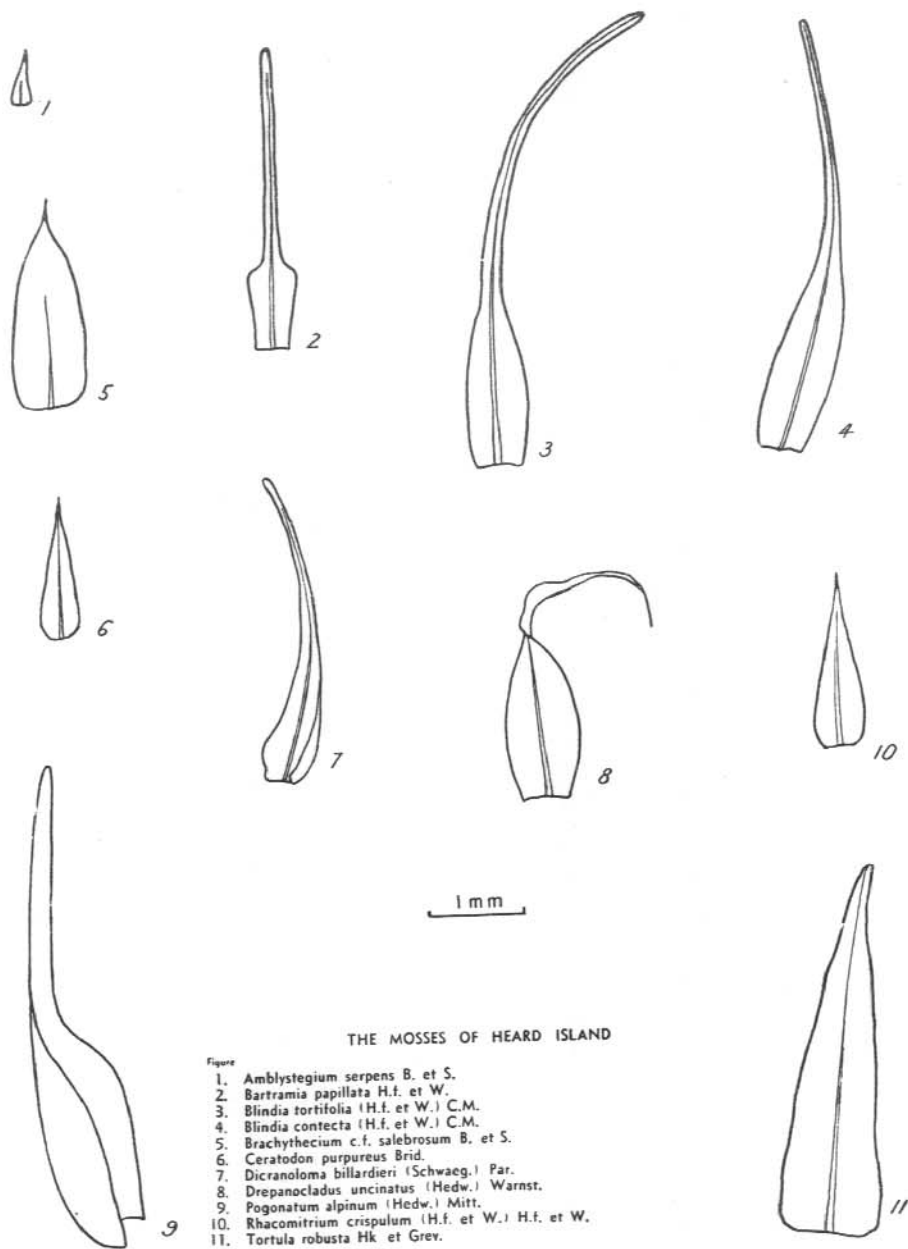
*Bryaceae**Bryum laevigatum* H.f. et W. (3)*Bryum c.f. amblyophyllum* Cardot. (3)

The Macquarie Island plant agrees closely with the type figure of this Fuegian species.

*Bryum mucronatum* Mitt. (2)*Leptostomaceae**Leptostomum inclinans* R.Br. (3)*Bartramiaceae**Breutelia pendula* (Hk.) Mitt. (2)*Breutelia elongata* (H.f. et W.) Mitt. (1)*Conostomum australe* Swartz. (3)*Bartramia papillata* H.f. et W. (2)

## ISOBRYALES

*Orthotrichaceae**Muelleriella crassifolia* (H.f. et W.) Dus. (2)*Zygodon menziesii* (Schwaeg.) W. Arn. (1)*Macromitrium longirostre* Schwaeg. (3)



THE MOSSES OF HEARD ISLAND

Figure

1. *Amblystegium serpens* B. et S.
2. *Bartramia papillata* H.f. et W.
3. *Blindia tortifolia* (H.f. et W.) C.M.
4. *Blindia contecta* (H.f. et W.) C.M.
5. *Brachythecium* c.f. *salebrosum* B. et S.
6. *Ceratodon purpureus* Brid.
7. *Dicranoloma billardieri* (Schwaeg.) Par.
8. *Drepanocladus uncinatus* (Hedw.) Warnst.
9. *Pogonatum alpinum* (Hedw.) Mitt.
10. *Rhacomitrium crispulum* (H.f. et W.) H.f. et W.
11. *Tortula robusta* Hk et Grev.

*Hedwigiaceae**Rhacocarpus humboldtii* (Hk.) Lindb. (3)*Ptychomniaceae**Ptychomnion aciculare* (Brid.) Mitt. (3)*Lembophyllaceae**Lembophyllum clandestinum* (H.f. et W.) Lindb. (2)

## HOOKERIALES

*Hookeriaceae**Pterygophyllum dentatum* (H.f. et W.) Mitt. (3)

## HYPNOBRYALES

*Thuidiaceae**Thuidium furfurosum* (H.f. et W.) Jaeg. (2)*Amblystegiaceae**Drepanocladus aduncus* (Hedw.) Moenk. (3)*Amblystegium serpens* B. et S. (3)*Brachytheciaceae**Brachythecium* c.f. *salebrosum* B. et S. (2)

Until a sporophyte is available, this determination must remain tentative.

*Hypnaceae**Hypnum cupressiforme* Hedw. (2)

## POLYTRICHALES

*Polytrichaceae**Pogonatum alpinum* (Hedw.) Mitt. (3)*Psilopilum australe* (H.f. et W.) Jaeg. (3)

TABLE 2

Key to the Mosses of Macquarie Island  
(Foliage damp unless otherwise stated)

Costa of leaf single, usually well developed	....	....	A.
Costa, if present, short and bifid	....	....	g.
A. Leaf contracting from a broad base to a long subula	....	....	B.
Leaf not subulate	....	....	F.
B. Lamellae on upper surface of leaf	....	....	<i>Pogonatum</i>
No lamellae on upper surface of leaf	....	....	C.
C. Leaves two ranked	....	....	<i>Distichium</i>
Leaves in more than two ranks	....	....	D.
D. Leaf-base stem sheathing	....	....	<i>Bartramia</i>
Leaf-base not stem sheathing	....	....	E.
E. Alar cells strongly differentiated	....	....	<i>Dicranoloma</i>
Alar cells not or scarcely differentiated	....	....	<i>Ditrichum</i>
F. Leaf or shoot tip falcate or circinate	....	....	G.
Leaf or shoot tip not falcate or circinate	....	....	H.
G. Leaf tip hyaline and coarsely toothed	....	....	<i>Rhacomitrium lanuginosum</i>
Leaf tip not hyaline, scarcely toothed	....	....	<i>Drepanocladus</i>
H. Leaf spatulate	....	....	<i>Tayloria</i>
Leaf not spatulate	....	....	I.
I. Leaf thick and fleshy, lamellae on upper surface	....	....	<i>Psilopilum</i>
Leaf neither thick nor fleshy, no lamellae on upper surface	....	....	J.
J. Leaf with a border at the proximal end	....	....	<i>Tridontium</i>
Leaf without border	....	....	K.
K. Basal cells of leaf thick walled, margin of lumen sinuose	....	....	<i>Rhacomitrium crispulum</i>
Basal cells of leaf, if thick walled, without a sinuose wall to the cell lumen	....	....	L.



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- L. Leaf tip obtuse with a thick apiculus ..... *Leptostomum*  
 Leaf tip, if obtuse lacking an apiculus ..... M.
- M. Leaf margin strongly recurved, particularly at  
 the distal end ..... N.  
 Leaf margin flat or incurved ..... P.
- N. Many branched creeping plant ..... *Macromitrium*  
 Erect rosette habit, branches few ..... O.
- O. Leaf bordered ..... *Bryum mucronatum*  
 Leaf unbordered ..... *Ceratodon*
- P. Leaves at least six times longer than broad ..... Q.  
 Leaves much less than six times longer than  
 broad ..... T.
- Q. Alar cells well differentiated ..... R.  
 Alar cells scarcely differentiated ..... S.
- R. Nerve about half the width of leaf at its  
 proximal end ..... *Campylopus*  
 Nerve narrower than half the width at its  
 proximal end ..... *Blindia*
- S. Foliage when dry crisped ..... *Macromitrium*  
 Foliage when dry rigid and appressed to axis *Conostomum*
- T. Leaf about 2 mm. or more long ..... U.  
 Leaf about 1 mm. or less long ..... d.
- U. Rosette plant, branches few ..... V.  
 Creeping plant, branches many ..... b.
- V. Stems closely matted with radicles ..... W.  
 Stems almost free of radicles ..... Z.
- W. Leaf plaited at the base ..... X.  
 Leaf not plaited at the base ..... Y.
- X. Leaf about 5 mm. long ..... *Breutelia elongata*  
 Leaf about 2 mm. long ..... *Breutelia pendula*
- Y. Leaf ovate-lanceolate about 1 mm. or more  
 broad ..... *Bryum laevigatum*  
 Leaf ligulate about 0.5 mm. broad ..... *Zygodon*



## HEARD ISLAND

Prior to 1948, three scientific expeditions had visited Heard Island for short periods and made collections of mosses — the "Challenger" Expedition in 1874, the Deutsche Südpolar-Expedition in 1902, and the British, Australian and New Zealand Antarctic Research Expedition in 1929. Of these the first two only have reported on their collections (Mitten, 1885; Brotherus, 1906); the plants collected by the B.A.N.Z.A.R. Expedition are dealt with for the first time in this report. The current Australian National Antarctic Research Expedition maintains a permanent station on the island and has provided the bulk of the material for the present paper.

These A.N.A.R.E. collections include all the moss species previously collected with the exception of *Ditrichum subaustrale*, Broth. The muscological flora of Heard Island is now reasonably well known and apparently contains only a few species.

Heard Island (Lat. 53°S, Long. 73½°E) is situated about 2,400 nautical miles from Western Australia and about 2,300 miles from South Africa; the Antarctic Continent lies about 900 miles to the south. The island which is about 27 miles long and 13 miles wide is physiographically little more than a cone jutting out of the sea to an elevation of over 9000 feet. It is permanently glaciated except for a few low-lying areas. Fog is very common. The annual range of monthly mean temperature is small — approximately 29° to 38°F.

Although such conditions do not favour plant growth, sporophytes are known for several of the species. The mosses now known from Heard Island are arranged systematically (Brotherus 1924-25) in Table 3 and a key to those collected by the Australian National Antarctic Research Expedition is given in Table 4.

TABLE 3

## MOSSES OF HEARD ISLAND

First collected by the "Challenger" Expedition<sup>(1)</sup>; Die Deutsche Südpolar-Expedition<sup>(2)</sup>; B.A.N.Z.A.R.E.<sup>(3)</sup>; A.N.A.R.E.<sup>(4)</sup>

## DICRANALES

*Seligeraceae*

*Blindia contecta* (H.f. et W.) C.M. <sup>(3)</sup>

*Blindia tortifolia* (H.f. et W.) C.M. <sup>(3)</sup>

*Ditrichaceae**Ditrichum subaustrale* Broth. (2)

Recorded by Brotherus but not subsequently collected.

*Ceratodon purpureus* Brid. (1)*Dicranaceae**Dicranoweisia grimmiaea* (C.M.) Broth. (2)Recorded by Brotherus but is probably a synonym of  
*Blindia contecta* (H.f. et W.) C.M.*Dicranoloma Billardieri* (Schwaeg.) Par. (4)The form commonly collected morphologically resembles  
*Blindia tenuifolia* (H.f. et W.) Mitt.

## POTTIALES

*Pottiaceae**Tortula robusta* Hk. et Grev. (4)

## GRIMMIALES

*Grimmiaceae**Grimmia insularis* Mitt. (1)Recorded and described by Mitten, but an examination of co-type material kindly loaned by Dr. D. P. Rogers of the New York Botanic Gardens suggests that this species is a synonym of  
*Blindia tortifolia* (H.f. et W.) C.M.

## EUBRYALES

*Bartramiaceae**Bartramia papillata* H.f. et W. (4)

A very plastic species.

*Bartramia diminutiva* C.M. (2)Recorded by Brotherus, but it is probably a synonym of  
*Bartramia papillata* H.f. et W.*Bartramia robusta* H.f. et W. (1)Recorded by Mitten, but the writer suggests that it was a mis-identification of *Bartramia papillata* H.f. et W.

## ISOBRYALES

*Orthotrichaceae**Rhacomitrium crispulum* (H.f. et W.) H.f. et W. (4)

*Rhacomitrium nigratum* (C.M.) Jaeg. <sup>(2)</sup>  
 Recorded by Brotherus but it is probably a synonym of  
*Rhacomitrium crispulum* (H.f. et W.) H.f. et W.

## HYPNOBRYALES

*Brachytheciaceae*

*Brachythecium* c.f. *salebrosum* B. et S. <sup>(4)</sup>  
 For exact determination a sporophyte is required.

*Amblystegiaceae*

*Drepanocladus uncinatus* (Hedw.) Warnst. <sup>(3)</sup>  
*Amblystegium serpens* B. et S. <sup>(3)</sup>

## POLYTRICHALES

*Polytrichaceae*

*Pogonatum alpinum* (Hedw.) Mitt. <sup>(2)</sup>

TABLE 4

Key to the Mosses of Heard Island  
 (Foliage damp unless otherwise stated.)

Leaf with lamellae on its upper surface	.....	<i>Pogonatum</i>
Leaf lacking lamellae on its upper surface	.....	A.
A. Leaf with a broad base and long subula	.....	B.
Leaf not subulate	.....	D.
B. Leaf base stem sheathing	.....	<i>Bartramia</i>
Leaf base not stem sheathing	.....	C.
C. Leaves closely appressed to the stem when dry	.....	<i>Blindia contecta</i>
Leaves not closely appressed to the stem when dry	.....	<i>Blinda tortifolia</i>
D. Tip of shoot falcate or circinate	.....	E.
Tip of shoot not falcate or circinate	.....	F.
E. Plant axis horizontal, many branched	.....	<i>Drepanocladus</i>
Plant axis erect with few branches	.....	<i>Dicranoloma</i>
F. Leaf about 1 mm. or less long	.....	<i>Amblystegium</i>
Leaf much longer than 1 mm.	.....	G.

- |  |       |                           |
|--|-------|---------------------------|
| G. Plant axis horizontal, many branched                      | ..... | <i>Brachythecium</i>      |
| Plant axis erect, branches few                               | ..... | H.                        |
| H. Leaf margin strongly recurved                             | ..... | <i>Ceratodon</i>          |
| Leaf margin flat or incurved                                 | ..... | I.                        |
| I. Leaves closely appressed on the stem when dry             | ..... | <i>Blindia contecta</i>   |
| Leaves not tightly appressed to the stem when dry            | ..... | J.                        |
| J. Leaf narrow lanceolate, about six times longer than broad | ..... | <i>Blindia tortifolia</i> |
| Leaf lanceolate about four times longer than broad           | ..... | <i>Tortula</i>            |

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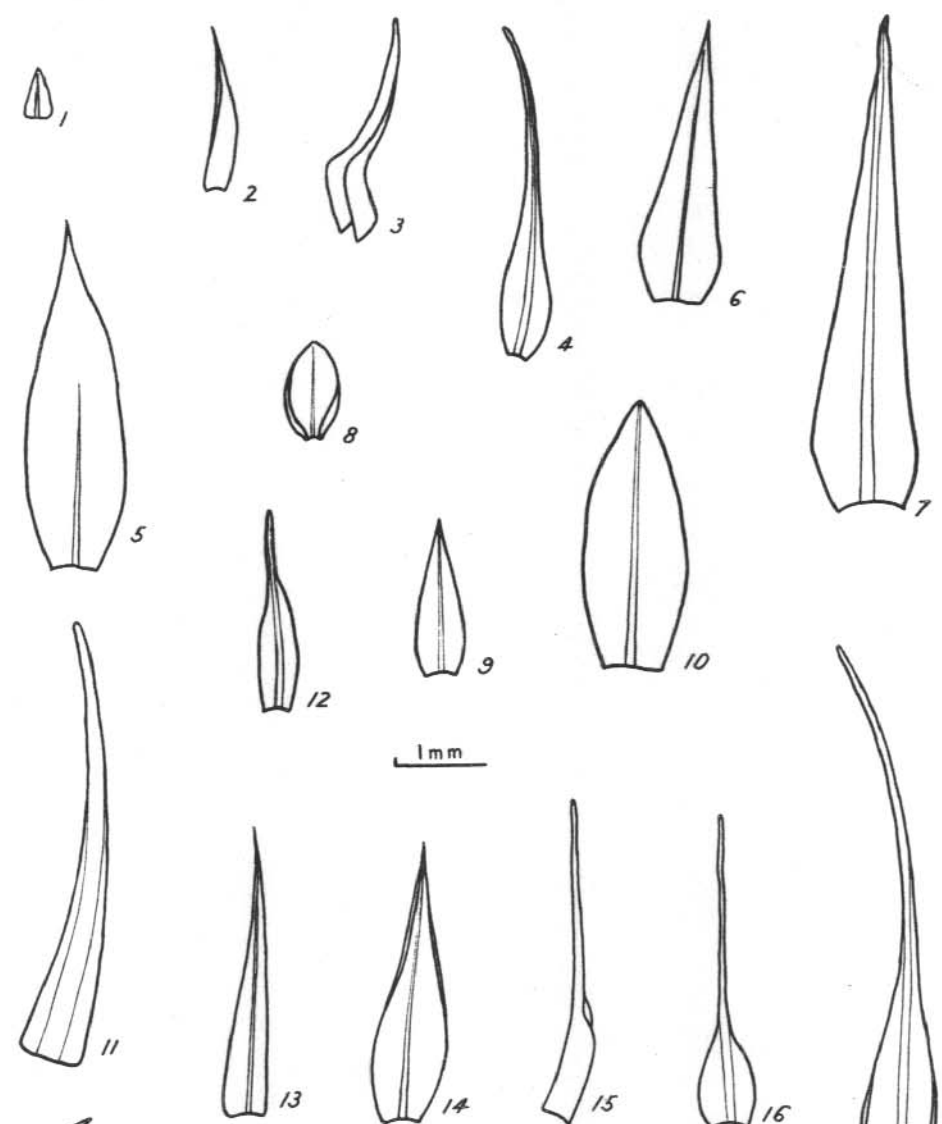
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#### ACKNOWLEDGMENTS

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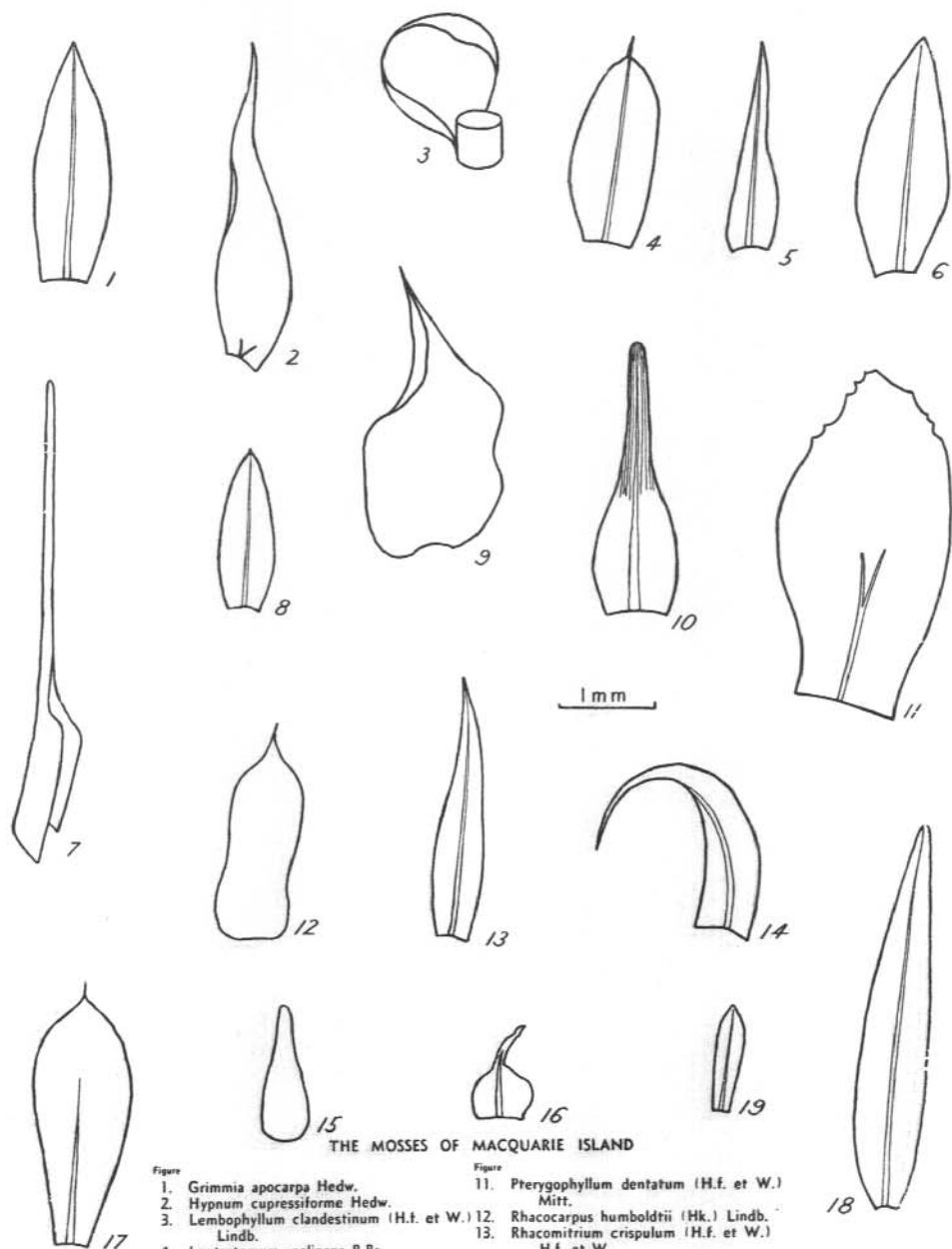
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| <p>Figures</p> <ol style="list-style-type: none"> <li>1. <i>Amblystegium serpens</i> B. et S.</li> <li>2. <i>Andreaea acutifolia</i> H.f. et W.</li> <li>3. <i>Bartramia papillata</i> H.f. et W.</li> <li>4. <i>Blindia tortifolia</i> (H.f. et W.) C.M.</li> <li>5. <i>Brachythecium</i> c.f. <i>salebrosum</i> B. et S.</li> <li>6. <i>Breutelia pendula</i> (Hk.) Mitt.</li> <li>7. <i>Breutelia elongata</i> (H.f. et W.) Mitt.</li> <li>8. <i>Bryum</i> c.f. <i>amblyophyllum</i> Cardot.</li> <li>9. <i>Bryum mucronatum</i> Mitt.</li> <li>10. <i>Bryum laevigatum</i> H.f. et W.</li> </ol> | <p>Figures</p> <ol style="list-style-type: none"> <li>11. <i>Campylopus clavatus</i> (R.Br.) H.f. et W.</li> <li>12. <i>Ceratodon purpureus</i> Brid.</li> <li>13. <i>Conostomum australe</i> Swartz.</li> <li>14. <i>Dicranoweisia antarctica</i> (C.M.) Par.</li> <li>15. <i>Distichium capillaceum</i> (S.) B. et S.</li> <li>16. <i>Ditrichum strictum</i> Hpe.</li> <li>17. <i>Dicranoloma robustum</i> (H.f. et W.) Par. var. <i>setosum</i> (H.f. et W.) Sains.</li> <li>18. <i>Drepanocladus aduncus</i> (Hedw.) Moenk.</li> </ol> |
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THE MOSSES OF MACQUARIE ISLAND

Figure

1. *Grimmia apocarpa* Hedw.
2. *Hypnum cupressiforme* Hedw.
3. *Lembophyllum clandestinum* (H.f. et W.) Lindb.
4. *Leptostomum inclinans* R.Br.
5. *Macromitrium longirostre* Schwaeg.
6. *Muelleriella crassifolia* (H.f. et W.) Dus.
7. *Pogonatum alpinum* (Hedw.) Mitt.
8. *Pottia* c.f. *heimii* (Hedw.) B. et S.
9. *Ptychomnion aciculare* (Brid.) Mitt.
10. *Psilopilum australe* (H.f. et W.) Jaeg.

Figure

11. *Pterygophyllum dentatum* (H.f. et W.) Mitt.
12. *Rhacocarpus humboldtii* (Hk.) Lindb.
13. *Rhacomitrium crispulum* (H.f. et W.) H.f. et W.
14. *Rhacomitrium lanuginosum* (Hedw.) Brid.
15. *Sphagnum falcatum* Besch.
16. *Thuidium furfuriosum* (H.f. et W.) Jaeg.
17. *Tayloria octoblepharis* (Hk.) Mitt.
18. *Tridontium tasmanicum* Hk.
19. *Zygodon menziesii* (Schwaeg.) W.Arn.