Bryophyte Surveys Ltd




Merkland Burn HEP:
bryophyte survey and assessment

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Date: 06 July 2022

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Bryophyte Surveys Ltd

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INTRODUCTION

The author was instructed by Naturally Wild Consultants Limited to undertake a bryophyte survey and assessment for a proposed HEP scheme at Merkland Burn, Arran. All work was undertaken by [redacted] (Bryophyte Surveys Ltd), a professional bryologist and an expert on the bryophytes of Britain.

METHOD

Taxonomy

Taxonomy follows Blockeel et al. (2021).

Desktop review

A review was undertaken of the scheme design and previous bryophyte records from the area, including those held by the NBN Gateway and within the national bryophyte recording database of The British Bryological Society, managed by the Biological Records Centre (Wallingford, UK).

Fieldwork

Fieldwork was undertaken during 29–30 June 2022. All parts of the length of stream that would be impacted by the HEP scheme were visited (Figures 1–3). No significant survey constraints were encountered. An inventory of the species present was compiled, with specific attention paid to locating species of conservation concern. A hand-held GPS (Garmin GPSMAP 62s) was used to record locations of all notable species encountered. Small samples of critical species were collected for determination by microscopy. In addition to the bryophyte survey, attention was paid to the detection of *Trichomanes speciosum*.

HEP assessment

An assessment of the conservation importance of the bryophyte assemblage along the impacted length of Merkland Burn was undertaken according to the classification system of NatureScot (Averis et al. 2011).

Figure 1. View of stream where the HEP powerhouse and outfall would be located.

Figure 2. Typical habitat along the length of the stream where flow would be depleted by the HEP scheme.

Figure 3. View downstream at the location where the offtake for the HEP scheme is planned.

RESULTS AND DISCUSSION

Previous bryophyte records

There are no previous bryophyte records from Merkland Burn.

Species inventory

A total of 100 bryophyte species (34 liverworts and 66 mosses) was recorded during the present fieldwork (Appendix 1).

HEP assessment

Two species included within the HEP assessment system were found along Merkand Burn, including *Cololejeunea microscopica* (Figure 4) and *Jubula hutchinsiae* (Figure 5), both present in small quantity at single locations (Figure 6). The site therefore scores two points, placing it within Category C, which comprise streams described as (Averis et al. 2011):

> "Surveyed; 0-4 points; additional scoring species unlikely to occur; flora of low to medium richness; no further survey necessary; hydroelectric development unlikely to have an impact of national importance, but in some cases could have an impact of significance at a more local scale."

Figure 4. Location of *Cololejeunea microscopica* (NS0184039005).

Figure 5. Location of *Jubula hutchinsiae* (NS0192938926).

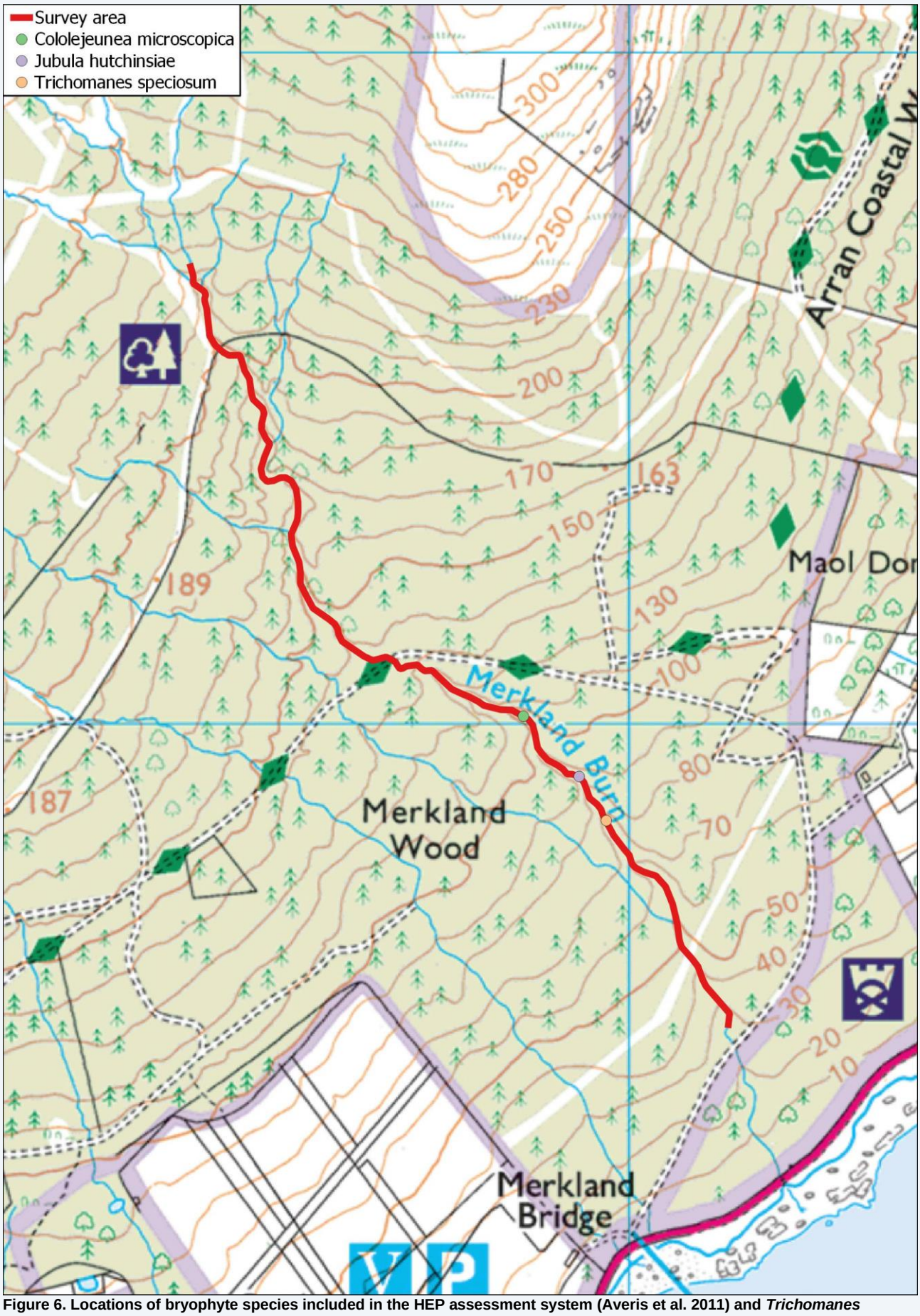

Figure 6. Locations of bryophyte species included in the HEP assessment system (Averis et al. 2011) and *Trichomanes speciosum*.

Trichomanes speciosum

The gametophyte of *Trichomanes speciosum* was found at a single location, heavily shaded on the underhang of a large boulder within the stream (Figures 7–8). No sporophytes of the species were found.

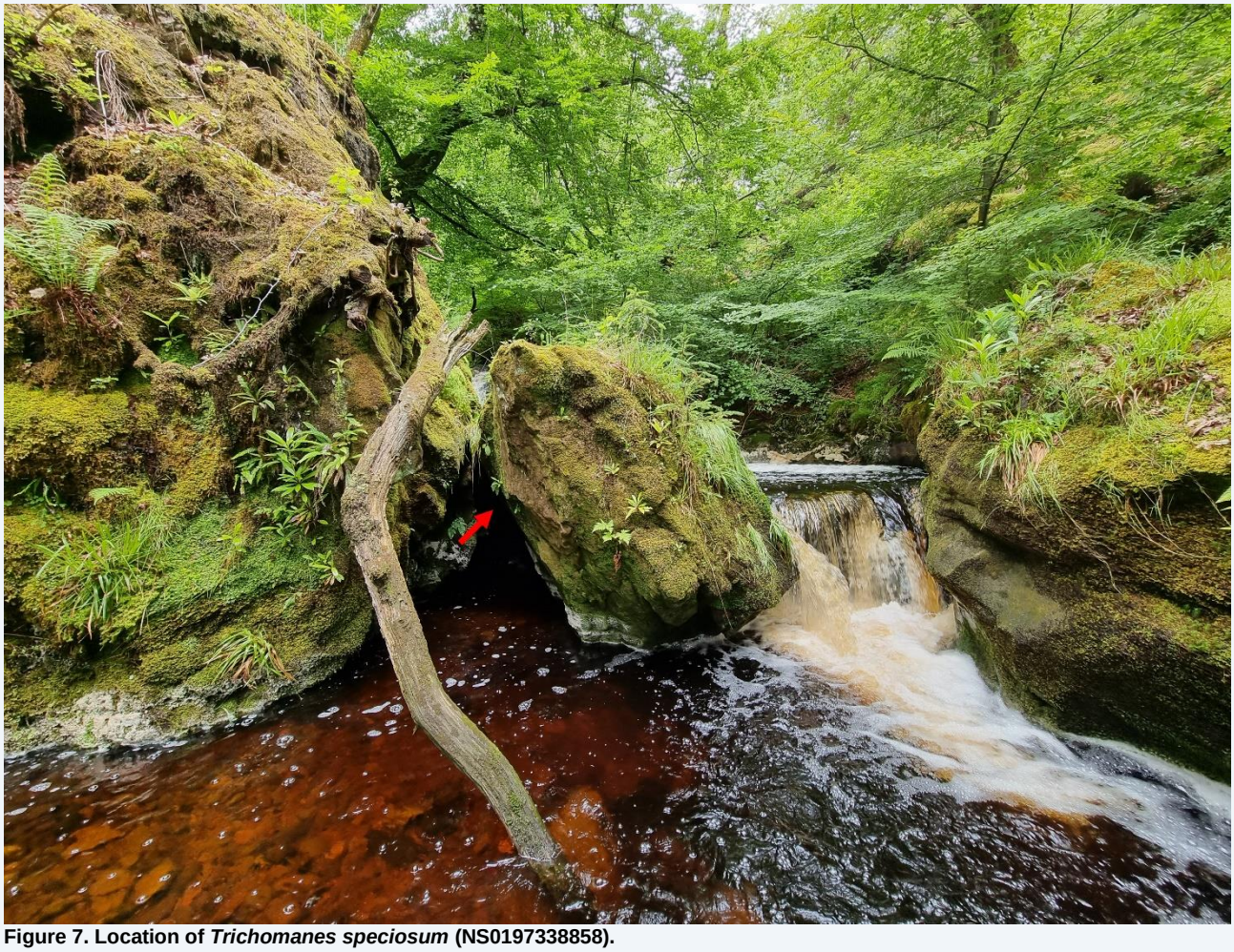

Figure 7. Location of *Trichomanes speciosum* (NS0197338858).

Figure 8. Location of *Trichomanes speciosum*, scattered across area indicated.

CONCLUSIONS

- The present report provides a comprehensive bryophyte survey and assessment of the proposed Merkland Burn HEP scheme.
- A total of 100 species of bryophytes was found within the survey area.
- According to the assessment scheme of NatureScot (Averis et al. 2011), the bryophyte flora is of low to medium richness and HEP development is unlikely to have an impact of national importance.
- The gametophyte of *Trichomanes speciosum* was found at a single location along the stream.

BIBLIOGRAPHY

Averis ABG, Hodgetts NG, Rothero GP, Genney D. 2011. Bryological assessment for hydroelectric schemes in the west Highlands. Scottish Natural Heritage Commissioned Report No. 449. Inverness: Scottish Natural Heritage.

[redacted]. 2021. A new checklist of the bryophytes of Britain and Ireland, 2020. Journal of Bryology. 43:1–51.

APPENDIX 1 – SPECIES INVENTORY

The below provides an inventory of bryophytes recorded during the present survey. Taxonomy follows Blockeel et al. (2021). Frequency of occurrence within the study area is estimated as: R – Rare; O – Occasional; LF – Locally Frequent; F – Frequent; LA – Locally Abundant; and A – Abundant.

CC No	Division	Family	Species	Freq.
L009.01	Marchantiophyta	Conocephalaceae	*Conocephalum conicum*	R
L013.01	Marchantiophyta	Pelliaceae	*Pellia epiphylla*	F
L019.01	Marchantiophyta	Metzgeriaceae	*Metzgeria violacea*	O
L019.03	Marchantiophyta	Metzgeriaceae	*Metzgeria furcata*	O
L021.01	Marchantiophyta	Aneuraceae	*Riccardia multifida*	R
L021.04	Marchantiophyta	Aneuraceae	*Riccardia palmata*	O
L024.01	Marchantiophyta	Frullaniaceae	*Frullania tamarisci*	F
L024.05	Marchantiophyta	Frullaniaceae	*Frullania dilatata*	F
L025.01	Marchantiophyta	Jubulaceae	*Jubula hutchinsiae*	R
L026.01	Marchantiophyta	Lejeuneaceae	*Cololejeunea microscopica*	R
L031.03	Marchantiophyta	Lejeuneaceae	*Lejeunea patens*	R
L033.01	Marchantiophyta	Lejeuneaceae	*Microlejeunea ulicina*	F
L038.01	Marchantiophyta	Lepidoziaceae	*Bazzania trilobata*	F
L040.01	Marchantiophyta	Lepidoziaceae	*Lepidozia reptans*	O
L044.01	Marchantiophyta	Lophocoleaceae	*Lophocolea bidentata*	R
L048.02.a	Marchantiophyta	Plagiochilaceae	*Plagiochila porelloides var. porelloides*	O
L048.06	Marchantiophyta	Plagiochilaceae	*Plagiochila spinulosa*	O
L048.08	Marchantiophyta	Plagiochilaceae	*Plagiochila punctata*	R
L054.01	Marchantiophyta	Calypogeiaceae	*Calypogeia fissa*	F
L054.02	Marchantiophyta	Calypogeiaceae	*Calypogeia muelleriana*	F
L054.08	Marchantiophyta	Calypogeiaceae	*Calypogeia arguta*	F
L060.02	Marchantiophyta	Jungermanniaceae	*Jungermannia pumila*	O
L062.01	Marchantiophyta	Saccogynaceae	*Saccogyna viticulosa*	O
L065.01	Marchantiophyta	Gymnomitriaceae	*Nardia compressa*	O
L067.02	Marchantiophyta	Gymnomitriaceae	*Marsupella emarginata*	F
L071.01	Marchantiophyta	Cephaloziaceae	*Cephalozia bicuspidata*	F
L071.06	Marchantiophyta	Cephaloziaceae	*Cephalozia lunulifolia*	F
L071.11	Marchantiophyta	Cephaloziaceae	*Cephalozia curvifolia*	F
L083.04	Marchantiophyta	Cephaloziellaceae	*Cephaloziella hampeana*	R
L087.01.a	Marchantiophyta	Scapaniaceae	*Lophozia ventricosa var. ventricosa*	R
L092.01	Marchantiophyta	Scapaniaceae	*Diplophyllum albicans*	F
L094.10	Marchantiophyta	Scapaniaceae	*Scapania umbrosa*	O
L094.15	Marchantiophyta	Scapaniaceae	*Scapania undulata*	F
L094.21	Marchantiophyta	Scapaniaceae	*Scapania gracilis*	F
M001.06.a	Bryophyta	Sphagnaceae	*Sphagnum palustre var. palustre*	O
M001.09	Bryophyta	Sphagnaceae	*Sphagnum squarrosum*	O
M001.12	Bryophyta	Sphagnaceae	*Sphagnum girgensohnii*	R
M001.14	Bryophyta	Sphagnaceae	*Sphagnum quinquefarium*	O
M001.16	Bryophyta	Sphagnaceae	*Sphagnum capillifolium*	O
M001.20.a	Bryophyta	Sphagnaceae	*Sphagnum subnitens subsp. subnitens*	O
M001.25	Bryophyta	Sphagnaceae	*Sphagnum auriculatum*	F
M001.33	Bryophyta	Sphagnaceae	*Sphagnum fallax*	O

CC No	Division	Family	Species	Freq.
M002.06.b	Bryophyta	Andreaeaceae	*Andreaea rothii subsp. falcata*	R
M004.01	Bryophyta	Tetraphidaceae	*Tetraphis pellucida*	O
M005.01	Bryophyta	Tetraphidaceae	*Tetrodontium brownianum*	R
M006.03	Bryophyta	Polytrichaceae	*Atrichum undulatum*	R
M009.02	Bryophyta	Polytrichaceae	*Pogonatum aloides*	R
M009.03	Bryophyta	Polytrichaceae	*Pogonatum urnigerum*	R
M010.02	Bryophyta	Polytrichaceae	*Polytrichum formosum*	O
M010.03	Bryophyta	Polytrichaceae	*Polytrichum commune*	F
M012.01	Bryophyta	Diphysciaceae	*Diphyscium foliosum*	O
M025.03	Bryophyta	Leucobryaceae	*Dicranodontium denudatum*	O
M026.11	Bryophyta	Leucobryaceae	*Campylopus introflexus*	R
M027.02	Bryophyta	Leucobryaceae	*Leucobryum juniperoideum*	O
M027.03	Bryophyta	Leucobryaceae	*Leucobryum albidum*	O
M028.02	Bryophyta	Amphidiaceae	*Amphidium mougeotii*	O
M029.02	Bryophyta	Aongstroemiaceae	*Dichodontium flavescens*	R
M029.03	Bryophyta	Aongstroemiaceae	*Dichodontium palustre*	R
M031.08	Bryophyta	Dicranellaceae	*Dicranella rufescens*	R
M031.10	Bryophyta	Dicranellaceae	*Dicranella heteromalla*	O
M032.15	Bryophyta	Fissidentaceae	*Fissidens taxifolius*	R
M032.16	Bryophyta	Fissidentaceae	*Fissidens dubius*	R
M034.04	Bryophyta	Dicranaceae	*Dicranum scoparium*	F
M034.06	Bryophyta	Dicranaceae	*Dicranum majus*	F
M049.05	Bryophyta	Ditrichaceae	*Ditrichum heteromallum*	R
M058.02	Bryophyta	Pottiaceae	*Chionoloma cylindrotheca*	R
M072.10	Bryophyta	Pottiaceae	*Didymodon insulanus*	R
M085.01	Bryophyta	Seligeriaceae	*Blindia acuta*	R
M094.02	Bryophyta	Grimmiaceae	*Racomitrium aciculare*	F
M094.03	Bryophyta	Grimmiaceae	*Racomitrium aquaticum*	R
M094.04	Bryophyta	Grimmiaceae	*Racomitrium fasciculare*	R
M094.07	Bryophyta	Grimmiaceae	*Racomitrium affine*	R
M094.08.a	Bryophyta	Grimmiaceae	*Racomitrium obtusum f. obtusum*	R
M094.08.b	Bryophyta	Grimmiaceae	*Racomitrium obtusum f. trichophorum*	R
M108.05	Bryophyta	Bartramiaceae	*Philonotis fontana*	R
M110.48	Bryophyta	Bryaceae	*Bryum pseudotriquetrum*	R
M115.01	Bryophyta	Mniaceae	*Mnium hornum*	F
M117.01	Bryophyta	Mniaceae	*Rhizomnium punctatum*	O
M118.06	Bryophyta	Mniaceae	*Plagiomnium undulatum*	R
M118.07	Bryophyta	Mniaceae	*Plagiomnium rostratum*	R
M126.04	Bryophyta	Orthotrichaceae	*Ulota bruchii*	O
M135.01	Bryophyta	Hookeriaceae	*Hookeria lucens*	R
M141.08	Bryophyta	Plagiotheciaceae	*Plagiothecium succulentum*	R
M141.10	Bryophyta	Plagiotheciaceae	*Plagiothecium undulatum*	O
M143.01	Bryophyta	Plagiotheciaceae	*Pseudotaxiphyllum elegans*	F
M151.01	Bryophyta	Amblystegiaceae	*Palustriella commutata*	R
M171.01	Bryophyta	Scorpidiaceae	*Hygrohypnella ochracea*	O
M178.01	Bryophyta	Thuidiaceae	*Thuidium tamariscinum*	F
M189.01	Bryophyta	Brachytheciaceae	*Kindbergia praelonga*	O
M190.05	Bryophyta	Brachytheciaceae	*Sciuro-hypnum plumosum*	R
M196.01.a	Bryophyta	Hypnaceae	*Hypnum cupressiforme var. cupressiforme*	F
M196.02	Bryophyta	Hypnaceae	*Hypnum andoi*	F
M196.04	Bryophyta	Hypnaceae	*Hypnum jutlandicum*	O

CC No	Division	Family	Species	Freq.
M210.03	Bryophyta	Hylocomiaceae	*Rhytidiadelphus loreus*	A
M214.01	Bryophyta	Hylocomiaceae	*Hylocomium splendens*	O
M225.01	Bryophyta	Neckeraceae	*Thamnobryum alopecurum*	R
M228.01	Bryophyta	Lembophyllaceae	*Heterocladium heteropterum*	F
M229.01	Bryophyta	Lembophyllaceae	*Isothecium myosuroides*	A
M230.01	Bryophyta	Myuriaceae	*Ctenidium molluscum*	R
M231.01	Bryophyta	Myuriaceae	*Hyocomium armoricum*	A