

Ecography

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**Supplementary material**

## 1 **Supplementary material**

2 **Appendix 1:** Study regions (n = 82) with geographical variables, and numbers of cryptogenic,  
3 casual, naturalized and alien (casual & naturalized) bryophyte species. Legend: *reg. abbr.:*  
4 region abbreviation; *hem.:* hemisphere (*N:* northern / *S:* southern); *cont.:* continent; *cont.:*  
5 continent (S Hem. marit. Isl.= Southern Hemisphere maritime Islands); *zon.:* zonobiome  
6 (according to Breckle, 1999: arctic – ZB IX, boreal – ZB VIII, temperate-arid – ZB VII,  
7 nemoral – ZB VI , oceanic-temperate – ZB V, Mediterranean – ZB IV, subtropical-humid –  
8 ZB II); *ann. prec.:* average annual precipitation; *ann. temp.:* average annual temperature; *pop.*  
9 *dens.:* average population density (people / km<sup>2</sup>); *GDP per capita:* average per capita GDP  
10 (year 2000); *exports* = proportion of exports in % of the GDP (year 2000), invasion status  
11 classification of alien bryophytes: *nat:* number of naturalized species, *cas:* number of casual  
12 species, *crypt:* number of cryptogenic species.

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14 **Appendix 2:** Data sources for records of alien and cryptogenic bryophyte species in the 82  
15 regions included in this study and the regions for which these data sources contained data.  
16 Additional unpublished data have been provided by colleagues.

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18 **Appendix 3:** Correlation plot of the regions and species variables used in the statistical  
19 analyses.

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21 **Appendix 4:** Bryophyte species and their invasion status (nat = naturalized, cas = casual,  
22 crypt = cryptogenic) in the 82 regions included in this study. Legend: ind = species being  
23 indigenous in a region, crypt = cryptogenic (i.e. probably alien, but clear evidence is lacking),  
24 cas = casual, nat = naturalized.

**Appendix 2:** Data sources for records of alien bryophyte species in the 82 regions included in this study and the regions for which these data sources contained data. Additional unpublished data have been provided by colleagues.

ref no	reference	region
1	Aleffi, M., Ricci, S. Tacchi R. (2010) <i>Hypopterygium tamarisci</i> (Sw.) Brid. ex Müll. Hal. (Hypopterygiaceae, Bryopsida), new to Italy. <i>Cryptogamie Bryologie</i> 31, 293–295.	Italy
2	Allen, B., Pursell R.A. & Darigo C. (2004) <i>Fissidens exilis</i> and a key to the species of <i>Fissidens</i> in Missouri. <i>Evansia</i> 21, 111-115.	USA
3	Allen, B.H. & Crosby M.R. (1987) <i>Pseudoscleropodium purum</i> re-established in South America. <i>Journal of Bryology</i> 14, 523– 525.	Chile
4	Arts T (2001) A revision of the Splachnobryaceae (Musci). <i>Lindbergia</i> 26, 77-96.	Europe
5	Artsdatabanken (2011) Alien species database. <a href="http://www.biodiversity.no">http://www.biodiversity.no</a> . (Accessed 2011-11-13).	Norway
6	Australian National Botanical Gardens (2011) Bryogeography. <a href="http://www.anbg.gov.au/bryophyte/bryogeography-imports-exports.html">http://www.anbg.gov.au/bryophyte/bryogeography-imports-exports.html</a>	Australia
7	Beever, J., Allison KW, Child J (1992) The Mosses of New Zealand. The University of Otago Press, Dunedin.	New Zealand
8	Beever, J.E. (1999) Studies of <i>Fissidens</i> (Bryophyta: Musci) in New Zealand: a synopsis and key to taxa. <i>New Zealand Journal of Botany</i> 37, 659-670.	New Zealand
9	BFNA Editorial Committee (2011) Bryophyte Flora of North America. <a href="http://www.mobot.org/plantscience/bfna/bfnamenu.htm">http://www.mobot.org/plantscience/bfna/bfnamenu.htm</a>	North America
10	Blackstock T.H. & Long D.G. (2002) <i>Heteroscyphus fissistipus</i> (Hook.f. & Taylor) Schiffn. established in south-west Ireland, new to the Northern Hemisphere. <i>Journal of Bryology</i> 24, 147-150.	Ireland
11	Brassard, G. R. (1983) <i>Pseudoscleropodium purum</i> in Newfoundland. <i>J. Bryol</i> 12, 618–619.	Newfoundland
12	Brinda, J.C., Stark, L. R., Shevock, J. R., Spence J.R. (2007) An annotated checklist of the bryophytes of Nevada, with notes on collecting history in the state. <i>Bryologist</i> 110, 673-705.	Nevada
13	Campbell EO (1965) <i>Marchantia</i> species of New Zealand. <i>Tuatara</i> 13, 122-136.	New Zealand
14	Campbell, E.O. (1965) <i>Lunularia</i> in New Zealand. <i>Tuatara</i> 13, 31-42. ( <a href="http://www.nzetc.org/tm/scholarly/tei-Bio13Tuat01-t1-body-d4.html">http://www.nzetc.org/tm/scholarly/tei-Bio13Tuat01-t1-body-d4.html</a> )	New Zealand
15	Campbell, E.O. (1975) Notes on the liverworts family Ricciaceae in New Zealand. <i>Tuatara</i> 21, 121-131.	New Zealand
16	Campbell, E.O. (1977) Further notes on the liverworts family Ricciaceae in New Zealand. <i>Tuatara</i> 22, 222-232.	New Zealand
17	Cave L (2005) <i>Climacium dendroides</i> (Hedw.) Web. et Mohr in Tasmania. <i>Australasian Bryological Newsletter</i> 50, 5-6.	Tasmania
18	Child, J. Allison, K.W. (1975) <i>Rhytidiadelphus squarrosus</i> (Hedw.) Warnst.: an addition to the New Zealand moss flora. <i>New Zealand Journal of Botany</i> 13, 321.	New Zealand
19	Christy JA, Lyford JH, Wagner DH (1982) Checklist of Oregon Mosses. <i>The Bryologist</i> 82, 22-36.	Oregon
20	Colpa, H. & van Zanten B. (2009) <i>Scopelophila cataractae</i> op stortplaats voormalig kamp Westerbork [ <i>Scopelophila cataractae</i> discovered on site of 60 year old dump of zinc-carbon batteries.]. <i>Buxbaumia</i> 84, 1–6.	Netherlands
21	Crum, H., Mueller-Dombois, D. (1968) Two new mosses from Hawaii. <i>Journal of the Hattori Botanical Laboratory</i> 31, 293–296.	Hawaii
22	Crundwell AC & Whitehouse HLK (1976) <i>Tortula bolanderi</i> (Lesq. & James) Hoew in France, new to Europe. <i>Journal of Bryology</i> 9, 13-15.	France
23	Crundwell, A.C., Greven, H. & Stern, R.C. (1994) Some additions to the bryophyte flora of the Azores. <i>Journal of Bryology</i> 18, 329-337.	Azores
24	Davis, D.D., Pursell, R.A. (2008) Additions to the Pennsylvania Bryoflora: <i>Dicranella cerviculata</i> and <i>Pseudoscleropodium purum</i> . <i>Evansia</i> 25, 12-14.	Pennsylvania
25	De Lange PJ, Fife AJ & Beever JE (2011) The mosses of the Chatham Islands. <a href="http://www.chatham.co.nz/index.php/naturalheritage/30-the-mosses-of-the-chatham-islands">http://www.chatham.co.nz/index.php/naturalheritage/30-the-mosses-of-the-chatham-islands</a>	Chatham Islands
26	Deguchi, H. 1991a. A list of moss collections made during the Expeditions to Chile in 1981 and 1987 (1). <i>Bulletin of the National Science Museum, Tokyo, Series B, Botany</i> 17, 15-34.	Chile
27	Deguchi, H. 1991b. A list of moss collections made during the Expeditions to Chile in 1981 and 1987 (2). <i>Bulletin of the National Science Museum, Tokyo, Series B, Botany</i> 17, 67-83.	Chile
28	Dickson, J. H. (1967) <i>Pseudoscleropodium purum</i> (Limpr.) Fleisch. on St. Helena and its arrival on Tristan da Cunha. <i>Bryologist</i> 70, 267–268.	St. Helena
29	Dobson, A. T. (1975) <i>Sphagnum subnitens</i> , <i>S. squarrosus</i> , and <i>Drepanocladus revolvens</i> in New Zealand mires. <i>New Zealand Journal of Botany</i> 13, 169–171.	New Zealand
30	Doyle W.T., Stotler R.E. (2006) Contributions toward a bryoflora of California III: keys and annotated species catalogue for liverworts and hornworts. <i>Madroño</i> 53, 89-197.	California
31	Equihua M. & Usher M. B. (1993) Impact of carpets of the invasive moss <i>Campylopus introflexus</i> on <i>Calluna vulgaris</i> regeneration. <i>J. Ecol.</i> 81, 359–365.	Europe
32	Erzberger P & Papp B (2004) Annotated checklist of Hungarian bryophytes. <i>Studia Bot. Hung.</i> 35, 91–149.	Hungary
33	Fife, A.J. (1995) Checklist of the mosses of New Zealand. <i>Bryologist</i> 98, 313-337.	New Zealand
34	Flora of North America Editorial Committee (eds.) (2007) <i>Flora of North American North of Mexico</i> , Vol 27. Bryophytes: Mosses. Part 1. Oxford Univ. Press, New York and Oxford, U.K.	USA
35	Frahm J.-P. (2008) Die Moosflora der abgelassenen Wahnachtalsperre 2008. <i>Archive für Bryologie</i> 32, 1-11.	Deutschland

36	Frahm JP & Häusler M (2006) A comparison of the bryofloras of the Macaronesian Islands. <i>Tropical Bryology</i> 28, 91-101.	Macaronesia
37	Frahm JP (2002) Zur aktuellen Verbreitung von <i>Phascum leptophyllum</i> in Deutschland. <i>Bryologische Rundbriefe</i> 55, 1.	Germany
38	Frahm, J.-P. (2005) New or interesting records of bryophytes from the Azores. <i>Tropical Bryology</i> 26, 45-48.	Azores
39	Frey W & Schaumann F (2002) Records of rare southern South American bryophytes: studies in austral temperate rain forest bryophytes 18. <i>Nova Hedwigia</i> 74, 533-543.	Chile
40	Frey, W., Frahm, J.P., Fischer, E. & Lobin, W. (2006) The liverworts, mosses and ferns of Europe. Harley Books, Colchester, U.K.	Europe
41	Fudalli E, Sczepanski M, Rusinska A, Rosadzinski S & Wolski G (2009) The current distribution in Poland of some European neophytic bryophytes with supposed invasive tendencies. <i>Acta Societas Botanicorum Poloniae</i> 78, 73-80.	Poland
42	Gallego MT, Cano MJ & Sergio C (2005) <i>Syntrichia bogotensis</i> (Bryopsida, Pottiaceae) new for Macaronesia. <i>The Bryologist</i> 108, 219-223.	Madeira
43	Grundwell AC (1985) The introduced bryophytes of the British Isles. <i>Bulletin of the British Bryological Society</i> 45, 8-9.	Great Britain
44	Hall, J., Fukuda S. & Hoe W.J. (1995) <i>Riccia fluitans</i> (Hepaticeae, Ricciaceae): first observation in Hawaii. <i>Fragmenta Floristica et Geobotanica</i> 40, 233-234.	Hawaii
45	Herben T (1994) Local rate of spreading and patch dynamics of an invasive moss species, <i>Orthodontium lineare</i> . <i>Journal of Bryology</i> 18, 115-125.	Czech Republic
46	Hill MO, Baker R, Broad G, Chandler PJ, Copp GH, Ellis J, Jones D, Hoyland C, Laing I, Longshaw M, Moore N, Parrott D, Pearman D, Preston C, Smith RM, Waters R (2005) Audit of non-native species in England. <i>English Nature Research Reports</i> 662: 1-81.	UK
47	Hill, M.O., Bell, N., Bruggeman-Nannenga, M.A., Brugués, M., Cano, M.J., Enroth, J., Flatberg, K.I., Frahm, J.-P., Gallego, M.T., Garilleti, R., Guerra, J., Hedenäs, L., Holyoak, D.T., yvönen, J., Ignatov, M.S., Lara, F., Mazimpaka, V., Muñoz, J., Söderström, L. (2006) An annotated checklist of the mosses of Europe and Macaronesia. <i>Journal of Bryology</i> 28, 198-267.	Europe
48	Hill, M.O., Preston, C.D., Smith, A.J.E. (1992) Atlas of the Bryophytes of Britain and Ireland. Harley Books, Colchester, U.K.	UK, Ireland
49	Hoe, W.J. (1975) Additional new and noteworthy records for Hawaiian mosses - 3. <i>Bryologist</i> 78, 359-360.	Hawaii
50	Hoe, W.J. (1978) Bryophyta Hawaiica exsiccata - the first century. <i>Bryologist</i> 81, 411-415.	Hawaii
51	Hoe, W.J. (1978) <i>Riccia sorocarpa</i> Bisch. in Hawaii. <i>Miscellanea Bryologica et Lichenologica</i> 8, 52-53.	Hawaii
52	Hoe, W.J. (1979) Additional new and noteworthy records for Hawaiian mosses - 5. <i>Bryologist</i> 82, 79-82.	Hawaii
53	Holyoak D & Lockhart N (2009) Australasian bryophytes introduced to South Kerry with tree ferns. <i>FieldBryology</i> 98, 3-7.	Ireland
54	Holyoak, D.T. (2001) <i>Ephemerum spinulosum</i> Bruch & Schimp. (Ephemeraceae) in Northern Ireland: a moss new to Europe. <i>Journal of Bryology</i> 23, 139-141.	Ireland
55	Infante, M., Heras, P. (2005) <i>Ephemerum cohaerens</i> (Hedw.) Hampe and <i>E. spinulosum</i> Bruch & Schimp. (Ephemeraceae, Bryopsida), new to the Iberian Peninsula. <i>Cryptogamie Bryologie</i> 26, 327-333.	Spain
56	Ireland, R.R., Bellolio, G., Rodríguez, R. & Larraín, J. 2007 [2006]. Studies on the moss flora of the Bío-Bío region of Chile. <i>Tropical Bryology</i> 28, 63-77.	Chile
57	Iwatzuki, Z. (1978) <i>Ephemerum spinulosum</i> Schimp. newly found in Japan. <i>Proceedings of the Bryological Society of Japan</i> 2, 45-48.	Japan
58	Klinck, J. (2010) Invasive Alien Species Fact Sheet: <i>Campylopus introflexus</i> . Online Database of the European Network on Invasive Alien Species – NOBANIS. <a href="http://www.nobanis.org">www.nobanis.org</a> .	Europe
59	Kucera, J. (1999) <i>Didymodon australasiae</i> var. <i>umbrosus</i> in the Czech Republic, with a review of recent records from Central Europe. <i>Journal of Bryology</i> 21, 71-77.	Czech Republic
60	Landcare Research (2012) A New Moss Flora of New Zealand. <a href="http://www.landcareresearch.co.nz/research/biosystematics/plants/moss/index.asp">http://www.landcareresearch.co.nz/research/biosystematics/plants/moss/index.asp</a> (Accessed 2012-03-19).	New Zealand
61	Lawton, E. (1960) <i>Pseudoscleropodium purum</i> in the Pacific Northwest. <i>The Bryologist</i> 63, 235-237.	Oregon
62	Lewinsky, J. & Bartlett, J. (1982) <i>Pseudoscleropodium purum</i> (Hedw.) Fleisch. in New Zealand. <i>Lindbergia</i> 8, 177-180.	New Zealand
63	Lin, S.-H. (2000) The Liverwort Flora of Taiwan. The Council of Agriculture, The Executive Yuan, Taipei. (in Chinese). 431 pp.	Taiwan
64	Magill, R.E. & van Rooy, J. (1998) Flora of Southern Africa - Bryophyta - Part 1 Musci, National Botanical Institute, Pretoria.	South Africa
65	Manville, G.C., Webster H.J. (1999?) Bryophyte and lichens: review and status in Pennsylvania. <a href="http://academic.keystone.edu/jskinners/WildlifeFisheries/BRYOPHYTES%20AND%20LICHENS_%20REVIEW%20OF%20STATUS%20IN%20PENNSYLVANIA.pdf">http://academic.keystone.edu/jskinners/WildlifeFisheries/BRYOPHYTES%20AND%20LICHENS_%20REVIEW%20OF%20STATUS%20IN%20PENNSYLVANIA.pdf</a> .	Pennsylvania
66	Matteri CM (2003) Los musgos (Bryophyta) de Argentina. <i>Tropical Bryology</i> 24, 33-100.	Argentina
67	Milne J & Jolley H (2010) The importance of herbarium records in documenting the occurrence and changing distribution of the adventive moss species <i>Pseudoscleropodium purum</i> in Victoria. <i>The Victorian Naturalist</i> 127, 146-150.	Victoria
68	Mikulášková E, Fajmonová Z & Hájek M (2012) Invasion of the moss <i>Campylopus introflexus</i> into central European habitats. <i>Preslia</i> , 84, 863-886.	Czech Republic
69	Miller HA (1967) Oddments of Hawaiian bryology. <i>Journ. Hattori Bot. Lab.</i> 30, 271-276.	Hawaii
70	Miller NG (2000) First records of a European moss, <i>Pseudoscleropodium purum</i> , naturalized in New England. <i>Rhodora</i> 102, 514-517.	Massachusetts, New York
71	Miller, N. G. & Robinson S. C. (2010) Introduction and recent range expansion in the moss <i>Ptychomitrium serratum</i> (Ptychomitriaceae) in the southern and eastern United States. <i>Botany</i> 88, 336-344.	USA
72	Miller, N.G. (2001) A European feather moss, <i>Pseudoscleropodium purum</i> , naturalized widely in New York State in cemeteries. <i>The Bryologist</i> , pp. 98-103	New York
73	Miller, N.G. (2009) Mosses adventive and naturalized in the northeastern United States. <i>New Examples and new</i>	USA

	distributional records. <i>Rhodora</i> 111, 218-230.	
74	Miller, N.G., Robinson, S.C. (2010) Introduction and recent range expansion in the moss <i>Ptychomitrium serratum</i> (Ptychomitriaceae) in the Southern and Eastern United States. <i>Botany</i> 88, 336-344.	USA
75	Mogensen, G.S., Hansen G.R., Jensen H.E. (1999) Danske navne for Tørvemusser, Sortmusser og Bladmusser, der forekommer i Danmark. Version 3. 24 sider. Botanisk Museum, Københavns Universitet, Danmark.	Denmark
76	Molnar, L. (1975) New distribution data on two mosses, <i>Fissidens exilis</i> and <i>Thuidium pygmaeum</i> , in Quebec. <i>Canadian Field Naturalist</i> 89, 324-325.	Quebec
77	Müller F & Pereira I (2006) The bryophyte flora of nature reserves in central Chile. 1: The moss flora of Los Riles Nature reserve, near Talca. <i>Tropical Bryology</i> 27, 55-66.	Chile
78	Müller F (2009) An updated checklist of the mosses of Chile. <i>Archive for Bryology</i> 58, 1-124.	Chile
79	Müller, F. (2002) Ein Freilandnachweis von <i>Didymodon australasiae</i> var. <i>umbrosus</i> in Deutschland. <i>Herzogia</i> 15, 187-190.	Germany
80	Müller, F. (2002) New records and new synonyms for the southern South American moss flora. <i>Nova Hedwigia</i> 74, 445-450.	Chile
81	Noguchi, A. (1987-1994) Illustrated Moss Flora of Japan Part 1 - 5. The Hattori Botanical Laboratory, Hiroshima.	Japan
82	Oldham, M.J. (1983) <i>Fissidens exilis</i> , a moss new to Ontario. <i>Ontario Field Biologist</i> 37, 38.	Ontario
83	Olson, S.L. (1999) Muscis Hawaiiensis Mantissae I: Two weedy species of <i>Bryum</i> new to the archipelago. <i>Tropical Bryology</i> 17, 129-130.	Hawai
84	Olson, S.L. (1999) Muscis Hawaiiensis Mantissae II. <i>Neckeropsis obtusata</i> (Mont.) Fleisch. restored to the flora of the archipelago. <i>Tropical Bryology</i> 17, 131-132.	Hawai
85	Paton, J.A. & Sheahan, M.C. (2006) <i>Lophocolea brookwoodiana</i> (Jungermanniales: Geocalyceae), a new species in Britain, <i>Journal of Bryology</i> 28, 163-166.	UK
86	Paton, J.A. (1999) The Liverwort Flora of the British Isles. B.H. & A. Harley Ltd., Colchester, U.K.	UK
87	Perold, S. M. (1997) Studies in the liverwort genus <i>Fossombronina</i> (Metzgeriales) from southern Africa. 4. A re-examination of <i>F. crispa</i> , <i>F. leucoxantha</i> and <i>F. tumida</i> . <i>Bothalia</i> 27, 105-115.	Europe
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89	Porley R & Haynes T (2009) An update on the alien liverwort <i>Lophocolea semiteres</i> (Lehm.) Mitt. and its spread in Britain and Ireland. <i>Field Bryology</i> 99, 3-9.	UK, Ireland
90	Porley, R. & Hodgetts, N. (2005) Mosses and Liverworts. New Naturalist series. Harper Collins publishers, London, U.K.	UK
91	Preston, C.D. & Finch, R.A. (2006) <i>Bryum valparaisense</i> Thér. in the Isles of Scilly. <i>Journal of Bryology</i> 28, 118-122.	UK
92	Pursell, R.A. & Hoe, W.J. (1977) <i>Fissidens</i> in Hawaii. <i>Journal of the Hattori Botanical Laboratory</i> 43, 81-106	Hawai
93	Pursell, R.A. (1998) <i>Fissidens taylorii</i> , New to North America North of Mexico. <i>The Bryologist</i> 100, 525-528.	USA
94	Pursell, R.A. (2006), <i>Fissidens curvatus</i> in Pennsylvania and California. <i>J. Hattori Bot. Lab. No. 100</i> , 351-354	Pennsylvania, California
95	Putzke, J., Pereira, A. B. (2001) The Antarctic mosses with special reference to the South Shetland Islands. Editora da Ulbra, Canoas.	South Shetland Islands
96	Rohrer JR, Kirkpatrick HE (1985) <i>Pseudoscleropodium</i> discovered in the Great Lakes Region. <i>The Bryologist</i> 88, 24-25.	USA
97	Rumsey, F.J. (1992) The status of <i>Tortula freibergii</i> in the British Isles. <i>Journal of Bryology</i> 17, 371-373.	Great Britain
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100	Sabovljević, M. (2003) The hepatic checklist of Croatia. <i>Archives of Biological Sciences</i> 55, 59-66.	Croatia
101	Sainsbury GOK (1935) Introduced mosses in New Zealand. <i>The Bryologist</i> 38, 91-92.	New Zealand
102	Schirmel J. (2010): Response of the grasshopper <i>Myrmeleotettix maculatus</i> (Orthoptera: Acrididae) to invasion by the exotic moss <i>Campylopus introflexus</i> in acidic coastal dunes. <i>Journal of Coastal Conservation</i> 15, 159-162..	Germany
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105	Schumacker R. & Vana J (1999) Two new liverworts for Europe in Macaronesia: <i>Odontoschisma prostratum</i> (Sw.) Trevis. on the Azores and <i>Jungermannia callithrix</i> Lindenb. & Gottsche on the Azores and Madeira. <i>Tropical Bryology</i> 17, 115-127.	Azores
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107	Segarra JG (2001) <i>Leptopascum leptophyllum</i> (Müll. Hal.) Guerra & Cano, novetata per a la flora briològica aragonesa. <i>Orsis</i> 16, 187-188.	Spain
108	Seppelt RD, Cave LH & Carter BE (2011) Introduced mosses in the flora of Tasmania I. <i>Scleropodium</i> and <i>Pseudoscleropodium</i> (Bryopsida: Brachytheciaceae). <i>Kannunah</i> 4, 72-81.	Tasmania
109	Seppelt, R.D. (2004), The Moss Flora of Macquarie Island. Australian Antarctic Division, 328 pp.	Macquarie Island
110	Seppelt, R.D., Cave, L.H. (2011) Introduced mosses in the flora of Tasmania, II. <i>Kindbergia praelonga</i> (Bryopsida: Brachytheciaceae). <i>Kannunah</i> 4, 82-88.	Tasmania
111	Sérgio, C. (1990) Perspectiva biogeográfica da flora briológica Ibérica. <i>Anales del Jardín Botánico de Madrid</i> 46, 371-392.	Spain, Portugal
112	Sjögren, E. (2001) Distribution of Azorean bryophytes up to 1999, their island distribution and information on their	Azores

	presence elsewhere, including Madeira and the Canary Islands. Boletim do Museu Municipal do Funchal Suppl. 7, 89 pp.	
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