

Amblyodon dealbatus (Musci, Meesiaceae) – a bipolar disjunct

RYSZARD OCHYRA

OCHYRA, R. 1992. *Amblyodon dealbatus* (Musci, Meesiaceae) – a bipolar disjunct. *Fragmenta Floristica et Geobotanica* 37(1): 251–259. Kraków. PL ISSN 0015–931x.

ABSTRACT: The occurrence of the genus *Amblyodon* Bruch & Schimp. in the Southern Hemisphere is established on the basis of a specimen from Tierra del Fuego in southern South America. *A. dealbatus* (Hedw.) Bruch & Schimp. presently appears to be a bipolar disjunct and its occurrence in southern South America is explained best by long-distance dispersal. Bipolar mosses disjunctive along the trans-American track are briefly re-assessed and this group now includes only twelve species. With the exception of *Tortella tortelloides* (S. W. Greene) (H. Robins.), they are strict bipolar disjuncts without intermediate altimontane stations in the tropical region.

KEY WORDS: Bryophyta, bipolar distribution, Tierra del Fuego, South America

R. Ochyra, Laboratory of Bryology, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL–31–512 Kraków, Poland

The Meesiaceae is an oligotypic moss family consisting of four genera, of which *Paludella* Brid., *Amblyodon* Bruch & Schimp. and *Neomeesia* Deguchi are monotypes and only *Meesia* Hedw. is a genus of 5–7 species. With the exception of *Neomeesia* which is a southern South American endemic genus (Deguchi 1983), the remaining genera have been reported to be restricted to the cold, cool or temperate zones of the Northern Hemisphere (Ochyra *et al.* 1988, 1992a). Some species of *Meesia* including *M. uliginosa* Hedw. and *M. triquetra* (Jolyc.) Ångstr. are additionally known to occur at bipolar stations in the Southern Hemisphere and at intermediate altimontane stations in the tropics. *Paludella squarrosa* (Hedw.) Brid. and *Amblyodon dealbatus* (Hedw.) Bruch & Schimp. have admittedly been recorded from South Africa (Harvey 1838) but this is most probably an error (Magill & Schelpe 1979). This part of Africa is a bryologically well-known area and despite field study of many generations of botanists and bryologists these species have never been rediscovered there. It proved, however, that *A. dealbatus* does occur beyond the Holarctic and the purpose of this article is to report the occurrence of the genus *Amblyodon* in the Southern Hemisphere, specifically, in Tierra del Fuego at the southernmost tip of South America.

In 1987 hiding in the bryological herbarium of the Botanical Museum of the Univer-

sity of Helsinki under the guise of collecting distributional data for some glacial relicts in Central Europe, the specimen of *Amblyodon dealbatus* collected in Tierra del Fuego by H. Roivainen during the course of the Finnish Expedition of 1928–1929 was uncovered (Fuegia media, Estancia Cameron, Puerto Millaldeo, in palude, 15.XII.1928, *Roivainen s.n.*).

The Fuegian plants of *A. dealbatus* are in fine fruiting condition and they do not differ morphologically from the Northern Hemisphere populations (Figs 1–2). As well, the southern South American population of this species appear to diverge little ecologically from the Holarctic populations. In Tierra del Fuego it was collected in mire growing in association with *Limprichtia revolvens* (Sw.) Loeske, a typical wetland moss, and unidentifiable, sterile species of *Bryum*.

Amblyodon dealbatus is a boreal-montane species having a strongly discontinuous range in the Holarctic, and only occasionally penetrating into the Arctic. It has the main centre of its occurrence in the boreal zone of Europe and North America, while in Asia it seems to be exceedingly rare and confined in distribution to the montane regions of Central Siberia, Central Asia and the Near East with a solitary station on the Chukchi Peninsula in the Arctic. The geographical distribution of *A. dealbatus* in the Northern Hemisphere was reviewed in the “Atlas of the geographical distribution of mosses in Poland” (Ochyra *et al.* 1992a) including the distribution maps for it in the Holarctic, Europe and in the world.

The discovery of *A. dealbatus* in austral South America increased by one distinct taxon the number of moss species with disjunctive bipolar ranges. The problem of bipolar disjuncts in bryophytes has recently received much attention of bryologists (e.g. Schuster 1969, 1983; Schofield & Crum 1972; Schofield 1974; Horton & Bartlett 1983; Eckel 1991; Hyvönen 1991). They accepted without exception classic and rather broad definition of bipolar plants of Du Rietz (1940) which included taxa distributed both in the boreal and austral temperate zones but absent from the tropical lowlands and with or without intermediate altimontane stations in the tropical regions. Because the overwhelming majority of bipolar bryophytes is clearly of Holarctic origin, it is generally postulated that they achieved their present range by long-distance dispersal from the Northern to Southern Hemisphere along one or more of the three main trans-tropical pathways, i.e. (1) the Cordilleran track across tropical America to Patagonia and the maritime Antarctic; (2) the East African mountain track across tropical Africa to southern Africa and some sub-Antarctic islands; and (3) the Indomalayan-Melanesian track across the chain of Malesian islands to Australia and New Zealand. Nevertheless other explanation of origin of this distribution pattern for some species seems to be possible, for instance by side-step migration in both directions along the mountain chains, especially in the case of taxa widely distributed in the austral region.

The increasing exploration of tropical mountains and austral regions in recent years as well as the progress in taxonomic study of many groups of mosses and liverworts have yielded numerous new geographical data which improved our knowledge of the geographical distribution of bipolar species. Schofield (1974) listed 24 species of bipolar

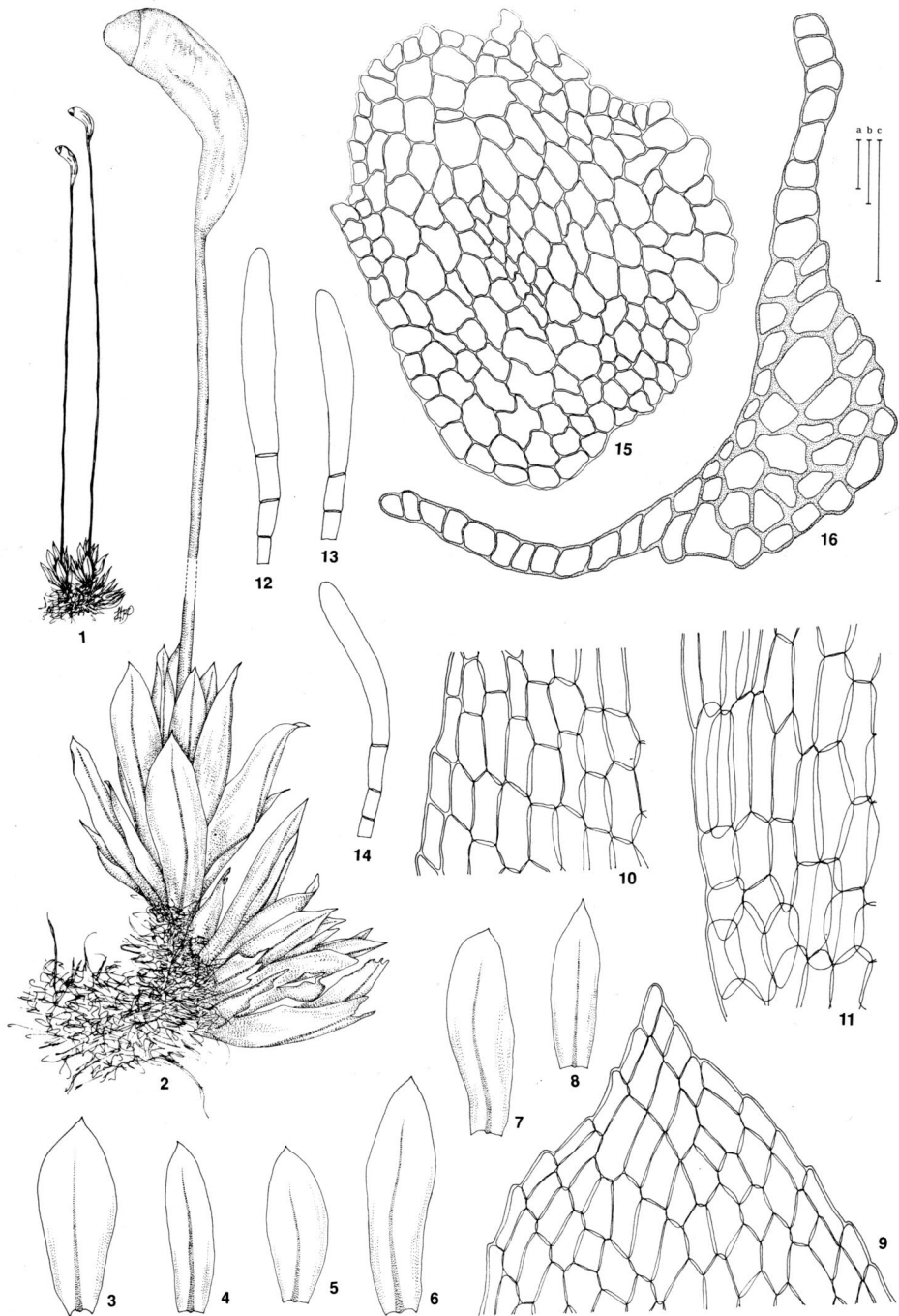


Fig. 1. *Amblyodon dealbatus* (Hedw.) Bruch & Schimp. 1–2: habit; 3–8 leaves; 9: leaf apex; 10: mid-leaf cells at the margin; 11: basal leaf cells; 12–14: axillary hairs; 15: transverse section of stem; 16: transverse sections of leaves (all drawn from *Roivainen s.n.*, 15.XII.1928 – H). Scale bars: a – 1 mm (2–8); b – 1 cm (1); c – 100 μm (9–16).

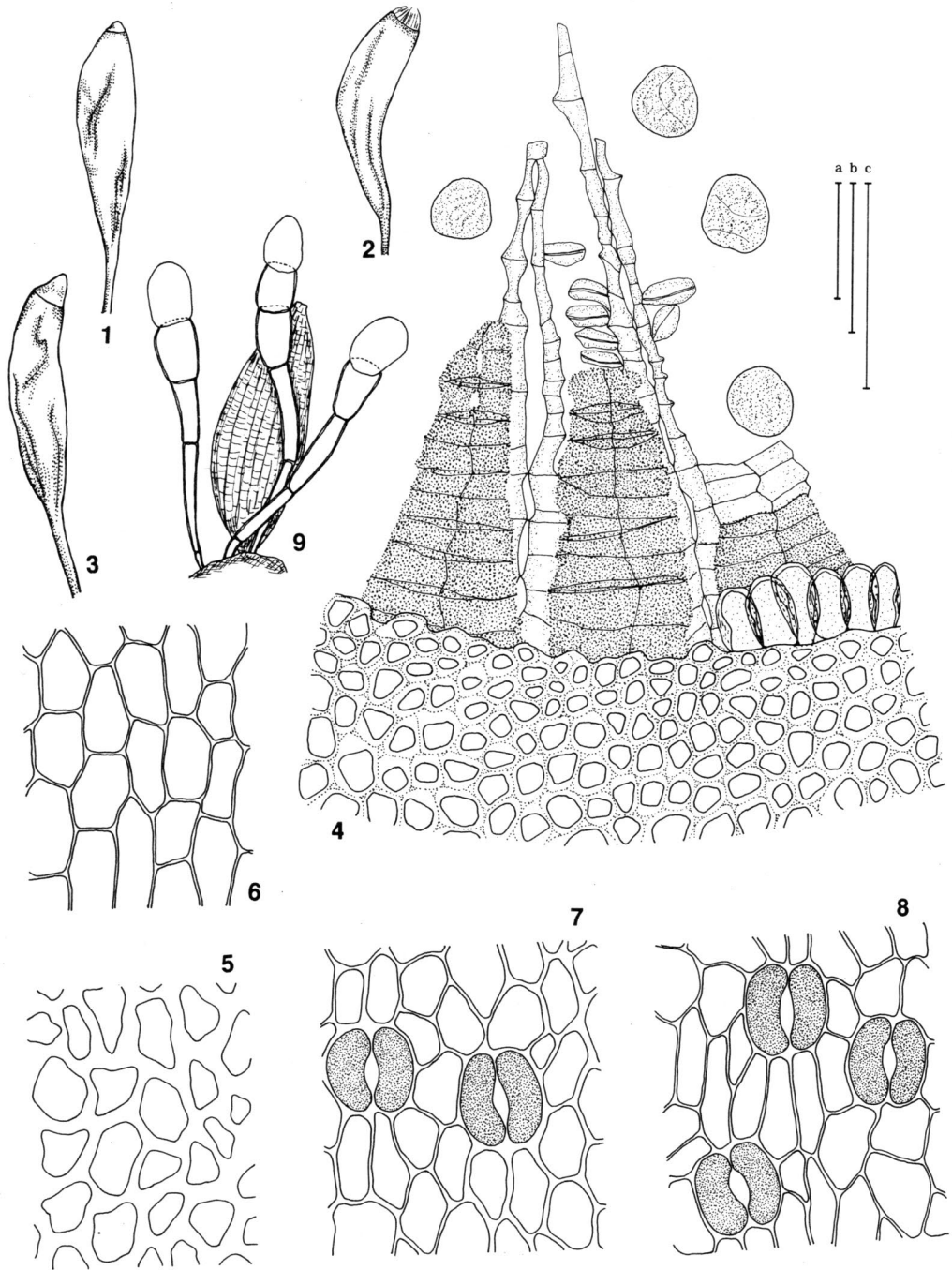


Fig. 2. *Amblyodon dealbatus* (Hedw.) Bruch & Schimp. 1–3: capsules; 4: peristome and spores; 5: exothecial cells at the dorsal side of the capsule; 6: exothecial cells at the ventral side of the capsule; 7: stomata on the dorsal side of the neck; 8: stomata on the ventral side of the neck; 9: antheridium and paraphyses (all drawn from *Roivainen s.n.*, 15.XII.1928 – H). Scale bars: a – 1 mm (1–3); b – 100 μ m (4–8); c – 100 μ m (9).

mosses along the trans-American track. In the light of the recent achievements of bryogeography and taxonomy of mosses it must considerably be modified.

The following species should be deleted from the Schofield's (1974) list since they have much wider distribution than previously assumed:

1. *Sphagnum fimbriatum* Wils. in Hook. f. is known to occur in South Africa (Magill 1981; Eddy 1985);

2. *S. magellanicum* Brid. has recently been recorded from New Zealand (Bartlett 1984);

3. *S. cuspidatum* Ehrh. ex Hoffm. is widespread in West and East Africa and on Madagascar (Eddy 1985) as well as in tropical Asia (Eddy 1977);

4. *Polytrichum piliferum* Hedw. is scattered in East and South Africa (De Sloover 1986);

5. *Tortella fragilis* (Drumm.) Limpr. – Schofield (1974) does not provide the source of information of his record of this species in southern South America and the bryological literature dealing with this region does not record it (Greene 1986). In fact the species has only very recently reported from this region (Hyvönen (1991) but it is also known from South Africa (Magill 1981), New Zealand (Fife 1984) and Campbell Island (Vitt 1974);

6. *Orthotrichum rupestre* Schleich. ex Schwaegr. is a frequent species in East African mountains (Lewinsky 1978) as well as in Australasia (Lewinsky 1984);

7. *Ulota phyllantha* Brid. is known from two sub-antarctic islands, Kerguelen (Ochyra & Bednarek-Ochyra 1991) and Macquarie (Seppelt 1978);

8. *Tetraplodon mnioides* (Hedw.) Bruch & Schimp. is known in the tropics at the altimontane stations in East Africa, Borneo and New Guinea (Szmajda *et al.* 1991);

9. *Anomobryum julaceum* (Gaertn., Meyer & Scherb.) Schimp. is widespread at altimontane stations in East and South Africa and on some sub-Antarctic islands (Ochi 1972);

10. *Bartramia pomiformis* Hedw. does not occur beyond the Holarctic at all. The southern South American records of this species are based upon misidentifications and actually they refer to *B. halleriana* Hedw. (Matteri 1984);

11. *B. ithyphylla* Brid. is widespread pan-temperate species in the Southern Hemisphere known from most of sub-Antarctic islands, New Zealand and Australia (Matteri 1984) as well as from East African mountains (Ochyra *et al.* 1992b);

12. *Plagiothecium cavifolium* (Brid.) Iwats. is unknown from South America, but its close kindred, *P. falklandicum* (Card. & Broth.) Newt., does occur on the Falkland Islands (Buck & Ireland 1989);

13. *Hypnum revolutum* (Mitt.) Lindb. is known to occur on New Zealand (Ochyra 1988);

14. *Pseudotaxiphyllum elegans* (Brid.) Iwats. has also been recorded from New Zealand (Fife 1984);

15. *Pleurozium schreberi* (Brid.) Mitt. – an unpublished record of this species is known from Bale Mts in Ethiopia (*S. & G. Miehe 189, KRAM*);

16. *Limprichtia revolvens* (Sw.) Loeske ex Nitardy is known from New Guinea (Ochyra *et al.* 1991) and New Zealand (Dobson 1975; Bartlett 1984);

17. *Drepanocladus polycarpos* (Voit) Warnst. – a revision of the voucher specimen of this species reported by Cardot and Brotherus (1923) from the Andes of Patagonia revealed that this material is fact is *Pseudoleskea chilensis* (Lor.) Ochyra.

On the other hand, two other bipolar disjunct mosses have been recorded from the maritime Antarctic, namely *Encalypta procera* Bruch (Newton 1977; Horton 1983) and *Stegonia latifolia* (Schwaegr.) Vent. ex Broth. (Myrcha *et al.* 1991). Additionally, I place in this list also *Pterygoneurum ovatum* (Hedw.) Dixon which has recently been recorded from the Antarctic Peninsula region (Lightowlers 1987). This species was also noted from New Zealand but according to Schofield (1974) it was introduced by man. Moreover, *Tortella tortelloides* (S. W. Greene) H. Robins., a species originally described from the Antarctic (Greene *et al.* 1971), is recorded from the Arctic and the Rocky Mountains (Eckel 1991) as well as from the Hawaii (Zander & Hoe 1979).

Summing up, the current list of American bipolar moss disjuncts consists of twelve species. Most are bisexual taxa and therefore can undergo successful long-range transport and subsequent establishment through single spores. It is interesting to note that all these species, with the exception of *Tortella tortelloides* which is known from the Hawaii (Zander & Hoe 1979), are without intermediate localities in the tropics. It is very likely that the following list will be still modified with the progress of floristic exploration of the areas concerned.

Polytrichum strictum Brid.

Ditrichum heteromallum (Hedw.) Britt.

Encalypta procera Bruch

Pterygoneurum ovatum (Hedw.) Dixon

Stegonia latifolia (Schwaegr.) Vent. ex Broth.

Tortella tortuosa (Hedw.) Limpr.

Tortella tortelloides (S. W. Greene) H. Robins.

Oedipodium griffithianum (Dicks.) Schwaegr.

Plagiomnium ellipticum (Brid.) T. Kop.

Cinclidium stygium Sw.

Meesia uliginosa Hedw.

Amblyodon dealbatus (Hedw.) Bruch & Schimp.

Acknowledgements. I am grateful to the Academy of Finland for scholarship for two months in 1987 which enabled my work in the Botanical Museum of the University of Helsinki. I also thank my wife, Halina Bednarek-Ochyra, who prepared the illustrations.

REFERENCES

- BARTLETT J. K. 1984. New or interesting records of mosses from New Zealand. – Nat. Mus. New Zealand Rec. 2(17): 181–189.

- BUCK W. R. & IRELAND R. R. 1989. Plagiotheciaceae. – Fl. Neotrop. Monogr. **50**: 1–22. The New York Botanical Garden, New York.
- CARDOT J. & BROTHERUS V. F. 1923. Les mousses. – In: Botanische Ergebnisse der Schwedischen Expedition nach Patagonien und dem Feuerlande 1907–1909. – K. Svensk. Vet. Akad. Handl. **63**(10): 1–74 + 4 pls. Stockholm.
- DEGUCHI H. 1983. *Neomeesia* Deguchi, a new genus of the family Meesiaceae from southern South America. – Bull. Natn. Sci. Mus. Ser. B (Bot.) **9**(4): 143–148.
- DE SLOOVER J. L. 1986. Note de bryologie africaine. XIII. – Polytrichaceae. – Bull. Jard. Bot. Nat. Belg. **56**(3–4): 241–300.
- DOBSON A. T. 1975. *Sphagnum subnitens*, *S. squarrosom* and *Drepanocladus revolvens* in New Zealand mires. – New Zealand J. Bot. **22**: 1–6.
- DU RIETZ G. E. 1940. Problems of bipolar plant distribution. – Acta Phytogeogr. Suecica **13**: 215–282.
- ECKEL P. M. 1991. *Tortella tortelloides* (Musci: Pottiaceae) new to North America. – The Bryologist **94**(1): 84–87.
- EDDY A. 1977. Sphagnales of tropical Asia. – Bull. Br. Mus. Nat. Hist. Bot. Ser. **5**(7): 357–445.
- EDDY A. 1985. A revision of African Sphagnales. – Bull. Br. Mus. Nat. Hist. Bot. Ser. **12**(3): 77–162.
- FIFE A. J. 1984. Records of new or otherwise interesting mosses in New Zealand, including a new species of *Racomitrium*. – New Zealand J. Bot. **22**: 1–6.
- GREENE D. M. 1986. A conspectus of the mosses of Antarctica, South Georgia, the Falkland Islands and southern South America. 314 pp. British Antarctic Survey, Cambridge.
- GREENE S. W., GREENE D. M., BROWN P. D. & PACEY J. J. M. 1970. Antarctic moss flora. 1. The genera *Andreaea*, *Pohlia*, *Polytrichum*, *Psilopilum*, and *Sarconeurum*. – Sci. Rep. Br. Antarct. Surv. **64**: 1–118.
- HARVEY W. H. 1838. The genera of South African plants, arranged according to the natural system. XLVI + 429 pp. A. S. Robertson, Cape Town.
- HORTON D. G. 1983. A revision of the Encalyptaceae (Musci), with particular reference to the North American taxa. Part II. – Journ. Hattori Bot. Lab. **54**: 353–532.
- HORTON D. G. & BARTLETT J. K. 1983. The genus *Timmia* Hedwig: a bipolar disjunct. – The Bryologist **86**(4): 370–373.
- HYVÖNEN J. 1991. *Tortella fragilis* (Pottiaceae) reported for southern South America. – The Bryologist **94**(4): 416–418.
- LEWINSKY J. 1978. The genus *Orthotrichum* Hedw. (Musci) in Africa south of the tropic of Cancer. – Bot. Tidsskr. **72**: 61–85.
- LEWINSKY J. 1984. The genus *Orthotrichum* Hedw. (Musci) in Australasia. A taxonomic revision. – Journ. Hattori Bot. Lab. **56**: 369–460.
- LIGHTOWLERS P. J. 1987. New or noteworthy mosses from the Antarctic Peninsula region. – Br. Antarct. Surv. Bull. **76**: 91–94.
- MAGILL R. E. 1981. Bryophyta. Part I. Mosses. Fascicle I. Sphagnaceae – Grimmiaceae. – In: O. A. LEISTNER (ed.), Flora of southern Africa which deals with the territories of South Africa, Transkei, Lesotho, Swaziland, Bophuthatswana, South West Africa/Namibia, Botswana and Venda. XIII + 291 pp. Pretoria.
- MAGILL R. E. & SCHELPE E. A. 1979. The bryophytes of Southern Africa. – Mem. Bot. Surv. S. Africa **43**: 1–39.
- MATTERI C. M. 1984. Sinopsis de las especies Andino – Patagónicas, Antárticas y Subantárticas de los generos *Bartramia*, *Bartramidula* y *Conostomum* (Bartramiaceae, Musci). – Darwiniana **25**(1–4): 143–162.

- MYRCHA A., OCHYRA R. & TATUR A. 1991. Site of Special Scientific Interest No. 8 – western shores of Admiralty Bay, King George Island, South Shetland Islands. – In: First Polish Antarctic Symposium “Arctowski '85”, pp. 157–168. Polish Academy of Sciences, Warszawa.
- NEWTON M. E. 1974. Notes on Antarctic bryophytes: IV. *Encalypta* Hedw. – Br. Antarct. Surv. Bull. **39**: 1–6.
- OCHI H. 1972. A revision of African Bryoideae, Musci (First part). – J. Fac. Educ. Tottori Univ. Nat. Sci. **23**(1): 1–126.
- OCHYRA R. 1988. *Hypnum revolutum* (Mitt.) Lindb. new to New Zealand. – J. Bryol. **15**(1): 236–237.
- OCHYRA R. & BEDNAREK-OCHYRA H. 1991. Notes on Polish mosses: II. *Ulota phyllantha* (Orthotrichaceae) new to Poland. – Fragn. Flor. Geobot. **36**(1): 57–70.
- OCHYRA R., BEDNAREK-OCHYRA H. & SZMAJDA P. 1992a. M. 385. *Amblyodon dealbatus* (Hedw.) Bruch & Schimp. – In: R. OCHYRA & P. SZMAJDA (eds), Atlas of the geographical distribution of mosses in Poland. **8**, pp. 15–19. W. Szafer Institute of Botany and Adam Mickiewicz University, Kraków – Poznań.
- OCHYRA R., BEDNAREK-OCHYRA H. & SZMAJDA P. 1992b. M. 385. *Bartramia ithyphylla* Brid. – In: R. OCHYRA & P. SZMAJDA (eds), Atlas of the geographical distribution of mosses in Poland. **8**, pp. 25–34. W. Szafer Institute of Botany and Adam Mickiewicz University, Kraków – Poznań.
- OCHYRA R., KOPONEN T. & NORRIS D. H. 1991. Bryophyte flora of the Huon Peninsula, Papua New Guinea. XLVI. Amblystegiaceae (Musci). – Acta Bot. Fennica **143**: 91–106.
- OCHYRA R., SZMAJDA P., BEDNAREK H. & BOCHEŃSKI W. 1988. Atlas of the geographical distribution of spore plants in Poland. Series V. Mosses (Musci). **3**. 61 pp. + 11 maps. Państwowe Wydawnictwo Naukowe, Warszawa – Poznań.
- SCHOFIELD W. B. 1974. Bipolar disjunctive mosses in the Southern Hemisphere, with particular reference to New Zealand. – Journ. Hattori Bot. Lab. **38**: 13–32.
- SCHOFIELD W. B. & CRUM H. A. 1972. Disjunctions in bryophytes. – Ann. Missouri Bot. Gard. **59**: 174–202.
- SCHUSTER R. M. 1969. Problems of antipodal distribution in lower land plants. – Taxon **18**: 46–91.
- SCHUSTER R. M. 1983. Phytogeography of the Bryophyta. – In: R. M. SCHUSTER (ed.), New manual of bryology. **1**, pp. 463–626. The Hattori Botanical Laboratory, Nichinan.
- SEPPELT R. D. 1978. Studies on the bryoflora of Macquarie Island II. *Ulota phyllantha* Brid. – New Zealand J. Bot. **16**: 21–23.
- SZMAJDA P., BEDNAREK-OCHYRA H. & OCHYRA R. 1991. M. 295. *Tetraplodon mnioides* (Hedw.) Bruch & Schimp. – In: R. OCHYRA & P. SZMAJDA (eds), Atlas of the geographical distribution of spore plants in Poland. Ser. V. Mosses (Musci). **7**, pp. 33–36. W. Szafer Institute of Botany and Adam Mickiewicz University, Kraków – Poznań.
- VITT D. H. 1974. A key and synopsis of the mosses of Campbell Island, New Zealand. – New Zealand J. Bot. **12**: 185–210.
- ZANDER R. H. & HOE W. J. 1979. Geographic disjunction and heterophylly in *Tortella fragilis* var. *tortelloides* (= *Sarconeurum toretelloides*). – The Bryologist **82**: 84–87.

STRESZCZENIE

Amblyodon dealbatus, panborealny gatunek na półkuli północnej, szeroko rozprzestrzeniony w Europie i Ameryce Północnej i bardzo rzadki w Azji, podany został po raz pierwszy z Ziemi Ognistej na południowym krańcu Ameryki Południowej. Jest to pierwsze stwierdzenie tego gatunku na południowej półkuli. Materiał *A. dealbatus* zebrany został przez fińskiego briologa H. Roivainena w 1928 roku.

Z Ameryki Południowej podano dotychczas 24 gatunki bipolarnych mchów, które nie występują w innych częściach półkuli południowej (Schofield 1974). W wyniku krytycznej analizy ich ogólnego rozmieszczenia lista mchów bipolarnych na zachodniej półkuli uległa została poważnie zmodyfikowana. Z jednej strony należało z niej usunąć aż 17 gatunków (*Sphagnum magellanicum* Brid., *S. fimbriatum* Wils. in Hook. f., *S. cuspidatum* Ehrh. ex Hoffm., *Polytrichum piliferum* Hedw., *Tortella fragilis* (Drumm.) Limpr., *Orthotrichum rupestre* Schleich. ex Schwaegr., *Ulota phyllantha* Brid., *Tetraplodon mnioides* (Hedw.) Bruch & Schimp., *Anomobryum julaceum* (Gaertn., Meyer & Scherb.) Schimp., *Bartramia pomiformis* Hedw., *B. ithyphylla* Brid., *Plagiothecium cavifolium* (Brid.) Iwats., *Hypnum revolutum* (Mitt.) Lindb., *Pseudotaxiphyllum elegans* (Brid.) Iwats., *Pleurozium schreberi* (Brid.) Mitt., *Limprichtia revolvens* (Sw.) Loeske ex Nitardy i *Drepanocladus polycarpus* (Voit) Warnst.), które albo zostały błędnie uznane za bipolarne albo okazały się być znacznie szerzej rozmieszczone na południowej półkuli lub w tropikach. Z drugiej strony w ostatnich latach stwierdzono cztery nowe gatunki mchów bipolarnych wzdłuż osi amerykańskiej, a mianowicie *Encalypta procera* Bruch, *Stegonia latifolia* (Schwaegr.) Vent. ex Broth., *Pterygoneurum ovatum* (Hedw.) Dixon oraz *Tortella tortelloides* (S. W. Greene) H. Robins. Za wyjątkiem tego ostatniego gatunku, który stwierdzony został na Hawajach, żaden z nich nie ma pośrednich stanowisk w wysokich położeniach górskich w strefie tropikalnej.

Biorąc pod uwagę wszystkie gatunki skreślone z listy jak i nowo na niej umieszczone, lista mchów bipolarnych wzdłuż osi amerykańskiej została zredukowana do 12 gatunków. Są to: *Polytrichum strictum* Brid., *Ditrichum heteromallum* (Hedw.) Britt., *Encalypta procera* Bruch, *Pterygoneurum ovatum* (Hedw.) Dixon, *Stegonia latifolia* (Schwaegr.) Vent. ex Broth., *Tortella tortuosa* (Hedw.) Limpr., *T. tortelloides* (S. W. Greene) H. Robins., *Oedipodium griffithianum* (Dicks.) Schwaegr., *Plagiomnium ellipticum* (Brid.) T. Kop., *Cinclidium stygium* Sw., *Meesia uliginosa* Hedw. i *Amblyodon dealbatus* (Hedw.) Bruch & Schimp. Za wyjątkiem wspomnianej wyżej *Tortella tortelloides* żaden z nich nie posiada pośrednich stanowisk w wysokich położeniach górskich w strefie tropikalnej. Generalnie przyjmuje się hipotezę, że ten typ zasięgu jest rezultatem dalekiego transportu bądź to zarodników bądź innych diaspor lub fragmentów gametofitów.