© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

Polytrichadelphus magellanicus sensu lato (Musci) and its ascomycetes – different fungi on different hosts

P. DÖBBELER

Abstract:
DÖBBELER, P.: *Polytrichadelphus magellanicus* sensu lato (Musci) and its ascomycetes – different fungi on different hosts. – Sendtnera 7: 35–45. 2001. ISSN 0944–0178.

Forty-six herbarium specimens of the moss *Polytrichadelphus magellanicus* s.l. (Polytrichaceae) from all parts of its (sub)antarctic distribution area were analysed for associated fungi. On thirty-eight specimens fruit-bodies representing ten species of ascomycetes were found. *P. magellanicus* s.str. from Patagonia and Tierra del Fuego was found to be an excellent host, infected by nine fungal species belonging to seven genera. Each of the fifteen infected collections was associated, on average, with four different fungal species. However, on the twenty-three infected specimens of *P. innovans* from New Zealand, the Auckland Islands, Australia and Tasmania, only *Epibryon pogonati-urnigeri* was present with regularity. Except for the unspecific *Bryochiton perpusillus* both host mosses have their own parasites. This underlines the distinctness of *P. magellanicus* s.str. from southern South America and *P. innovans* from Australasia. These taxa have probably developed independently from each other over a long time period. Relations between *P. innovans* and *Pogonatum urnigerum* are discussed.

Zusammenfassung:
Sechsundvierzig Herbarbelege des Laubmooses *Polytrichadelphus magellanicus* s.l. (Polytrichaceae) aus allen Teilen des (sub)antarktischen Verbreitungsgebietes wurden auf Pilzbefall hin analysiert. Auf achtunddreißig Proben konnten Fruchtkörper nachgewiesen werden, die zehn Arten von Ascomyceten repräsentieren. *P. magellanicus* s.str. aus Patagonien und Feuerland ist mit neun vorkommenden Pilzarten, die zu sieben Gattungen gehören, ein ausgezeichneter Wirt. Jede der fünfzehn befallenen Aufsammlungen weist im Durchschnitt vier verschiedene Pilzarten auf. Auf den dreiundzwanzig Proben von *P. innovans* aus Neuseeland, den Auckland Inseln, Australien und Tasmanien ist hingegen fast nur *Epibryon pogonati-urnigeri* vorhanden, allerdings mit erstaunlicher Regelmäßigkeit. Abgesehen von dem unspezifischen *Bryochiton perpusillus* haben beide Wirtsmoose ihre eigenen Parasiten. Das unterstreicht die Eigenständigkeit von *P. magellanicus* s.str. aus dem südlichen Südamerika und *P. innovans* aus Australasien. Vermutlich haben sich beide Sippen über lange Zeiträume getrennt voneinander entwickelt. Diskutiert werden Beziehungen zwischen *P. innovans* und *Pogonatum urnigerum*.

Introduction

Two randomly collected specimens of *Polytrichadelphus magellanicus* (Hedw.) Mitt. (Polytrichales, Musci) from Tierra del Fuego proved to be extremely good hosts for parasitic asco-

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

mycetes. Six and seven species, respectively, were recorded, representing no less than five genera and four orders. Apparently, hundreds of ascomata may be formed on a single host plant without causing any symptoms visible to the naked eye (DÖBBELER 1999b). The present study analyses the fungal diversity within different populations of *P. magellanicus* in southern South America and *P. innovans* (Müll.Hal.) A.Jaeger in Australasia. The latter taxon often was not separated from *P. magellanicus* (e.g. BEEVER et al. 1992, FIFE 1995, RAMSAY 1997, SCOTT & STONE 1976, van ZANTEN 1978: 460).

Material and methods

Specimens of *Polytrichadelphus magellanicus* s.l. from the bryological herbaria B, F, G, GZU, JE, M and W were screened for the presence of fungi. Before studying the plants it was necessary to wet them thoroughly. This clearly demonstrates their endohydric organization as well as highlighting the water repellent lamellae margins. Small or sparsely distributed ascomata were only detectable by microscopic screening of individual host leaves. Lugol's solution (Merck 9261) was used to test iodine reactions. Infected plants, or parts of them, were separated and deposited under the fungal name in the corresponding host herbarium.

Specimens examined

Polytrichadelphus magellanicus s.str. as host (specimens 12 and 13, reported by DÖBBELER 1996, are included)

1 Chile. Prov. de Cautín, Volcano Villarrica, ca. 1000 m, *Hollermayer 56* (W). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa, Potriphila neurogena, Rogellia nectrioidea.*

2 Chile. Prov. de Cautín, Andes of Villarrica, (probably 1897), *Neger* (JE). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa, Potriphila navicularis, P. neurogena.*

3 Chile. Prov. de Valdivia, Corral, near Quitaluto, ca. 400 m, 2.2.1935, *Hosseus 698* (JE). Recorded species: *Bryochiton perpusillus, Crocicreas magellanicum.*

4 Chile. Prov. de Valdivia, Cordillera Pelada, road from La Unión to El Mirador, 800 m, 12.12. 1985, *Hellwig 8560* (M). Recorded species: *Dawsophila polycarpa, Rogellia nectrioidea.*

5 Chile. Prov. de Valdivia, West slope of Cordillera Pelada, 8.8 km by road W of El Mirador on road between La Unión and Punta Hueicolla, 580 m, 40°07'S, 73°16'W, 18.2.1976, *Crosby 12758* (B, W). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa.*

6 Chile. Prov. de Chiloé, Trumao, path to "Madrina", 200 m, 28.5.1932, *Junge 424* (F). Recorded species: *Bryochtion perpusillus, Crocicreas magellanicum, Dawsophila polycarpa.*

7 Chile. "Waldhagen", [*Nothofagus*] *pumilio*-tree line, 1200 m, 1.1.1938, *Schwabe 34* (JE). Recorded species: *Dawsophila polycarpa, Epibryon eremita, Potridiscus polymorphus, Potriphila navicularis, P. neurogena, Rogellia nectrioidea.*

8 Chile. Prov. de Coihaique, Checkpoint Cisnes Medio of the Carretera Austral, IV.1985, *Hellwig 811* (M). Recorded species: *Bryochiton perpusillus, Crocicreas magellanicum, Dawsophila polycarpa.*

9 Chile. Prov. de Magallanes, Punta Arenas, 1917, *Hicken* (B). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa, Potriphila navicularis, P. neurogena.*

10 Chile. Prov. de Antártica Chilena, Canal Beagle, II.1922, *Gusinde 339* (W). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa, Potriphila navicularis, P. neurogena, Rogellia nectrioidea.*

11 Argentina. Tierra del Fuego, Dep. Ushuaia, Río Olivia, 27.9.1979, *Matteri NC2153* (B). Recorded species: *Bryochiton perpusillus, Crocicreas magellanicum, Dawsophila polycarpa.*

12 Argentina. Tierra del Fuego, Dep. Ushuaia, about 30 km E of Ushuaia, road from Ushuaia to Paso Garibaldi, ca. 190 m, 22.3.1997, *Mues* (M). Recorded species: *Crocicreas magellanicum, Dawsophila polycarpa, Epibryon eremita, E. interlamellare, Potriphila navicularis, P. neurogena* (Type).

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

13 Argentina. Tierra del Fuego, Dep. Ushuaia, near Paso Garibaldi, ca. 430 m, 20.3.1997, *Mues* (M). Recorded species: *Crocicreas magellanicum* (Type), *Dawsophila polycarpa* (Type), *Epibryon eremita* (Type), *E. interlamellare*, *Potriphila navicularis*, *P. neurogena*, *Rogellia nectrioidea* (Type).
14 Argentina. Tierra del Fuego australis, Dep. Ushuaia, Montes Martiales, 320 m, 54°46'S, 68°18'W, 30.12.1969, *Roivainen* (Plantae Argentinae 1480, sub *Polytrichadelphus magellanicus*), (G). Recorded species: *Dawsophila polycarpa*.
15 Argentina. Tierra del Fuego, Dep. Ushuaia, Cerro Martial, 350 m, 5.1.1989, *Schäfer-Verwimp & Verwimp 10849* (G). Recorded species: *Crocicreas magellanicum*, *Dawsophila polycarpa*, *Epibryon eremita*, *E. interlamellare*, *Potriphila navicularis*, *P. neurogena*.

Polytrichadelphus innovans as host

16 New Zealand. (without further notes), com. Dr. Schwarz (W). Recorded species: *Epibryon pogonati-urnigeri*.
17 New Zealand. North Island, North Auckland, Waipoua forest, 50 km NW of Dargaville, ca. 300 m, 9.1.1974, *van Zanten 7401214* (B). Recorded species: *Epibryon pogonati-urnigeri*.
18 New Zealand. North Island, Paradise Valley, Fish hatchery, near Rotorua, 7.1.1969, *O. & I. Degener 31830* (GZU). Recorded species: *Epibryon pogonati-urnigeri*.
19 New Zealand. North Island, Waiotapu, IX.1929, *Meebold* (M). Recorded species: *Epibryon pogonati-urnigeri*.
20 New Zealand. North Island, Bay of Plenty, Kaingaroa plantation forest, SE of Rotorua, ca. 600 m, 25.10.1959, *van Zanten 1251* (B). Recorded species: *Epibryon pogonati-urnigeri*.
21 New Zealand. North Island, Tauhara, Taupohill, about 2500', IX.1929, *Meebold* (M). Recorded species: *Epibryon pogonati-urnigeri*.
22 New Zealand. North Island, Waitakerei Range, 1206', IX.1929, *Meebold* (M). Recorded species: *Bryochiton perpusillus*.
23 New Zealand. North Island, Gisborn district, Lake Waikaremoana, along road from Waiotukupuna-bridge to Cascade Falls, ca. 600 m, 29.8.1968, *van Zanten 681886* (JE). Recorded species: *Epibryon pogonati-urnigeri*.
24 New Zealand. North Island, Mt. Egmont, 3000', VIII.1929, *Meebold* (M). Recorded species: *Epibryon pogonati-urnigeri*.
25 New Zealand. North Island, Mt. Egmont, Dawson Falls, 6.3.1959, *H. & E. Walter* (M). Recorded species: *Epibryon pogonati-urnigeri*.
26 New Zealand. North Island, Hawke's Bay, near Whakarara, Gardiner's Mill, 31.12.1950, *Sainsbury* (W). Recorded species: *Epibryon pogonati-urnigeri*.
27 New Zealand. North Island, Wellington, York Bay, V.1929, *Meebold* (M). Recorded species: *Epibryon pogonati-urnigeri*.
28 New Zealand. South Island, Westland, Teramakau Valley, 600 ft, 6.2.1903, *Naylor Beckett* (JE). Recorded species: *Epibryon pogonati-urnigeri*.
29 New Zealand. South Island, West Coast Area, N of Whataroa, 7.2.1970, *Vitt 4505* (B). Recorded species: *Bryochiton perpusillus*, *Epibryon pogonati-urnigeri*.
30 New Zealand. South Island, South Otago, The Chaslands, along highway 93, 14.I.1973, *Visch* (B). Recorded species: *Epibryon pogonati-urnigeri*.
31 New Zealand. Stewart Island, I.1889, *Bell* (M). Recorded species: *Epibryon pogonati-urnigeri*.
32 Auckland Islands. Auckland Island, South end of North Harbour, 12.1.1973, *Vitt 10223* (M). Recorded species: *Epibryon pogonati-urnigeri*.
33 Australia. Victoria, Baw Baw National Park, 6 km SE of Mt. Erica, road cutting on Mt. Erica, 700–800 m, 37°35'S, 146°23'E, 10.1.1986, *Rambold 3276* (M). Recorded species: *Epibryon pogonati-urnigeri*.
34 Australia. Victoria, Baw Baw National Park, 6 km SE of Mt. Erica, road cutting on Mt. Erica, 900–1000 m, 37°35'S, 146°23'E, 10.1.1986, *Rambold 3280* (M). Recorded species: *Epibryon pogonati-urnigeri*.
35 Australia. Victoria, Mt. Donna Bvang, 5 km N of Warburton, 1200 m, 12.4.1974, *Streimann 991* (B). Recorded species: *Epibryon pogonati-urnigeri*.
36 Tasmania. (without further notes), *Lucas* (M). Recorded species: *Epibryon pogonati-urnigeri*.
37 Tasmania. NW of Mt. Field, Florentine Valley, 21.1.1959, *H. & E. Walter* (M). Recorded species: *Epibryon pogonati-urnigeri*.
38 Tasmania. Hobart, Mt. Wellington, 14.4.1903, *Fleischer B2074* (B). Recorded species: *Epibryon pogonati-urnigeri*.

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

The ascomycetes recorded

Bryochiton perpusillus Döbbeler (DÖBBELER, Mitt. Bot. Staatssamml. München 14: 226, 1978)
Hosts: *Polytrichadelphus magellanicus, P. innovans* (and other bryophytes, see below)
Distribution on *Polytrichadelphus*: Chile, Argentina, New Zealand
Specimens examined: 3, 6, 8, 11, 22, 29

Bryochiton perpusillus is a very widespread and variable species recorded from distantly related bryophytes, often with a withered appearance, indicating that taxonomic uniformity should be proved. Partially damaged hepatics, like *Ptilidium* occur within the spectrum of hosts besides the Polytrichaceae, including *Dawsonia* (DÖBBELER 1978, 1981). *B. perpusillus* most regularly colonises *Polytrichum piliferum* Hedw. where it develops subcuticularly from a conspicuous network of thick brown hyphae, especially in the apical, abaxial region of normal looking or hardly altered leaves. On *Polytrichadelphus, Bryochiton perpusillus* occurs in lower concentrations. Ascomata are sparse on the lower, withering leaves of a plant, suggesting the saprophytic tendency of the fungus. Generally, apical regions of individual leaves are preferred and often both sides of a leaf have fruit-bodies as well as the interlamellar spaces being infected. Here the ascomata may look very similar to those of *Epibryon pogonati-urnigeri*. However, the latter species prefers upper healthy leaves where the fungus is completely surrounded by the leaf lamellae. A positive iodine reaction within the ostiolar region immediately reveals *E. pogonati-urnigeri*.

Crocicreas magellanicum Döbbeler (DÖBBELER, Haussknechtia Beih. 9: 81, 1999b)
Host: *Polytrichadelphus magellanicus*
Distribution: Chile, Argentina
Specimens examined: 1–3, 5, 6, 8–13, 15

Due to a lack of contrast with its substrate, the white to nearly hyaline apothecia of *Crocicreas magellanicum* are often difficult to detect, especially when hidden between the leaf lamellae and sparse in numbers. Microscopically screened leaves repeatedly proved to be infected, though apothecia could not be seen by low stereo-microscopic magnification.

Dawsophila polycarpa Döbbeler (DÖBBELER, Haussknechtia Beih. 9: 83, 1999b)
Host: *Polytrichadelphus magellanicus*
Distribution: Chile, Argentina
Specimens examined: 1, 2, 4–15

The two species *Dawsophila callichroma* Döbbeler and *D. pygmaea* Döbbeler frequently colonise different members of the genus *Dawsonia* and are present within its whole Australasian distribution range (DÖBBELER 1981). Though special attention was paid to seeking *Dawsophila* on *Polytrichadelphus innovans*, which shares its distribution for the most part with *Dawsonia*, ascomata could not be detected.

Epibryon eremita Döbbeler (DÖBBELER, Haussknechtia Beih. 9: 85, 1999b)
Host: *Polytrichadelphus magellanicus*
Distribution: Chile, Argentina
Specimens examined: 7, 12, 13, 15

Several ascomata of collection 15 had approximately thirty-two spores per ascus unlike the eight spores per ascus found in the other three specimens, including the type specimen. Spore size among specimens was similar. The larger asci (up to 60 µm long) found in the 32-spored asci

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

simply accommodate a larger spore number than the smaller asci (35–40 µm long). As there are no other differences to the type material, spore number and ascus size do not seem to be of taxonomic significance. Relations to *Epibryon elegantissimum* Döbbeler on *Dawsonia superba* Grev. in New Zealand (DÖBBELER 1981) may exist, judging by fruit-body morphology, hymenial features and the peculiar microhabitat preference.

Epibryon interlamellare (Racov.) Döbbeler (DÖBBELER, Mitt. Bot. Staatssamml. München 14: 279, 1978)
Hosts: *Polytrichadelphus magellanicus* (and other Polytrichaceae)
Distribution on *Polytrichadelphus*: Argentina
Specimens examined: 12, 13, 15

This frequent and widespread species infects different Polytrichaceae (see DÖBBELER 1999b).

Epibryon pogonati-urnigeri Döbbeler (DÖBBELER, Mitt. Bot. Staatssamml. München 14: 296, 1978)
Hosts: *Polytrichadelphus innovans* (and other Polytrichaceae, see below)
Distribution on *Polytrichadelphus*: New Zealand, Auckland Islands, Australia, Tasmania
Specimens examined: 16–21, 23–38

The young, upper leaves of an infected plant normally contain only a few ascomata which are restricted to the apical leaf region. Due to a lack of space, they are very laterally compressed. Often the ascomatal walls adjacent to the lamellae are reduced or completely missing. In older leaves ascomata are more evenly distributed and spherical. Heavily infected, 6 mm long leaves of different collections commonly yielded about hundred ascomata. In one case an individual leaf of 8 mm length was colonised by approximately 180 ascomata. The species is quite uniform on *Polytrichadelphus innovans*, although slight differences in spore size and other features between collections on different Polytrichaceae or from different geographical regions apparently exist. An essential feature of *Epibryon pogonati-urnigeri* is its iodine reaction, which is not known in other bryophilous ascomycetes. The ostiolar region turns reddish in Lugol's solution and KOH pretreatment gives a more distinct bluish colour (hemiamyloid reaction, BARAL 1987).

Four polytrichaceous hosts are known for *Epibryon pogonati-urnigeri* in addition to *Polytrichadelphus innovans*, namely *Pogonatum urnigerum* (Hedw.) P.Beauv., *P. dentatum* (Brid.) Brid. (DÖBBELER 1978, 1985), *Dawsonia longiseta* Hampe and *D. polytrichoides* R.Br. (DÖBBELER 1981). With the exception of *P. dentatum,* for which only a few data are available, these mosses are very regularly or (in certain regions) even indiscriminately infected by *E. pogonati-urnigeri*. Both species of *Pogonatum* represent the subgenus *Dendroidea* (HYVÖNEN 1989). It is rather well documented that *E. pogonati-urnigeri* occupies wide areas of the geographical range of *P. urnigerum* (DÖBBELER 1978, 1985) which is distributed in northern Eurasia, North America and in scattered high mountain localities in Africa, southeast Asia and Papua New Guinea (HYVÖNEN 1989). After studying hundreds of European Polytrichaceae it is obvious that species like *Pogonatum aloides* (Hedw.) P.Beauv. (*P.* subgen. *Pogonatum*) or *Polytrichastrum alpinum* (Hedw.) G.L.Sm. (syn. *Pogonatum alpinum* (Hedw.) Röhl.) do not host *E. pogonati-urnigeri*. *Dawsonia longiseta* and *D. polytrichoides* make up the more primitive section of the genus *Dawsonia* (*D.* sect. *Dawsonia*) and are restricted to eastern Australia (van ZANTEN 1973). On studying representative material DÖBBELER (1981) observed that ascomata of *Epibryon pogonati-urnigeri* were always present on both *D. longiseta* and *D. polytrichoides* whereas for *D. superba* (*D.* sect. *Superba*) the situation is quite different. Though occurring within the range of the parasite in New Zealand, Australia and Tasmania, parasitism by

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

E. pogonati-urnigeri occurred only exceptionally. The mosses in question are not ecologically separate as they (as most Polytrichaceae) prefer open, exposed soil as on river banks and road cuttings.

How should one interpret the range of hosts for *Epibryon pogonati-urnigeri*? It exhibits specificity between sections within *Dawsonia* and *Pogonatum* and between *Pogonatum urnigerum* and *Polytrichastrum alpinum*, but it does not discriminate among genera as different as *Pogonatum, Polytrichadelphus* and *Dawsonia*. The differences between these genera may not be as great as one might initially suppose because they are distinguished by sporophytic characters, i.e. capsule morphology. The gametophytic plants are well-developed and share several common features. The leaves are characterised by a distinct sheath and swelling tissue. They bear densely formed adaxial lamellae with specialised marginal cells which are covered in *Polytrichadelphus* and *Dawsonia* with angular flakes of epicuticular wax. In this respect they differ from other Polytrichaceae (PROCTOR 1992). Though species of *Pogonatum* vary greatly regarding waxy deposits, *P. urnigerum* appears "to be highly distinctive, with epicuticular wax on the papillose lamella margins in the form of flakes or platelets not unlike those of *Dawsonia* and *Polytrichadelphus*" (CLAYTON-GREENE et al. 1985: 552; see also PROCTOR 1979). On a macroscopic level, the upper leaf surface of these mosses displays a glaucous bloom caused by the waxy coverings. Another leaf character common to *Pogonatum urnigerum* and *Polytrichadelphus innovans* are similar lamellae hairs (DÖBBELER 1999a, Figs. 4, 5). Nevertheless, recent molecular results on the phylogeny of the Polytrichales by HYVÖNEN et al. (1998) do not support a very close relationship between the genera in question.

Potridiscus polymorphus Döbbeler & Triebel (DÖBBELER & TRIEBEL, Hoppea 61: 72, 2001)
Hosts: *Polytrichadelphus magellanicus* (and other Polytrichaceae, especially *Polytrichum juniperinum* Hedw., DÖBBELER & TRIEBEL 2001)
Distribution on *Polytrichadelphus*: Chile
Specimen examined: 7

This distinctive species with a palaeoaustral distribution is more frequent than previously thought. *Polytrichadelphus* seems only to be an occasional host. Within a rather rich collection of *P. innovans* from New Zealand (collection 20) a few intermingled plants of *Polytrichum juniperinum* were heavily infected by *Potridiscus polymorphus,* whereas no ascomata could be detected on the predominant *Polytrichadelphus*.

Potriphila navicularis Döbbeler (DÖBBELER, Nova Hedwigia 62: 62, 1996)
Host: *Polytrichadelphus magellanicus* (and other Polytrichaceae)
Distribution on *P. magellanicus*: Chile, Argentina
Specimens examined: 2, 7, 9, 10, 12, 13, 15

Potriphila navicularis has a bipolar distribution type and is very frequent on *Polytrichastrum alpinum* (DÖBBELER 1996). On *Polytrichadelphus magellanicus*, as in nearly all southern hemisphere records, only the anamorphic state is present. In addition to normal leaves, bracts and scale leaves should also be screened. Usually only a few pycnidia are detectable on dozens of potential host plants. The host of *Potriphila navicularis* from the Auckland Islands is not *Polytrichadelphus magellanicus*, as recorded by DÖBBELER (1996), but *Polytrichastrum longisetum* (Brid.) G.L.Sm.

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

Potriphila neurogena Döbbeler (DÖBBELER, Haussknechtia Beih. 9: 88, 1999b)
Host: *Polytrichadelphus magellanicus*
Distribution: Chile, Argentina
Specimens examined: 1, 2, 7, 9, 10, 12, 13, 15
Ascomata also develop within male bracts surrounding the antheridia.

Rogellia nectrioidea Döbbeler (DÖBBELER, Haussknechtia Beih. 9: 91, 1999b)
Host: *Polytrichadelphus magellanicus*
Distribution: Chile, Argentina
Specimens examined: 1, 4, 7, 10, 13
In several cases the ascomata of both *Rogellia nectrioidea* and *Potriphila neurogena* were observed on the same host leaf.

Geographical range of *Polytrichadelphus magellanicus* and *P. innovans*

Austral populations of *Polytrichadelphus* are often regarded as a single species, *P. magellanicus*. All of the herbarium material cited (specimens 1–38) was determined as *P. magellanicus* (specimen 7 as *P. horridus* Mitt.). However, SMITH (1971) considers *Polytrichadelphus* of New Zealand and Australia as a distinct taxon, *P. innovans*. "Compared with the American *P. magellanicus*, the plants are smaller and more slender, with shorter, subsecund leaves. The leaf sheath is broader, with more pronounced shoulders, and the teeth on the margin of the blade less well developed" (SMITH 1971: 41). He additionally noted differences in capsule morphology. Moreover, the presence of two distinct species is clearly indicated by completely different lamellae hair types as documented by DÖBBELER (1999a) and repeatedly observed in this study. If one accepts *P. innovans* as a distinct taxon, then *P. magellanicus* s.str. is confined to Chile and Argentina south of about 40 latitude, the Fuegian region, Juan Fernández Islands, the Falkland Islands, Tristan da Cunha and Gough Island (GREENE 1986, HE 1998, PROCTOR 1992, ROBINSON 1975, SCHIAVONE 1993, SCHIAVONE & HYVÖNEN 1992, SMITH 1971). The assumed disjunct occurrence in the northern Andes of Peru (SCHULTZE-MOTEL & MENZEL 1987, GRADSTEIN & FRAHM 1987, MENZEL 1992) is based on a BRYOTROP-specimen [Peru. Dep. Amazonas, Prov. Chachapoyas, road Chachapoyas-Cajamarca km 413, mountain rain forest, 3000 m, 5.9.1982, *Frahm, Geissler, Gradstein, Philippi & Schultze-Motel 916* (Herbarium Frahm!). Female plants with only one capsule and several successive, apparently lateral setae typical for the genus *Polytrichadelphus*.]. This species clearly differs by habit and leaf lamellae characters from the southern South American *Polytrichadelphus magellanicus*. The Australasian *P. innovans* is known from New Zealand, southeastern Australia, Tasmania, the Auckland Islands and Campbell Island (SMITH 1971, VITT 1974, 1979).

Comparison of the ascomycetes on *Polytrichadelphus magellanicus* and *P. innovans*

Careful analysis of forty-six collections of both species of *Polytrichadelphus* revealed the presence of ten different ascomycetes, eight only present on the American, one only on the Australasiatic host and one common to both. Of the seventeen collections of *Polytrichadelphus magellanicus* from Chile and Argentina, fifteen are infected by one to seven species of ascomycetes. Altogether fifty-eight specimens of ascomycetes are found, on average nearly four

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

on each host collection. Thus *P. magellanicus* represents one of the best hosts, not only within Polytrichaceae but also within bryophytes in general, with regard to the number of associated fungi and the frequency of infection. *Dawsophila polycarpa*, the most common species, is present on fourteen host specimens; *Crocicreas magellanicum*, on twelve; *Potriphila neurogena*, on eight; *P. navicularis*, on seven; *Rogellia nectrioidea*, on five; *Bryochiton perpusillus* and *Epibryon eremita*, on four and *Potridiscus polymorphus*, on one host collection. Twenty-eight specimens of *Polytrichadelphus innovans* from New Zealand, Australia and Tasmania and one collection from the Auckland Islands were examined. Twenty-three proved to be colonised. *Epibryon pogonati-urnigeri* was present on twenty-two specimens, whereas *Bryochiton perpusillus* was encountered only twice. This means that on average only one associated fungus per host collection was found.

The present inventory should not imply that the fungal diversity of the two austral species of *Polytrichadelphus* is completely covered. Only the more frequent, previously described parasites are discussed. On several occasions ascomata of an undescribed species were detected but are not discussed in this paper. In most cases the potential hosts consisted of only a few plants gathered for bryological purposes. More extensive collections are required to obtain a sufficient number of ascomata for a proper investigation of the other sparsely distributed parasites. Field studies are also required to seek out the relatively conspicuous, necrotrophic fungi that are unlikely to be represented in bryophyte herbarium material. An example is *Lizonia*, which occupies the antheridial cups of various polytrichaceous mosses. One should also search for orange coloured apothecia formed on the ground between individual plants, as they may belong to rhizoidparasitic species of *Octospora* or *Leucoscypha*. Whether *Polytrichadelphus* belongs to the host range of the latter genera and also *Lizonia* is not currently clear.

Interpretation of bryomycological evidence

The most surprising result of this bryomycological analysis is the diversity of the fungal associates of the two austral species of *Polytrichadelphus* studied. Only one species out of ten was encountered several times on both hosts, namely *Bryochiton perpusillus*, a very common and critical taxon which is also recorded from hepatics. Five ascomycete species are known exclusively on *P. magellanicus* s.str., among them *Potriphila neurogena* and *Rogellia nectrioidea*. The latter two species develop within the leaf nerves, a distinct niche rarely occupied by the multitude of polytrichophilous ascomycete species.

The marked differences in suitability of the two moss species as hosts was also unexpected. *Polytrichadelphus magellanicus* is an excellent substrate, whereas *P. innovans* is less attractive. The absence of common fungal parasites supports the distinctness of both moss taxa as has already been shown by morphological features. Another question concerns the phylogenetic relationship of the *Polytrichadelphus* species. Geographical isolation even for long geological periods does not automatically lead to genetic diversification as demonstrated by FREY et al. (1999) using molecular methods. In the ancient *Lopidium concinnum* (Musci) which has exactly the same distribution range as *P. magellanicus* s.l. little genetic divergence has occurred within the isolated populations since their separation by geotectonic events about 80–60 million years ago.

The vicariant taxa *P. magellanicus* and *P. innovans* (SMITH 1972: 46) are "undoubtedly closely related" (PROCTOR 1992: 317). This inferred relationship is not mirrored by an overlap of the more significant fungal parasites. Furthermore, *Dawsophila* frequently colonises various species of *Dawsonia* (DÖBBELER 1981) and *P. magellanicus*, but avoids *P. innovans*. *Epibryon elegan-*

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

tissimum occurring on *Dawsonia* and *E. eremita* infecting *P. magellanicus* seem to represent a further link between Australasian and South American polytrichaceous hosts, leaving *P. innovans* apart. The bryomycological facts documented herein indicate that *P. magellanicus* and *P. innovans* have had a very long, separate evolution. It would be interesting to know more about the ascomycetes on the relatives of *Polytrichadelphus*, both in South America and Australasia.

I am indebted to the curators of the herbaria B, F, G, GZU, JE, M and W for loans of specimens. Prof. Dr. F. Hellwig (Jena) provided several specimens collected in Chile many years ago. Dr. H. Nowak-Krawietz (Berlin) helped with the literature. Prof. Dr. W. Frey (Berlin) and Prof. Dr. H. Hertel (München) made comments on an early draft of the manuscript. I am grateful to Prof. Dr. T. H. Nash III (Tempe) and M. Cullen (Dublin) for linguistic correction of this paper.

Literature

BARAL, H.O. 1987: Lugol's solution/IKI versus Melzer's reagent: hemiamyloidity, a universal feature of the ascus wall. – Mycotaxon 29: 399–450.

BEEVER, J., ALLISON, K.W. & CHILD, J. 1992: The mosses of New Zealand, sec. ed. Dunedin.

CLAYTON-GREENE, K.A., COLLINS, N.J., GREEN, T.G.A. & PROCTOR, M.C.F. 1985: Surface wax, structure and function in leaves of Polytrichaceae. – J. Bryol. 13: 549–562.

DÖBBELER, P. 1978: Moosbewohnende Ascomyceten I. Die pyrenocarpen, den Gametophyten besiedelnden Arten. – Mitt. Bot. Staatssamml. München 14: 1–360.

– 1981: Moosbewohnende Ascomyceten V. Die auf *Dawsonia* vorkommenden Arten der Botanischen Staatssammlung München. – Mitt. Bot. Staatssamml. München 17: 393–473.

– 1985: Moosbewohnende Ascomyceten VII. Neufunde einiger Arten der Gattung *Epibryon*. – Mitt. Bot. Staatssamml. München 21: 757–773.

– 1996: *Potriphila navicularis* gen. et sp. nov. (Ostropales, Ascomycetes), ein bipolar verbreiteter Parasit von *Polytrichum alpinum*. – Nova Hedwigia 62: 61–77.

– 1999a: Lamellen- und Epidermishaare als neues Merkmal der Polytrichaceen (Musci). – Nova Hedwigia 69: 357–380.

– 1999b: *Polytrichadelphus magellanicus* - a mycological Eldorado: five new ascomycetes on a single collection from Tierra del Fuego. – Haussknechtia Beih. 9: 79–96.

– & TRIEBEL, D. 2001: *Potridiscus polymorphus* (Leotiales) – a new ascomycete on Polytrichaceae (Musci) with palaeoaustral distribution. – Hoppea 61 (2000): 71–83.

FIFE, A.J. 1995: Checklist of the mosses of New Zealand. – Bryologist 98: 313–337.

FREY, W., STECH, M. & MEISSNER, K. 1999: Chloroplast DNA-relationship in palaeoaustral *Lopidium concinnum* (Hypopterygiaceae, Musci). An example of stenoevolution in mosses. Studies in austral temperate rain forest bryophytes 2. – Plant Syst. Evol. 218: 67–75.

GRADSTEIN, S.R. & FRAHM, J.-P. 1987: Die floristische Höhengliederung der Moose entlang des BRYOTROP-Transektes in NO-Peru. – Beih. Nova Hedwigia 88: 105–113.

GREENE, D.M. 1986: A conspectus of the mosses of Antarctica, South Georgia, the Falkland Islands and southern South America. – British Antarctic Survey: Cambridge.

HE, S. 1998: A checklist of the mosses of Chile. – J. Hattori Bot. Lab. 85: 105–189.

HYVÖNEN, J. 1989: A synopsis of genus *Pogonatum* (Polytrichaceae, Musci). – Acta Bot. Fenn. 138: 1–87.

– & HEDDERSON, T.A., SMITH MERRILL, G.L., GIBBINGS, J.G. & KOSKINEN, S. 1998: On phylogeny of the Polytrichales. – Bryologist 101: 489–504.

MENZEL, M. 1992: Preliminary checklist of the mosses of Peru (Studies on Peruvian Bryophytes IV). – J. Hattori Bot. Lab. 71: 175–254.

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

PROCTOR, M.C.F. 1979: Surface wax on the leaves of some mosses. – J. Bryol. 10: 531–538.
– 1992: Scanning electron microscopy of lamella-margin characters and the phytogeography of the genus *Polytrichadelphus*. – J. Bryol. 17: 317–333.
RAMSAY, H.P. 1997: Cytotaxonomic studies on some Polytrichales from Australia, New Zealand, Papua New Guinea and Vanuatu. – J. Hattori Bot. Lab. 82: 213–226.
ROBINSON, H. 1975: The mosses of Juan Fernandez Islands. – Smithsonian Contr. Bot. 27: I–IV, 1–88.
SCHIAVONE, M.M. 1993: Bryophyta, Musci: Polytrich[in]ales. – Flora criptogámica de Tierra del Fuego 14 (12): 1–61.
– & HYVÖNEN, J. 1992: Distribution maps of mosses from Tierra del Fuego, Argentina. 3. – Lindbergia 17: 47–49.
SCHULTZE-MOTEL, W. & MENZEL, M. 1987: Die Laubmoosflora im BRYOTROP-Transekt von Peru. – Beih. Nova Hedwigia 88: 9–59.
SCOTT, G.A.M. & STONE, I.G. 1976: The mosses of southern Australia. – London.
SMITH, G.L. 1971: Conspectus of the genera of Polytrichaceae. – Mem. New York Bot. Gard. 21(3): 1–83.
– 1972: Continental drift and the distribution of Polytrichaceae. – J. Hattori Bot. Lab. 35: 41–49.
VITT, D.H. 1974: A key and synopsis of the mosses of Campbell Island, New Zealand. – N. Zealand J. Bot. 12: 185–210.
– 1979: The moss flora of the Auckland Islands, New Zealand, with a consideration of habitats, origins, and adaptations. – Canad. J. Bot. 57: 2226–2263.
ZANTEN, B.O. van 1973: A taxonomic revision of the genus *Dawsonia* R. Brown. – Lindbergia 2: 1–48, pl. II–XI.
– 1978: Experimental studies on trans-oceanic long-range dispersal of moss spores in the southern hemisphere. – J. Hattori Bot. Lab. 44: 455–482.

Dr. Peter DÖBBELER, Institut für Systematische Botanik der Ludwig-Maximilians-Universität München, Menzinger Straße 67, D-80638 München, Deutschland.

Table 1: The hosts, the associated ascomycetes and their frequency (by number of specimens recorded).

Fifteen specimens of *Polytrichadelphus magellanicus* s.str. (southern South America) are infected by:	
Bryochiton perpusillus	(4)
Crocicreas magellanicum	(12)
Dawsophila polycarpa	(14)
Epibryon eremita	(4)
Epibryon interlamellare	(3)
Potridiscus polymorphus	(1)
Potriphila navicularis	(7)
Potriphila neurogena	(8)
Rogellia nectrioidea	(5)

Twenty-three specimens of *Polytrichadelphus innovans* (Australasia) are infected by:	
Bryochiton perpusillus	(2)
Epibryon pogonati-urnigeri	(22)

Table 2: The infected specimens of *Polytrichadelphus magellanicus* and *P. innovans* and their parasitic ascomycetes.

Host	*Polytrichadelphus magellanicus*														
Areas	Chile										Argentina				
Nr. of collection	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bryochiton perpusillus			●			●		●			●				
Crocicreas magellanicum	●	●	●		●	●		●	●	●	●	●	●		●
Dawsophila polycarpa	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Epibryon eremita							●					●	●		●
Epibryon interlamellare												●	●		●
Epibryon pogonati-urnigeri															
Potridiscus polymorphus							●								
Potriphila navicularis		●					●		●	●		●	●		●
Potriphila neurogena	●	●					●		●	●		●	●		●
Rogellia nectrioidea	●			●			●			●			●		

Host	*Polytrichadelphus innovans*																						
Areas	New Zealand																A.I.	Australia			Tasmania		
Nr. of collection	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Bryochiton perpusillus							●							●									
Crocicreas magellanicum																							
Dawsophila polycarpa																							
Epibryon eremita																							
Epibryon interlamellare																							
Epibryon pogonati-urnigeri	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Potridiscus polymorphus																							
Potriphila navicularis																							
Potriphila neurogena																							
Rogellia nectrioidea																							

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.biologiezentrum.at

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Sendtnera = vorm. Mitt. Bot. Sammlung München

Jahr/Year: 2001

Band/Volume: 7

Autor(en)/Author(s): Döbbeler Peter

Artikel/Article: Polytrichadelphus magellanicus sensu lato (Musci) and its ascomycetes different fungi on different hosts 35-45