

# Antipodal mosses: IX. *Platydictya* (Bryopsida, Hypnaceae)

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A taxonomic and nomenclatural history of *Platydictya* Berk. is outlined and the genus is considered to be a member of the Hypnaceae. *Platydictya densissima* (Card.) Robins., a species originally described from the Antarctic as *Amblystegium densissimum* Card. and considered to be endemic to this region, is briefly evaluated. It is shown that this species is identical to the holarctic *P. jungermannioides* (Brid.) Crum which is now established as a bipolar disjunct and is the only representative of the genus *Platydictya* in the Southern Hemisphere. *Platydictya jungermannioides* is very rare in Tierra del Fuego and on South Georgia, whereas in the maritime Antarctic it is locally frequent, extending from the South Orkney Islands to Alexander Island. The austral plants of *P. jungermannioides* are described and illustrated and the regional and global distributions of the species are mapped. The ecological requirements of the species in Antarctica are also described.

Keywords: Amblystegiaceae, Antarctica, bryophytes, distribution, Hypnaceae, Musci, nomenclature, *Platydictya*, Tierra del Fuego, South Georgia, taxonomy

## INTRODUCTION

*Platydictya* Berk. has a chequered taxonomic and nomenclatural history. The genus was established by Berkshire (1863) to accommodate a single species, *P. sprucei* (Spruce) Berk. (*Leskea sprucei* Spruce), which is currently known as *P. jungermannioides* (Brid.) Crum (Isoviita 1979). In the original description Berkshire (1863) emphasized the large uniform cells, erect capsules and imper-

fect inner peristome as the diagnostic characters of the new genus separating it from *Amblystegium* Schimp. These seem to be somewhat trivial features and not entirely definitive, because the laminal cells in *P. jungermannioides* are not overly large in comparison with those in other species of *Amblystegium* and the segments of the endostome are developed normally, with only the cilia being occasionally rudimentary. It is therefore not surprising that *Platydictya* was not accepted by bry-

ologists and fell into oblivion for almost a century.

*Platydictya jungermannioides* is among the tiniest of pleurocarpous mosses and its filamentous appearance, coupled with the lack of a central strand and costa, prompted Loeske (1903) to recognize the genus *Amblystegiella* Loeske for the placement of this species [as *A. sprucei* (Bruch) Loeske] as well as two others, *A. confervoides* (Brid.) Loeske and *A. subtilis* (Hedw.) Loeske. Surprisingly, this genus gained wide acceptance, although nomenclaturally *Amblystegiella* was illegitimate because it included the type of an earlier generic name. Crum (1964, 1969) resurrected *Platydictya* and transferred to it three additional species, making the appropriate new combinations. Since then, the genus has been unanimously accepted by bryologists who have placed it either in the Amblystegiaceae (e.g. Kanda 1975, Smith 1978, Corley *et al.* 1981) or Hypnaceae (Crum & Anderson 1981, Vitt 1984). In total, eleven species were given names in *Platydictya* (Crosby *et al.* 1992, Redfearn & Tan 1995), but some species names have already been reduced to synonymy by Noguchi (1991) and Enroth (1997) including *P. yuennanensis* (Broth.) Redf. & Tan [= *Amblystegium serpens* (Hedw.) Schimp.] and *P. shiromuensis* Kanda and *P. sinensi-subtilis* (C. Müll.) Redf. & Tan [= *P. subtilis* (Hedw.) Crum]. Chopra (1975) listed two additional species of *Platydictya* from the Himalayan region, *P. confervula* C. Müll. and *P. harsukhi* Broth., but those names have never been validly published. It is worth noting that *Amblystegiella spuriotubilis* (Broth. & Par.) Broth., which should be given a name under *Platydictya*, is in fact a member of the genus *Orthoamblystegium* Dix. & Sak. (Noguchi 1982).

As presently conceived, *Platydictya* is a heterogeneous genus, consisting of two species groups. The first, comprising the generitype as well as *P. minutissima* (Sull.) Crum and *P. densissima* (Card.) H. Robins., is characterized by having axillary, purple and granular-papillose rhizoids, whereas the second group consists of the remaining species of the genus having smooth, brown and intercalary rhizoids inserted below the leaf bases. The first group constitutes the genus *Platydictya* in the strict sense, while the second group forms the separate genus *Serpoleskea* (Limpr.) Warnst. Hedenäs (1987, 1989, 1995) placed *Platy-*

*dictya* in the Plagiotheciaceae on account of the similar colour of the rhizoids and their papillosity in some species when young. This seems to be weak evidence of the phylogenetic relationships, especially as in many species of *Plagiothecium*, for instance in those with broad laminal cells, the rhizoids are smooth and intercalary, not papillose and axillary. Therefore, until more convincing evidence is provided, *Platydictya* is better placed in the Hypnaceae, near *Isopterygiopsis* Iwats. with which it shares similar rhizoids and ecostate leaves.

*Platydictya* in the strict sense is a small bipolar genus consisting of three species. *Platydictya jungermannioides* has a circumpolar range in the Northern Hemisphere, *P. minutissima* is a narrow endemic of eastern North America (Crum & Anderson 1981), while *P. densissima* has so far been recorded only from the northern maritime Antarctic (Steere 1961, Robinson 1972, Greene 1986).

#### THE TAXONOMIC STATUS OF *PLATYDICTYA DENSISSIMA*

During the Belgian Antarctic Expedition of 1897–1899, which is famous as the first to overwinter in Antarctica, E. Racovitza, naturalist of the expedition, made an extensive collection of bryophytes in the Gerlache Strait area on the Danco Coast of the West Antarctic Peninsula. The mosses were subsequently investigated by Cardot (1900, 1901). A total of 26 species and four varieties were recognized, of which 14 species and two varieties were described as new to science.

*Platydictya densissima* was described as *Amblystegium densissimum* from a single collection made at Cape Anna. In the diagnosis Cardot (1900, 1901) stressed the very small size of the plants and their overall similarity to *P. jungermannioides* and *P. subtilis*, but the Antarctic plants were considered more julaceous and to have more crowded, subimbricate and shorter acuminate leaves. Additionally, they were entirely sterile and grew in exceedingly dense mats; the species name therefore clearly referred to the growth form of this moss. Brotherus (1908) transferred *Amblystegium densissimum* to *Amblystegiella* and Robinson (1972) reassigned it to *Platydictya*, but the species has remained poorly known and apparently

not examined taxonomically since its description. This was chiefly because, until the early 1960s, this species was known only from the type collection (Steere 1961). Fortunately, the increasing botanical exploration of Antarctica which started in the 1960s has yielded many specimens of *P. densissima*, mostly preserved in the herbarium of the British Antarctic Survey (AAS), especially from Signy Island in the South Orkney Islands (Lewis-Smith 1972), Argentine Islands (Lewis-Smith & Corner 1973), and King George and Livingston Islands in the South Shetland Islands (Robinson 1972, Schulz 1993, Ochrya 1998). In addition, an investigation of large unnamed collections from South Georgia preserved in AAS resulted in the discovery of two collections of this species on this subantarctic island, and a single specimen collected by H. Roivainen in Tierra del Fuego during the Finnish Expedition of 1928–1929 was discovered in H.

All available material from the Southern Hemisphere is sterile and no sexual organs have been observed. On the other hand, in many specimens obcuneate propagules composed of 2–4 cells are present. The plants exhibit considerable variation, particularly in the size and shape of leaves, serrulation of leaf margins and habit (Fig. 1). Phenotypes closely matching the type of *Platydictya densissima* are quite frequent, but plants growing in moderately dense or even thin mats have also been collected, sometimes growing intermingled with other moss species. Similar phenotypes of *P. jungermannioides* are frequently found in the Arctic to which the Antarctic material seems to be very closely related. A comparison of the two species revealed excellent correspondence in all characters of the gametophytes, including leaf shape, areolation and serrulation of leaf margins as well as propagules. There seems to be no reason to maintain two separate species because of the lack of definite differentiating characters and accordingly *P. densissima* is reduced to synonymy with *P. jungermannioides*.

## DESCRIPTION AND DIFFERENTIATION

*Platydictya jungermannioides* (Brid.) Crum (Fig. 1)

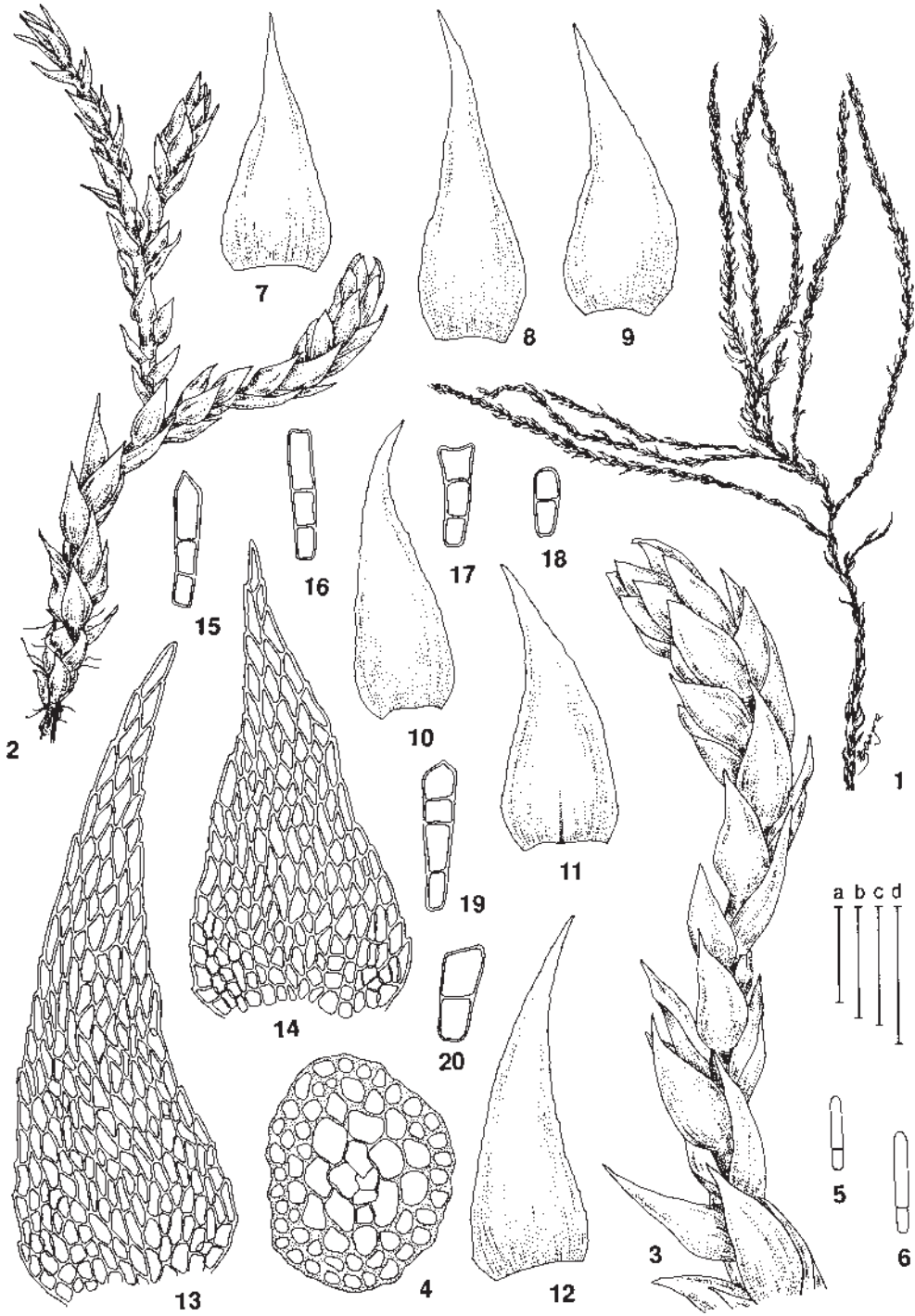
Michigan Bot. 3: 60. 1964. — *Hypnum jungermannioides* Brid., Musc. Rec. 2: 255. 1812. — *Amblystegiella junger-*

*mannioides* (Brid.) Giac., Atti Ist. Bot. Univ. Lab. Critt. Pavia ser. 5, 4: 262. 1947. — Type: In introitu speluncae Baumannianae in Hercynia legit Weberus (neotype *fide* Isoviita 1979: 281); “Am Eingange in die Baumannshöhle 24 Sept. 97 Flörke”, JE!).

*Amblystegium densissimum* Card., Rev. Bryol. 27(3): 46. 1900. — *Amblystegiella densissima* (Card.) Broth. in Engl. & Prantl, Nat. Pflanzenfam. 1(3): 1025. 1908. — *Platydictya densissima* (Card.) H. Robins. in Llano, Antarct. Res. Ser. Am. Geoph. Union 20: 176. 1972, *syn. nov.* — Type: [Antarctica] détroit de Gerlache, IX<sup>me</sup> débarquement; later Cardot (1901) added: Terre de Danco, près du cap Anna Osterrieth, sur les petites terrasses humides de la falaise. (N° 205°; 29 janvier 1898) (holotype PC!, isotypes BR!, S — the latter not seen).

*Plants* very small, threadlike, in dense, soft, silky mats up to 2 cm tall, pale- or yellow-green above, brownish below. *Stems* fragile, erect, 5–10 mm long, subjulaceous, irregularly branched, branches easily detached, in cross-section without central strand, consisting of large, thin-walled, hyaline medullary cells and 1–2-layered cortex of smaller, thicker-walled, pale brownish cells; *rhizoids* arising from leaf axils, purple-brown, granular-papillose; *pseudoparaphyllia* small, filiform; *axillary hairs* short, 2–3-celled, hyaline. *Gemmae* often clustered in leaf axils on stems and branches, smooth, elongate, obcuneate, 2–3-cellular. *Leaves* crowded, erect to erect-spreading, 0.2–0.3(–0.35) mm long, 0.1–0.17 mm wide, concave, straight or sometimes subsecund, ovate-lanceolate, slenderly acute, usually somewhat narrowed at the insertion; *margin* flat, serrulate to sinuate; *costa* lacking or sometimes very slightly marked; *laminal cells* firm-walled, shortly oblong-rhomboidal, 6–7 µm wide, (15–)18–27(–30) µm long; *alar cells* subquadrate to short-rectangular, forming inconspicuous groups of 3–5 cells along the margins in the basal angles. Always sterile in the Southern Hemisphere.

*Platydictya jungermannioides* is the tiniest of all the mosses occurring in the Antarctic. It can be easily distinguished in the field, even with the naked eye, by its characteristically very slender, filiform and fragile plants forming dense, light- to yellow-green mats. Microscopically, the species is very distinct in its small, nerveless leaves with serrulate margins, although the species is very variable in the degree of serrulation. In addition, it is the only pleurocarpous moss in the Antarctic which produces propagules in abundance.



**Fig. 1.** *Platydictya jungermannioides* (Brid.) Crum. — 1–2. Habit. — 3. Portion of shoot, dry. — 4. Cross-section of stem. — 5–6. Axillary hairs. — 7–12. Leaves. — 13–14. Leaf areolation. — 15–20. Propagules. — Drawn from *Ochyra* 926/80 (1, 4, 8–13, 15–20); *Killingbeck* 146 (2–3); *Racovitza* 205e (type of *Amblystegium densissimum*), BR (5–7, 14); all in KRAM unless otherwise stated. — Scale bars: a: 25  $\mu$ m (5–6) and 50  $\mu$ m (13–14); b: 100  $\mu$ m (7–12); c: 1 mm (1), 0.5 mm (2) and 0.25 mm (3); d: 50  $\mu$ m (4, 15–20).

## ECOLOGY

*Platydictya jungermannioides* is predominantly associated with calcareous habitats and only occasionally grows in acidic sites. It is a typical sciophile growing on damp or wet mineral soil, gravel, scree or humus in deep and sheltered rock crevices, in rock fissures and recesses, often under overhanging rocks on cliffs, outcrops and knolls of marble and amphibolite. On Signy Island it is an occasional constituent of the association dominated by *Syntrichia saxicola* and *Schistidium antarctici* on calcareous soils (Lewis-Smith 1972). Apart from the dominant species, it grows together with the mosses *Pohlia cruda* (Hedw.) Lindb., *Bartramia patens* Brid., *Orthotheciella varia* (Hedw.) Ochyra, *Sanionia uncinata* (Hedw.) Loeske and *Syntrichia princeps* (De Not.) Mitt. and the liverworts *Cephaloziella varians* (Gott.) Steph. and *Marchantia berteriana* Lehm. & Lindenb.

## GEOGRAPHICAL DISTRIBUTION

In the Southern Hemisphere *Platydictya jungermannioides* is widely distributed but scattered throughout the maritime Antarctic, ranging from Signy Island in the South Orkney Islands to Alexander Island and reaching its southernmost locality at lat. 71°11'S (Fig. 2). It grows from near sea level to about 400 m, although one collection was at 465 m on the Loubet Coast. Outside the Antarctic it has been found only occasionally on the subantarctic island of South Georgia and was once collected in Tierra del Fuego in southern South America.

*Specimens seen* — SOUTH AMERICA. **Chile.** Prov. de Magallanes, Tierra del Fuego, Estancia Vicuña, Cerro Fuentes, 1929, *Roivainen s.n.* (H). SUBANTARCTICA. **South Georgia.** West of Mt. Skittle (GR 152 110), alt. ca. 330 m, 1976, *Lewis-Smith 2059B* (AAS, KRAM); Dartmouth Point, S of outwash plain, (GR 135 120), alt. ca. 6 m, 1976, *Lewis-Smith 2023* (AAS, KRAM); NE side of Hettesletten, alt. ca. 8 m (GR 130 120), 1968, *Greene CG 355A* (AAS, KRAM). ANTARCTICA. **South Orkney Islands.** *Signy Island.* Ridge to south of Foca Point, lat. 60°42'S, long. 45°40'W, ca. 12 m, 1981, *Lewis-Smith 3173* (AAS, KRAM), ca. 15 m, 1965, *Lewis-Smith 366* (AAS, KRAM) and 35 m, 1966, *Lewis-Smith 502A* (AAS, KRAM); Foca Point, lat. 60°42'S, long. 45°39'W, 5 m, 1989, *Lewis-Smith 8050A* (AAS, KRAM) and ca. 37 m, *Lewis-Smith 502A* (AAS, KRAM); slope above Foca Cove, lat. 60°43'S, long.

45°38'W, 1985, *Lewis-Smith 5134* (AAS, KRAM); Knife Point, lat. 60°43'S, long. 45°38'W, 25 m, 1984, *Lewis-Smith 5066 & 5067* (AAS, KRAM); Limestone Valley, lat. 60°42'S, long. 45°37'W, 1976–1977, *Lewis-Smith 1809 & 1810* (AAS, KRAM) and 15 m, 1984, *Lewis-Smith 5139* (AAS, KRAM); Snow Hill, lat. 60°43'S, long. 45°37'W, ca. 215 m, 1966, *Lewis-Smith 602 & 603A* (AAS, KRAM); Elephant Flats, lat. 60°43'S, long. 45°37'W, ca. 15 m, 1966, *Lewis-Smith 609* (AAS, KRAM) and ca. 115 m, 1966, *Lewis-Smith 627* (AAS, KRAM); Factory Cove, lat. 60°43'S, long. 45°37'W, ca. 35 m, 1965, *Longton 1063* (AAS, KRAM); between Observation Bluff and Polynesia Point, lat. 60°43'S, long. 45°36'W, ca. 15 m, 1965, *Longton 1084* (AAS, KRAM); cliffs above Paal Harbour, lat. 60°43'S, long. 45°35'W, 80 m, 1984, *Lewis-Smith 5152* (AAS, KRAM) and ca. 85 m, 1966, *Lewis-Smith 676A* (AAS, KRAM); Rusty Bluff, lat. 60°44'S, long. 45°37'W, 100 m, 1965, *Lewis-Smith 346* (AAS, KRAM); Knob Lake, 15 m, 1984, *Lewis-Smith 5132* (AAS, KRAM). **South Shetland Islands.** *King George Island.* Admiralty Bay: Breccia Crag, lat. 62°10'30''S, long. 58°32'30''W, 140 m, *Ochyra 926/80* (KRAM). *Livingston Island.* Hurd Peninsula, South Bay, NE of the Spanish station "Juan Carlos I", lat. 62°39'50''S, long. 60°22'45''W 20 m, 1992, *Schulz HA-2765* (AAS, KRAM). **West Antarctic Peninsula.** *Danco Coast.* Cape Anna Osterrieth, lat. 64°35'S, long. 62°26'W, 29.I.1898, *Racovitza 205e* (BR, PC); Anvers Island, Arthur Harbour, Hermit Island, lat. 64°48'S, long. 64°02'W, ca. 25 m, 3.III.1967, *Lewis-Smith 878B* (AAS, KRAM); Anvers Island, Norsel Point, lat. 64°46'S, long. 64°07'W, 5–10 m, 6.II.1977, *Lewis-Smith 1951* (AAS, KRAM). *Graham Coast.* Peterman Island, lat. 65°11'S, long. 64°11'W, ca. 13 m, 6.XII.1964, *Corner 721 & 724B* (AAS, KRAM) and ca. 17 m, 10.III.1965, *Longton 1345B, 1346 & 1347B* (AAS, KRAM). Argentine Islands: Irizar Island, lat. 65°13'S, long. 64°13'W, ca. 7 m, 28.X.1964, *Corner 605* (AAS, KRAM); between Irizar and Uruguay Islands, lat. 65°13'S, long. 64°13'W, ca. 16 m, 3.III.1964, *Corner 432* (AAS, KRAM); Galindez Island, overlooking Stella Creek, lat. 65°15'S, long. 64°14'W, ca. 3.5 m, 28.II.1964, *Corner 402A* (AAS, KRAM) and 5.V.1964, *Corner 555* (AAS, KRAM) and 5 m, 15.III.1964, *Corner 469* (AAS, KRAM). Edge Hill, lat. 65°14'S, long. 64°06'W, 10 m, 19.XII.1964, *Lewis-Smith 651* (AAS, KRAM). *Loubet Coast.* Adelaide Island, Mt. Gaundry, lat. 67°32'S, long. 68°37'W, ca. 465 m, *Nixon & Killingbeck 146* (AAS, KRAM). *Fallières Coast.* Lagotellerie Island, lat. 67°53'S, long. 67°24'W, 50–75 m, 1977, *Lewis-Smith 1780* (AAS, KRAM) and 35–80 m, 22.II.1977, *Lewis-Smith 2194A* (AAS, KRAM). *George VI Sound.* Alexander Island, Succession Cliffs, lat. 71°11'S, long. 68°16'W, 20 m, *Taylor 533* (AAS, KRAM). **East Antarctic Peninsula.** *Joinville Island Group.* Joinville Island: Mt. Alexander, 60 m, lat. 63°21'S, long. 55°34'W, 27.III.1981, *Lewis-Smith 3667A* (AAS, KRAM). *Trinity Peninsula.* James Ross Island: E side of Lachman Crags, 20–35 m, lat. 63°53'S, long. 57°50'W, 31.I.1989, *Lewis-Smith 7382A & 7383* (AAS, KRAM). *Oscar II Coast.* South side of Starbuck Glacier, lat. 65°37'S, long. 62°25'W, ca. 400 m, 26.XI.1963, *Kennett 40* (AAS, KRAM).

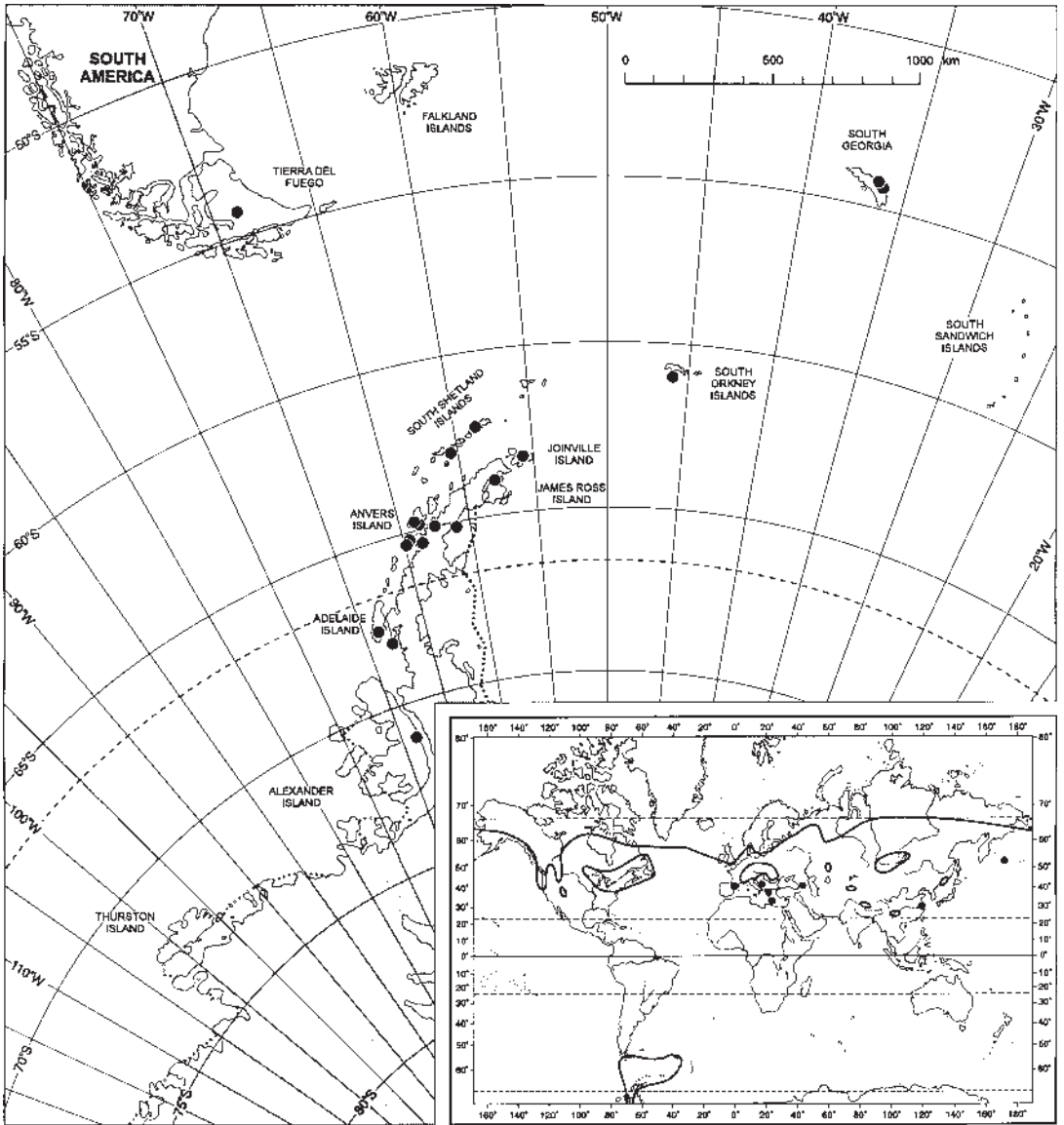


Fig. 2. Distribution map for *Platydictya jungermannioides* (Brid.) Crum in the Antarctic and Fuegian region. Inset: Global range of the species.

*Platydictya jungermannioides* is a species of the Northern Hemisphere which so far has not been reported from outside the Holarctic. It is a relatively frequent arctic-boreal-montane species having a continuous circumpolar geographical range (Fig. 2, inset). It is common throughout the Arctic reaching the highest possible latitudes in Greenland (Mogensen 1986) and on Spitsbergen (Kuc 1973). In the southern part of the Holarctic it decreases in frequency and has a strongly dissected range, be-

ing confined mostly to mountainous regions.

The conspecificity of *Platydictya densissima* and *P. jungermannioides* has phytogeographical implications, since it changes the phytogeographical status of the latter species. At present it should be considered a bipolar species. Ochyra (1992) and Ochyra and Lewis-Smith (1996) critically reviewed the strictly bipolar moss disjuncts (i.e. those which do not occur at intermediate stations in the tropics) in the western hemisphere and

found that this group comprised a mere ten species. Because *P. jungermannioides* has not so far been recorded in the tropics, it can be added to this list, thus increasing it to eleven species.

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