

## New records for the Falkland Islands moss flora

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**Abstract** – We present 25 new moss records for the Falkland Islands, together with vouchers for three names previously reported for the archipelago without specimen citation, based on recent collections made by the authors in several localities throughout the Falkland Archipelago. Voucher information together with habitat details are given for each of the taxa mentioned. With these new additions, the moss flora of the Falkland Islands rises to 185 taxa.

**Bryophyta / herbarium collections / floristics / southern South America**

### INTRODUCTION

The Falkland Islands are a relatively large group of islands located in the South Atlantic Ocean approximately 500 km east from the Argentinian coast. Its capital, Port Stanley is on the eastern edge of the group at 51°41'40"S and 57°51'27"W. The archipelago comprises two main islands: West Falkland and East Falkland, and over 700 smaller islands, islets and rocks, which cover about 12,000 km<sup>2</sup>. The islands are predominantly hilly with the highest elevations at 705 m a.s.l. on the summit of Mount Osborne on East Falkland and at 700 m a.s.l. at Mount Adam on West Falkland. The islands are situated in the cool-temperate zone, characterized by a cold and windy oceanic climate with relatively low annual rainfall, which is lower in the west and south of the archipelago.

The bryophyte flora of the Falklands is fairly well known although unevenly studied (Ochyra & Broughton, 2004). At present, much more is known about the hepatic flora, which consists of 131 species of liverworts and hornworts (Engel, 1990). The moss flora of the archipelago was summarized for the first time by Matteri (1986), who recorded 141 species and 20 varieties. More recently, Matteri (2003) provided a new list of the moss taxa of the Falklands within a checklist of the mosses of Argentina. It comprised 146 species, two subspecies and eight varieties,

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but a great deal of taxa have never been taxonomically revised and many of them may not merit taxonomic recognition. That same year, three additional species were reported for the islands: *Weymouthia mollis* (Hedw.) Broth. (Allen & Magill, 2003), *Racomitrium patagonicum* Bedn.-Ochyra & Ochyra (Bednarek-Ochyra & Ochyra, 2003), and *Campylopus pyriformis* (Schultz) Brid. (Blockeel *et al.*, 2003).

Ochyra & Broughton (2004) reported four new moss records for the archipelago [*Polytrichastrum alpinum* (Hedw.) G.L.Sm., *Hymenoloma antarcticum* (Hook.f. & Wilson) Ochyra, *Bucklandiella orthotrichacea* (Müll.Hal.) Bedn.-Ochyra & Ochyra, and *Bryoerythrophyllum recurvirostrum* (Hedw.) P.C.Chen], and also excluded five names listed in Matteri (2003) considered synonyms of names also listed for the islands (Ochyra & Matteri, 2001; Zanten 1971). Another three taxa have been reported in the literature but are not listed in Matteri (1986, 2003), i.e. *Racomitrium heterostichum* (Hedw.) Brid. (Wilson & Hooker, 1847), *Acrocladium auriculatum* (Mont.) Mitt., and *Dicranoloma imponens* (Mont.) Renauld (Engel, 1990). More recently, two additional taxa were reported for the islands: *Bucklandiella membranacea* (Mitt.) Bedn.-Ochyra & Ochyra (Ellis *et al.*, 2011), and *Andreaea flexuosa* R.Br.bis (Ellis *et al.*, 2016). Finally, Ochyra *et al.* (2015) added *Bucklandiella didyma* (Mont.) Bedn.-Ochyra & Ochyra and *Codriophorus laevigatus* (Mitt.) Bedn.-Ochyra & Ochyra but excluded five taxa of the Racomitrioideae previously reported for the archipelago. In summary, the moss diversity for the islands is currently estimated at 160 taxa, comprising 152 species, two subspecies and six varieties.

In 2013, the UK government funded a Darwin Initiative entitled “Bryophyte and Lichens Project for the Falkland Islands” for the years 2014-2016. The project aimed at addressing the critical gap in the knowledge of bryophyte and lichen diversity in the Falkland Islands and to provide conservation tools to improve local policy and decision-making. Lower plant geospatial data have been added to local Information Systems, a reference collection and laboratory have been set up in Port Stanley, and training in bryophyte and lichen identification was delivered to the local community. The project was a collaboration between Falklands Conservation and Amgueddfa Cymru – National Museum Wales.

## MATERIALS AND METHODS

Three visits to the Falkland Islands were made in relation to this project: a pre-project reconnaissance expedition in 2011 and two collecting trips in 2015. The 2011 trip report (Duckett *et al.*, 2012) referred to a number of taxa for the islands, but without specimen data. The present paper provides that supporting information and presents new records based on the 2015 expeditions.

New records are given indicating the author’s collecting numbers after their initials (JL = Juan Larrain, DEC = Dafydd Crabtree, RT = Ray Tangney). All identifications were made by the authors unless otherwise indicated. Vouchers are deposited in NMW and CONC with duplicates at FINH.

## RESULTS

### New records for the Falkland Islands

***Acroschisma wilsonii*** (Hook.f.) A.Jaeger

WEST FALKLAND, foothills of Mount Adam, between Mount Adam and Mount Donald, 330 m, 22 November 2015, JL 38910.

Found on a rock along a mountain stream with rock outcrops and tundra vegetation. Apparently, it is very rare on the islands and the specimen found was very depauperate.

***Bartramia ithyphylloides*** Schimp. ex Müll.Hal.

WEST FALKLAND, Chartres, Nature Reserve Patricia Luxton, 5 m, 24 November 2015, JL 39045, JL 39052.

Found growing on soil filling crevices of rock wall outcrops next to a river.

***Breutelia angustiretis*** E.B.Bartram

WEST FALKLAND, foothills of Mount Adam, between Mount Adam and Mount Donald, 330 m, 22 November 2015, JL 38922.

Found on soil on the banks of a mountain stream surrounded by tundra vegetation and rock outcrops. Although it could possibly be an extreme phenotype of *B. integrifolia*, the laminal cells are very narrow, with walls thicker than the lumina, the leaves are long and narrowly acuminate, and the excurrent costa ends in a hyaline arista.

***Breutelia aureola*** (Müll.Hal.) Besch.

WEST FALKLAND, Mount Adam, summit of Mount Donald, 600 m, 22 November 2015, JL 38895. East Falkland, Port San Carlos, Race Point Farm, 182 m, ridge above farm, on a hummock at the edge of a seep, 18 November 2015, RT 15/457.

Found on soil on slope among *Juncus* species in very humid tundra with scattered rocks at the summit of Mount Donald. Laminal cells are clearly porose at the base of the leaves, but less so in the distal part.

***Bryum orbiculatifolium*** Cardot & Broth.

WEST FALKLAND, Dunbar, Byron Heights, past Dunbar settlement, in protected area with military facilities on top of mountain, 350 m, 23 November 2015, JL 38975.

Found partially submerged on a flat rock in a mountain stream surrounded by quartzite outcrops, where it was rare.

***Catagonium nitens*** (Brid.) Cardot

WEST FALKLAND, Dunbar, Byron Heights, past Dunbar settlement, in protected area with military facilities on top of mountain, 350 m, 23 November 2015, JL 38990.

Found on protected rock ledges at the base of quartzite outcrops by mountain stream, seemingly very rare.

***Conostomum magellanicum*** Sull.

WEST FALKLAND, foothills of Mount Adam, between Mount Adam and Mount Donald, 540 m, 22 November 2015, JL 38942; Mount Maria, Snow Hole, forming mats over rocks in upper corrie heathland, 420 m, J.D. Duckett coll., 18 January 2011 (RT 11-372); Mount Maria, below Freezer Rocks, in wet seep on the ground, 200 m, 19 January 2011, RT 11-428 (Duckett *et al.*, 2012). EAST FALKLAND, Mount Kent, 1km east of MOD radar site on quartzite rock outcrop, 424 m, 20 January 2015, DEC 416.

Found on soil in river banks next to a small waterfall in alpine zone, and on soil on a rock ledge near the summit of Mount Kent, rare.

***Distichophyllum krausei*** (Lorentz) Mitt.

WEST FALKLAND, Dunbar, Byron Heights, past Dunbar settlement, in protected area with military facilities on top of mountain, 350 m, 23 November 2015, JL 38978.

Found partially submerged in lower river bank, at edge of water, among thick mats of liverworts.

***Ditrichum ditrichoideum*** (Cardot) Ochyra

EAST FALKLAND, Lafonia, Goose Green, some km S of Goose Green settlement, in wide river tributary of Bodie Creek, 5 m, 1 December 2015, JL 39260.

Found on river banks along rock outcrops by a river close to vehicular road.

***Grimmia anodon*** Bruch & Schimp.

WEST FALKLAND, Rincon Ridge, Fox Bay West settlement, behind Black Shanty house, 30 m, 25 November 2015, JL 39073B.

Growing on cement in disturbed back yard and abandoned dog cages.

***Henediella antarctica*** (Ångstr.) Ochyra & Matteri

WEST FALKLAND, Chartres, Nature Reserve Patricia Luxton, 5 m, 24 November 2015, JL 39041.

Found growing in crevices of rock outcrops next to a river.

***Hymenodontopsis mnioides*** (Hook.) N.E.Bell, A.E.Newton & D.Quandt

EAST FALKLAND, Race Point, a few kilometers before entrance of Port San Carlos settlement, 150 m, 16 November 2015, JL 38724, 17 November 2015, JL 38764. WEST FALKLAND, Rincon Ridge, Fox Bay West, trail to coastline south of Fox Bay West, 10 m, 24 November 2015, JL 39071.

Found on soil in sheep grazed prairies with *Cortaderia* heath, *Empetrum* patches and *Juncus*, with scattered rock outcrops; relatively common.

***Hypnum cupressiforme*** Hedw.

GRAND JASON ISLAND, coastal turf 2 km south of shearing shed, 17 m, 12 December 2014, DEC 328 (det. R. Ochyra). WEST FALKLAND, Rincon Ridge, Fox Bay West settlement, behind Black Shanty house, 30 m, 24 November 2015, JL 39067.

Growing profusely on grass lawn behind house (JL 39067), and in a small area on the east coast of Grand Jason Island (DEC 328).

***Leptodictyum humile*** (P.Beauv.) Ochyra

WEST FALKLAND, Mount Alice, inside perimeter of MOD radar site, 345 m, 7 January 2015, DEC 362 (det. R. Ochyra).

This single specimen was found in a humid, sheltered location on soil, under large quartzite boulders. Apparently rare in the Archipelago.

***Lepyrodon lagurus*** (Hook.) Mitt.

WEST FALKLAND, Mount Maria, on face of rock outcrop in *Cortaderia* heath, 315 m, 19 January 2011, RT 11-415.

Found only once, in a dry silty crevice on an exposed rock outcrop. Apparently rare on the Falkland Islands.

***Philonotis polymorpha*** (Müll.Hal.) Kindb.

EAST FALKLAND, Lafonia, Goose Green, some km S of Goose Green settlement, in wide river tributary of Bodie Creek, 5 m, 1 December 2015, JL 39263, JL 39266.

Growing on irrigated soil among grasses or on seepage face of rock outcrops by the river close to vehicular road.

***Ptychomnion densifolium*** (Brid.) A.Jaeger

EAST FALKLAND, Port Stanley, peat deposits just above the town, 55 m, 15 November 2015, JL 38706.

Abundant on wet soil among *Juncus* sp. in *Empetrum rubrum* heath with several species of Poaceae and Juncaceae. The morphology of this specimen does not perfectly match the description given in Hattaway (1984). The leaves are not plicate at base, the costa is double and well marked, cells are almost non-porose, and leaf apices are channeled.

***Racomitrium pachydictyon*** Cardot

WEST FALKLAND, SW slopes of Mount Donald, 530 m, 21 November 2015, JL 38882, JL 38886, JL 38887.

Forming dense cushions on quartzite rock outcrops among feldmark vegetation. This taxon was previously collected on the Islands by J. D. Hooker, but without precise location (Larraín, 2012).

***Schistidium andinum*** (Mitt.) Herzog

EAST FALKLAND, Lafonia, North Arm, just in front of North Arm settlement, 5 m, 1 December 2015, JL 39291.

Growing on rock in outcrops on eastern shore of sea inlet.

***Schistidium cupulare*** (Müll.Hal.) Ochyra

EAST FALKLAND, Lafonia, Goose Green, some km S of Goose Green settlement, in wide river tributary of Bodie Creek, 5 m, 1 December 2015, JL 39231B, JL 39243; North Arm, sea inlet just east of Fanny Cove house, 2 m, 2 December 2015, JL 39333.

On vertical rock outcrops and on shale outcrops, by the sea.

***Sciuro-hypnum glaciale*** (Bruch *et al.*) Ignatov & Huttunen

WEST FALKLAND, Mount Alice, within the perimeter of the MOD radar site, 370 m, 7 January 2015, DEC 364A (det. R. Ochyra).

Found in grassy area at the rear of large building. Due to its usual global distribution and its present location in the Falkland Islands, this species could possibly be introduced and non-native.

***Sphagnum palustre*** var. ***cymbifolium*** Ehrh.

WEST FALKLAND, Mount Maria, 8 km west of Port Howard Settlement, 431 m, 25 January 2015, DEC 445 (det. R. Ochyra).

Growing profusely in large waterlogged area on saddle between Mount Maria and Black Mountain in the Hornby Mountain range.

***Tetraplodon fuegianus*** Besch.

East Falkland, Mount Osborne, stone run, on the bones of a dead sheep, 300 m, 11 January 2011, RT 11-156. [Duckett *et al.* (2012), as *Tetraplodon mnioides*].

Found only once. Despite searches of potential habitat, which is relatively frequent and widespread on the Falklands, no further populations were found. The material has immature capsules, which precludes certain identity of this specimen. The gametophytes of the southern South American endemic taxon *Tayloria stenophysata* (Herzog) A.K.Kop. are very similar to *Tetraplodon fuegianus* (Herzog 1939) with differences mainly observed on mature capsules, as summarized by Koponen (1977). We determine this taxon provisionally as *T. fuegianus* until new specimens with mature capsules are found, because of the general appearance of the plants and the ubiquity of this taxon in adjacent southern South America.

***Warnstorfia exannulata* var. *nigricans* (Brid.) Ochyra**

SAUNDERS ISLAND, southern flank of Rookery Mountain, 9 m, 1 March 2015, DEC 446 (det. R. Ochyra).

Found partially submerged in a large waterlogged area on the southern edge of Rookery Mountain. From this location, water drains into the two lakes east of Sealers Cove. Other species found at the site, mainly *Drepanocladus longifolius* and *Warnstorfia fluitans*, are typical of this habitat.

***Zygodon intermedius* Bruch. & Schimp.**

EAST FALKLAND, Lafonia, Goose Green, some km S of Goose Green settlement, in wide river tributary of Bodie Creek, 5 m, 1 December 2015, JL 39235.

On rock ledges on outcrops by the sea. Although the specimen is sterile, the presence of very few propagules point to this taxon.

### **Specimen information for taxa previously reported for the Falkland Islands without voucher details**

***Acrocladium auriculatum* (Mont.) Mitt.**

WEST FALKLAND, Mount Adam, summit of Mount Donald, 600 m, JL 38900; Chartres, Nature Reserve Patricia Luxton, 5 m, 24 November 2015, JL 39042. EAST FALKLAND, Stanley Harbour, track towards Engineers Point, north of wreck of the Elizabeth, amongst grasses, heathland behind coastal sward, 9 January 2011, RT 11-14.

Found on soil in very humid tundra with scattered rocks at the summit of Mount Adam, and also in dry slopes with *Empetrum rubrum* along a river flanked by rock outcrops almost at sea level. It was also collected in a number of other localities on both West and East Falkland islands, at sea level on East Falkland, North Arm and Stanley Harbour, and at higher altitudes on Mount Maria and Mount Weddell. Reported by Engel (1990), without specimen data.

***Dicranoloma imponens* (Mont.) Renaud**

WEST FALKLAND, Mount Maria, above Freezer Rocks, 18 January 2011, RT 11-360, 370 m, on ground in *Cortaderia* heath. EAST FALKLAND, Stanley area, Wireless Ridge, 9 January 2011, RT 11-25, 32 m, on ground in *Cortaderia* heath.

Previously reported by Engel (1990), without specimen data. *Dicranoloma imponens* is frequent in damp areas of heathland on both West and East Falkland.

***Rhacocarpus purpurascens* (Brid.) Paris**

WEST FALKLAND, Mount Maria, Snow Hole, forming mats over rocks in upper corrie heathland, 420 m, JD Duckett coll., 18 January 2011 (RT 11-373) (Duckett *et al.*, 2012), 26 January 2015, RT 15-248.

Matteri (1986) excluded this species from the Falkland Islands. She noted that the early record by Paris (1894-1898, as “Maclov.”), subsequently followed by Brotherus (1909) and Cardot (1908), lacked supporting specimens, concluding that its existence in the islands was dubious, although possible. However, Matteri included the species for the Falklands in her checklist of Argentinian mosses (Matteri, 2003), without any discussion. *Rhacocarpus purpurascens* was found at only one site, where it is restricted to a group of rock outcrops.

## DISCUSSION

We report 25 new moss records for the Falkland Islands, and voucher information for three other taxa previously included without voucher specimen details. These new records mostly do not include the families Andreaeaceae, Bryaceae and Pottiaceae, because their study is still in progress and will be published later in separate accounts. These records increase the known moss diversity of the archipelago from 160 to 185 taxa, representing a 13.5% increase.

As stated by Ochyra & Broughton (2004), many groups are in need of taxonomic revision, and hence these numbers are still provisional. We are currently working on an updated checklist of the mosses of the archipelago that hopefully will address some of these problems and lead to a better understanding of the moss diversity of the Falkland Islands.

With these additions, the bryophyte diversity of the Falklands reaches 316 taxa, comprising 185 mosses and 131 liverworts and hornworts (Engel, 1990). This total is comparable to 48% of the indigenous plant diversity of the archipelago (663 taxa), which includes 171 native vascular plants (Broughton & McAdam, 2005) and 175 alien vascular plant taxa (Broughton & McAdam, 2002). If we exclude the alien vascular plant species, the bryophyte diversity of the archipelago constitutes 65% of the native land plant flora.

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