

## Studies on mosses in the Falkland Islands: I. *Bucklandiella* and *Codriophorus* (Grimmiaceae)

Ryszard OCHYRA<sup>a\*</sup>, Dafydd CRABTREE<sup>b</sup> & Ray TANGNEY<sup>c</sup>

<sup>a</sup>Laboratory of Bryology, Institute of Botany,  
Polish Academy of Sciences, ul. Lubicz 46, 31-512 Kraków, Poland

<sup>b</sup>Falklands Conservation, 41 Jubilee Villas, Port Stanley,  
FIQQ 1ZZ, Falkland Islands

<sup>c</sup>National Museum of Wales, Cathays Park, Cardiff,  
CF10 3NP, United Kingdom

**Abstract** – *Bucklandiella didyma* (Mont.) Bednarek-Ochyra *et* Ochyra and *Codriophorus laevigatus* (Mitt.) Bednarek-Ochyra *et* Ochyra are recorded for the first time from the Falkland Islands. *Bucklandiella heterostichoides* (Cardot) Bednarek-Ochyra *et* Ochyra, *B. membranacea* (Mitt.) Bednarek-Ochyra *et* Ochyra and *B. ptychophylla* (Mitt.) Bednarek-Ochyra *et* Ochyra are newly reported from East Falkland and *B. sudetica* (Funck) Bednarek-Ochyra *et* Ochyra is a new addition to the bryoflora of West Falkland. In total, seven species of *Bucklandiella* Roiv. are currently known from the Falkland Islands and they are briefly characterised, their geographical range is surveyed and global distribution of selected species is mapped. The status of five species of *Bucklandiella* which are excluded from the bryoflora of the archipelago is briefly considered. A key to determination of species of taxa of the Racomitrioideae in the Falkland Islands is presented.

**Bryophyta / *Bucklandiella* / *Codriophorus* / geographical distribution / Racomitrioideae / *Racomitrium* / South America / taxonomy**

### INTRODUCTION

The Falkland Islands are a relatively large archipelago located in the South Atlantic Ocean on the Patagonian Shelf, 500 km east off the coast of Santa Cruz Province, Argentina, at latitude 51°40'-53°00'S and longitude 57°40'-62°00'W. The archipelago comprises of two main islands: West and East Falkland, and about 780 smaller islands, islets and rocks, which total about 12,000 sq. km. The islands are predominantly mountainous and hilly; the highest elevations are 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 cool-temperate zone, and have a cold, windy, and humid oceanic climate with relatively low rainfall figure which is lower in the west and south of the archipelago.

The bryophyte flora of the Falkland Islands is fairly well, though, unevenly studied. At present much more is known on the hepatic flora, which consists of

\* Corresponding author: r.ochyra@botany.pl

131 species of liverworts and hornworts (Engel, 1990). The moss flora of the Falkland Islands was summarised for the first time by Matteri (1986) who recorded 141 species and 20 varieties. Later, Matteri (2003) provided a new list of the moss taxa of the Falkland Islands within a checklist of the mosses of Argentina. It comprised 146 species, two subspecies and eight varieties but a great deal of taxa have never been taxonomically revised and many of them do not merit a taxonomic recognition, for instance *Hygroamblystegium fuegianum* (Besch.) Reimers, *H. fuegianum* var. *skottsbergii* (Cardot) E.B.Bartram and *H. sordidoviride* (Cardot & Broth.) Reimers are identical to the polymorphous *Cratoneuropsis relaxa* (Hook.f. *et* Wilson) Broth. subsp. *minor* (Wilson *et* Hook.f.) Ochyra (Ochyra *et al.*, 2008a).

The inevitable loss of a number of species as a result of taxonomic revisions and critical evaluation of the historical voucher collections are compensated by new additions to the moss flora of the Falkland Islands (Allen & Magill, 2003; Bednarek-Ochyra & Ochyra, 2003; Blockeel *et al.*, 2003; Ochyra & Broughton, 2004; Ellis *et al.*, 2011b). In addition, the number of new bryophyte species is expected to increase with the exploration of the archipelago and the discoveries of *Bucklandiella didyma* (Müll.Hal.) Bednarek-Ochyra *et* Ochyra and *Codriophorus laevigatus* (A.Jaeger) Bednarek-Ochyra *et* Ochyra, which are presented in this paper, support this assumption.

We present a series of publications of the taxonomic and phytogeographical assessment of the various, but mostly poorly known and critical taxa of mosses in the Falkland Islands on the basis of modern and historical collections. It deals with the genera *Bucklandiella* Roiv. and *Codriophorus* P.Beauv. which belong within the subfamily Racomitrioidae of Grimmiaceae. These are prominent constituents of the moss flora, in terms of frequency, cover and the number of species, in the coterminous regions of Patagonia, Tierra del Fuego and sub-Antarctic South Georgia. Besides *Bryum* Hedw., *Campylopus* Brid. and *Syntrichia* Brid., *Bucklandiella* Roiv. is the largest genus in the moss flora of the Falkland Islands. However, some species which are widely distributed in these areas, including *B. rupestris* (Hook.f. *et* Wilson) Bednarek-Ochyra *et* Ochyra, *B. orthotrichacea* (Müll.Hal.) Bednarek-Ochyra *et* Ochyra, *B. pachydictyon* (Cardot) Bednarek-Ochyra *et* Ochyra and *B. longtonii* Bednarek-Ochyra *et* Ochyra (Bednarek-Ochyra & Ochyra, 2012a,b) are also likely to be found in the Falkland Islands.

## A BRIEF HISTORY OF RECORDS OF RACOMITRIUM-LIKE MOSSES IN THE FALKLAND ISLANDS

The bryological exploration of the Falkland Islands began in the early 1820s by Charles Gaudichaud-Dupré, a botanist aboard French naval ships the *Uranie* and *Physicienne*, under the command of Louis C.D. de Freycinet. Collections of bryophytes on this expedition were made between 14 February and 28 April 1820 in Port Louis on East Falkland, and consisted of six species of moss which were determined by Ch. Schwägrichen, one being *Trichostomum lanuginosum* Hedw. (Gaudichaud, 1825; Gaudichaud-Beaupré, 1828). This latter species currently known as *Racomitrium lanuginosum* (Hedw.) Brid. was the first record of a species of this genus in the Falkland Islands (Bednarek-Ochyra, 2015a).

Two years later the Falkland Islands were visited by a French naval expedition of 1822-1825 on the ship *Coquille* under the command of Admiral Louis-Isidor Duperrey. Between 20 November and 18 December 1822 whilst operating in

the areas of Port Louis and Mount Simon, Jules-Sébastien-César Dumont d'Urville, second-in-command of the expedition, made extensive botanical collections which were the basis of his Flora of the Falkland Islands (d'Urville, 1825; Dumont d'Urville, 1826). Some twelve taxa of mosses were reported with seven named to species level, including *Trichostomum lanuginosum*.

The third bryophyte collection on the Falkland Islands was made by J.D. Hooker, a botanist aboard H.M.S. *Erebus* during the British Antarctic Expedition of 1839-1843. The expedition visited East Falkland between 6 April and 8 September 1842 and between 12 November and 17 December 1842 and operated in Port William, Salvador Bay and Mount Vernet. Amongst the 50 taxa of mosses described and/or reported from the archipelago (Hooker & Wilson, 1844; Wilson & Hooker, 1847), a number of species of *Racomitrium s. lat.*, namely *R. lanuginosum*, *R. heterostichum* (Hedw.) Brid. and *R. protensum* (Duby) Bruch & Schimp., were collected. The material of the latter species was reported as an unnamed variety which was subsequently described by Müller (1849) as *Grimmia lamprocarpa* Müll. Hal. [= *Racomitrium lamprocarpum* (Müll.Hal.) A.Jaeger ≡ *Bucklandiella lamprocarpa* (Müll.Hal.) Bednarek-Ochyra et Ochyra].

From 1842 to 1901, no bryophytes were recorded and published from the Falkland Islands, the only exception were mosses collected by the German explorer, Willibald Lechler, in the Port Stanley area from 2 to 18 September 1850. The collection was distributed to various herbaria (Sayre, 1975) but have only occasionally been published in taxonomic papers, for instance *Racomitrium lanuginosum* subsp. *geronticum* (Müll.Hal.) Vitt et C.Marsh (Vitt & Marsh, 1988) and *R. patagonicum* Bednarek-Ochyra et Ochyra (Bednarek-Ochyra & Ochyra, 2003).

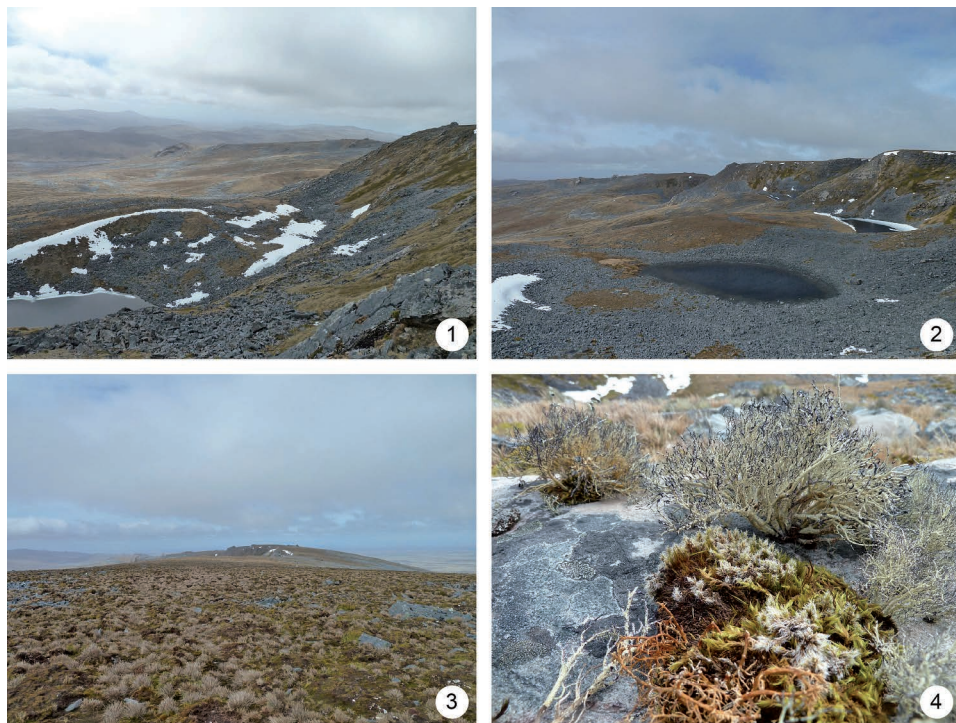
Breaking this long interval, Carl Skottsberg, a member of the Swedish South Polar Expedition of 1901-1903, collected *R. symphyodontum* in Port Louis (Cardot, 1905, 1908). Five years later, he made the rich collection of *Racomitrium* species in the Falkland Islands during the Swedish Expedition to Patagonia and Tierra del Fuego of 1907-1909. This collection was studied by Cardot and Brotherus (1923) who reported six taxa, including *R. lamprocarpum*, *R. subnigratum* (Müll. Hal.) Paris, *R. ptychophyllum* Mitt., *R. heterostichoides* Cardot, *R. striatipilum* Cardot and *R. lanuginosum* fo. *chrysoblata* (Müll.Hal.) Cardot.

Six decades have elapsed since the collecting activity of C. Skottsberg in the Falkland Islands until additional taxa of *Racomitrium* were recorded from this area in 1968 by John J. Engel. His specimens were mostly determined by the Finnish bryologist and expert in southern South American mosses, H. Roivainen, and published by Matteri (1986). Two additional taxa of the genus were added, including *R. austrogeorgicum* Paris and *R. crispulum* (Hook.f. et Wilson) Wilson var. *rupestre* (Hook.f. et Wilson) Dixon. In addition, following the broad taxonomic concept of austral species of *Racomitrium* (Clifford, 1955), Matteri (1986) merged some species with *R. crispulum* which to date are not recorded from the Falkland Islands. Finally, Ochyra and Broughton (2004) reported *Bucklandiella orthotrichacea* [= *Racomitrium orthotrichaceum* (Müll.Hal.) Paris] from West Falkland.

In 2013, the UK government funded a Darwin Initiative for a two year Lower Plants and Lichens Project for the Falkland Islands for the years 2014-2016. The project aims to address the critical gap in knowledge of lower plants and lichens diversity in the Falkland Islands, and provide conservation tools to improve local policy and decision making. Lower plants geospatial data will be added to local Information Systems, a reference collection and laboratory created, and training in lower plant and lichen identification. The project is a collaboration between Falklands Conservation and the National Museum Wales.

A bryological survey of the Falkland Islands during 2014-2015 resulted in the discoveries of racomitrialean mosses on the archipelago. Two species, *Bucklandiella didyma* (Mont.) Bednarek-Ochyra *et* Ochyra and *Codriophorus laevigatus* (A.Jaeger) Bednarek-Ochyra *et* Ochyra are new discoveries for the area, whilst *B. heterostichoides* (Cardot) Bednarek-Ochyra *et* Ochyra, *B. membranacea* (Mitt.) Bednarek-Ochyra *et* Ochyra and *B. ptychophylla* (Mitt.) Bednarek-Ochyra *et* Ochyra are newly recorded for East Falkland. In addition, a re-examination of the voucher material of *B. orthotrichacea* showed that it correctly represents *B. sudetica* (Funck) Bednarek-Ochyra *et* Ochyra and this is a new addition to the moss flora of West Falkland.

The vast majority of new species of racomitrialean mosses reported in this account were collected on Mount Osborne on East Falkland (Figs 1-4), part of the Wickham Heights, a rugged chain of mountains and hills stretching in a west-east direction across the northern part of East Falkland. The habitat of Mount Osborne comprises of dwarf shrub heath from *ca* 200 m a.s.l. to around 650 m a.s.l. with higher elevations predominated with feldmark habitat. Dwarf shrub heath is characterised by vascular species such as *Empetrum rubrum* Willd., *Lycopodium magellanicum* (P.Beauv.) Sw., *Blechnum magellanicum* (Desv.) Mett., *Oxalis enneaphylla* Cav. and *Bolax gummifera* (Lam.) Spreng., a good representation of the bryoflora from the genus *Dicranoloma* (Renauld) Renauld, consisting of species such as *D. billardierei* (Brid.) Paris var. *compactum* (Cardot) Cardot & Broth., *D. robustum* (Hook.f. *et* Wilson) Paris and *D. falklandicum* (Cardot) Broth. Other



Figs 1-4. 1. North-eastern slope of Mount Osborne, the highest point in the Falkland Islands, looking over to Mount Simon and the Onion Range. 2. Corries and tarns on Mount Osborne. 3. Feldmark habitat on summit Mount Osborne. 4. *Codriophorus laevigatus* (A.Jaeger) Bednarek-Ochyra *et* Ochyra with *Racomitrium lanuginosum* (Hedw.) Brid. on Mount Osborne.



moss genera well represented in dwarf shrub heathland include species of *Campylopus* and *Bryum* and members of the family Polytrichiaceae.

Above ca 650 m on Mount Osborne, feldmark habitat is dominant in the more exposed areas with ground cover typically quartzite gravel and exposed rock. There, vascular plants are diminished and usually consist of cushion plants such as *Bolax gummifera* and *Azorella selago* Hook.f. as well as non-cushion forming plants, namely the shrub *Pernettya pumila* (L.f.) Hook. and grass *Festuca contracta* Kirk. Bryophytes and lichens are generally more conspicuous in feldmark habitat. Lichens such as *Usnea aurantiacoatra* (Jacq.) Bory, *U. subantarctica* F.J.Walker, *Thamnolia vermicularis* (Sw.) Schaer. and *Sphaerophorus globosus* (Huds.) Vain. are dominant in areas, combined with a high representation from the bryophytes, especially from the families Andreaeaceae and Grimmiaceae.

At its highest elevations the remains of glacial cirques are visible which are evidence of glaciation and formation of ice domes. This may suggest that racomitrialean species occurring exclusively in this mountain are postglacial colonisers of this as is the case with many species of moss and liverwort on subantarctic islands (Van der Putten *et al.*, 2004, 2010).

Mount Osborne was botanically explored for the first time by a Swedish Expedition on the turn of 1907 and 1908 (Skottsberg, 1913) and this resulted in a very few moss specimens collected, with none belonging to *Racomitrium* s. lat. In contrast, at the geologically similar Mount Adam on West Falkland, a greater number of mosses were collected including four species of *Racomitrium* (Cardot & Brotherus, 1923). The recent discoveries of racomitrialean moss species on Mount Osborne would have been expected considering the optimal habitats presented under these geological conditions.

## A SURVEY OF *BUCKLANDIELLA* AND *CODRIOPHORUS* SPECIES IN THE FALKLAND ISLANDS

The traditionally interpreted *Racomitrium* exhibits the considerable heterogeneous morphology of both gametophytes and sporophytes which warranted its division into four distinct subgenera, namely subg. *Racomitrium*, subg. *Cataractarum* Vilh., subg. *Niphotrichum* Bednarek-Ochyra and subg. *Ellipticodryptodon* (Vilh.) Bednarek-Ochyra *et* Ochyra (Bednarek-Ochyra, 1995a). These subgenera were subsequently elevated to generic ranks which appeared to be natural, homogeneous and well defined taxa sharply differing from each other in a set of gametophyte and sporophyte characters. They represent the separate subfamily Racomitrioideae within the large family Grimmiaceae (Ochyra *et al.*, 2003).

The polyphyletic nature of the traditionally interpreted genus *Racomitrium* and the necessity of its division into some segregates is confirmed by the mitochondrial phylogenomics (Sawicki *et al.*, 2015). Phylogenetic analysis based on the complete mitochondrial genomes revealed some incongruence with plastid/nuclear data in the topology of main clades and provided a strong support for recognition of *Niphotrichum* Bednarek-Ochyra *et* Ochyra, *Codriophorus* P.Beauv., *Frisvolla* Sawicki, Szczecińska, Bednarek-Ochyra *et* Ochyra and *Bucklandiella* Roiv. as separate monophyletic genera. In the phylogenetic analysis, *Bucklandiella* is revealed to be the ancestral genus characterised by some primitive characters including smooth laminal cells and short peristome teeth which are variously divided into two broad segments or sometimes they are undivided or merely perforated.

In the Falkland Islands the Racomitrioideae are represented by three genera, namely *Bucklandiella*, *Codriophorus* and *Racomitrium*. The first of these is the largest and taxonomically most diverse segregate of the broadly conceived genus *Racomitrium*. It consists of about 60 species with a worldwide distribution, with particular concentration of species in temperate and cool regions of both hemispheres, whereas in the tropical regions they occur at high elevations in the mountains. Of these, no fewer than 18 species occur in South America (Bednarek-Ochyra & Ochyra, 2012a) and seven has been hitherto recorded in the Falkland Islands.

*Codriophorus* is primarily a Northern Hemisphere genus consisting of 15 species (Bednarek-Ochyra, 2006), although *C. varius* (Mitt.) Bednarek-Ochyra *et* Ochyra, a western North American species, is now positioned in a monotypic genus *Frisvollia* (Sawicki *et al.*, 2015). Of these, *C. laevigatus* is the only species of this genus occurring exclusively in the Southern Hemisphere, i.e. southern South America and on some islands in the South Atlantic Ocean. Herein, its geographical range is extended to the Falkland Islands.

As a result of splitting the broadly understood *Racomitrium*, this genus in the strict sense consists of only three species, *R. lanuginosum* (with two subspecies, subsp. *lanuginosum* and subsp. *geronticum*), *R. patagonicum* and *R. pruinosum* (Wilson) Müll.Hal. Except for the bipolar type subspecies of *R. lanuginosum*, the remaining taxa occur exclusively in the Southern Hemisphere and they occur in the Falkland Islands (except for *R. pruinosum*) (Vitt & Marsh, 1988).

### ***Bucklandiella didyma* (Mont.) Bednarek-Ochyra *et* Ochyra**

*Bucklandiella didyma* is apparently the most common species of the genus in southern South America. It has a continuous range from the VII Región del Maule in central Chile at lat. *ca* 35°S to Tierra del Fuego (Deguchi, 1984), extending to the Archipelago Juan Fernández in the Pacific Ocean and Santa Catarina Province in SE Brazil (Bednarek-Ochyra *et al.*, 1999) in the north and to Tierra del Fuego, sub-Antarctic South Georgia and the northern maritime Antarctic (Ochyra *et al.*, 2008b) in the south. *Bucklandiella didyma* is a southern pantemperate species occurring in southern Africa (Ochyra *et al.*, 2008a) and Australasia (Blockeel *et al.*, 2008, 2010). The occurrence of this species in the Falkland Islands is indicated on the map of its global distribution but without identifying the source of information (Ochyra *et al.*, 2008a). Herein, this record is substantiated by the citation of many collections from East and West Falkland.

*Bucklandiella didyma* was collected for the first time in the Falkland Islands by J.D. Hooker in 1842, apparently in the Port William area. The voucher specimens were designated as an unnamed variety No. 2 of *Racomitrium protensum*. There are several specimens so named in BM but only those bearing No. 205 and 208 clearly belong within this species. The species is easily known by having a very short, brown leaf hair-point; an uniseriate basal marginal border of pellucid straight-walled cells, mostly bistratose leaf lamina forming multiseriate border in the distal part, although in many populations the leaf lamina is entirely unistratose; flattened to reniform or rectangular costa that is moderately convex on the abaxial side and consists of 3-4 enlarged adaxial guide cells in the proximal part; and fairly large spores, 17-23 µm in diameter. *Bucklandiella didyma* usually produces sporophytes in abundance in mainland South America but most plants from the Falkland Islands are sterile.

**Specimen examined:** FALKLAND ISLANDS. **Saunders Island:** sheltered, humid gorge, 184 m a.s.l., prostrate on quartzite rock, *Crabtree* 484 (KRAM, NMW). **Jason Islands:**

Grand Jason, 224 m a.s.l., NE aspect, on rock just below ridgeline, *Crabtree* 346 (KRAM, NMW); same locality, 110 m a.s.l., on rock just below ridgeline, *Crabtree* 326 (KRAM, NMW). **West Falkland:** Byron Heights, 485 m a.s.l., crevice in rock face, *Crabtree* 380 (KRAM, NMW); Fox Bay, outcrops at summit of Fox Bay Mt., 307 m a.s.l., on exposed rock, *Engel* 3451 (H, KRAM); Shallow Bay, on rock in stream, *Valentin* 270 (BM); Mount Alice, 351 m a.s.l., on rock, feldmark habitat, *Crabtree* 368 (KRAM, NMW); same locality, 354 m a.s.l., on rock, feldmark habitat, *Crabtree* 367 (KRAM, NMW); same locality, 356 m a.s.l., on rock, feldmark habitat, *Crabtree* 358 (KRAM, NMW). **East Falkland:** Sapper Hill 2 km west of Port Stanley, 100 m a.s.l., on dry and exposed quartzite rocks, *Ochyra* 2840/80, 2847/80 & 2885/80 (KRAM); Mount Kent, 403 m a.s.l., on rock outcrop, northerly aspect, *Crabtree* 421 (KRAM, NMW); Vantan Arroyo, 70 m a.s.l., southern aspect, very common on rock in river, *Crabtree* 226 (KRAM, NMW); Port Louis, *Skottsberg* 228 (PC, S) [Cardot 1905: p. 1003 as *Racomitrium symphyodontum*]; Wickham Heights, No Man's Land, Table Rock (UC 78/67), 458 m a.s.l., sheltered, shady crevice in rock face, *Broughton* 24 (KRAM); Port Stanley, 1850, *Lechler* 91 (LE); without closer locality [apparently in the Port William area], *Hooker* 205 & 208 (BM) [Wilson & Hooker, 1847: p. 402 as *R. protensum* var. 2]. **New to the Falkland Islands!**

### *Bucklandiella heterostichoides* (Cardot) Bednarek-Ochyra et Ochyra

*Bucklandiella heterostichoides* is a very distinct and unmistakable species which is easily recognised in the field by its characteristic overall appearance. It has the creeping stem closely attached to the rocky substrate from which ascends upwards numerous short lateral branches. This unique branching pattern gives the plants a cristate habit. The plants are small to medium-sized with narrowly ovate-lanceolate leaves terminated with a short or long, smooth hyaline hair-point. The laminal cells are usually strongly pseudopapillose and mostly bistratose at the margin in the distal part, though they do not form a bulging border. Basal marginal cells are hyaline and transparent and form a uniseriate border. The costa is narrow and consist of 2-3 enlarged adaxial guide cells. The plants from the Falkland Islands are sterile and, in general, *B. heterostichoides* produces sporophytes only occasionally throughout its range.

Although Matteri (1986) designated *Bucklandiella heterostichoides* as a circumsubantarctic species, it was known for over a century only from southern South America. It was restricted in its distribution to Tierra del Fuego (Cardot, 1908; Roivainen, 1955) and the Falkland Islands where it was found in West Falkland (Cardot & Brotherus, 1923). Later the species was found on some subantarctic islands, including South Georgia (Bell, 1974), Îles Kerguelen (Blockeel *et al.*, 2009b) and Heard Island (Ellis *et al.*, 2014a) as well as on Gough Island in the South Atlantic Ocean (Ellis *et al.*, 2012a). Dixon (1960) reported this species from Tristan da Cunha but the voucher specimen proved to be *B. striatipila* (Cardot) Bednarek-Ochyra & Ochyra (Bednarek-Ochyra & Ochyra, 2010, 2011; Ellis *et al.*, 2011b). Consequently, *B. heterostichoides* can be designated as a typical amphiatlantic subantarctic species having maximum occurrence on subantarctic islands and penetrating into the south-cool-temperate zone where it usually occurs at high elevations and its distribution in the Falkland Islands is the best illustration of this distribution pattern (Fig. 5). It was first discovered to in the summit area on Mount Adam in West Falkland (Cardot & Brotherus, 1923) and herein it was found in similar habitats on Mount Osborne in East Falkland.

**Specimen examined:** FALKLAND ISLANDS. **West Falkland:** lower summit of Mount Adam, 610 m a.s.l., moss carpet on and among rocks in exposed area with bryophytes *Azorella selago* and sparse *Festuca contracta* and *Poa alopecurus* (Gaudich.) Kunth acid

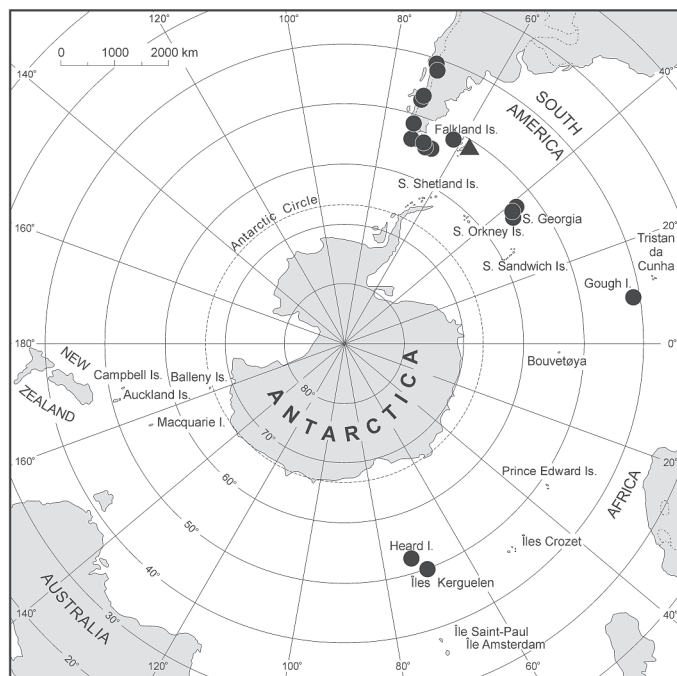


Fig. 5. Global distribution of *Bucklandiella heterostichoides* (Cardot) Bednarek-Ochyra *et* Ochyra. New record from East Falkland marked with a triangle.

grassland, *Broughton 2A, 5C, 5F & 17A* (KRAM); same locality, *Skottsberg 424* (PC, S). **East Falkland:** Wickham Heights, Mount Usborne, 624 m a.s.l., southerly aspect, among rocks in *Empetrum* heath, *Crabtree 275* (KRAM, NMW). **New to East Falkland!**

### *Bucklandiella lamprocarpa* (Müll.Hal.) Bednarek-Ochyra *et* Ochyra

*Bucklandiella lamprocarpa* is the only species of racomitrialean moss which has its *locus classicus* in the Falkland Islands. The original material was collected by J.D. Hooker in East Falkland in 1842 and it was designated as an unnamed variety No. 2 of *Racomitrium protensum* (Wilson & Hooker, 1847). Duplicates of this specimen were widely distributed to various world herbaria and Müller (1849) described his collection as a separate species, *Grimmia lamprocarpa*. The species is very distinct and easy to distinguish by a combination of both gametophyte and sporophyte characters. Its most characteristic trait is the structure of leaf laminae. They are variously 1-4-stratose in the distal part and are bordered by 2-5-layered fleshy limbodia of variable number of cell rows which extend from the base to the apex where that are confluent with the costa and merge imperceptibly with the laminal cells in the upper part. The costa is strong and prominently convex dorsally and reniform on the ventral side in the proximal portion. The angular cells are large and moderately thick-walled and form pronounced, orange-brownish, pellucid decurrencies. The basal marginal cells are not differentiated from adjacent laminal cells and consequently the leaves are not bordered in the proximal portion. Like elsewhere, the plants of *B. lamprocarpa* produce often sporophytes, with the capsules that are obloid, 1.8-3.0 mm long, lustrous and blackish-brown, and the spores are coarsely papillose and large, 20-28  $\mu\text{m}$  in diameter. The peculiar



morphology of the leaves of *B. lamprocarpa*, especially multistratose laminal cells and the presence of the fleshy marginal thickenings and salient costa are adaptations to rheophytic habitats which are known in a number of mosses growing in such habitats (Ochyra, 1985a,b, 1987; Ochyra & Vanderpoorten, 1999). The species grows on rocks in streams, brooks and cascades with swiftly flowing water, often submerged, and strongly thickened leaves protect the plants against the destructive action of water currents.

*Bucklandiella lamprocarpa* is a southern pantemperate species deeply penetrating into tropics along the Andean chain in South America (Blockeel *et al.*, 2002, 2009a; Bednarek-Ochyra, 2014a, 2015b) and East African mountains (Ochyra *et al.*, 1988). It has optimum occurrence in southern South America, where it occurs from central Chile to Tierra del Fuego and the Falkland Islands (Bednarek-Ochyra & Ochyra, 1994, 2012a; Bednarek-Ochyra *et al.*, 1996) and in South Africa (Bednarek-Ochyra & Ochyra, 2012c; Ochyra & van Rooy, 2013). Additionally it occurs on some subantarctic islands (Bednarek-Ochyra & Ochyra, 1998; Blockeel *et al.*, 2007a; Ellis *et al.*, 2010, 2011b) and on Gough Island and in Tristan da Cunha in the South Atlantic Ocean (Ochyra *et al.*, 1988).

**Specimens examined:** FALKLAND ISLANDS. **Saunders Island:** rock above river, 7 m a.s.l., uncommon on river bank, *Crabtree 490* (KRAM, NMW); same locality, 5 m a.s.l., uncommon on rock in river, *Crabtree 491* (KRAM, NMW). **West Falkland:** by Pilot Stream, Hill Cove (TC 95/87), 137 m a.s.l., cobbles in stream just above or at water surface, *Broughton 9A* (KRAM); Warrah River, on rocks in stream, *Halle & Skottsberg 421* (PC, S); Lake Sullivan, 9 m a.s.l., uncommon on rocks on lake shore, *Crabtree 446* (KRAM, NMW). **Weddell Island:** *Empetrum*-heath in Waterfall Valley, west of settlement, 122 m a.s.l., *Engel 3306* (H, KRAM) [Matteri, 1986 as *Racomitrium crispulum*]; in waterfall valley, 153 m a.s.l., southerly aspect, very common on rock, *Crabtree 424* (KRAM, NMW). **West Point Island:** without closer details, *Skottsberg 422* (PC, S) [Cardot & Skottsberg, 1923 as *Racomitrium subnigrum*]. **East Falkland:** in Stanley Sound, 1850, *Lechler 93* (BM-Hooker); without closer locality [apparently in the Port William area], *Hooker 207* (BM-Hooker, BM-Hampe, BM-Schuttleworth, BR, KRAM, NY-Mitten, PC-Montagne – type of *Grimmia lamprocarpa* Müll.Hal.); Moody Brook just to the north-west of Port Stanley, 39 m a.s.l., western aspect, very common on rock in river, *Crabtree 19* (KRAM, NMW); Vantan Arroyo, 56 m a.s.l., eastern aspect, very common on rock in river, *Crabtree 225* (KRAM, NMW).

### *Bucklandiella membranacea* (Mitt.) Bednarek-Ochyra *et* Ochyra

Although *Bucklandiella membranacea* was described relatively early as a species in its own right by Mitten (1876 as *Grimmia membranacea* Mitt.), it has fallen for a long time into obsolence when Cardot (1911) reduced its name to synonymy with *Racomitrium symphyodontum* (Müll.Hal.) A.Jaeger. Dixon (1926) lumped it with the then all-encompassing *R. crispulum* and this concept was subsequently adopted by Clifford (1955). Having examined the type material of this species originating from Tristan da Cunha, Lawton (1973) considered this species to be identical to *R. crispulum* var. *tasmanicum* (Hampe) E.Lawton. A re-examination of the type material of *G. membranacea*, as well as numerous non-type specimens from subantarctic islands and the Kerguelen Biogeographical Province by Bednarek-Ochyra and Ochyra (in Ellis *et al.*, 2011b) revealed it to be a distinct species of *Bucklandiella*. It has nothing in common with the Tasmanian endemic *R. crispulum* var. *tasmanicum* which is actually identical to *B. pycnotricha* (Müll.Hal.) Bednarek-Ochyra, Ochyra *et* Seppelt, a species having the main centre of its occurrence in Tasmania but recently discovered also in New Zealand (Ellis *et al.*, 2014b). *Bucklandiella membranacea* is characterised by having unistratose laminal cells that



Fig. 6. Global distribution of *Bucklandiella membranacea* (Mitt.) Bednarek-Ochyra *et* Ochyra. New record from East Falkland marked with a triangle.

are elongated throughout the leaf; a long basal marginal border of pellucid cells; and a capillaceous hair-point, 0.1-0.35 mm long, that is hyaline throughout or yellowish to yellowish-brownish tinged below and hyaline in the distal portion. The plants from the Falkland Islands are entirely sterile as is the case with those from southern South America. On the other hand, the species produces sporophytes in great profusion on subantarctic islands in the Kerguelen biogeographical province.

*Bucklandiella membranacea* is a typical amphiatlantic subantarctic species (Fig. 6) occurring abundantly on subantarctic islands in the Kerguelen biogeographical province where it seems to have optimum occurrence. It is very common in the Prince Edward Islands (Ochyra & Hertel, 1990), Îles Crozet (Ellis *et al.*, 2013c), Îles Kerguelen and on Heard Island (R. Ochyra, unpublished records) in the Subantarctic, as well as in Tristan da Cunha (Mitten, 1876), and Tierra del Fuego, the Falkland Islands and the Archipelago Juan Fernández in the Pacific Ocean (Ellis *et al.*, 2011b), where it is rare and occurs at high elevations. *Bucklandiella membranacea* is one of a long array of species showing this distribution pattern in the Southern Hemisphere, for example, *Ditrichum conicum* (Mont.) Mitt. and *D. ditrichoideum* (Cardot) Ochyra (Ochyra & Lewis Smith, 1998). In the Falkland Islands *B. membranacea* is, besides *B. didyma*, the second commonest species of the genus. Hitherto, it was known from West Falkland and herein it is recorded for the first time from East Falkland. It was admittedly reported from this island (Ellis *et al.*, 2011b) but a careful examination of the voucher material showed that it correctly belongs within *B. didyma*.

**Specimens examined:** FALKLAND ISLANDS. **Saunders Island:** Rookery Mount, on exposed ridge, 500 m from the summit, 386 m a.s.l., on rock, 1 March 2015, *Crabtree* 482 (KRAM, NMW); Rookery Mount, 417 m a.s.l., feldmark habitat on the summit, *Crabtree* 463 (KRAM, NMW); Rookery Mt., 423 m a.s.l., feldmark habitat on the summit, *Crabtree* 460

(KRAM, NMW); Rookery Mount, 424 m a.s.l., feldmark habitat on the summit, *Crabtree* 461 (KRAM, NMW). **West Falkland:** Byron Heights, 485 m, under rock outcrop, feldmark habitat with *Bolax gummifera*, *Crabtree* 386 (KRAM, NMW); Hill Cove, outcrops on summit of West French Peak, 290 m a.s.l., on *Bolax* cushion, *Engel* 2953 (H) & 2957 (AAS, H, KRAM) [Matteri 1986 as *Racomitrium crispulum* var. *rupestre*]; Hill Cove, outcrops and Polsterboden on ridge of N slope of Mt. Fegen, 275 m a.s.l., *Engel* 3060 (AAS, H, KRAM) [Matteri 1986 as *Racomitrium crispulum* var. *rupestre*]; Mount Alice, 295 m a.s.l., on summit of broad ridge, amongst *Cortaderia pilosa* grassland, *Crabtree* 374 (KRAM, NMW). **Weddell Island:** 353 m a.s.l., *Crabtree* 430 (KRAM, NMW); same locality, 356 m a.s.l., *Crabtree* 429 (KRAM, NMW). **East Falkland:** Wickham Heights, Two Sisters Mountain, 238 m a.s.l., on rock, *Crabtree* 215 (KRAM, NMW); Sapper Hill 2 km west of Port Stanley, 100 m a.s.l., on dry and exposed quartzite rocks, *Ochyra* 2861/80 & 2877/80 (KRAM); Mount Kent, 411 m a.s.l., between quartzite boulders, northerly aspect, *Crabtree* 418 (KRAM, NMW); same locality, 411 m a.s.l., amongst dwarf shrub heath, southerly aspect, *Crabtree* 422 (KRAM, NMW). **New to East Falkland!**

***Bucklandiella ptychophylla* (Mitt.) Bednarek-Ochyra et Ochyra**

*Bucklandiella ptychophylla* is one of the most distinctive species of the genus which is easily known by its leaves that are epilose or very shortly hyaline tipped and strongly longitudinally plicate with two prominent folds on each side of the costa. The costa is fairly salient and ceases below the leaf apex and the laminal cells are short rectangular distally and become elongate in the proximal portion. The plants are easy to recognise in the field by their regular growth form with upright stems that are sparingly fastigiately branched. The species is known exclusively in the barren state in the Falkland Islands and elsewhere in South America, however it produces sporophytes occasionally in New Zealand.

*Bucklandiella ptychophylla* is an amphipacific south-temperate species (Fig. 7) which has its main centre of occurrence on both islands of New Zealand

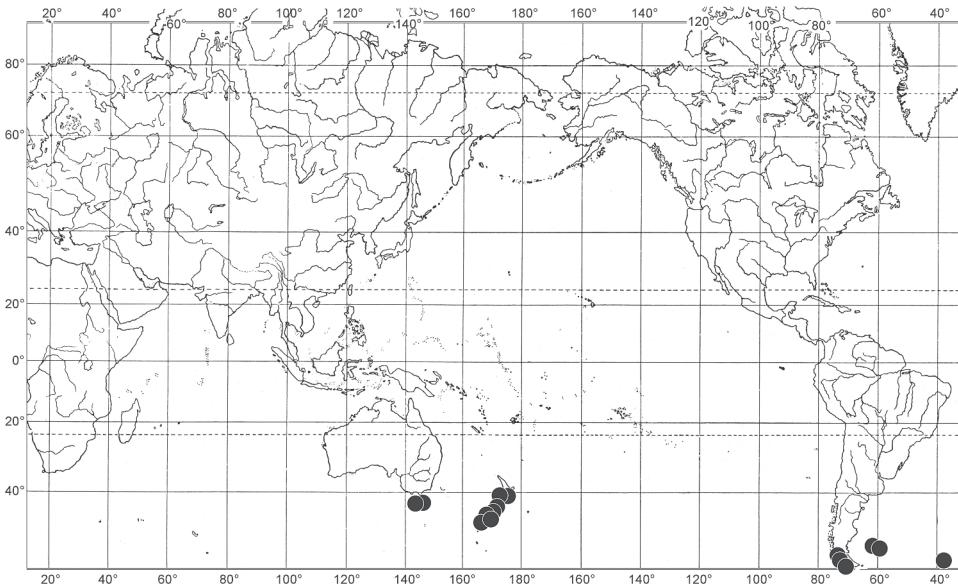


Fig. 7. Global distribution of *Bucklandiella ptychophylla* (Mitt.) Bednarek-Ochyra et Ochyra.

and in Tasmania. On the opposite side of the Pacific Ocean it is scattered in southern South America in Western Patagonia (Greene, 1986), on subantarctic South Georgia (Bell, 1974) and in the Falkland Islands, where it was only once collected in West Falkland (Cardot & Brotherus, 1923).

**Specimen examined:** FALKLAND ISLANDS. **West Falkland:** Mount Adam, ca 700 m a.s.l., *Skottsberg 423* (PC-Cardot, S). **East Falkland:** Wickham Heights, Mount Osborne, 656 m a.s.l., southern aspect, in between exposed rock on south flank of the mountain, with *Empetrum rubrum*, *Crabtree 276* (KRAM, NMW). **New to East Falkland!**

### ***Bucklandiella striatipila* (Cardot) Bednarek-Ochyra *et Ochyra***

Apart from *Bucklandiella lamprocarpa* and *B. didyma*, *B. striatipila* is the third species of this genus which was earliest collected in the Falkland Islands. It was gathered in 1842 by J.D. Hooker in the Port William area in East Falkland and reported in “Flora antarctica” as *Racomitrium heterostichum* (Wilson & Hooker, 1847). However, the voucher specimen has nothing in common with this northern species and is at once apparent in having a distinct, long 1-2-seriate basal marginal border composed of 15-25 pellucid and straight-walled cells in the outer row and esinuose and strongly porose basal laminal cells which are characteristic for *B. striatipila* (Ochyra *et al.*, 2008a). In fact, this is the oldest known specimen of *B. striatipila* which was described some six decades later (Cardot, 1905, 1908) on the basis of specimens collected in 1896 and 1902 in Western Patagonia and Tierra del Fuego, respectively (Bednarek-Ochyra & Ochyra, 2010). This species was formally recorded for the first time as *Racomitrium striatipilum* in 1907 on Mount Adam in West Falkland and herein it is also reported from Mount Osborne in East Falkland. All specimens of *B. striatipila* from the Falkland Islands are sterile but, in general, the species produces sporophytes infrequently on mainland South America.

*Bucklandiella striatipila* is an amphiatlantic south-cool-temperate species (Fig. 8). It has the main centre of distribution in southern South America where it is widely distributed in the *Nothofagus* zone at the western fringes of this continent, ranging from the Valdivian region in central Chile to Tierra del Fuego and the Falkland Islands (Deguchi, 1984; Greene, 1986). Moreover, it occurs at an isolated station in the Archipelago Juan Fernández in the Pacific Ocean (Robinson, 1975) and, additionally, it extends to subantarctic South Georgia in the South Atlantic Ocean (Bell, 1974) and to the northern maritime Antarctic (Ellis *et al.*, 2013a) where it is evidently a postglacial immigrant (Birkenmajer *et al.*, 1985). The second centre of distribution of *B. striatipila* is in the archipelagoes of Îles Crozet (Blockeel *et al.*, 2009b) and Îles Kerguelen (Ellis *et al.*, 2010) in the South Indian Ocean in the Subantarctic. These highly disjunct centres are bridged by the station in Tristan da Cunha (Ellis *et al.*, 2011b) and on Gough Island (Ellis *et al.*, 2012b) in the middle of the South Atlantic Ocean in the south-temperate zone as well as in the Cape Floral Region in South Africa (Bednarek-Ochyra *et Ochyra*, 2013a).

**Specimens examined:** FALKLAND ISLANDS. **West Falkland:** Byron Heights, 491 m a.s.l., on rock, feldmark habitat, northerly aspect, *Crabtree 395* (KRAM, NMW); Mount Adam, ca 680 m a.s.l., *Halle 425* (PC-Cardot, S); lower summit of Mount Adam (TC 87/83), 610 m a.s.l., moss carpet on and among rocks, *Broughton 17C* (KRAM). **Weddell Island:** without details, *Hamilton 763* (BM-Dixon). **East Falkland:** Wickham Heights, Mount Osborne, 657 m a.s.l., northern aspect, on rock, on the steep slopes of the corrie, *Crabtree 283* (KRAM, NMW); Mount Kent, 420 m a.s.l., on soil in feldmark habitat, *Crabtree 420* (KRAM, NMW); without closer locality [apparently in the Port William area], *Hooker 206* (BM [3 specimens], BM-Hooker, PC-Montagne) [Wilson & Wooker 1847 as *Racomitrium heterostichum*].





Fig. 8. Global distribution of *Bucklandiella striatipila* (Cardot) Bednarek-Ochyra *et* Ochyra.

### *Bucklandiella sudetica* (Funck) Bednarek-Ochyra *et* Ochyra

So far, *Bucklandiella sudetica* was known in the Falkland Islands from a single collection from Mount Usborne in East Falkland from whence it was reported by Matteri (1986) as *Racomitrium austrogeorgicum* Paris and this name is a taxonomic synonym of *B. sudetica* (Frisvoll, 1986). The species was rediscovered on this site during the present survey of the moss flora of the archipelago and, additionally, it is reported for the first time from West Falkland. This record is based on the specimen which was misnamed as *B. orthotrichacea* (Ochyra & Broughton, 2004). Although the local plants are sterile, this species is distinguished by its strongly pseudopapillose laminal cells and a biseriolate basal marginal border of translucent and straight-walled cells which is markedly obscured by the leaf recurvature (Bednarek-Ochyra & Ochyra, 2012a; Bednarek-Ochyra, 2014b). In contrast, *B. sudetica* has weakly pseudopapillose laminal cells and a short, uniseriate basal marginal border consisting of up to 5 transparent cells with esinuose walls.

*Bucklandiella sudetica* is a bipolar species in strict sense, *i.e.* lacking any intermediate stations in the tropics (Ochyra *et al.*, 2008a). In the Southern Hemisphere it has a wide panholantarctic range in cool-temperate regions southern South America (Frisvoll, 1986), New Zealand (Ellis *et al.*, 2011a), Tasmania (Ellis *et al.*, 2011b) and SE Australia (Frisvoll, 1986; Bednarek-Ochyra & Ochyra, 2013b), as well as in the austral polar regions (Fig. 9). Here, it is relatively frequent in the northern maritime Antarctic (Ochyra *et al.*, 2008a) and on subantarctic islands, including South Georgia (Bell, 1974 as *Racomitrium austrogeorgicum*), Heard Island (Ellis *et al.*, 2013a) and Marion Island (Ellis *et al.*, 2014b).

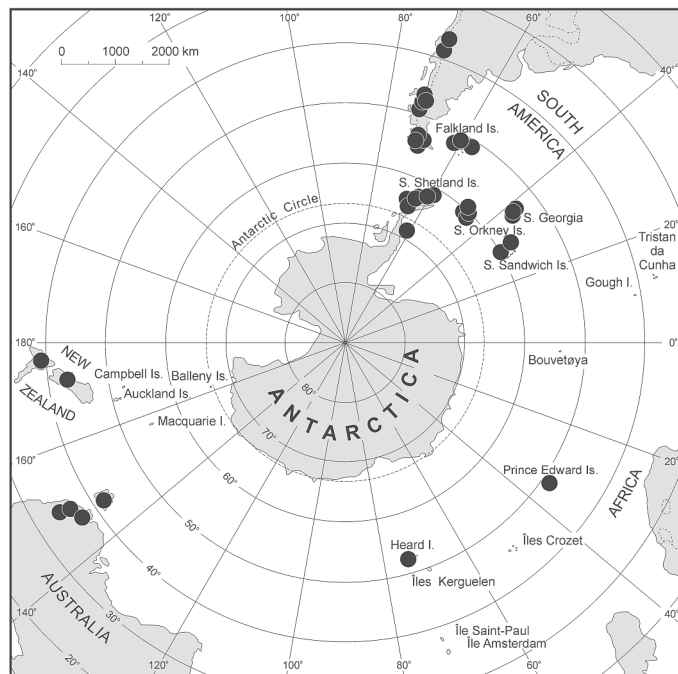


Fig. 9. Distribution map for *Bucklandiella sudetica* (Funck) Bednarek-Ochyra *et* Ochyra in the Southern Hemisphere.

**Specimens examined:** FALKLAND ISLANDS. **West Falkland:** lower summit of Mount Adam (TC 87/83), 610 m a.s.l., exposed summit area with bryophytes, *Azorella selago* and sparse *Festuca contracta* and *Poa alopecurus* acid grassland, *Broughton 2B & 5B* (KRAM) [Ochyra & Broughton 2004 as *Bucklandiella orthotrichacea*]. **New to West Falkland!** **East Falkland:** Wickham Heights, Mount Osborne, on summit plateau, feldmark habitat, north aspect, 701 m a.s.l., *Crabtree 287* (KRAM, NMW); feldmark on summit of Mount Osborne, 701 m a.s.l., on exposed rock surface, *Engel 2498* (H, KRAM) [Matteri 1968 as *Racomitrium austrogeorgicum*].

### *Codriophorus laevigatus* (A.Jaeger) Bednarek-Ochyra *et* Ochyra

Occurrence of this species was expected on the Falkland Islands since there are no phytogeographical or other reasons why it could not occur in this archipelago. Nevertheless, it seems to be rather rare and infrequent in this area because as a relatively large and attractive moss it cannot escape notice even of casual collectors. This handsome species is easy to recognise in the field by its bright yellow colour of the plants, erect stems with numerous, regularly arranged short, lateral tuft-like branchlet and ovate-lanceolate, plicate leaves, terminated with a short, hyaline or yellowish-hyaline hair-point (Fig. 4). At first glance the species has a resemblance to some species of *Breutelia* (Bruch *et* Schimp.) Schimp., for instance to *B. integrifolia* (Taylor) A.Jaeger which occurs also on the Falkland Islands (Matteri, 1986). This refers to the nodose lateral branchlets, coloration of the plants, plicate leaves and rigidly deflexed leaves of the tuft-like branchlets. However, microscopic details, including the leaf areolation of elongate cells with strongly sinuose lateral walls and the flat large papillae situated over the cell walls immediately exclude any alliance

of this species with *Breutelia*. *Codriophorus laevigatus* is notoriously sterile and so far only a very few plants with immature or mature sporophytes have been detected in Chile (Bednarek-Ochyra, 2006; Larráin *et al.*, 2014). The same is also true with the plants discovered in the Falkland Islands which are entirely sterile.

*Codriophorus laevigatus* is an amphiatlantic south-temperate species. It has optimum occurrence in the *Nothofagus* zone in southern South America, ranging along the western coasts of the continent from lat. ca 40°S in the Valdivian Phytogeographical Province to Tierra del Fuego and extending to the Archipelago Juan Fernández in the Pacific Ocean and to subantarctic South Georgia in the Southern Ocean. Moreover, the species occurs at highly disjunct station in Tristan da Cunha and on Gough Island in the middle of the South Atlantic Ocean (for the global distribution map see Bednarek-Ochyra, 2006). Thus, the present discovery of *C. laevigatus* in the Falkland Islands completes its geographical range on the islands in the South Atlantic Ocean.

**Specimen examined:** FALKLAND ISLANDS. **West Falkland:** Byron Heights, 509 m a.s.l., feldmark habitat on summit, outside army barracks, *Crabtree 393* (KRAM, NMW); Mount Maria, base of Snow Hole, ca 400 m a.s.l., on ground, *Tangney 15/199 & 15/216* (KRAM, NMW); Mount Maria, ca 600 m a.s.l., on ground, *Tangney 11/404* (KRAM, NMW); same locality, 644 m a.s.l., on quartzite gravel, exposed summit area, *Crabtree 442* (KRAM, NMW). **East Falkland:** Wickham Heights, Mount Osborne, north aspect, 644 m a.s.l., NE aspect, growing on quartzite gravel on the sides of southern corrie above the tarn, *Crabtree 284* (KRAM, NMW). **New to the Falkland Islands!**

### EXCLUDED SPECIES

***Bucklandiella crispipila*** (Taylor) Bednarek-Ochyra *et* Ochyra – This is a pantropical oreophyte with its main centre of occurrence in the Neotropics (Frisvoll, 1988) and scattered in sub-Saharan Africa (Ochyra, 1993) and New Guinea (Blockeel *et al.*, 2007b). It was reported from the Falkland Islands as *Racomitrium crispipilum* (Taylor) A.Jaeger (Matteri, 1986) and this record was based upon the taxonomic conclusion on the conspecificity of this species with *Bucklandiella striatipila* (Robinson, 1975; Deguchi, 1984; Frisvoll, 1988). Bednarek-Ochyra (1995b) demonstrated the essential and indisputable differences in the shape and anatomy of the costa between the two species. *Bucklandiella striatipila* and *B. crispipila* share a similar habit being relatively robust, hoary plants with long flexuose hair-points. However, *B. crispipila* has a much narrower costa which is bistratose throughout, with mostly three enlarged adaxial guide cells towards the base and a single layer of abaxial stereid cells, only occasionally with a second incomplete layer consisting of a few stereids. Conversely, the costa in *B. striatipila* is strongly flattened on the abaxial side in the proximal half, with as many as 6-10 enlarged adaxial guide cells. It is relatively thin, with only a single row of abaxial stereid cells for most of its length and with a second, often incomplete row of stereids in the extreme base as clearly visible in transverse section. Both *B. striatipila* and *B. crispipila* are closely related species which are vicariant in South America. The latter is a widely distributed montane species, ranging along the Cordillera from Mexico (Frisvoll, 1988) to Bolivia (Churchill *et al.*, 2000, 2009), whereas *B. striatipila* has its main occurrence centre in the temperate regions of southern South America. Thus, *B. crispipila* has to be definitely excluded from the bryoflora of the Falkland Islands.

***Bucklandiella crispula*** (Hook.f. *et* Wilson) Bednarek-Ochyra *et* Ochyra – Besides *B. rupestris*, this is the earliest *Bucklandiella* species described in the

Southern Hemisphere (Bednarek-Ochyra, 2015a). Although in subsequent decades there have been many species of this genus described from all austral regions, the vast majority of them were lumped with *B. crispula* which was then considered as a member of the broadly understood *Racomitrium* (Dixon, 1926; Clifford, 1955; Lawton, 1973). As a result, for nearly a century this species has served as a convenient repository for a great number of austral species of racomitrialean mosses throughout the Southern Hemisphere. Matteri (1986) followed this concept and recorded *R. crispulum* from the Falkland Islands, lumping *R. lamprocarpum*, *R. subnigratum* and *R. symphyodontum* with it. The two former species are conspecific with *Bucklandiella lamprocarpa* and the latter is identical to *B. didyma*.

***Bucklandiella heterosticha*** (Hedw.) Bednarek-Ochyra *et* Ochyra – This species was reported from the Falkland Islands as *Racomitrium heterostichum* (Hedw.) Brid. (Wilson & Hooker, 1847). Examination of the voucher material (Hooker 206, BM) revealed that it correctly belongs within *Bucklandiella striatipila* (Ochyra *et al.*, 2008a). *Bucklandiella heterosticha* is a widespread Euro-American oceanic species (Frisvoll, 1988; Bednarek-Ochyra, 1995a) and its reports from outside the Holarctic in southern South America are based on the misidentification of specimens.

***Bucklandiella orthotrichacea*** (Müll.Hal.) Bednarek-Ochyra *et* Ochyra – This species was erroneously reported from West Falkland (Ochyra & Broughton, 2004) and the re-examination of the voucher specimens (Broughton 2B & 5B, KRAM) showed that in fact they correctly represent *B. sudetica*. Nonetheless, occurrence of *B. orthotrichacea* in the Falkland Islands is expected, since the species is frequent on sub-Antarctic South Georgia (Ochyra *et al.*, 2002) and scattered on the South American mainland (Bednarek-Ochyra & Ochyra, 2012a), and common on the islands in the Kerguelen biogeographical province (Ochyra & Hertel, 1990; Ellis *et al.*, 2013b; Bednarek-Ochyra, 2014b).

***Bucklandiella rupestris*** (Hook.f. *et* Wilson) Bednarek-Ochyra *et* Ochyra – Although this is a distinct and unmistakable species, it was quite often misinterpreted and a number of its records from various parts of the Southern Hemisphere are erroneous. This confusion of the species was certainly due to the lack of its detailed circumscription. Hooker and Wilson (1844) provided only a short and sketchy diagnosis of *Dryptodon rupestris* Hook.f. *et* Wilson, the basionym of *B. rupestris*, and its re-description and illustration in “Flora antarctica” (Wilson & Hooker, 1847) also lacked some essential diagnostic traits. The original material of this species was described and illustrated in detail only by Deguchi (1984) who precisely indicated the diagnostic characters of *B. rupestris* and the name was formally lectotypified only recently (Bednarek-Ochyra, 2015a). *Bucklandiella rupestris* is recognised by the following combination of characters: the lack of the basal marginal border of pellucid cells, unistratose laminal cells having transverse striation on both adaxial and abaxial surfaces, the spiral leaf arrangement, entire or nearly so peristome teeth and large spores, 22-30 µm in diameter.

*Bucklandiella rupestris* was reported from the Falkland Islands by Matteri (1986) as *Racomitrium crispulum* var. *rupestre* but the voucher specimens (Engel 2957 & 3060, AAS, H, KRAM and Engel 2953, H) correctly belong within *B. membranacea*.



**KEY TO DETERMINATION OF THE RACOMITRIOIDEAE TAXA  
IN THE FALKLAND ISLANDS**

The following key contains all taxa of racomitrialean mosses now known to occur in the Falkland Islands. Because they occur mostly in the barren state and only some species often produce mature sporophytes, the key is based exclusively on gametophyte characters which are easy to observe.

1. Hyaline hair-point always present, usually long, strongly papillose eroso-dentate, long decurrent down the leaf margins.....2
1. Hyaline hair-point absent or present, short or rarely long, smooth to denticulate, never papillose or conspicuously decurrent .....4
  2. Hair-point conspicuously long-decurrent to  $\frac{1}{2}$ - $\frac{2}{3}$  down the leaf margin; decurrent part distinctly ruffled or wavy ..... ***Racomitrium patagonicum***
  2. Hair-point short-decurrent, mostly to  $\frac{1}{3}$  down the leaf margin; decurrencies consistently flat .....3
3. Distal teeth of hair-points spreading at  $55^{\circ}$ - $90^{\circ}$ , mostly at  $70^{\circ}$ - $90^{\circ}$ , 15-30  $\mu$ m long ..... ***Racomitrium lanuginosum* subsp. *lanuginosum***
3. Distal teeth of hair-points spreading at  $20^{\circ}$ - $50^{\circ}$ , mostly less than  $45^{\circ}$ , 40-65  $\mu$ m long ..... ***Racomitrium lanuginosum* subsp. *geronticum***
4. Laminal cells with large, flat papillae situated over the longitudinal walls; costa vanishing at  $\frac{1}{2}$ - $\frac{3}{4}$  of the leaf length, indistinct and faint, concolorous with the laminal cells; stems with numerous, short, tuft-like lateral branchlets ..... ***Codriophorus laevigatus***
4. Laminal cells smooth or pseudopapillose; costa percurrent or subpercurrent, distinct and sharply demarcated from the laminal cells; stems sparingly or profusely fastigiately branched, lacking short lateral branchlets (*Bucklandiella*) .....5
5. Leaves deeply multiplicate on either side of the costa, epilose or with a very short, diaphanous hyaline tip ..... ***Bucklandiella ptychophylla***
5. Leaves smooth throughout or with a single plica near the costa in the proximal part, terminated with a hyaline or yellowish to yellowish-brownish hair-point.. 6
  6. Costa in transverse section semi-terete, tristratose distally; basal marginal border very short, consisting of 2-5 pellucid cells .. ***Bucklandiella sudetica***
  6. Costa in transverse section elliptical, reniform to lunate, bistratose distally; basal marginal border absent or very long, consisting of 10-25 transparent cells .....7
7. Basal marginal border absent; rheophyte ..... ***Bucklandiella lamprocarpa***
7. Basal marginal border present; terrestrial plants of dry habitats.....8
  8. Leaf hair-point hyaline throughout .....9
  8. Leaf hair-point yellowish to yellowish-brownish throughout, sometimes hyaline on the tip only .....10
9. Leaf margin bistratose; laminal cells strongly pseudopapillose; hair-point short, 0.3-0.5 mm long; costa semi-terete in cross-section, narrow with 2 enlarged adaxial guide cells; leaves small,  $1.1$ - $2.5 \times 0.2$ - $0.7$  mm ..... ***Bucklandiella heterostichoides***
9. Leaf margin unistratose; laminal cells smooth; hair-point long, to 1.2 mm; costa strongly flattened in cross-section, broad with 6-10 enlarged adaxial guide cells? leaves large,  $2.5$ - $3.5 \times 0.7$ - $1.0$  mm ..... ***Bucklandiella striatipila***

10. Leaf hair-point capillaceous, 0.2-0.6 mm long, yellowish to yellowish-brownish below, hyaline at the tip, smooth or nearly so .....  
 ..... ***Bucklandiella membranacea***
10. Leaf hair-point broad and massive, to 0.2 mm long, brown or yellow-brown, never hyaline, distinctly sharply or bluntly serrate .... ***Bucklandiella didyma***

**Acknowledgements.** The contribution of the first author to this work was financially supported by the Polish National Centre of Science through grant No. N N 303 796 940 for Halina Bednarek-Ochyra and, partly, through the statutory fund of the Institute of Botany of the Polish Academy of Sciences. The contribution of the second authors to this account was financially supported by the United Kingdom Government through DEFRA and the Darwin Initiative. Funding was allocated to the Lower plants and lichen inventory and conservation in the Falkland Islands; Reference number: DPLUS017. Support in the form of fieldwork and advice regarding landowners was provided by Falklands Conservation; Charity number 1073859. Thanks are due to the Curators of the herbaria at AAS, BM, BR, H, LE, NY, PC and S for kindly allowing us to study specimens cited in the paper.

## REFERENCES

- ALLEN B. & MAGILL R.E., 2003 — A revision of *Pilotrichella* (Lembophyllaceae: Musci). *Acta academiae paedagogicae agriensis sectio biologicae nova series* 24: 43-83.
- BEDNAREK-OCHYRA H. & OCHYRA R., 1994 — *Racomitrium lamprocarpum* (Musci, Grimmiaceae) in southern South America. *Fragmenta floristica et geobotanica* 39: 361-367.
- BEDNAREK-OCHYRA H., 1995a — Rodzaj *Racomitrium* (Musci, Grimmiaceae) w Polsce: taksonomia, ekologia i fitogeografia [The genus *Racomitrium* (Musci, Grimmiaceae) in Poland: taxonomy, ecology and phytogeography]. *Fragmenta floristica et geobotanica series polonica* 2: 3-307 (in Polish with extensive English summary).
- BEDNAREK-OCHYRA H., 1995b — A note on *Racomitrium tortipilum* (Musci, Grimmiaceae) from Brazil. *Fragmenta floristica et geobotanica* 40: 177-180.
- BEDNAREK-OCHYRA H., MATTERI C.M. & OCHYRA R., 1996 — A major range extension of *Racomitrium lamprocarpum* (Musci, Grimmiaceae) in South America. *Fragmenta floristica et geobotanica* 41: 995-1000.
- BEDNAREK-OCHYRA H. & OCHYRA R., 1998 — *Racomitrium lamprocarpum* (Müll. Hal.) Jaeg. — an addition to the moss flora of Îles Kerguelen and the Subantarctic. *Journal of bryology* 20: 525-528.
- BEDNAREK-OCHYRA H., OCHYRA R. & BUCK W.R., 1999 — The genus *Racomitrium* (Grimmiaceae) in Brazil, with the first report of *R. subsecundum* in South America. *Brittonia* 51: 93-105.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2003 — *Racomitrium patagonicum*, a new moss species from southern South America. *Journal of bryology* 25: 181-187.
- BEDNAREK-OCHYRA H., 2006 — *A taxonomic monograph of the moss genus Codriophorus P. Beauv. (Grimmiaceae)*. Kraków, W. Szafer Institute of Botany, Polish Academy of Sciences. 276 p.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2010 — *Bucklandiella allanfjei* (Grimmiaceae), a new moss species from New Zealand, with a note on South American *B. striatipila*. *Journal of bryology* 32: 245-255.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2011 — *Bucklandiella angustissima* sp. nov. (Grimmiaceae), a new austral amphipacific species with the smallest capsules and the shortest setae in the genus. *Cryptogamie, Bryologie* 32: 13-27.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2012a — A consideration of *Bucklandiella* (Bryophyta, Grimmiaceae) in South America, with a taxonomic re-assessment of *Racomitrium looseri*. *Nova Hedwigia* 95: 153-163.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2012b — Antipodal mosses: XVII. *Bucklandiella longtonii* (Bryopsida, Grimmiaceae), a new species with caducous leaf apices from subantarctic South Georgia. *Nova Hedwigia* 94: 373-384.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2012c — The taxonomic status of *Racomitrium capense* (Bryophyta, Grimmiaceae) from South Africa. *Cryptogamie, Bryologie* 33: 97-106.

- BEDNAREK-OCHYRA H. & OCHYRAR., 2013a — Diversity of Grimmiaceae subfam. Racomitrioideae in sub-Saharan Africa, including an addition of *Bucklandiella striatipila* to the moss flora of the continent. *Cryptogamie, Bryologie* 34: 3-12.
- BEDNAREK-OCHYRA H. & OCHYRA R., 2013b — Taxonomic status of *Grimmia procumbens* (Bryophyta, Grimmiaceae) from Australia. *Journal of bryology* 35: 149-152.
- BEDNAREK-OCHYRA H., 2014a — A taxonomic assessment of *Racomitrium steerei* (Grimmiaceae, Musci) from Venezuela. *Herzogia* 27: 141-146.
- BEDNAREK-OCHYRA H., 2014b — On the identities of some neglected species of Grimmiaceae from Îles Kerguelen. *Journal of bryology* 36: 300-305.
- BEDNAREK-OCHYRA H., 2015a — Early records of *Racomitrium* s. lat. (Grimmiaceae, Musci) in the Southern Hemisphere and the correct author citations for *R. crispulum* and *R. rupestre*. *Cryptogamie, Bryologie* 36: 143-154.
- BEDNAREK-OCHYRA H., 2015b — *Bucklandiella lamprocarpa* (Musci, Grimmiaceae) in central and northern Andes. *Cryptogamie, Bryologie* 36: 81-90.
- BELL B.G., 1974 — A synoptic flora of South Georgian mosses: V. *Willia* and *Racomitrium*. *British antarctic survey bulletin* 38: 73-101.
- BIRKENMAJER K., OCHYRA R., OLSSON I.U. & STUHLIK L., 1985 — Mid-Holocene radiocarbon-dated peat at Admiralty Bay, King George Island (South Shetland Islands, West Antarctica). *Bulletin of the polish academy of sciences, earth sciences* 33: 7-13.
- BLOCKEEL T.L., DUCKETT J.G., FERNÁNDEZ M.C., HÉBRARD J.-P., MATCHAM H.W., PORLEY R.D., OCHYRAR., BEDNAREK-OCHYRA H., SOLDÁN Z. & TOWNSEND C.C., 2002 — New national and regional bryophyte records, 5. *Journal of bryology* 24: 88-91.
- BLOCKEEL T.L., ABAY G., ÇETIN B., BEDNAREK-OCHYRA H., OCHYRA R., LEWIS SMITH R.I., MATTERI C.M., FARIAS R.M., NOVOTNÝ I., RAO P., ENROTH J., VAN ROOY J., SCHIAVONE M.M. & VÁŇA J., 2003 — New national and regional bryophyte records, 7. *Journal of bryology* 25: 141-144.
- BLOCKEEL T.L., BEDNAREK-OCHYRA H., OCHYRAR., DÜZENLIA., ERDAĞ A., ERZBERGER P., EZER T., HESPAÑHOL H., KARA R., MATTERI C.M., MÜLLER F., SÉNECA A., SÉRGIO C. & VÁŇA J., 2007a — New national and regional bryophyte records, 15. *Journal of bryology* 29: 139-142.
- BLOCKEEL T.L., BEDNAREK-OCHYRA H., OCHYRA R., GARILLETI R., GLIME J.M., LARA F., MAZIMPAKA V., RUSIŇSKA A., SCHAEFER-VERWIMP A., SHABBARA H.M., SÖDERSTRÖM L., STEBEL A., TOWNSEND C.C., VÁŇA J., YAYINTAŞ Ö.T. & ŻARNOWIEC J., 2007b — New national and regional bryophyte records, 17. *Journal of bryology* 29: 277-283.
- BLOCKEEL T.L., BEDNAREK-OCHYRA H., OCHYRA R., DUCKETT J.G., ERZBERGER P., HEDENÄS L., HUGONNOT V., MAIER E., MARKOVÁ I., MATCHAM H.W., PLAŠEK V., PÓCS T., SEPPELT R.D., SZÚCS P., THOUVENOT L. & VAN ZANTEN B.O., 2008 — New national and regional bryophyte records, 18. *Journal of bryology* 30: 161-167.
- BLOCKEEL T.L., BAKALIN V.A., BEDNAREK-OCHYRA H., OCHYRA R., BUCK W.R., CHOI S., CYKOWSKA B., ERDAĞ A., ERZBERGER P., KIRMACI M., KÜRSCHNER H., LÉBOUVIER M., PAPP B., SABOVLJEVIĆ M., SABOVLJEVIĆ A., SCHRÖDER W., SINGH S.M., SUN B.-Y., TOWNSEND C.C., VÁŇA J. & YAYINTAŞ Ö.T., 2009a — New national and regional bryophyte records, 20. *Journal of bryology* 31: 54-62.
- BLOCKEEL T.L., BASTOS C.J.P., BEDNAREK-OCHYRA H., OCHYRA R., DULIN M.V., FOVET L., GARCIA C., HEDENÄS L., HUGONNOT V., KIRMACI M., KOPONEN T., LÉBOUVIER M., MARTINS A., MÜLLER F., SABOVLJEVIĆ M., LAKUŠIĆ D., SCHÄFER-VERWIMP A., SÉRGIO C., SURINA B. & YAYINTAŞ Ö.T., 2009b — New national and regional bryophyte records, 22. *Journal of bryology* 31: 201-210.
- BLOCKEEL T.L., BEDNAREK-OCHYRA H., CYKOWSKA B., OCHYRA R., DÜZENLIA., EZER T., HOLYOAK D.T., HUGONNOT V., KARA R., LARRAIN J., LÉBOUVIER M., PRESTON C.D., SCHÄFER-VERWIMP A., SMITH V.R., SPITALE D., ŞTEFĂNUŢ S. & VÁŇA J., 2010 — New national and regional bryophyte records, 23. *Journal of bryology* 32: 140-147.
- CARDOT J., 1905 — Notice préliminaire sur les mousses recueillies par l'Expédition antarctique suédoise. I. Espèces de la région magellanique. *Bulletin de l'herbier Boissier, série 2*, 5: 997-1011.
- CARDOT J., 1908 — *La flore bryologique des terres magellaniques, de la Géorgie du Sud et de l'Antarctide*. In: *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901-1903 unter Leitung von Dr. Otto Nordenskjöld*. 4(8). Stockholm, Lithographisches Institut des Generalstabs, pp. 1-298 + pls. 1-11.

- CARDOT J., 1911 — Les mousses de l'Expédition nationale antarctique écossaise. *Transactions of the royal society of Edinburgh* 48: 67-82 + pls i-iii.
- CARDOT J. & BROTHERUS V.F., 1923 — Botanische Ergebnisse der Schwedischen Expedition nach Patagonien und dem Feuerlande 1907-1909. X. Les mousses. *Kongliga svenska vetenskapsakademiens handlingar* 63(10): 1-74 + pls. 1-4.
- CHURCHILL S.P., GRIFFIN D. III & MUÑOZ J., 2000 — A checklist of the mosses of the tropical Andean countries. *Ruizia* 17: 1-203.
- CHURCHILL S.P., SANJINES N.N. & ALDANA C.M., 2009 — *Catálogo de las briofitas de Bolivia: diversidad, distribución y ecología*. St. Louis: Missouri Botanical Garden and Santa Cruz de la Sierra, Bolivia: Museo de Historia Natural Noel Kempff Mercado. 340 p.
- CLIFFORD H.T., 1955 — On the distribution of *Rhacomitrium crispulum* (H.f. & W.) H.f. & W. *The bryologist* 58: 330-334.
- DEGUCHI H., 1984 — Studies on some Patagonian species of Grimmiaceae (Musci, Bryophyta). In: H. Inoue (ed.), *Studies on cryptogams in southern Chile*. Tokyo, Kenseisha, pp. 17-72.
- DIXON H.N., 1926 — Studies in the bryology of New Zealand, with special reference to the herbarium of Robert Brown, of Christchurch, New Zealand. Part IV. *New Zealand institute bulletin* 3: 153-238 + pl. ix.
- DIXON H.N., 1960 — Mosses of Tristan da Cunha. In: E. Christophersen (ed.), *Results of the Norwegian Scientific Expedition to Tristan da Cunha 1937-1938. No. 48*. Oslo, Kommissjon hos H. Aschehoug & Co. (W. Nygaard), pp. 1-49.
- DUMONT D'URVILLE J., 1826 — Flore des Malouines. *Mémoires des société linnéenne de Paris* 4: 573-621.
- D'URVILLE J., 1825 — Flore des Iles Malouines. Paris, de l'Imprimerie de Lebel. 56 p.
- ELLIS L.T., ASTHANA A.K., SAHU V., BEDNAREK-OCHYRA B.H., OCHYRA R., CANO M.J., COSTA D.P., CYKOWSKA B., OCHYRA R., PHILIPPOV D.A., DULIN M.V., ERZBERGER P., LÉBOUVIER M., MOHAMED H., OCHYRA R., ORGAZ J.D., PHEPHU N., VAN ROOY J., STEBEL A., SUÁREZ G.M., SCHIAVONE M.M., TOWNSEND C.C., VÁŇA J., VONČINA G., YAYINTAŞ Ö.T., YONG K.T. & ZANDER R.H. 2010 — New national and regional bryophyte records, 25. *Journal of bryology* 32: 311-322.
- ELLIS L.T., BEDNAREK-OCHYRA H., OCHYRA R., CALVO ARANDA S., COLOTTI M.T., SCHIAVONE M.M., DULIN M.V., ERZBERGER, P., EZER T., KARA R., GABRIEL R., HEDENÁS L., HOLYOAK D.T., ÓDOR P., PAPP B., SABOVLEVIĆ M., SEPELLT R.D., SMITH V.R., SOTIAUX A., SZURDOKI E., VANDERPOORTEN A., VAN ROOY J. & ŻARNOWIEC J., 2011a — New national and regional bryophyte records 26. *Journal of bryology* 33: 66-73.
- ELLIS L.T., ASTHANA A.K., SAHU V., SRIVASTAVA A., BEDNAREK-OCHYRA H., OCHYRA R., CHLACHULA J., COLOTTI M.T., SCHIAVONE M.M., HRADILEK Z., JIMENEZ M.S., KLAMA H., LÉBOUVIER M., NATCHEVA R., PÓCS T., PORLEY R.D., SÉRGIO C., SIM-SIM M., SMITH V.R., SÖDERSTRÖM L., ŞTEFĂNUŢ S., SUÁREZ G.M. & VÁŇA J., 2011b — New national and regional bryophyte records, 28. *Journal of bryology* 33: 237-247.
- ELLIS L.T., BEDNAREK-OCHYRA H., CYKOWSKA B., OCHYRA, R., GARCÍA C., SÉRGIO C., LÉBOUVIER M., MANOLAKI P., GIANNOURIS E., KADIS C., MARKOVÁ I., PAPP B., SZURDOKI E., PERALTA D.F., PLÁŠEK V., RISTOW R., SABOVLEVIĆ M., SIM-SIM M., SMITH V.R., TSAKIRI E., VÁŇA J., VIRCHENKO V.M. & BARSUKOV O.O., 2012a — New national and regional bryophyte records, 30. *Journal of bryology* 34: 45-51.
- ELLIS L.T., ALEGRO A., BEDNAREK-OCHYRA H., OCHYRA R., BERGAMINI A., COGONI A., ERZBERGER P., GÓRSKI P., GREMMEN N., HESPANHOL H., VIEIRA C., KURBATOVA L.E., LÉBOUVIER M., MARTINČIĆ A., ASTHANA A.K., GUPTA R., NATH V., NATCHEVA R., GANEVA A., ÖZDEMİR T., BATAN N., PLÁŠEK V., PORLEY R.D., RANDIĆ M., SAWICKI J., SCHRODER W., SÉRGIO C., SMITH V.R., SOLLMAN P., ŞTEFĂNUŢ S., STEVENSON C.R., SUÁREZ G.M., SURINA B., UYAR G. & SURINA Z.M., 2012b — New national and regional bryophyte records, 31. *Journal of bryology* 34: 123-134.
- ELLIS L.T., ASTHANA A.K., GUPTA R., NATH V., SAHU V., BEDNAREK-OCHYRA H., OCHYRA R., CYKOWSKA B., CALVO ARANDA S., FISCHER E., GABRIEL R., GÓRSKI P., GREMMEN N., HESPANHOL H., KURBATOVA L.E., LEWIS SMITH R.I., LONG D.G., BELL D., MOGRO F., SÉRGIO C., GARCIA C.A., STOW S., MARTINS A., SMITH V.R., VÁŇA J. & VANDERPOORTEN A., 2013a — New national and regional bryophyte records, 34. *Journal of bryology* 35: 62-70.
- ELLIS L.T., BEDNAREK-OCHYRA H., OCHYRA R., BENJUMEA M.J., SAÍS L.V., CAPARRÓS R., LARA F., MAZIMPAKA V., DULIN M.V., GARILLETI R., GREMMEN N.,



- GRUNDLING P.-L., HERAS P., INFANTE M., HUTTUNEN S., IGNATOV M.S., KORVENPÄÄ T., LÉBOUVIER M., LEWIS SMITH R.I., LIN S.-H., YANG J.-D., LINSTRÖM A., PLÁŠEK V., ROSSELLÓ J.A., SAWICKI J., VAN ROOY J., SMITH V.R., 2013b — New national and regional bryophyte records, 35. *Journal of bryology* 35: 129-139.
- ELLIS L.T., BAKALIN V.A., BAIŠEVA E., BEDNAREK-OCHYRA H., OCHYRA R., BOROVICHEV E.A., CHOI S.S., SUN B.-Y., ERZBERGER P., FEDOSOV V.E., GARILLETI R., ALBERTOS B., GÓRSKI P., HÁJKOVÁ P., HODGETTS N.G., IGNATOV M., KOCZUR A., KURBATOVA L.E., LÉBOUVIER M., MEŽÁKA A., MIRAVET J., PAWLIKOWSKI P., PORLEY R. D., ROSELLÓ J.A., SABOVLEVIĆ M.S., PANTOVIĆ J., SABOVLEVIĆ A., SCHRÖDER W., ŠTEFĀNUŢ S., SUÁREZ G.M., SCHIAVONE M., YAYINTAŞ Ö.T. & VÁNA J., 2013c — New national and regional bryophyte records, 36. *Journal of bryology* 35: 228-238.
- ELLIS L.T., AFONINA O.M., ASTHANA A.K., GUPTA R., SAHU V., NATH V., BATAN N., BEDNAREK-OCHYRA H., BENITEZ A., ERZBERGER P., FEDOSOV V.E., GÓRSKI P., GRADSTEIN S.R., GREMMEN N., HALLINGBÄCK T., HAGSTRÖM M., KÖCKINGER H., LÉBOUVIER M., MEINUNGER L., NÉMETH C., NOBIS M., NOWAK A., ÖZDEMİR T., PANTOVIĆ J., SABOVLEVIĆ A., SABOVLEVIĆ M.S., PAWLIKOWSKI P., PLÁŠEK V., ČÍHAL L., SAWICKI J., SÉRGIO C., MINISTRO P., GARCIA C.A., SMITH V.R., ŠTEFĀNUŢ S., STOW S., SUÁREZ G.M., FLORES J.R., THOUVENOT L., VÁNA J., VAN ROOY J. & ZANDER R.H., 2014a — New national and regional bryophyte records, 39. *Journal of bryology* 35: 134-151.
- ELLIS L.T., ALEFFI M., ASTHANA A.K., SRIVASTAVA A., BAKALIN V.A., BATAN N., ÖZDEMİR T., BEDNAREK-OCHYRA H., BOROVICHEV E.A., BRUGUÉS M., CANO M.J., CHOI S.S., DE BEER D., ECKSTEIN J., ERZBERGER P., FEDOSOV V.E., GANEVA A., NATCHEVA R., GARCIA C.A., SÉRGIO C., GARILLETI R., ALBERTOS B., PUCHE F., GÜCEL S., HIGUCHI M., HUGONNOT V., HYLANDER K., KIRMACI M., ASLAN G., KOPONEN T., LARA F., MAZIMPAKA V., VAN MELICK H., MÜLLER F., ÖZENOGLU KIREMIT H., PAPP B., SZURDOKI E., PLÁŠEK V., ČÍHAL L., VAN DER PLUIJM A., POPONESSI S., MARIOTTI M.G., REYNIERS J., SABOVLEVIĆ M.S., SAWICKI J., SMITH V.R., STEBEL A., ŠTEFĀNUŢ S., SUN B.-Y. & VÁNA J., 2014b — New national and regional bryophyte records, 40. *Journal of bryology* 36: 223-244.
- ENGEL J.J., 1990 — Falkland Islands (Islas Malvinas) Hepaticae and Anthocerotophyta: a taxonomic and phytogeographic study. *Fieldiana botany, new series* 25: i-viii + 1-209.
- FRISVOLL A.A., 1986 — Southern hemisphere synonyms of *Racomitrium sudeticum* (Funck) Bruch et Schimp. *Journal of bryology* 14: 339-346.
- FRISVOLL A.A., 1988 — A taxonomic revision of the *Racomitrium heterostichum* group (Bryophyta, Grimmiaceae) in N. and C. America, Europe and Asia. *Gunneria* 59: 1-289.
- GAUDICHAUD [CH.], 1825 — Rapport sur la Flore des Îles Malouines. *Annales des sciences naturelles* 5: 89-110.
- GAUDICHAUD-BEAUPRÉ CH., 1828 — *Voyage autour du monde, enterpris par ordre du roi, [...] exécute sur les corvettes de S.M. l'Uranie et la Physicienne, pendant les années 1817, 1818, 1819 et 1820*. Botanique Musci, Jussieu. 6. Paris, chez Pillet Ainé, pp. 221-230.
- GREENE D.M., 1986 — *A conspectus of the mosses of Antarctica, South Georgia, the Falkland Islands and southern South America*. Cambridge, British Antarctic Survey. 314 p.
- HOOKE J.D. & WILSON W., 1844 — Musci antarctici; being characters with brief descriptions of the new species of mosses discovered during the voyage of H.M. discovery ships, *Erebus* and *Terror*, in the southern circumpolar regions, together with those of Tasmania and New Zealand. *London journal of botany* 3: 533-556.
- LARRAÍN J., QUANDT D. & MUÑOZ J., 2014 — The discovery of mature sporophytes of *Racomitrium laevigatum* A.Jaeger (Grimmiaceae). *Journal of bryology* 36: 295-299.
- LAWTON E., 1973 — *Rhacomitrium crispulum* and some related species. *Bulletin of the Torrey botanical club* 100: 230-235.
- MATTERI C.M., 1986 — Los Musci (Bryophyta) de las Islas Malvinas, su habitat y distribución. *Nova Hedwigia* 43: 159-189 (in Spanish with English summary).
- MATTERI C.M., 2003 — Los musgos (Bryophyta) de Argentina. *Tropical bryology* 24: 33-100.
- MITTEN W., 1876 — The Musci and Hepaticae collected by H. N. Moseley, M. A., naturalist to H. M. S. "Challenger". *The journal of the linnean society botany* 15: 59-73.
- MÜLLER C., 1849 — *Synopsis muscorum frondosorum omnium hucusque cognitorum. Pars prima. Musci vegetationis acrocarpicae*. Berolini, sumtibus Alb. Forstner. viii + 812 p.
- OCHYRA R., 1985a — *Hypnobartlettia fontana* gen. et sp. nov. (Musci: Hypnobartletticiae fam. nov.), a unique moss from New Zealand. *Lindbergia* 11: 2-8.

- OCHYRA R., 1985b — *Koponenia*, a new pleurocarpous moss genus from Bolivia. *Journal of bryology* 13: 479-486.
- OCHYRA R., 1987 — On the taxonomy and family placement of the moss genus *Limbella* (C. Muell.) Broth. *Journal of bryology* 14: 465-485.
- OCHYRA R., SÉRGIO C. & SCHUMACKER R., 1988 — *Racomitrium lamprocarpum* (C. Muell.) Jaeg., an austral moss disjunct in Portugal, with taxonomic and phytogeographic notes. *Bulletin du jardin botanique national de Belgique* 58: 225-258.
- OCHYRA R. & HERTEL H., 1990 — Contribution to the moss flora of the subantarctic island Marion. *Polish botanical studies* 1: 19-34.
- OCHYRA R., 1993 — Taxonomic results of the BRYOTROP Expedition to Zaire and Rwanda. 20. Grimmiaceae, Funariaceae, Bartramiaceae (*Philonotis*), Amblystegiaceae, Plagiotheciaceae. *Tropical bryology* 8: 181-187.
- OCHYRA R. & LEWIS SMITH R.I. 1998 — Antarctic species in the genus *Ditrichum* (Ditrichaceae, Bryopsida), with a description of *D. gemmiferum* sp. nov. *Annales botanici fennici* 35: 33-53.
- OCHYRA R. & VANDERPOORTEN A., 1999 — *Platyhypnidium mutatum*, a mysterious new moss from Germany. *Journal of bryology* 21: 183-189.
- OCHYRA R., BEDNAREK-OCHYRA H. & LEWIS SMITH R.I., 2002 — New and rare moss species from subantarctic South Georgia. *Nova Hedwigia* 74: 121-147.
- OCHYRA R., ŻARNOWIEC J. & BEDNAREK-OCHYRA H., 2003 — *Census catalogue of Polish mosses*. Kraków, Polish Academy of Sciences, Institute of Botany. 372 p.
- OCHYRA R. & BROUGHTON D.A., 2004 — Additions to the moss flora of the Falkland Islands. *Journal of bryology* 26: 232-236.
- OCHYRA R., LEWIS SMITH R.I. & BEDNAREK-OCHYRA H., 2008a — *The illustrated moss flora of Antarctica*. Cambridge, Cambridge University Press. xvii + 685 p. [+ 24 p. with plates].
- OCHYRA R., BEDNAREK-OCHYRA H. & LEWIS SMITH R.I., 2008b — New and rare moss species from the Antarctic. *Nova Hedwigia* 87: 457-477.
- OCHYRA R. & VAN ROOY J., 2013 — Distribution of *Bucklandiella lamprocarpa* (Grimmiaceae, Musci) in South Africa. *Cryptogamie, Bryologie* 34: 359-366.
- ROBINSON H., 1975 — The mosses of Juan Fernandez Islands. *Smithsonian Contributions to Botany* 27: I-iv + 1-88.
- ROIVAINEN R., 1955 — Contribution to the Fuegian species of the genus *Racomitrium* Bridel. *Archivum societatis zoologicae bōtanicae fennicae "Vanamo"* 9: 85-98.
- SAWICKI J., SZCZECIŃSKA M., BEDNAREK-OCHYRA H. & OCHYRA R., 2015 — Mitochondrial phylogenomics supports splitting the traditionally conceived genus *Racomitrium* (Bryophyta: Grimmiaceae). *Nova Hedwigia* 100: 293-317.
- SAYRE G., 1975 — Cryptogamae exsiccatae — an annotated bibliography of published exsiccatae of Algae, Lichenes, Hepaticae, and Musci. V. Unpublished exsiccatae. 1. Collectors. *Memoirs of the New York botanical garden* 19(3): 277-423.
- SKOTTSBERG C., 1913 — Botanische Ergebnisse der Schwedischen Expedition nach Patagonien und dem Feuerlande 1907-1909. III. A botanical survey of the Falkland Islands. *Kongliga svenska vetenskapsakademiens handlingar* 50(3): 1-129 + pls. 1-14.
- VAN DER PUTTEN N., STIEPERAERE H., VERBRUGGEN C. & OCHYRA R., 2004 — Holocene palaeoecology and climate history of South Georgia (sub-Antarctica) based on a macrofossil record of bryophytes and seeds. *The holocene* 14: 382-392.
- VAN DER PUTTEN N., VERBRUGGEN C., OCHYRA R., VERLEYEN E. & FRENOT Y., 2010 — Subantarctic flowering plants: pre-glacial survivors or post-glacial immigrants? *Journal of biogeography* 37: 582-592.
- VITT D.H. & MARSH C., 1988 — Population variation and phytogeography of *Racomitrium lanuginosum* and *R. pruinosum*. *Nova Hedwigia Beihefte* 90: 235-260.
- WILSON W. & HOOKER J.D., 1847 — Musci. In: Hooker J.D., *The botany of the Antarctic voyage of H. M. discovery ships Erebus and Terror in the years 1839-1843, under the command of Captain Sir James Clark Ross, Kt., R.N., F.R.S., &c. I. Flora Antarctica. Part. II., Botany of Fuegia, the Falklands, Kerguelen's Land, etc.* London, Reeve Brothers, pp. 395-423, 550-551 + pls. cli-clv.