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THE MOSS FLORA OF OSTROV GEOLOGOV (GEOLOGISTS ISLAND), MAXWELL BAY, KING GEORGE ISLAND, ANTARCTICA

PAULO E.A.S. CÂMARA^{1,2}, BARBARA GUEDES COSTA SILVA¹, MICHELINE CARVALHO-SILVA^{1,3} and DIEGO KNOP HENRIQUES¹

Summary: Located of the east coast of Fildes Peninsula, South of Ardley Island, at King George Island, Ostrov Geologov (Geologist Islands) is a small island with 0.25 miles long. It only had one plant record published so far. We have conducted extensive fieldwork on the site and provide here a comprehensive checklist and a key for the moss species occurring on the island. Despite its small size, the island contains about 35% of all the Fildes Peninsula moss flora, six new records were found. The pristine state of the island due to its relative isolation, presence of avian nesting sites and a relatively rich moss flora are strong arguments in favor of protection status for the island.

Key words: Antarctica, Bryophyta, Fildes Peninsula, moss.

Resumen: Flora de musgos de Ostrov Geologov (Isla de los Geólogos), Maxwell Bay, King George Island, Antártica. Ubicada en la costa este de la Península Fildes, al sur de la isla Ardley en Isla 25 de Mayo, la isla del Geólogo es una pequeña isla con 0.5 Km de extensión. Hasta ahora, solo existe un registro de planta. Hemos realizado colecciones y presentamos una lista y una clave para las especies de musgos que ocurren en la isla. Aunque de pequeño tamaño, la isla posee cerca de 35% de todas las especies de musgos que ocurren en la península Fildes y seis nuevos registros fueron encontrados. Su relativo aislamiento de los turistas es un factor que contribuye para su preservación.

Palabras clave: Antártica, Bryophyta, Fildes, musgos.

INTRODUCTION

Antarctica and its surrounding islands are considered one of the most isolated places in the world, making this continent a unique place for biodiversity and environmental studies. The South Shetlands archipelago is located north of the Antarctic Peninsula. It has cold moist maritime climate and longer snow free period when compared with the continental areas (Lewis Smith, 1984). Such conditions favor the development of vegetation (especially cryptogamic), making the South Shetlands a place rich in plant and lichen species (Ochyra *et al.*, 2008).

The King George Island is the biggest island in the South Shetlands and houses several scientific stations and field huts from different countries, making it one of the areas with more human activity in Antarctica. This is specially seen in Fildes Peninsula, situated in the southwestern portion of King George, where 5 stations and the Chilean airport are located (Peter, 2008). The Fildes region is home to several protected species and counts with two protected areas (ASPAs 125 and ASPA 150). The ASPA 150 comprises the island of Ardley, located in the Maxwell Bay. Ardley harbours of an outstanding flora, with several species of lichens, mosses and vascular plants (Environment Protocol, 2009).

South of Ardley, outside the protected area, is the small island of Ostrov Geologov, translated from the Russian as Geologist Island also known as isla Catedral in Chilean toponymy. It is 0.25 miles long and approximately 78,765 m², located just

¹ Universidade de Brasília, Departamento de Botânica, Brasília, DF, Brasil.

² pcamara@unb.br (Corresponding author)

³ Universidade Federal dos Vales do Jequitinhonha e Mucuri, Campus Unaf.

south of Ardley Island at Fildes Peninsula in King George Island (62°13'18"S and 58°56'35"W) with elevations reaching up to 35 m above sea level.

The island is rarely visited and is not on the tourist route and is likely to contain very few science activities. Peter *et al.* (2008) considered its northern part as a sensitive area due to the presence of breeding sites for giant Petrels (*Macronectes giganteus*).

The flora of Ostrov Geologov remains largely unknown, as only one plant has been reported for the site so far: *Hypnum revolutum* (Mitt.) Lindb. By Ochyra *et al.* (2008), and a comprehensive checklist for the island is still missing.

Areas in Antarctic are always of conservation interest, and this can only be achieved by better knowledge of its flora and fauna. It is our hope that data provided here will increase this knowledge helping with future decision processes towards the conservation of this site.

In order to fill the gap in the knowledge of Ostrov Geologov's flora, an expedition was set in order to collect the mosses of the island. The plants were identified and a list of species and identification key is provided.

METHODS

A field survey was carried during the summer of 2017, and samples were collected all over the area. Due to the small size of the site, only one field trip was needed. Collections were made according to Schofield (1984) and vouchers are deposited at herbarium UB - University of Brasília. Classification system follows Goffinet *et al.* (2009). Identifications were done with the use of proper literature (mostly Ochyra *et al.*, 2008) using a dissecting and compound microscope. Voucher specimens are listed in table 1.

RESULTS

Collections resulted in 89 samples, belonging to 17 species divided among 10 genera and nine families. This represents ca. 35% of the moss flora of Fildes Peninsula and ca. 15% of the known species in Antarctic (Ochyra *et al.*, 2008). The most diverse family is Pottiaceae with two genera and

five species, of which *Syntrichia* is the most diverse genus with three species. Most of the vegetation is being formed by big carpets of *Sanionia uncinata* (Hedw.) Loeske, that virtually dominates the landscape. Six new records for Fildes Peninsula and the Maxwell Bay region are reported here, marked with asterisks in the species list below.

Species list (asterisks mark new records for the Fildes region)

- Amblystegiaceae
 - Sanionia uncinata* (Hedw.) Loeske
- Andreaeaceae
 - Andreaea gainii* Cardot
 - Andreaea regularis* Müll.Hal.
- Batramiaceae
 - Bartramia patens* Brid.
- Brachytheciaceae
 - Brachythecium austrosalebrosum* (Müll.Hal.) Kindb.
- Bryaceae
 - Bryum argenteum* Hedw.*
 - Bryum orbiculatifolium* Cardot & Broth.*
 - Bryum pseudotriquetrum* (Hedw.) P.Gaertn., B.Mey. & Scherb.
- Ditrichaceae
 - Ceratodon purpureus* (Hedw.) Brid.
- Grimmiaceae
 - Schistidium andinum* (Mitt.) Herzog *
 - Schistidium lewis-smithii* Ochyra *
- Hypnaceae
 - Hypnum revolutum* (Mitt.) Lindb.
- Pottiaceae
 - Henediella antarctica* (Ångstr.) Ochyra & Matteri *
 - Henediella heimii* (Hedw.) R.H. Zander *
 - Syntrichia magellanica* (Mont.) R.H. Zander
 - Syntrichia saxicola* (Cardot) R.H. Zander
 - Syntrichia filaris* (Müll.Hal.) R.H.Zander

Comments on some species distribution:

- *Bartramia patens* has been reported for Fildes region only once, limited to lake Kitezh region and this is the second report.
- *Bryum argenteum* has been reported from King George Island but not for the Fildes Peninsula or Maxwell Bay and adjacent areas. It is considered by Ochyra *et al.* (2008) as rare in the South Shetlands (reported only from the islands of King George (Admiralty Bay) and Deception). We

preferred to use *B. argenteum* as *sensu lato* and did not differentiated between the two varieties recognized in Antarctica; we hope that DNA studies will improve our understanding of the real identity of those taxa.

- According to Ochyra *et al.* (2008) *Bryum orbiculatifolium* has not yet been reported for King George Island, but in the South Shetlands is reported only for Deception island.
- *Hennediella Antarctica* has been reported from King George Island but not for the Fildes Peninsula or Maxwell Bay and adjacent areas. According to Ochyra *et al.* (2008) it is rare but widely scattered in the South Shetlands, been reported for King George Island (Admiralty Bay, Bransfield Strait, Drake Passage and Potter Peninsula), Greenwich island, Livingston island (Byers and Hurd peninsula) and Deception island.
- *Hennediella heimii* has been reported from King George Island but not for the Fildes Peninsula or Maxwell Bay and adjacent areas. According

to Ochyra *et al.* (2008) it is widely distributed in the South Shetlands, with reports from Elephant, Clarence, as pland and Gibbs islands, King George Island (Admiralty Bay and Potter Cove), Livingston (Byers peninsula) and Deception islands.

- *Schistidium andinum* has been reported from King George Island but not for the Fildes Peninsula or Maxwell Bay and adjacent areas. According to Ochyra *et al.* (2008) the species is rare and only occasionally found in the South Shetlands, with reports for King George Island (Admiralty Bay), Livingston Island (Byers and Hurd Peninsula) and Deception island.
- *Schistidium lewis-smithii* has been reported from King George Island but not for the Fildes Peninsula or Maxwell Bay and adjacent areas. According to Ochyra *et al.* (2008) the species is rare and only known from two collections in King George Island (Admiralty Bay) and Livingston island (Byers peninsula).

Key to the mosses of Ostrov Geologov

1. Plants pleurocarpous.	2
2. Costa short and double.	<i>Hypnum revolutum</i>
2'. Costa single.	3
3. Leaves falcate secund.	<i>Sanionia uncinata</i>
3'. Leaves straight.	<i>Brachythecium austrosalebrosum</i>
1'. Plants acrocarpous.	4
4. Leaves ecostate.	5
5. Leaves lanceolate.	<i>Andreaea gainii</i>
5'. Leaves panduriform.	<i>Andreaea regularis</i>
4'. Leaves costate.	6
6. Hyaline cells present at leaf base.	7
7. Subulapresent, hyaline cells papillose.	<i>Bartramia patens</i>
7'. Subula absent, hyaline cells smooth.	8
8. Laminal cells epapillose, hyaline cells occupying then tire base.	9
9. Apex serrulate.	<i>Ceratodon purpureus</i>
9'. Apex smooth.	10
10. Leaf margin plane.	<i>Schistidium lewis-smithii</i>
10'. Leaf margin recurved or revolute.	<i>Schistidium andinum</i>
8'. Laminal cells papillose, hyaline cells surrounded by at least one row of non hyaline ones. .	11
11. Long hyaline awn present.	<i>Syntrichia magellanica</i>
11'. Long hyaline awn absent.	12

12. Costa excurrent. *Syntrichia saxicola*
 12'. Costa percurrent. *Syntrichia filaris*
 6'. Hyaline cells absent from leaf base. 13
 13. Leaves marginal border absent or indistinct. *Hennediella heimii*
 13'. Leaves with distinct margin of elongate cells. 14
 14. Basal leaves papillose. *Hennediella antarctica*
 14'. Basal leaves smooth. 15
 15. Upper half of the leaf hyaline, silver. *Bryum argenteum*
 15'. Upper and lower half of leaf same, green. 16
 16. Leaf base red, lanceolate or oblong-lanceolate. *Bryum pseudotriquetrum*
 16'. Leaf base green, leaves orbicular. *Bryum orbiculatifolium*

Final Considerations

The moss flora of Ostrov Geologov, which consists of about 35% of all mosses known from the Fildes region is quite diverse for its size (only 0.25 miles long).

Its location, out of the interests of tourists and with few scientific studies made, has resulted in a quite undisturbed area, free of garbage and pollution, which are sometimes quite frequent in Fildes as the direct result of human occupation. Those facts as well as the presence of avian nesting sites observed on the island, makes this area an important site for preservation. It is our hope that this floristic survey will contribute to the knowledge needed for the conservation of the island.

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Table 1. Voucher information (note that is common that species grow associated causing number duplication):

Andreaea gainii: Câmara et al. 4044, 4048.
Andreaea regularis: Câmara et al. 4066. *Bartramia*

patens: Henriques et al. 217, 219, 232, 234.
Brachythecium austrosalebrosom: Câmara et al. 4043. *Bryum argenteum*: Câmara et al. 4024, 4033, 4038, 4039, 4042. *Bryum orbiculatifolium*: Henriques et al. 225, 226. *Bryum pseudotriquetrum*: Câmara et al. 4032, 4034, 4037a, 4043, 4065. *Ceratodon purpureus*: Câmara et al. 4068. *Hennediella antarctica*: Câmara et al. 4024, 4037. *Hennediella heimii*: Câmara et al. 4034, 4068. *Hypnum revolutum*: Câmara et al. 4055, 4063a; Henriques et al. 233. *Sanionia uncinata*: Câmara et al. 4020, 4021, 4022, 4023, 4024, 4025, 4026, 4029, 4032, 4034, 4035, 4036, 4037, 4038, 4039, 4041, 4043, 4045, 4046, 4047, 4054, 4055, 4056, 4063. *Schistidium andinum*: Câmara et al. 4020. *Schistidium lewis-smithii*: Câmara et al. 4026, 4027, 4050, 4067, 4067. *Syntrichia magellanica*: Câmara et al. 4020, 4022, 4028, 4049, 4059, 4063; Henriques et al. 228. *Syntrichia saxicola*: Câmara et al. 4021, 4024, 4029, 4031, 4032, 4038, 4040, 4043, 4046, 4047, 4049, 4051, 4052, 4053, 4056, 4060, 4061, 4062, 4064; Henriques et al. 229, 230. *Syntrichia filaris*: Câmara et al. 4030, 4063; Henriques et al. 227.

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