PLANT COMMUNITIES FROM ICE-FREE AREAS OF DEMAY POINT, KING GEORGE ISLAND, ANTARCTICA

<http://dx.doi.org/10.4322/apa.2014.024>

Antonio Batista Pereira^{1,*}, Márcio Rocha Francelino², Valdir Marcos Stefenon¹,
Adriano Luis Schünemann¹, Luiz Fernando Wurdig Roesch¹

¹Universidade Federal do Pampa – UNIPAMPA, São Gabriel, RS, Brazil

²Universidade Federal Rural do Rio de Janeiro – UFRRJ, Seropédica, RJ, Brazil

*e-mail: anbatistape@gmail.com

Abstract: *This research presents the study of plant communities in ice-free areas of Demay Point, which is located at the south of the Admiralty Bay, King George Island, Antarctica. The aim of this research was to collect data about the plant coverage, classification and distribution of plant communities, contributing with the evaluation of possible environmental impacts of anthropogenic or natural origin, following the evolution of such communities over the length of time. The study started with the classification and description of the plant communities based mainly on the plant physiognomy, biodiversity and the relation with local abiotic factors. Each community was mapped with an Astech Promark II DGPS and the data was processed using AstechSolutions software to obtain sub-metric accuracy. Seven plant communities were identified and described as: 1 Grass and cushion chamaephyte formation; 1.2 Deschampsia and mosses subformation; 2 Moss carpet formation; 3 Moss hummock formation; 4 Moss tuft formation; 5 Fruticose lichen and moss tuft formation and 6 Fellfield communities. These plant communities are shown in a map, with their description.*

Keywords: vegetation, plant coverage, King George Island, Antarctica

Introduction

Demay Point is an ice-free area located in the south of Admiralty Bay, within the SSSI 8, being delimited by the Baranowski Glacier to the North and by Windy Glacier to the South. Since it is located within an area of scientific interest, very important for preservation and rich in plant communities, it constitutes an excellent ecosystem for monitoring plant communities.

Regarding the study of plant communities of Antarctica, one of the first attempts of describing the plant populations occurring in ice-free areas of this continent was made by Skottsberg (1912), who identified and classified some lichens and moss communities, based mainly on the physiognomy of the plant formations. A further piece of research describing the plant formations from Antarctica – performed by

Allison and Lewis-Smith (1973), using mainly quantitative characters from the populations – was completed just six decades after the work of Skottsberg. Lewis-Smith (1988) was one of the first to present a classification for population groups of the plant communities of Antarctica, clustering them in formations and sub-formations. Pereira and Putzke (1994) presented a study of the plant communities of Stinker Point, Elephant Island, Antarctica, in which they classified the plant communities based mainly on the work of Lewis-Smith and Gimingham (1976). Putzke and Pereira (1998) presented a study of the moss communities of the Rip Point, Nelson Island, Antarctica, using the quadrat method.

In addition to these studies, there is the work of Pereira *et al.* (2007), presenting a map with the description

and distribution of the plant communities of the Keller Peninsula, King George Island, and the work of Victoria *et al.* (2009), about the composition and distribution of the moss formations in ice-free areas near the Polish Station Arctowski, King George Island, South Shetlands.

The present study had the purpose of collecting and registering data about the diversity and the plant coverage of ice-free areas in Antarctica, given that these aspects are outstanding indicators of environmental changes. Because it is an area of environmental protection, this data is important for an evaluation of the environmental impacts of both, anthropogenic and natural origin.

Material and Method

The study of the vegetation of ice-free areas in Demay Point started with the identification of the most representative populations (Figures 1 and 2). The studies of Putzke and Pereira (2001) and Ochyra (1998) were used for

the identification of moss and the research work of Øvstedal and Lewis-Smith (2001) and of Redón (1985), for the identification of lichens. In some areas, the quadrat method, modified from Braun-Blanquet (1964), was employed. Based on the data collected, the plant communities were identified and classified according to Pereira and Putzke (1994) and Lewis-Smith and Gimingham (1976).

The plant communities were geo-referenced and mapped utilizing the Astech Promark II® DGPS, which is able to obtain sub-metric accuracy after processing the data with Astech Solutions® software, based on data from the active GPS station of the Comandante Ferraz Brazilian Antarctic Base.

Results and Discussion

This is the first study on vegetation cover and distribution of plant communities at Demay Point, hence there is no historical data to be discussed and compared for this area.

Figure 1. Location of study area.

Figure 2. Spatial distribution of vegetation communities in Demay Point, King George Island, Antarctica.

Based primarily on the biodiversity and physiognomy, it was possible to recognize six plant formations and one subformation (Figure 2), which can be clearly identified and delimited:

Grass and cushion chamaephyte formation

These formations were present in two areas situated close to the beach. In these communities, the soil is usually deep, originating mainly from the sediments carried by the water from the melting process. The floristic composition is formed mostly by dense populations of *Deschampsia antarctica* Desv. (*Poaceae*) and rare grass turf of *Colobanthus quitensis* (Kunth.) Bart. (*Caryophyllaceae*). The moss is represented by small and rare populations of *Sanionia uncinata* Hedw. Loeske. Populations of *Bryum* spp. occur in wet places, mostly along the drainage lines.

Deschampsia and moss subformation

These subformations were represented by a small, discontinuous formation located near the beach, in the central part of the studied region (Figure 2). This is an area with relatively well-differentiated soil, originated mostly from the decomposition of sediments carried by the water from the defrosting process. The vegetation is composed of *Deschampsia antarctica* associated with *Colobanthus quitensis*. The moss populations are more representative than in the *Deschampsias* communities. Among the moss species, *Sanionia uncinata*, *Bryum* spp. and *Polytrichastrum alpinum* (Hedw.) G.L.Sm. represent the higher biomass.

Moss carpet formation

The moss carpet formations were usually located in fairly flat areas, in the coastal region, formed by jackstone or by

small rock fragments. In this substrate, the species with higher biomass are mainly *Sanionia uncinata*, with rare grass turf of *Deschampsia antarctica*. In sites where there is soil or deposit of thin sediments, the most abundant populations are formed by *Polytrichum juniperinum* in areas without the influence of guano. Where guano is present, the most common *Politrichaceae* is *Polytrichastrum alpinum*, both associated with *Bryum* spp. and *Syntrichia* spp..

Moss hummock formation

These communities were very similar to the *Deschampsia* and moss communities. The main difference is the higher biomass and higher biodiversity of moss associated with flowering plants. The most frequent moss populations were of *Polytrichastrum alpinum*, *Polytrichum juniperinum* Hedw. and *Syntrichia princeps* (De Not.) Mitt. Populations of *Bryum* spp. occurred in wet areas and along drainage lines. These communities can be found frequently in areas with soil, represented by large formations along the beach in the central region of Demay Point.

Moss tuft formation

The moss tuft formations are characterized primarily by a floristic composition where moss populations predominate, without forming carpets or cushions, since the populations usually are isolated in small, more or less discontinuous spots. The biodiversity depends mainly on the presence of soil and the influence of guano. While *Polytrichastrum alpinum*, which is ornithocoprophilic, occurs primarily in areas near the bird colonies, *Polytrichum juniperinum*, which is ornithocoprophobous, grows in regions distant from the guano. Other moss species like *Syntrichia* spp. and *Bryum* spp. are frequent. *Deschampsia antarctica* and *Colobanthus quitenses* are represented by small and rare grass turf. In Demay Point, this community is represented in the north extremity, by a small area.

Fruticose lichen and moss tuft formation

The Fruticose lichen and moss tuft formations are characterized mainly by the predominance of *Usnea aurantiaco-atra* (Jacq.) Bory and *Usnea antarctica* Du Rietz. populations. Other species of fruticulous lichens usually

associated with lichen communities of the region are less representative in these areas. These communities occur in areas with predominance of big blocks of rock or of rocky outcrops, without soil formation. Moss populations are less frequent. Populations made up of representatives of the genus *Pohlia* can appear in wet locations among the rocks with soil decomposition. Populations of *Sanionia uncinata* and *Polytrichum juniperinum* can occur in other places. *Polytrichastrum alpinum* can happen in places of bird nesting.

Fellfield communities

In Demay Point, fellfield communities occupy the biggest areas in terms of extension. In these areas, the substrate available for the plant populations are areas with deposition of rock fragments or coarse non-consolidate sediments frequently moved and washed by the water from the defrosting process. The vegetation is usually represented by rare and small grass turf of *Colobanthus quitensis* and *Deschampsia antarctica*. The most representative mosses are small populations of *Sanionia uncinata*, *Syntrichia* spp. and *Bryum* spp., among others.

Conclusion

The vegetation of Demay Point is apparently a continuity occurring in the region of Copacabana and in the coastal areas of Punta Thomas. However, it differs from the last ones by the little influence of the guano, since the population of birds is much smaller. Since it is located at the entrance of Admiralty Bay, the vegetation is different from the vegetation occurring in other areas with lower influence of the guano, like the Keller Peninsula and Hannequim Point, due to the fact that these areas face towards the interior of the bay, free of the action of the humidity from the winds of the open sea.

The total vegetation cover on the studied areas is described as follows: Glass and cushion chamaephyte formation represents 2.43%, *Deschampsia* and moss sub-formations 0.09%, Moss carpet formations 2.52%, Moss hummock formations 1.69%, Fruticose lichen and moss tuft formations 11.53% and Fellfield communities 81.73%.

Acknowledgements

This work was supported by the Brazilian Antarctic Program through the CNPq (process nº. 574018/2008), FAPERJ (process E-26/170.023/2008), Ministry of Environment – MMA, Ministry of Science and Technology – MCT and CIRM.

References

- Allison, S.E. & Lewis-Smith, R.I. (1973). The vegetation of Elephant Island, South Shetland Island. *British Antarctic Survey Bulletin*, 33-34: 185-212.
- Braun-Blanquet, J. (1964). *Plant Sociology: The study of plant communities*. New York, McGraw-Hill.
- Lewis-Smith, R.I. (1988). Classification and ordination of cryptogamic communities in Wilkes Land, Continental Antarctica. *Vegetatio* 76: 155-66.
- Lewis-Smith, R.I. & Gimingham, C.H. (1976). Classification of cryptogamic communities in the maritime Antarctic. *British Antarctic Survey Bulletin*, 33-34: 89-122.
- Ochyra, R. (1998). The moss flora of King George Island Antarctica. Polish Academy of Sciences. Cracow, 198 p.
- Øvstedal, D.O. & Lewis-Smith, R.I. (2001). *Lichens of Antarctica and South Georgia – A guide to their identification and ecology*. Studies in Polar Research. Cambridge University Press. 411p.
- Pereira, A.B. & Putzke, J. (1994). Floristic composition of Stinker Point. Elephant Island, Antarctica. *Korean Journal of Polar Research*, 5(2): 37-47.
- Pereira, A.B.; Spielmann, A.A.; Martins, M.F.N. & Francelino, M. R. (2007) Plant Communities from ice-free areas of Keller Peninsula, King George Island, Antarctica. *Oecologia Brasiliensis*, 10(1): 14-22.
- Putzke, J. & Pereira, A.B. (1998). Moss communities of Rip Point in Northern Nelson Island, Antarctica. *Pesquisa Antártica Brasileira*, 3(1): 104-15.
- Putzke J. & Pereira, A.B. (2001). The Antarctic Moss with special reference to the Shetland Island. Canoas. Ed. ULBRA.
- Redón, J. (1985). *Líquenes Antárticos*. Instituto Antártico Chileno (INACH), Santiago de Chile. 123p.
- Skottsberg, C.J.E. (1912). Einige Bemerkung über die Vegetationsverhältnisse des Grahamlandes. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar Expedition - 1901-1903*, 4(13):1-16.
- Victoria, F.C.; Pereira, A.B. & Costa, D.P. (2009). Composition and distribution of moss formations in the ice-free areas adjoining the Arctowski region, Admiralty Bay, King George Island, Antarctica. *Iheringia Série Botânica*, 64(1): 81-91.