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PHYTOSOCIOLOGICAL APPROACH OF LICHENS IN THE ICE-FREE AREAS ADJOINING THE ARCTOWSKI REGION, ADMIRALTY BAY, KING GEORGE ISLAND, ANTARCTICA

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Abstract: *The Antarctic lichens have been used as bioindicators in biomonitoring studies, having an important contribution to the floristic composition, and its existence is dependent on ice-free regions. The phytosociological data were obtained according to the Braun-Blanquet sampling method. This study compares the lichen formation of Arctowski region, using data collected during the Brazilian Antarctic Program expedition conducted in the austral summer of 2003/2004 and 2012/2013. According to data collected at the moment, increases of the lichens occurrences in the plant formations in the region were found. Studies indicate that abiotic factors, once linked to local factors can to affect the distribution of the communities in the environment. This essay suggests the fragility of lichen formation in the ice-free areas of Arctowski region. However, a long term evaluation as necessary to confirm this hypothesis. The phytosociological studies can contribute to the management of scientific activities involved with the Brazilian Antarctic Program.*

Keywords: Antarctic Plant Communities; Lichenized Fungi; Bioindicators

Introduction

Rocks and volcanic sediment compose the landscape of the Arctowski region (Holdgate, 1977), as well whale skeletons deposited as remains of the whaling activities during the nineteenth and early twentieth centuries (Headland, 1990; Coleman, 1995). The Antarctic lichens have been used in studies of environmental monitoring, bioaccumulation and global warming (Sancho & Pintado, 2004). These species can withstand long periods of drought and resist freezing temperatures. These adaptations have implications for growth and survival particularly in response to climate change and human activities (Øvstedal & Lewis-Smith, 2001). Lichenized fungi have an important contribution to the floristic composition in these areas, and its existence is dependent on ice-free areas (Kappen & Schroeter, 1997).

The aim of this work is to compare the lichen formations in the ice-free areas of the Arctowski region, based on

phytosociological data obtained in the Antarctic Expeditions of the Brazilian Antarctic Program, held during the austral summer of 2003/2004 and 2012/2013.

Materials and Methods

During the austral summer of 2003/2004 and 2012/2013, members of the Antarctic Expedition of the Brazilian Antarctic Program studied the cryptogamic communities, adjoining the Polish H. Arctowski Station and the beach close to the Ecology Glacier (Figure 1).

The data was obtained from a survey using Braun-Blanquet phytosociological method (Braun-Blanquet, 1964), adapted to Antarctic conditions (Kanda, 1986) (Figure 2). In order to illustrate the species in the total sampling, the Index of Ecological Importance – IES was applied (Lara & Mazimpaka, 1998).

Figure 1. Left: Location of the study area. Arctowski region. Right: Polish H. Arctowski Station and Ecology Glacier, Admiralty Bay, King George Island.

Figure 2. The use of Braun-Blanquet phytosociological method in Arctowski region.

Results

According to the data obtained, the specie *Usnea aurantiacoatra* (Jacq.) Bory showed the highest index of ecological importance, seven-fold increase in a period ten years (IES 15 to 101.12), outperforming the *Usnea antarctica* Du Rietz, previously had the highest value. The *Cladonia* spp. and *Cornicularia* sp. presented a lower value of IES, compared to the study conducted the austral summer of 2003/2004 (Figure 3).

Discussion

Studies conducted in the austral summer of 2003/2004, reports the association of lichens with moss formations (Victoria *et al.*, 2009). According to data collected in the 2012/2013 austral summer, an increase of lichens occurrences in the most common plant formations in the region were found.

The vegetation of continental Antarctic is limited by the availability of free water, and your distribution, depend on light incidence. Studies indicate that abiotic factors, once linked to local factors affecting the distribution of these communities in the environment (Kennedy, 1993; Pereira & Putzke, 1994; Seppelt *et al.*, 2010).

The IES values found in the present approach suggests changes may be occurring, due to environmental effects, not yet known, however related to the increase in annual average temperatures in the region, since some lichens genus mentioned in this paper respond to this factor (Figuroa, 1985; Victoria & Pereira, 2007).

Conclusion

This essay suggests the fragility of lichen formation in the ice-free areas of Arctowski region. However, a long term evaluation as necessary to confirm this hypothesis. The increase in the IES can be attributed to a better adaptation of these species to local environmental conditions that

Figure 3. IES comparison of four species of Antarctic lichens between the austral summer of 2003/2004 and 2012/2013.

can be influenced by global warming, thus affecting the distribution of these communities in the environment. The phytosociological studies can contribute to the management of scientific activities involved with the Brazilian Antarctic Program.

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