PHYTOSOCIOLOGY APPROACH OF PLANTS COMMUNITIES IN STINKER POINT, ELEPHANT ISLAND, ANTARCTICA IN THE 2011/2012 AUSTRAL SUMMER

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Abstract : Elephant Island is located at 61° 07' S and 55° 03' W in the north of the South Shetland Islands. Stinker Point is the largest ice-free coastal area along Elephant Island, showing the highest level of richness of the island's fauna and flora. The Antarctic biome is affected by its geographical isolation and special climatic conditions. The objective of this work is to define the most important species at Stinker Point, Elephant Island being the base index of ecological importance. The phytosociological study was conducted using the method of the quadrats. The sampling was done in the austral summer to 2012 in ice-free areas of Stinker Point. To obtain the importance of the species at the points of sampling the index of ecological significance (IES) was applied. Twenty-two different sites in the ice-free areas were sampled in this study and 70 species until now (including algae, liverworts, mosses, lichens, mushrooms and angiosperms) were identified. Thirty-four species have an IES higher than 50, being *Sanionia uncinata* (Hedw.) Loeske the most important species.

Key word: ecological significance, mosses, lichens, flowering plants

Introduction

The Antarctic continent is one of the harshest habitats in the world, especially for Antarctic flowering plants, lichens and bryophytes, which form the dominant elements in rocks and vegetation on the rocky ground (Kappen & Schroeter, 1997). The Antarctic vegetation is affected by the geographical isolation, climatic conditions and its development is restricted to ice-free areas.

Elephant Island is located at 61° 07' S and 55° 03' W in the north of the South Shetland Islands. It is a mountainous island covered with ice in its central area and in the austral summer parts of the coast are ice-free. Stinker Point is the largest coastal ice-free area of Elephant Island rich in fauna and flora (Pereira & Putzke, 1994). These authors inform that Stinker Point has two species of higher plants, *Deschampsia antarctica* Desv. (*Poaceae*) and *Colobanthus quitensis*

(Kunth.) Bart. (*Caryophyllaceae*), 38 species of mosses, seven species of liverworts, 68 species of lichens and four species of macroscopic fungi.

Lewis-Smith (2001) in a phytosociological survey found many species of mosses in association with the dominant species in the formation, reflecting the dependence of these species of mosses on the dominant species, which should they become endangered, the dependent species in turn would be endangered due to interdependency.

The bird colonies are decisive in the distribution of plant species, as well as the climatic conditions and the soil. (Pereira & Putzke, 1994).

The objective of this work was to define the most important species in Stinker Point, Elephant Island using the index of ecological significance.

Materials and Methods

Phytossociological study was conducted using the method of quadrats of Braun-Blanquet (1964), adapted to Antarctic conditions (Kanda, 1986). The sampling was done in the

2011/2012 austral summer in the ice-free areas of Stinker Point, Elephant Island, Antarctica.

The species were identified during the phytossociological survey. The plants not identified *in situ* were collected and

Table 1. The species with IEI ≥ 50 and the point/formation sample in the Stinker Point, Elephant Island.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<i>Andreaea depressinervis</i> Cardot												X			X							
<i>Andreaea gainii</i> Cardot															X							
<i>Brachythecium austrosalebrosum</i> (Müll. Hal.) Paris			X		X	X																
<i>Bryum argenteum</i> Hedw.		X	X		X		X															
<i>Caloplaca cinericola</i> (Hue) Darb.				X																		
<i>Caloplaca regalis</i> (Vain.) Zahlbr.				X																		
<i>Chorisodontium aciphyllum</i> (Hook. f. & Wilson) Broth.								X	X			X		X	X	X					X	X
<i>Cystocoleus niger</i> (Huds.) Har.								X				X			X							
<i>Cladonia metacorallifera</i> Asahina								X				X	X				X					X
<i>Cladonia rangiferina</i> (L.) Weber ex F.H. Wigg.												X	X	X		X	X					
Mushroom						X																
<i>Colobanthus quitensis</i> (Kunth) Bartl.	X			X	X																	
<i>Cornicularia aculeata</i> (Schreb.) Ach												X										
<i>Deschampsia antarctica</i> E. Desv				X				X	X													
<i>Hennediella heimii</i> (Hedw.) R.H. Zander	X	X	X		X	X												X	X			
<i>Leptogium puberulum</i> Hue	X																					
<i>Mastodia tessellata</i> (Hook. f. & Harv.) Hook. f. & Harv.				X																		
<i>Ochrolechia frigida</i> (Sw.) Lynge							X					X		X	X	X						
<i>Pohlia nutans</i> (Hedw.) Lindb																			X			
<i>Polytrichastrum alpinum</i> (Hedw.) G.L. Sm										X		X				X	X			X		
<i>Prasiola crispa</i> (Lightfoot) Kützing				X													X				X	
<i>Psoroma cinnamomeum</i> Malme	X																					
<i>Psoroma hypnorum</i> (Vahl) Gray								X							X	X						
<i>Sanionia uncinata</i> (Hedw.) Loeske		X						X	X	X	X	X	X	X	X	X				X	X	X
<i>Sphaerophorus globosus</i> (Huds.) Vain.								X				X		X			X					
<i>Syntrichia magellanica</i> (Mont.) R.H. Zander				X	X	X																
<i>Usnea aurantiacoatra</i> (Jacq.) Bory														X	X							
<i>Usnea antarctica</i> Du Rietz								X				X	X			X	X					
<i>Warnstorfia sarmentosa</i> (Wahlenb.) Hedenäs	X								X													

identified in the laboratory analyzing the characters in the optical microscopy with help of the keys for species proposed by Putzke & Pereira (1990, 2001) and Ochyra *et al.* (2008) for bryophytes, Bednarek-Ochyra *et al.* (2000) for liverwort, Redon (1985) and Øvstedal & Lewis-Smith (2001) for lichens.

To show the importance of the species in the points of sampling the index of ecological significance (IES) of Lara & Mazimpaka (1998) was applied, which combines the coverage and frequency (Victoria *et al.*, 2009). This index has a value from 0-600, a value above 400 is very rare, because it would denote a consistent area almost absolute taxon in formation, but the value up to 50 showed a significant ecological importance (Victoria & Pereira, 2007).

Results

Twenty-two different formations in the ice-free areas were sampled in this study. 70 species were identified (including algae, liverworts, mosses, lichens, mushroom and flowering plants). The species of macroscopic fungi, such as mushrooms cited in this study, have not been identified to species level.

In Table 1 the list of species with higher IES (>50) and the sampled point where they were found at Stinker Point is presented.

Discussion

Sanionia uncinata (Hedw.) Loeske showed IES ≥ 50 in 13 to 18 points where that species were found. In 8 of these 13 points *S. uncinata* was the most important species that had the highest IES value in the formation. In a single sample (point 20) this species reached a 573 value, in an index that ranged up to 600 as the maximum value. These results demonstrate *S. uncinata* as a dominant species in most of the formations in which it occurs.

Hennediella heimii (Hedw.) R.H Zander was the second most important specie found in the plant formation of Stinker Point, occurring in 16 of 22 sampled points. In seven points this species reached an IES ≥ 50 and in three of these points it showed itself to be the specie with the highest IES, reaching IES = 364 in a single point (point 19). Probably, the highest occurrence of this species in recent rocky terrains

without a higher frequency of plant and lichen species, an increase of significant value.

Chorisodontium aciphyllum (Hook. f. & Wilson) Broth. occurred in 11 of 22 sample points. In 8 points this species showed a IES above 50, with two of these points showing the highest IES values (297 in point 9 up to 497 in point 21). In spite of *C. aciphyllum* being less frequent in the ice-free areas of Stinker Point, when this species occurs it is important for the characterization of plant formation.

For the lichens analyzed, two species showed an ecological importance. The IES were higher than 50 in five of the 22 sampling sites, when for *Usnea antarctica* Du Rietz the highest value at point 12 (IES = 253) was observed.

Deschampsia antarctica Desv. showed an IES value higher than 50 in three of the five points sampled. For *Colobanthus quitensis* (Kunth) Bartl. an IES value higher than 50 was observed in three of six points sampled, although the higher values observed for the grass species that were not found as a dominant species in the samples. However, *C. quitensis* was observed as a dominant species in two sites when it occurred with an IES value up to 480 in a single point (point 6).

Conclusion

Stinker Point has a widespread variety of plant species, being *S. uncinata* and *H. heimii* the most distributed species among the sampled points. The higher IES of both species in the region can be attributed to a better adaptation of these species to local environmental conditions. Further studies are being developed to better understand the phytosociology of the plant communities in this region.

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