



The diatom flora of lakes on James Ross Island (Antarctica)



Kateřina Kopalová¹, Linda Nedbalová^{1,2} & Bart Van de Vijver³

¹Charles University in Prague, Faculty of Science, Department of Ecology, Viničná 7, Prague 2, 128 44, Czech Republic (k.kopalova@hotmail.com, lindane@natur.cuni.cz)

²Academy of Science of the Czech Republic, Institute of Botany, Section of Plant Ecology, Dukelská 135, 379 82 Třeboň, Czech Republic

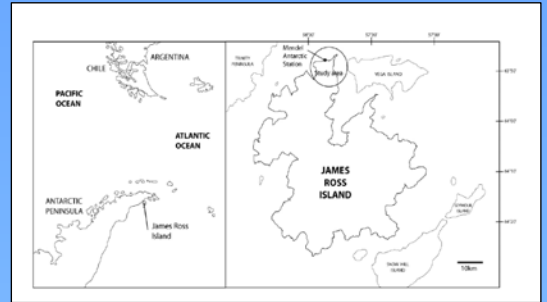
³National Botanical Garden, Department of Bryophyta & Thallophyta, Domein van Bouchout, B-1860 Meise, Belgium (vande Vijver@br.fgov.be)

Introduction

James Ross Island (64°10'S, 57°45'W) is a large (2450 km²) island situated in the north-western part of the Weddell Sea, close to the northern tip of the Antarctic Peninsula. Several years ago, a detailed study was started on the taxonomy and ecology of the non-marine diatoms from the northern part of the island. In a first study, the diatoms from seepage areas and streams were investigated, leading to the publication of 4 new species (Esposito et al. 2008, Kopalová et al. in press).

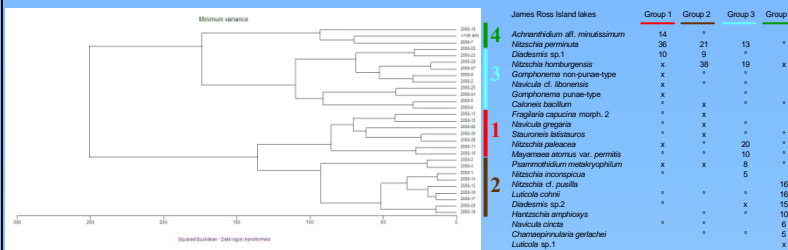
During the Antarctic summers of 2007-2008 a large number of samples have been collected from the numerous lakes that are present on the ice-free areas. The physico-chemical characteristics of these lakes show a large variability in pH, specific conductance and nutrients. This variability determines the diatom composition of the different lakes, as is shown by the community analysis.

After detailed morphological research, several species, within the list of observed species of the James Ross Island lakes, proved to be new for science. Some of these species are represented on the poster such as *Craticula antarctica* Van de Vijver & Sabbe sp. nov., *Chamaepinnularia gerlachei* Van de Vijver & Sabbe sp. nov., *Luticola gigacohnii* Van de Vijver & Kopalová sp. nov. and *Luticola adela* Van de Vijver & Kopalová sp. nov.



Map of the Antarctic Peninsula area with the geographic position of James Ross Island and the location of the sampled area close to the Mendel Antarctic Station.

Community analysis of the James Ross Island lakes



The cluster analysis revealed 4 groups of samples, separated based on their diatom composition. The separation is supported by the physico-chemical characteristics of the groups.

Group 1 and 2 mainly cluster all lakes located at low altitude (mean alt. 69 & 33 m vs. 167 m for Group 3). These two groups are further separated based on the nutrient- and salinity values of the lake water with Group 1 containing lakes with low conductivity, salinity and nutrient values and Group 2 clustering eutrophic lakes with high chloride and sulfate values. The first group is dominated by *Nitzschia perminuta* whereas another *Nitzschia* species, *N. hamburgiensis* dominates the second group.

All lakes, found at higher altitudes cluster together in the third group, dominated by *Nitzschia paleacea*, a species almost absent in the other two groups.

Group 4 contains 3 samples, taken from aerial habitats, related to the lakes such as drying sediment and mosses. This is reflected in the species composition with a dominance of several aerophilic genera such as *Hantzschia*, *Luticola* and *Diademesis*, almost absent in the samples taken from the epilithon and epipelon.

| Species | Dominant Species | |
|--|------------------|---------------|
| | Lakes | Seepage areas |
| <i>Nitzschia hamburgiensis</i> Lange-Bertalot | X | |
| <i>Nitzschia paleacea</i> Grunow | X | |
| <i>Diademesis</i> sp.1 | X | |
| <i>Psammodium metakryophilum</i> (Lange-Bertalot & Schmidt) Sabbe | X | |
| <i>Achnanthes</i> aff. <i>minutissimum</i> (Kützinger) Czarnecki | X | |
| <i>Diademesis</i> sp.2 | X | |
| <i>Nitzschia inconspicua</i> Grunow | X | |
| <i>Nitzschia cf. perminuta</i> (Grunow) Peragallo | X | O |
| <i>Luticola cohnii</i> (Hilse) Mann | X | X |
| <i>Mayamaea atomus</i> var. <i>permissis</i> (Hustedt) Lange-Bertalot | X | X |
| <i>Stauroneis latistaurus</i> Van de Vijver & Lange-Bertalot | O | X |
| <i>Nitzschia agnita</i> Hustedt | O | X |
| <i>Hantzschia amphioxys</i> (Ehrenberg) W. Smith | O | X |
| <i>Luticola austroatlantica</i> Van de Vijver et al. | X | X |
| <i>Luticola multicopsis</i> (Van Heurck) Mann | X | X |
| <i>Hantzschia abundans</i> Lange-Bertalot | X | X |
| <i>Hantzschia hyperborea</i> (Grunow) Lange-Bertalot | X | X |
| <i>Diademesis inconspicua</i> Kopalová & Van de Vijver | X | X |
| <i>Eolimna jamesrossensis</i> Kopalová & Van de Vijver | X | X |
| <i>Pinnularia borealis</i> var. <i>scalaris</i> (Ehrenberg) Rabenhorst | X | X |

The comparison between the JRI lake diatom flora and the flora found in the study of the seepage habitats showed some interesting differences. In the samples of the seepage habitat study, only 55 species have been found whereas in an almost equal amount of samples taken from lakes, 105 species were found. The seepage habitat was dominated by typical aerophilic genera such as *Hantzschia*, *Luticola* and *Diademesis*, whereas in lakes, these genera were hardly found. In the lakes, mainly the genus *Nitzschia* was very dominant with more than 50 % of all counted valves.

Luticola gigacohnii Van de Vijver & Kopalová sp. nov.

valves elliptical with convex margins and broadly rounded apices
L 21-50 µm, W 8.3-13.7 µm
raphe slightly curved with expanded, deflected central endings and elongated terminal fissures
striae radiate, 14-18 in 10 µm composed of 5-7 areolae
4-5 shortened central striae
small stigma present
close to central striae

Distribution: James Ross Island, King George Island

Luticola adela Van de Vijver & Kopalová sp. nov.

valves linear with a rectangular central part, concave in the middle and capitate apices
L 17-18.5 µm, W 5.6-6.0 µm
raphe slightly curved with simple, weakly deflected central endings and very short terminal fissures
striae radiate, 18-20 in 10 µm composed of 2-3 areolae
isolated, small stigma present

L. mollis Lange-Bertalot & Rumrich has a similar outline but is much larger (L 18-30 µm vs. 17-18.5 µm, W 9-11 µm vs. 5.6-6.0 µm).

Distribution: James Ross Island

The species is named after our dear friend drs. Adéla Moravcová (University of Prague)

Craticula antarctica Van de Vijver & Sabbe sp. nov.

valves lanceolate to lanceolate-elliptical with convex margins, capitate apices
L 31-36 µm, W 6.5-8.0 µm
raphe straight with simple central pores
striae parallel to weakly radiate becoming convergent to arcuate near the poles
17-20 in 10 µm
in SEM, areolae apically elongated

A small portion of the population has valves entirely covered with silica.

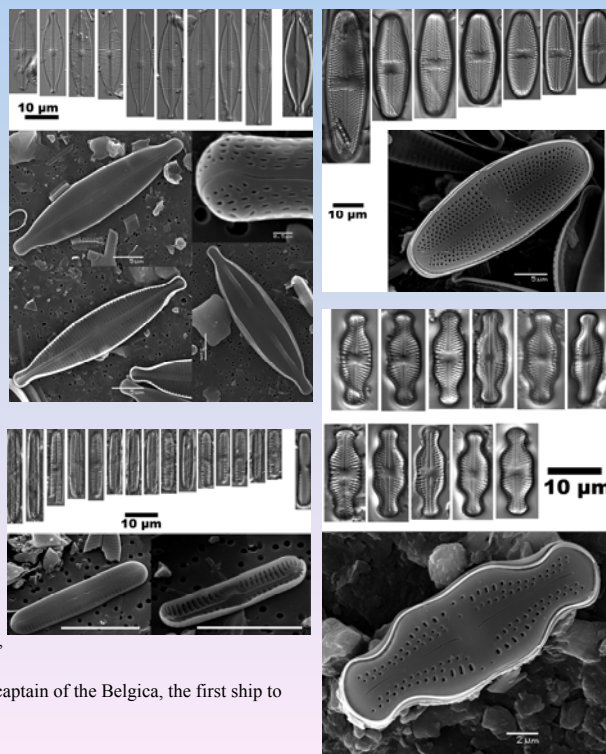
Distribution: James Ross Island, Beak Island, Antarctic Continent

Chamaepinnularia gerlachei Van de Vijver & Sabbe sp. nov.

valves linear, parallel margins
L 12-30 µm, W 3.3-4.9 µm
raphe straight with expanded central pores
striae parallel to weakly radiate, 16-19 in 10 µm in SEM, striae interrupted by hyaline line

Distribution: James Ross Island, South Georgia, South Shetland Islands,

The species is named after Adrien de Gerlache, captain of the Belgica, the first ship to stay overwinter in the Antarctic ice



Acknowledgments: The authors wish to thank Mrs. Myriam de Haan for her help with the SEM. Part of the research was funded by the following projects: GA CR 206/050253, MSMT 0021620828 and AV0Z60050516.