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Some Diatoms Reported from East Antarctica

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ABSTRACT

From Larsemann Hills and Schirmacher Oasis in East Antarctica, a floristic survey of diatom communities on microbial mats was made from 20 freshwater, saline lakes and pools. Samples were preserved with standard procedures. Identifications were made by Leica Digital Imaging System and processed with Adobe Photoshop. A total of 42 taxa (including species, varieties, forms and subspecies) belonging to 24 genera have been recorded. Both centrales and pennales were present, notably 16% of total flora were marine and 84% freshwater forms. Thalassiothrix spp., *Coscinodiscus curvatulus, Actinocyclus actinocyclus, Eucampia balaustium, Hemidiscus cuneiformis, Muelleria peraustralis, Chamaepinnularia cymatopleura* were marine and brackish water species. Among the fresh water flora *Nitzschia* (18.42%), *Navicula* (13.15%), *Pinnularia* (10.52%) and *Luticola* (7.89%) were species rich genera.

Keywords: East Antarctica, Larsemann Hills, Schirmacher Oasis, Diatoms.

1.0 INTRODUCTION

East Antarctica is characterized by a cold temperate climate with a strong maritime influence (Stonehouse 1982). Diatoms are micro-algae that possess inorganic, bipartite cell walls (frustules) and are abundant in freshwater and marine ecosystems. Diatoms are unique proxy indicators in high-latitude environments (Lim *et al*. 2001), especially in the Antarctic where many other proxies are lacking. Diatoms form an important component of benthic freshwater communities in Antarctica and they have been used successfully as proxies to reconstruct changes in lake salinity, ice cover, and sea level, phenomena indicative of climatic change (Zidarova *et al*. 2009, Van de Vijver 2012, Vinocur 2010, Kopalova 2012, Spaulding and McKnight 1999). The communities, and especially those of continental Antarctica, are usually characterized by low diversity (Jones 1996). Diatoms preserved in sediments are used as indicators of past

environmental changes because species assemblages reflect environmental conditions, such as water chemistry (Fallu *et al*. 2002; Sabbe etal. 2003).

2.0 STUDY AREA

The Larsemann Hills Oasis (69°23'S, 76°53'E), Prydz Bay, is an ice-free area on the Ingrid Christensen Coast, Princess Elizabeth Land (eastern Antarctica). The Schirmacher Oasis (70°46'04"-70°44'21"S; 11°49'54"-11°26'03"E) is a group of ice free, low lying-hills, in the Eastern Dronning Maud land, East Antarctica; it is 80 km south of Princes Astrid Coast. The elevation of Oasis ranges between 0 to 228 m, with an average of 100 m.

3.0 MATERIAL AND METHODS

Samples were preserved in formalin solution and refrigerated at 4°C. Each sample was treated with Hydrochloric acid and H202. The treated material was dried onto cover slips and mounted onto permanent glass microscope slides with the mounting medium Naphrax. Relative abundance of diatom species was determined using a light microscope with a lOOx oil objective. Images were obtained by Leica Digital Imaging System and Adobe Photoshop. Identifications and classifications have been done according to the standard literature (Krammer and Lange-Bertalot 1991, Lange-Bertalot and Krammer 1989, Lange-Bertalot 2001).

4.0 OBSERVATIONS

A total of 42 taxa belonging to 24 genera have been recorded; these are shown in Plts-1. Most of them are freshwater forms; while a few are marine forms. In the Antarctic samples centric diatoms were represented by 7 genera; whereas the Pennales by 17 genera. *Nitzschia* (18.42%), *Navicula* (13.15%), *Pinnularia* (10.52%) and *Luticola* (7.89%) were species rich genera.

5.0 DISCUSSION

The diatoms have been used in Antarctica as: 1). The indicators of climate. 2). changes in lake salinity. 3). Lacustrine environmental changes. 4). Determining historical lake-ice cover. 5). Environmental changes in surrounding watersheds. 6). To determine the presence of freshwater taxa in marine environments (Spaulding and McKnight 1999).

Gupta (2002) observed that only 3 cosmopolitan species of diatoms, viz. *Hantzschia amphioxys*, *Navicula muticopsis* and *Pinnularia borealis*

are encountered regularly and these taxa have also been observed in our study. Ten species of diatoms are recorded from the various ecological niches of Schirmacher Oasis of which *Pinnularia* borealis and *Hantzschia amphioxys* are dominant.

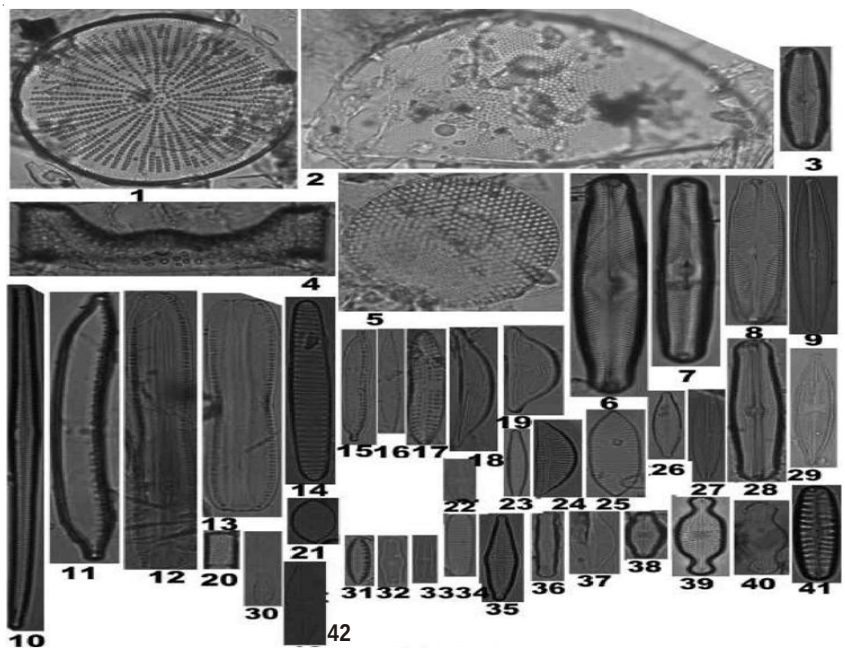

Plate-1 (Figures 1-42)

1. Actinocyclus sp. Ehrenberg, 2. Hemidiscus cuneiformis Wallich, 3 Pinnularia sp. 1 Ehrenberg, 4. Eucampia balaustium Castracane, 5. Coscinodiscus curvatulus Grunow ex A.Schmidt, 6. Pinnularia divergens W.Smith, 7. Pinnularia sp. 2 Ehrenberg, 8. Pinnularia cf. subsolaris (Grunow) Cleve. M., 9. Navicula sp. 1 Bory, 10. Ceratoneis arcus v. recta (Holmboe) R. Ross, 11. Hantzschia amphioxys (Ehrenberg) Grunow, 12. Nitzschia linearis (C.Agardh) W.Smith, 13. Nitzschia pellucida Grunow, 14. Nitzschia ritscherii (Hustedt) Hasle, 15. Hantzschia sp4 (Ehrenberg) Grunow, 16. Nitzschia palea (Kiitzing) W.Smith, 17. Achnanthes brevipes v. intermedia (Kiitzing) P.T. Cleve, 18. Amphora oligotraphenta Lange-Bertalot, 19. Amphora veneta Kiitzing, 20. Aluacosiragranulata (Ehrenberg) Simonsen, 21. Nitzschia separanda (Hustedt) Hasle 22. Navicula sp. 2 Bory, 23. Stauroforma inermis RJ.Flower, V.J.Jones & F.E.Round, 24. Enchyonema minutum (Hilse) D.G.Mann, 25. Nitzschia separanda (Hustedt) Hasle, 26. Navicula caterva Hohn & Hellerman, 27. Navicula cryptocephala Kiitzing, 28. Muelleria peraustralis (West & G.S.West) S.A.Spaulding & E.EStoermer, 29. Stauroneis anceps Ehrenberg, 30. Craticula molestiformis (Hustedt) Mayama, 31. Nitzschia amphibia Grunow, 32. Diadesmis perpusilla (Grunow) D.G.Mann, 33. Achnanthes pusilla Grunow, 34. Nitzschia curta (Van Heurck) Hasle, 35. Gomphonema cf. gracile Ehrenberg, 36. Chamaepinnularia cymatopleura (W.West & G.S.West) P.Cavacini., 37. Psammothidium germainii (Manguin) Sabbe, 38. Luticola mutica (Kiitzing) D.G.Mann, 39. Luticola muticopsis (Van Heurck) D.G.Mann, 40. Luticola gaussii (Heiden) D.G.Mann, 41. Thalassiothrix sp. Cleve & Grunow, 42. Pinnularia borealis Ehrenberg

Pankow and Haendel (1995) listed 57 taxa (*Melosira 2; Stephanodiscus; Cyclotella 2; Tabellaria 1; Diatoma 2; Asterionella 1; Fragilaria 6; Achnanthes 6; Cocconeis 4; Stauroneis 1; Navicula 15; Pinnularia 1; Rhoicosphenia 1; Cymbella 2; Epithemia 2; Rhopalodia 1; Hantzschia 5; and Nitzschia 4*).

The dominant family is Naviculaceae and subdominant includes Fragilariaceae and Achnanthaceae. Similar observation was recorded in our study.

Chattova et al. (2014) observed 98 diatom taxa (including species, varieties and forms) belonging to 33 genera from lie Amsterdam (TAAF, southern Indian Ocean). Amsterdam is not truly sub-Antarctic. Nevertheless, on the higher central plateau, the vegetation has a typical sub Antarctic character consisting of mosses, small ferns [e.g., *Blechnum* pennamarina (Poiret) kuhn], grasses, sedges (e.g., *Uncinia brevicaulis thouars*) and Lycopodiums sp. (Trehen et al. 1990). The *Pinullaria accounts* for more than 20% of all recorded taxa.

More than 75% of these shared taxa show a cosmopolitan, even worldwide, distribution. Typical examples such as Amphora veneta are widespread in the world and seem to be present on every continent (Kellogg and Kellogg 2002; Metzeltin *et al.* 2009; Hofmann *et al.* 2011). Important genera such as *Pinnularia* and *Eunotia* show more than 60% of taxa that are found on He Amsterdam (Vandevijver *et al.* 2012).

6.0 CONCLUSIONS

1. Diatom flora observed is a mixture of freshwater and marine water species, of which the former dominate.

2. Diversification at generic level is higher than at species level.

3. *Nitzschia* is relatively species rich genus; but *Luticola*, *Muelleria*, *Pinnularia* and *Nitzschia* species dominate.

4. The present results are similar to the earlier studies, which indicate low diatom diversity in this region. However, the number of species reported in the present study is higher.

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