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RECENT DIATOMS FROM THE EAST ANTARCTICA WITH NOTE ON THE FLORISTIC COMPOSITION

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Diatoms have been used successfully as proxies to reconstruct changes in lake salinity, ice cover, and sea level, phenomena indicative of climatic change. East Antarctica is characterized by a cold temperate climate with a strong maritime influence. A floristic survey of diatom communities on microbial mats was made from 20 freshwater, saline lakes and pools samples collected around Larsemann Hills and Schirmacher Oasis, Samples were preserved in 4% formalin solution. Each sample (~10 ml) was treated with Hydrochloric acid and H_2O_2. The treated sample was mounted in Naphrax and observed under 100x oil immersion. Identifications were made according to standard literature. Images were obtained by Leica Digital Imaging System and processed with ADOBE PHOTOSHOP. In all 42 taxa (including species, varieties, forms and subspecies) belonging to 24 genera were 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. The earlier studies from the east Antarctica have reported 21 and 31 species from 22 and 66 samples respectively. In view of these observations the present analysis has revealed relatively more richness from 20 samples.

Key words: ***East*** *Antarctica, Diatom*, Larsemann Hills and Schirmacher Oasis

Diatoms form an important component of benthic freshwater communities in the Antarctic 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). The area 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 preserved in sediments are used as indicators of past environmental change because species assemblages reflect environmental conditions, such as water chemistry (Fallu *et al.* 2002; Sabbe *et al*. 2003).

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) located approximately midway between the eastern extremity of the Amery Ice Shelf and the southern boundary of the Vestfold Hills. The Schirmacher Oasis (70°46'04"-70°44'21"S; 11°49'54"-11°26'03"E) is a group of relatively ice free, low lying-hills, in the Eastern Dronning Maud land, East Antarctica is approximately 70 km south of Princes Astrid Coast. It has a maximum width of 2.7 km and a length of 17 km and is oriented in East-West direction. The elevation of Oasis ranges between 0 to 228 m with an average of 100 m.

METERIAL AND METHODS

Samples were preserved in formalin solution and refrigerated at 4°C. Each sample was treated with Hydrochloric acid and H_2O_2. 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 100x oil objective. Images were obtained by Leica Digital Imaging System and ADOBE PHOTOSHOP. Identifications and classification were according to standard

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literature (Krammer and Lange-Bertalot 1991, Lange-Bertalot and Krammer 1989, Lange-Bertalot 2001).

OBSERVATIONS

A total of 42 taxa belonging to 24 genera were recorded (Plate 1) in which most of them were freshwater forms while few were marine forms. In the Antarctic samples centric diatoms were represented by seven genera where as the Pennales by seventeen genera. *Nitzschia* (18.42%), *Navicula* (13.15%), *Pinnularia* (10.52%) and *Luticola* (7.89%) were species rich genera.

DISCUSSION

Diatoms are unique proxy indicators in high-latitude environments (Lim *et al*. 2001), and especially in the Antarctic where many other proxies are lacking. The application of a more fine-grained taxonomy and a rigorous taxonomic practice will also result in a better understanding of the processes shaping diatom floras in the different Antarctic regions. 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 change in surrounding watersheds, and 6. To determine the presence of freshwater taxa in marine environments and vis - a - vis (Spaulding and McKnight 1999).

Gupta (2002) observed that the Only three cosmopolitan species of diatoms, viz. *Hantzschia amphioxys, Navicula muticopsis* and *Pinnularia borealis* are encountered regularly and these taxa also 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.

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. The 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 Ile Amsterdam (TAAF, southern Indian Ocean). Ile 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. Most remarkably is the fact that 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 Ile Amsterdam (Vandevijver *et al*. 2012).

CONCLUSIONS

1. Flora is a mixture of freshwater and marine water species of which the former dominate.

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

3. *Nitzschia* is relatively species rich genus, but *Luticola, Muelleria, Pinnularia* and *Nitzschia* species dominate by virtue of abundance.

4. However Antarctic Peninsula is known to be more diverse than the other regions of Antarctica including Eastern part. The present results are similar to the earlier studies, which indicate low diversity in this region, although the number of species is relatively higher in the present study.

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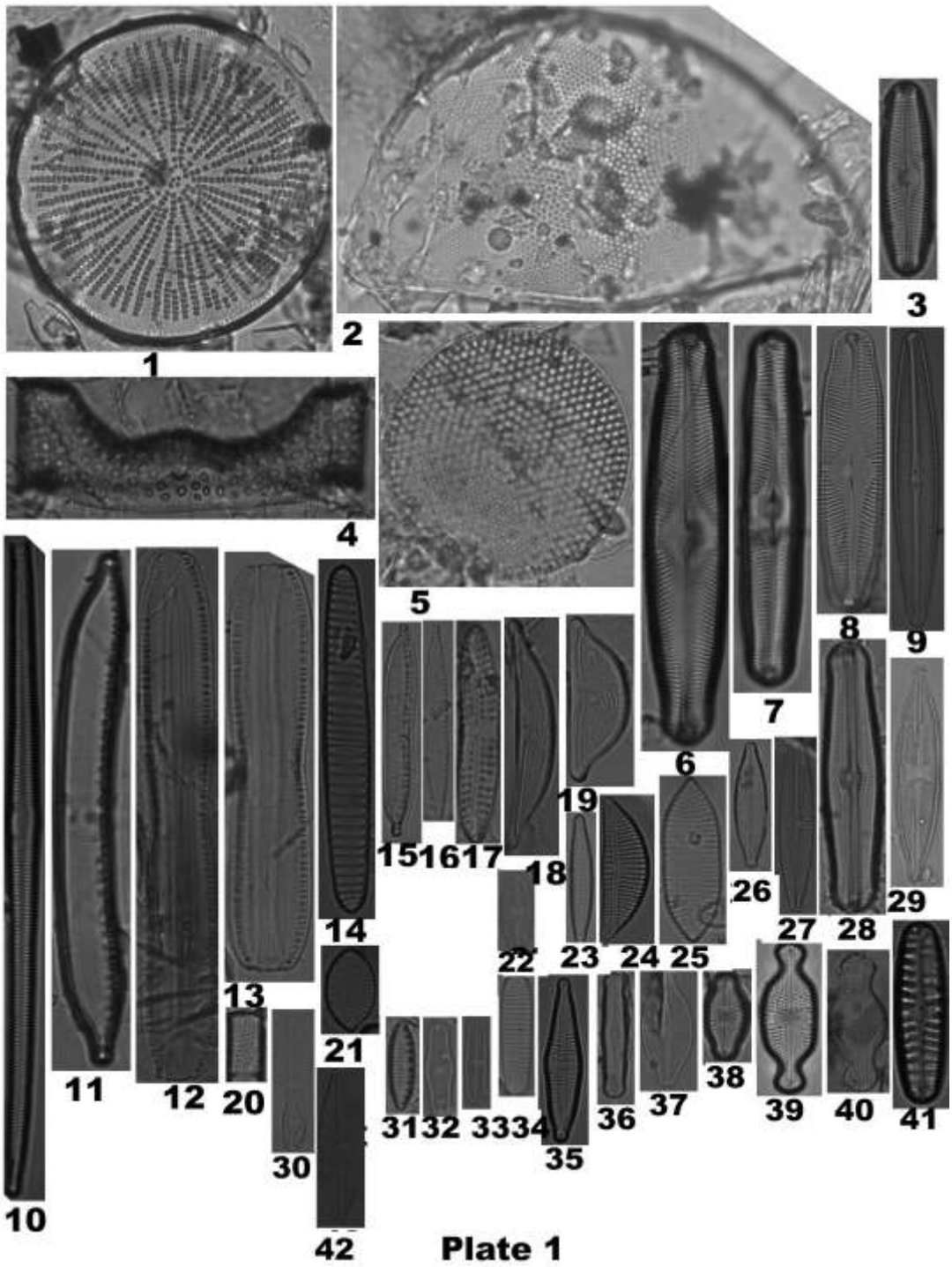

Plate No. 1 (Figure 1-42)

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* (Kützing) W.Smith, 17. *Achnanthes brevipes* v.

intermedia (Kützing) P.T. Cleve, 18. *Amphora oligotraphenta* Lange-Bertalot, 19. *Amphora veneta* Kützing, 20. *Aluacosira granulata* (Ehrenberg) Simonsen, 21. *Nitzschia separanda* (Hustedt) Hasle 22. *Navicula* sp. 2 Bory, 23. *Stauroforma inermis* R.J.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* Kützing, 28. *Muelleria peraustralis* (West & G.S.West) S.A.Spaulding & E.F.Stoermer, 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* (Kützing) 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

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