BENTHIC MACROALGAE DIVERSITY IN ADMIRALTY BAY (KING GEORGE ISLAND, SOUTH SHETLAND ISLANDS, ANTARCTIC PENINSULA)

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Marine macroalgae are among the main primary producers in the coastal ecosystem of our planet be they in tropical locations, temperate or polar. They are formed from an evolutionary complex thallus, possessing a high morphological diversity, of colours and in terms of dimension (Figure 1). They constitute one of the most important renewable marine resources functioning as: direct food for oriental people, using colloids from their

cellular walls in a number of industry segments, apart from playing an important role in the nutrient cycles, source of new pharmacological products, amongst others.

C. Skottsberg was the pioneer in research of macroalgae in Antarctica through Swedish expeditions in this region in 1901-1903 (Lüning, 1990). According to the author, the flora of macroalgae in the Antarctic region consists of approximately 100 species of which some 30% are endemic to the Antarctic Peninsula, mainly represented by five species of the *Desmarestia* (Peters *et al.*, 2000). One of the characteristics of this faraway ambience is the absence of the Order Laminariales, substituted by the predominance of Desmarestiales, which can reach a high biomass (279 tons of dry matter) registered at certain times of the year (Goméz, 1997) (Figure 2).

These photosynthesizing organisms form expressive submarine forests in sublittoral areas covered by irregular or rocky bottom of the Sub-Antarctic Islands (Denlille *et al.*, 1997) making up the flora of the Southern Hemisphere, which is adapted to the environmental stress of the freezing and melting processes. Gomez (1997) proved in his studies that Antarctic macroalgae, which develop in temperatures of below 0°C are capable of photosynthesizing at comparable rates to those macroalgae of temperate latitudes. This capacity is clearly responsible for the high productivity and abundance of macroalgae in shallow waters of this cold region.

In these extreme environments such as the Antarctic region these plants are also key organisms for the shelter,

Figure 1. Morphological diversity of macroalgae. Photos: 1 - Rafael B. Moura; 2 and 4 - Adriana G. Dalto; 3 - Andre L. Monnerat.

Figura 2. Heterokontophyta: *Himantothallus grandifolius*.
Photo: Rafael B. Moura.

nursing ground and food for other various marine creatures of the trophic level of the food web. Studies concerning fauna associated to the thalli of the macroalgae in Polar Regions are relatively scarce, especially those related to meiofauna associated with these algae (Figure 3). In Admiralty Bay (Antarctic Peninsula these studies are still rare and emphasize above all the amphipods (Wakabara & Tararam, 1983; Tararam *et al.*, 1995; Wakabara *et al.*, 1990; Nascimento, 1999 a,b,c,d; Berardo & Piera, 2006).

In spite of this ecological importance, only three studies have been published on Admiralty Bay, related to these macroalgae (Zielinski, 1981, 1990 and Oliveira *et al.*, 2009), one of the biggest of King George Island. Apart from this, these macroalgae are important sources of organic material after the degrading of their thalli in the water expanse, in several locations of the Antarctic coast. Especially in Admiralty Bay these large scale photosynthesizing organisms cover 30% of the bottom of its shallow areas (Oliveira *et al.*, 2009) (Figure 4).

To continue to study these benthic organisms for their relevance as indicators of past, present and future conditions, as a consequence of environmental alterations, is justified. For example, if the Antarctic region should

Figure 3. Morphological diversity of the associated meiofauna.

Figure 4. Macroalgae biomass washed ashore in the tidal shoreline in front of the Brazilian Antarctic Station Comandante Ferraz, Admiralty Bay. Photo: Rafael B. Moura.

be affected by climatic modifications, consequently temperature alterations to the marine environment could occur, which in turn would cause alterations to the diversity of the local species, favouring the arrival of invading species from low latitude locations, modifying the degree of characteristic endemism of the Antarctic region (Oliveira *et al.*, 2009). One of the tools to test the substitution of species is the taxonomic survey, which is one of the objectives of this study.

Admiralty Bay, including the Martel Inlet, is an Antarctic Specially Managed Area (ASMA). The Inlet sustains a great amount of change over the length of the year regarding its coverage of ice, creating disturbances in the climatic conditions, which could negatively affect the benthic flora and macro plus meiofauna linked to these macroalgae fronds, making the sediment more anoxic and permitting the development of anaerobic microbiota. The dynamics of the marine biota is still unknown in the light of these disturbances. The photosynthesizing benthic

organisms survey through long temporal series, favours the monitoring of the marine environment as to environmental and biological indicators, in this way permitting the analysis of the subsequent effects of the pressures created by the presence of the humans in Antarctica.

In this context, the intention is to study the diversity of the macroalgae of the Antarctic Peninsula, especially of Admiralty Bay (King George Island, South Shetland Islands), as well as the diversity of the meiofauna linked to the thalli structure of these macroalgae.

References

- BERARDO, M. T. V.; PIERA, F. E. Description of a new species of Pseudoharpinia (Amphipoda: Phoxocephalidae: Harpiniinae) from Admiralty Bay, King George, Antarctic Peninsula. **Nauplius**, v. 14, p. 75-82, 2006.
- DENLILLE, D. *et al.* Influence of subantarctic *Macrocystis* bed metabolism in diel changes of marine bacterioplankton and CO₂ fluxes. **Journal of Plankton Research**, v. 19, n. 9, p. 1251-1264, 1997.
- GOMÉZ, I. M. Life strategy and ecophysiology of Antarctic macroalgae. **Berichte zur Polarforschung**, v. 238, p. 1-99, 1997.
- LÜNING, K. **Seaweeds**: Their environment, biogeography, and ecophysiology. New York: Wiley, 1990. 518 p.
- NASCIMENTO, E. F. I. *Desmarestia menziesii*, habitat para a meiofauna, na Enseada Martel, Baía do Almirantado, Antártica. In: SEMINÁRIO SOBRE PESQUISA ANTÁRTICA, 7, São Paulo. **Livro de Resumos...** 1999a
- NASCIMENTO, E. F. I. Algas Marinhas Bentônicas da Baía do Almirantado, Península Antártica. In: REUNIÃO BRASILEIRA DE FICOLOGIA, 8, Porto de Galinhas, Recife-PE. **Livro de Resumos...** 1999b
- NASCIMENTO, E. F. I. Habitat para a meiofauna, na enseada Martel, Baía do Almirantado, Antártica. In: CONGRESSO NACIONAL DE BOTÂNICA, Blumenau-SC. **Livro de Resumos...** 1999c
- NASCIMENTO, E. F. I. Harpacticoida Copepods on *Desmarestia menziesii* at Martel Cove, Aldmitant Bay, King George Island, Antarctica. In: INTERNATIONAL CONFERENCE ON COPEPODA, 7. **Proceedings'...** 1999d
- OLIVEIRA, E. C. *et al.* The seaweed flora of Admiralty Bay, King George Island, Antarctic. **Polar Biology**, v. 32, p. 1639–1647, 2009.
- PETERS, A.; RAMIREZ, M. E.; RÜLKE, A. The phylogenetic position of the subantarctic marine macro-alga *Desmarestia chordalis* (Phaeophyceae) inferred from nuclear ribosomal ITS sequence. **Polar Biology**, v. 23, p. 95–99, 2000.
- TARARAM, A. S.; WAKABARA, Y.; MIYAGI, V. K. The Amphipod fauna of the west Antarctic region (South Shetland Islands and Bransfield Strait). **Polskie Archiwum Hydrobiologii**, v. 42, p. 347-365, 1995.
- WAKABARA, Y.; TARARAM, A. S. Amphipoda (Crustacea) da I expedição brasileira à Antártica. In: SIMPÓSIO DO PROGRAMA ANTÁRTICO. **Resumos...** São Paulo: Instituto Oceanográfico da Universidade de São Paulo, 1983. p. 26-26.
- WAKABARA, Y. *et al.* **Records of Amphipoda collected during I and II Brazilian Antarctic Expedition**. São Paulo: Universidade de São Paulo, 1990. p. 1-9. (Relatório do Instituto de Oceanografia)
- ZIELINSKI, K. Benthic macro-algae of Admiralty Bay (King George Island, South Shetland Islands) and circulation of algal matter between the water and the shore. **Polish Polar Research**, v. 2, p. 71–94, 1981.
- ZIELINSKI, K. Bottom macro-algae of Admiralty Bay (King George Island, South Shetland Islands, Antarctic). **Polish Polar Research** v. 11, p.95–131, 1990.