

MEIOFAUNA AND MICROPHYTOBENTHOS OF MARTEL INLET (ADMIRALTY BAY, KING GEORGE ISLAND, ANTARCTICA)

<http://dx.doi.org/10.4322/apa.2014.012>

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Studies on the meiofauna community in Admiralty Bay started in 1991, when samples were collected through SCUBA diving in front of the Brazilian Station “Comandante Ferraz” (Martel Inlet) at depths ranging from 6 to 25 m. The dominant groups were Nematoda and Harpacticoida, followed by nauplii and Polychaeta. The density of meiofauna in Martel Inlet, excluding the ice scour affected areas, was high, and varied from $3,523 \pm 2,117$ to $7,641 \pm 388$ ind.10 cm⁻² (mean \pm SD) at 6-11 m depth, and from $3,479 \pm 1,205$ to $8,216 \pm 3,030$ ind.10 cm⁻² at 18-25 m depth (Skowronski *et al.*, 1998).

Further samplings, including measurement of microphytobenthic biomass, were done at 15-20 m depth in seven areas of Martel Inlet: in front the Brazilian Station (CF), Yellow Point (YP), Rock O’Connor (RO), Ullman Point (UP), Botany Point (BP), Hennequin Point (HP) and Plaza Point (PP) (Figure 1). The sampling was undertaken during two consecutive summers (1996/97 and 1997/98) and the results revealed that high meiofaunal densities are characteristic of this whole inlet, varying between $1,952 \pm 326$ and $6,738 \pm 1542$ ind.10 cm⁻² and were correlated with the percentage of gravel, silt and clay (Skowronski & Corbisier, 2002). In both summers, the areas with the highest densities were CF and UP and also HP in the first summer and PP in the second (Figure 1). There was no significant difference in the densities between the two summers, although the higher value of microphytobenthic biomass, the potential food for the meiofauna, was recorded in the first summer.

Horizontal differences were found in the microphytobenthic biomass throughout the inlet and seemed to be more related to the sediment characteristics, but no clear pattern of microphytobenthic distribution could be distinguished. An inter-summer variation was observed: the first summer showed the highest microphytobenthic biomass apparently related to more hydrodynamic conditions, which causes the deposition of allochthonous material (Skowronski *et al.*, 2009).

A positive correlation between the microphytobenthos biomass and the meiofaunal densities was observed during the second summer, when the microphytobenthos biomass was approximately 25% lower than in the first summer (Skowronski *et al.*, 2009). This might have acted as a limiting factor to the meiofauna in some of the areas (Skowronski & Corbisier 2002). It may be supposed that the stronger hydrodynamic conditions of the first summer led to a high deposition of phytodetritus (phaeopigments), which masked the interaction between the meiofauna and the microphytobenthos.

The bathymetric variation of the meiofauna and the microphytobenthos was also evaluated along transects (10 to 60 m depth) in five areas (CF, YP, RO, UP and BP) in Martel Inlet during the summer of 1997/98 and 2004/05 (Gheller, 2007; Skowronski *et al.*, 1998; 2009). Concerning the microphytobenthos, mean biomass values were inversely related to the depth gradient. The highest values were found at 10 to 20 m (mean \pm SD: 136.2 ± 112.5 mg Chl *a*.m⁻², 261.7 ± 455.9 mg Phaeo.m⁻²),

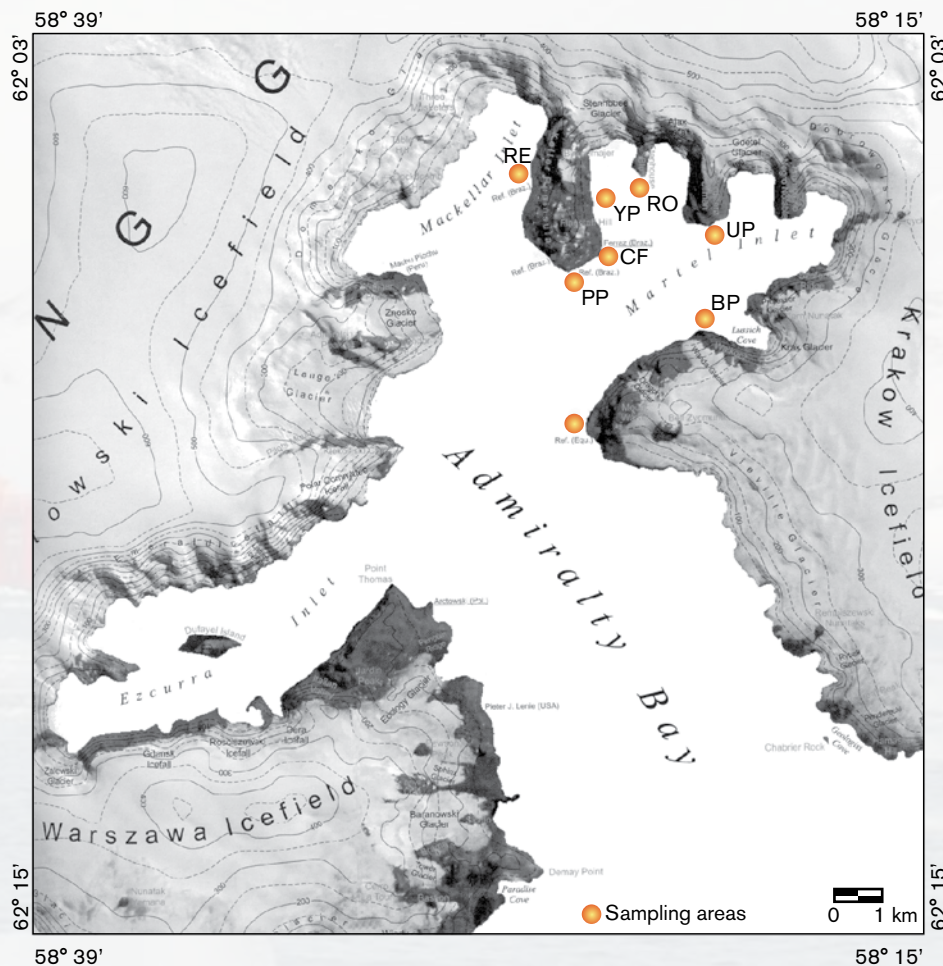


Figure 1. Admiralty Bay, King George Island. Sampling areas: PP - Plaza Point; CF - off Brazilian Antarctic Station "Comandante Ferraz"; YP - Yellow Point; RO - Rock O'Connor; UP - Ullmann Point; BP - Botany Point; HP - Hennequin Point; RE - Refuge 2. Adapted from Braun *et al.* (2001).

slightly lower at 20 to 30 m (55.6 ± 39.5 mg Chl *a*.m⁻², 108.8 ± 73.0 mg Phaeo.m⁻²), and the lowest ones were found at 40 to 60 m (22.7 ± 23.7 mg Chl *a*.m⁻², 58.3 ± 38.9 mg Phaeo.m⁻²), comparable to those found in tropical regions at depths between 0 and 5 m (Cahoon, 1999). There was also a reduction in the Chl *a*/Phaeo ratio in relation to depth, from 3.2 ± 3.2 at 10-20 m to 0.7 ± 1.0 at 40-60 m, showing a higher contribution of senescent phytoplankton and/or macroalgae debris at the deeper sites and the limited light flux reaching the bottom.

The decrease of meiofauna densities in relation to increasing depth was observed. CF and RO had their highest densities at 25 m, while YP and UP had theirs at 10 m. It would seem that the influence of the ice scours

at the first two sites disturbed the shallower zone at about 10 m, because at UP and YP the local topography and circulation hindered the effect of excavation by ice blocks (Skowronski, 2002). Ice scours in shallow Antarctic zones have a negative effect on the meiofauna (Skowronski *et al.*, 1998; Lee *et al.*, 2001). Below 40 m the densities were much lower possibly because of the reduction in food supply, mainly the microphytobenthos (Skowronski, 2002; Gheller, 2007). The high benthic microalgal biomass on the two-first centimeters of sediments of the shallow coastal zone must be ecologically important to sustain the abundant benthic communities in Martel Inlet, since Admiralty Bay is considered an area where the pelagic primary production is low (Brandini & Rebello,

1994; Lange *et al.*, 2007). The coupling of many abundant benthic macroinvertebrates and the meiofauna with the organic matter of the microphytobenthos was verified by carbon stable isotopic analysis (Corbisier *et al.*, 2004).

Nematodes are the dominant meiofaunal group of Martel Inlet soft bottoms, representing more than 85% of this fauna, from 6 to 60 m depth. Until now 98 genera belonging to 28 families were identified (Skowronski *et al.*, 1998; Skowronski, 2002; Gheller, 2007). This is a high diversity when compared to the values found in the few studies undertaken in the Antarctic coastal zone (between 19 and 49 genera and 11 to 19 families) (Vanhove *et al.*, 1998; Lee *et al.*, 2001). The most frequent genera were the non-selective depositivores *Sabatieria*, *Odontophora*, *Axonolaimus*, *Paralinhomoeus* and *Daptonema* and the epistrate feeders *Microlaimus*, *Dichromadora*, *Prochromadorella* and *Acantholaimus*. The predators/omnivores and selective depositivores genera were less numerous. The diversity of genera was related to the grain size and the availability of food, mainly microphytobenthos (Skowronski, 2002; Gheller, 2007).

A study on meiofaunal polychaetes in the nearshore zone in front of the Brazilian Station (Martel Inlet) showed that more than 70% were young individuals, mainly of three species: *Apistobanchus glaciera*, *Leitoscoloplos kerguelensis* and *Ophryotrocha notialis*. However, these are considered temporary meiofauna,

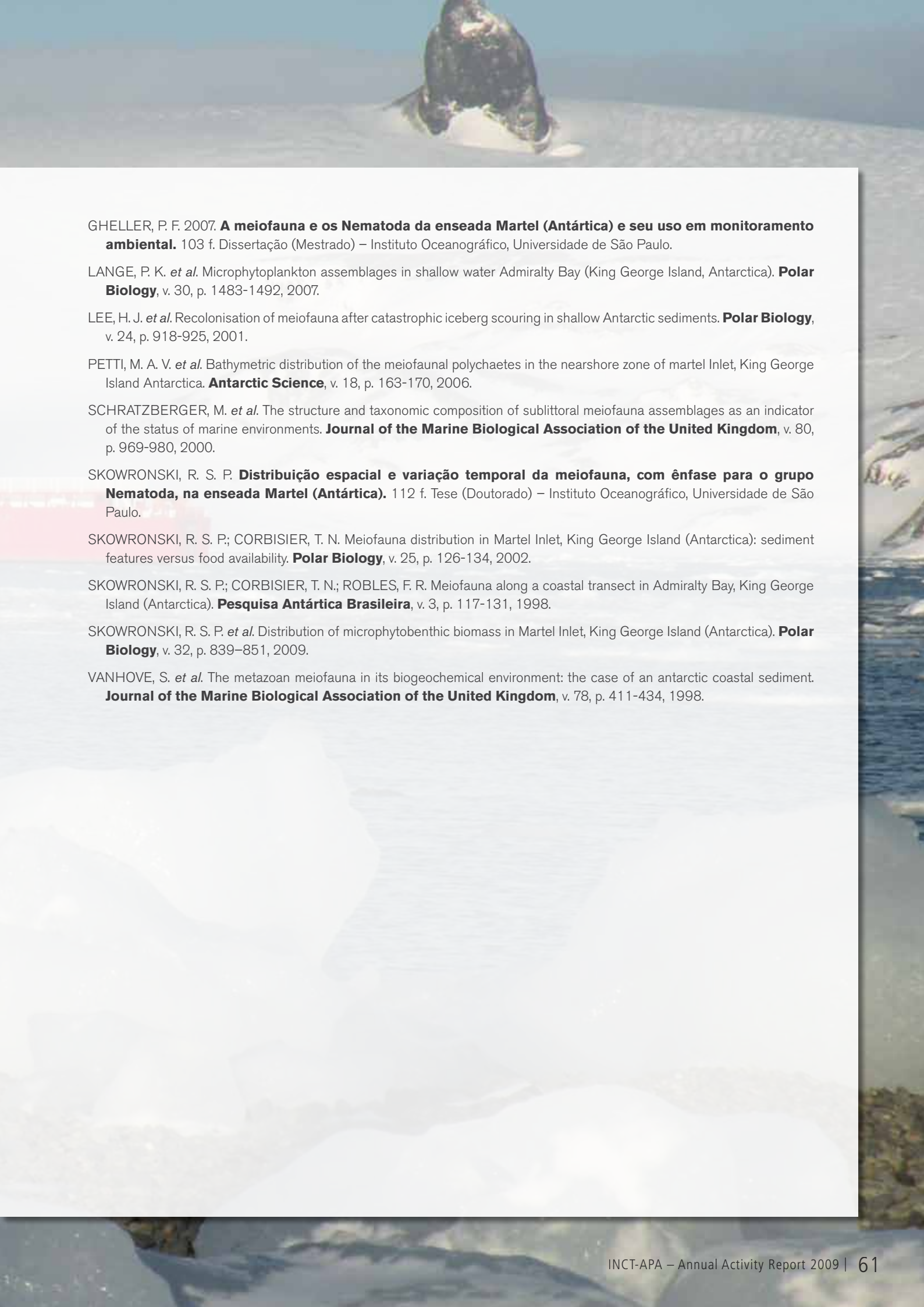
and their distribution patterns were strongly related to the macrofaunal polychaetes in the same area (Bromberg *et al.*, 2000; Petti *et al.*, 2006).

Samples between 100 to 500 m depth were collected in Admiralty Bay in the summer of 2008/09 and 2009/10 during the International Polar Year (MABIREH Project), so additional information about the microphytobenthos and the meiofauna in deeper areas will be available soon.

Due to the meiofauna characteristics, such as small size, limited mobility, short life cycle lived entirely in the sediment, reproductive strategy without a larval dispersion phase, and intimate association with and dependence on the bottom environment (sediment and interstitial water), this community has been used for environmental monitoring (Coull & Chandler, 1992; Schratzberger *et al.*, 2000). In this sense, a meiofaunal study was undertaken in the summer of 2004/2005 and aimed to verify possible impacts due to the Brazilian activities, comparing CF with a reference area (BP) (Gheller, 2007). Results showed no significant differences in composition and abundance of meiofauna and nematodes between the two areas, which could indicate an anthropogenic impact near the Brazilian Station. A monitoring program (INCT-APA) was also established since this last summer (2009/10) when the meiofauna and the microphytobenthos were sampled at three sites in Martel Inlet (CF, UP and BP) and one in Mackellar Inlet (RE) (Figure 1).

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