**Glacial melting effects on the respiration of the coastal meiobenthic community at Potter Cove, King George Island and their contribution to total ecosystem functioning**

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Within the IMCOAST project, our aim to understand meiobenthic structure and function in response to the effects of glacier melt and retreat is limited to assessing biodiversity, structure, and trophodynamics. So far, own efforts and collaboration with other institutes at the Jubany/Carlini Antarctic Station, King George Island in the austral summers of 2009/2010 and 2010/2011 has led to extensive field sampling and feeding experiments on nematodes, copepods and cumaceans, and several manuscripts are currently underway [1]. Investigating meiobenthic food preferences is of crucial importance since climate change may alter the benthic food resources and the functionality of polar benthic ecosystems [2, 3]. However, in benthic ecosystems, the meiobenthic taxa are often treated as individual functional groups, ignoring the structural and possible associated functional diversity within each taxon. This is mainly caused by the need for large quantities (>100) of very small organisms to attain sufficient biomass for stable isotope and biomarker analyses and the laborious sample processing involved, hence precluding the separation of different taxa or functional groups in such analyses. Respiration measurements offer a way out of this predicament, providing the measurements can be performed on very small samples (1-50 individuals). Moreover, essential in a more complete assessment (beyond the level of trophic status) of meiobenthic and nematode functioning in benthic ecosystems undergoing environmental change is their respiration and contribution to sediment community oxygen consumption. The methodology currently used (modelling approach based on biomass data or arduous Winkler titration [4, 5]) is far from ideal and does not allow for highly accurate measurements in experimental setups using a small number of individuals, which would allow distinguishing between the functional groups.

To attain a more accurate view on the climate change effects on functioning of meiobenthic organisms, we proposed to investigate respiration over time, by means of ex-situ experiments using micro-respiration systems [6, 7] under different experimental conditions. Cleaned meiofauna individuals (1-20) will be brought into microvials under sterile conditions to preclude contamination of any other benthic component, allowing us to focus solely on the respiration of selected organisms as a proxy for their contribution to mineralization and total ecosystem functioning in Antarctic coastal systems

**Work carried out to date**

The awarded Antarctic Science Bursary has allowed us to acquire micro-respiration equipment (Unisense) enabling us to perform respiration measurements on small quantities of nematodes, the dominant group within the meiofauna size range. Following several tests with nematodes from local mud flats, we fine-tuned the protocol for measuring respiration over several time intervals and under in-situ environmental conditions. We assessed the time needed to obtain oxygen/respiration measurements for 1, 5 and 10 nematodes under these conditions across the oxygen spectrum, allowing nematodes to respire from fully oxygenated conditions to hypoxic conditions. The rate at which oxygen consumption changed gave an indication of the respiration intensity of the nematodes contained within the micro-vials.

The equipment was taken to the Jubany/Carlini Antarctic research station at King George Island in February-March 2012. Samples were taken from soft sediments in the Potter Cove Bay (station 7: 62.226° S, 58.668 W) where the Fourcade glacier is currently retreating.

Nematodes where picked out from the sediments, cleaned in sterile sea water at in-situ temperature and salinity and put in micro-vials for respiration measurements. Several environmental conditions were tested in different experimental setups: 1°C-32psu; 4°C-32psu; 2°C-30psu and 2°C-32psu in order to test for effects of salinity and temperature changes on nematode respiration rates, and so to mimic deglaciation effects.

Results of these experiments are still to be processed and analysed in the near future.

We aim at comparing the obtained respiration rates from the Antarctic experiments under different treatments and also compare with the respiration results obtained from experiments performed with nematodes from a temperate climate. References

1. Pasotti, F., et al., *Feeding preferences of Sub-Antarctic meiofauna in the contaxt of global change: a mesocosm experiment from Potter Cove, King George Island.* Marine Ecology Progress Series, Submitted.

2. Moline, M.A., et al., *Alteration of the food web along the Antarctic Peninsula in response to a regional warming trend.* Global Change Biology, 2004. **10**(12): p. 1973-1980.

3. Clarke, A., et al., *Climate change and the marine ecosystem of the western Antarctic Peninsula.* Philosophical Transactions of the Royal Society B-Biological Sciences, 2007. **362**: p. 149-166.

4. Winkler, L.W., *Die Bestimmung des im Wasser gelösten Sauerstoffes.* Berichte der deutschen chemischen Gesellschaft, 1888. **21**(2): p. 2843-2854.

5. Greenberg, A.E. and A.D. Eaton, *Standard methods for the examination of water and wastewater 20th. edition.* American Public Health Association, American Water Works Association, Water Environment Federation, 1998.

6. Brodersen, K.P., et al., *Respiration of midges (Diptera; Chironomidae) in British Columbian lakes: oxy-regulation, temperature and their role as palaeo-indicators.* Freshwater Biology, 2008. **53**(3): p. 593-602.

7. Moodley, L., et al., *Biomass-specific respiration rates of benthic meiofauna: Demonstrating a novel oxygen micro-respiration system.* Journal of Experimental Marine Biology and Ecology, 2008. **357**(1): p. 41-47.