

Final project report

Project ID	2003/8.01
Title	SEAROWS-Sea Ice Ecology in the Antarctic: Ross and Weddell Seas
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Duration	2 years
Assigned funding	110.000,00 Euro

Activities and results

The sampling was carried out during November and December 2004. In this year the ice break occurred earlier than in previous years, in the Gerlache Inlet on November 27 and in Tethys Bay on December 27. We were also forced to leave some stations located in the TNB even before 27 November for the early retreat of the pack, so limiting the program on spatial survey. Most of the sampling and all the ecophysiology experiments began on November 8, 2004. Several sampling sites in the Gerlache Inlet were identified after a careful survey activity with an helicopter and explorative core drilling on sympagic populations associated with the bottom-ice and the platelet-ice. Different types of ice and 3 main sites along a transect off-shore were identified. Site 1, located on the compact pack thickness of about 180 cm, was the setting for the fixed field work. The site 2 was located in an area of thinner ice (about 100 cm), made of fused large slabs of ice. The site 3 was located on solid ice about 100 cm thick, near the marginal area of the pack to the polynya of TNB. Successively, other stations have been identified for monitoring the spatial variability (Sites 4, 6 and 7). Finally, in place of the field work at site 1, for the sudden rupture of the pack-ice on November 27, was set up a new field in Tethys Bay (Site 5). During the austral spring of 2004, in both the sampling sites was not found a layer of ice strongly coloured in the bottom-ice in contrast to the findings during the austral spring of 1997 and 1999 (Project PIPEX and PIED). Another feature highlighted was the great accumulation of ammonia (100 $\mu\text{mol/L}$ in 50-70 cm layer), never before detected.

The total phytoplankton biomass at Site 1 was very high only in platelet-ice and showed a tendency to enhance from 3 to 13 November, reaching its maximum value of 1460 $\mu\text{g/L}$. In the following days the biomass decreased, reaching a value $<250 \mu\text{g/L}$ on the 22 of November. Several species of *Fragilariopsis*, particularly *F. curta* and *F. cylindrus*, were abundant both in platelet-ice and in water samples collected immediately below the ice. Since the first ice cores taken, in the layer of bottom-ice many eggs of *Pleurogramma antarcticum* as embryos or empty were observed. In the layer of water below the pack-ice, total concentrations of organisms were greatly influenced by the different behaviour patterns within the Bay, particularly in the direction S->N into the Bay, showed waters richer of planktonic organisms with the presence of many taxa including the main *Euphausia crystallorophias*, *Clione limacina* (carnivorous), *Limacina helicina*, and larvae of *P. antarcticum* particularly towards the end of November. The presence of dead and incorporated organisms, for the pack-ice thickening, can give a preliminary explanation of the anomalous increase of ammonia and of other nutrients found in the intermediate layers of the cores taken in the outer stations.

Products

A – papers in scientific magazines

1. Cianelli D., Ribera d'Alcalà M., Saggiomo V., Zambianchi E. (2004) Coupling mixing and physiological response of Antarctic plankton: a Lagrangian approach. *Antarctic Science*, 16(2) 133-142.
2. Guglielmo L., Carrada G.C., Catalano G., Cozzi S., Dell'anno A., Fabiano M., Granata A., Lazzara L., Lorenzelli R., Manganaro A., Mangoni O., Misic C., Modigh M., Pusceddu A. and Saggiomo V. (2004). Biogeochemistry and algal communities in the annual sea ice at Terra Nova Bay (Ross Sea, Antarctica). *Chemistry and Ecology*, 20: 43-55.

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3. Mangoni O., Modigh M., Conversano F., Carrada G.C. and Saggiomo V. (2004). Exceptional summer ice coverage in the Ross Sea, Antarctica: implications for phytoplankton composition and biomass. *Deep Sea Res. I*, 51,1601-1617.
4. Misic C., Castellano M., Fabiano M., Ruggiere N., Saggiomo V., Povero P. (2006). Ectoenzymatic activity in surface waters: A transect from the Mediterranean Sea across the Indian Ocean to Australia. *Deep Sea Research I* 53 , 1515-1532.
5. Povero P., Castellano M., Ruggiere N., Ponticelli S.L., Saggiomo V., Chiantore M., Guidetti M., and Cattaneo-Vietti R. (2006) Water column features and their relationship with sediments and benthic communities along the Victoria Land coast, Ross Sea, summer 2004. *Antarctic Science* 18(4), 603-613.
6. Smith WO Jr., Shields AR, Peloquin JA, Catalano G, Tozzi S, Dinniman MS, Asper VA (2006). Interannual variations in nutrients, net community production, and biogeochemical cycles in the Ross Sea. *Deep-Sea Res. II*, 53:815-833.
7. Guglielmo L. and Saggiomo V. (2007). The BIOTROPH project. BIOlogical resources in Antarctic polynias: TROPHodynamics of planktonic and sympagic communities. *Globec International Newsletter* April 2007: 28-29.
8. Guglielmo L., Zagami G., Saggiomo V., Catalano G. and Granata A. (2007). Copepods in spring annual sea ice at Terra Nova Bay (Ross Sea, Antarctica). *Polar Biology*, 30: 747-758.
9. Lazzara L., Nardello I. , Ermanni C., Mangoni O. , Saggiomo V. (2007) Light environment and seasonal dynamics of microalgae in the annual sea ice at Terra Nova Bay (Ross Sea, Antarctica). *Antarctic Science*. 19 (1) . 83-92.
10. Cellusi M., Paoli A., Crevatin E., Bergamasco A., Margiotta F., V. Saggiomo, Fonda S. Umani, Del Negro P. (2009). Short-term under-ice variability of prokaryotic plankton communities in coastal Antarctic waters (Cape Hallet, Ross Sea). *Estuarine coastal and shelf science* 81: 491-500.
11. Granata A., Zagami G., Vacchi V. and Guglielmo L. (2009) Summer and spring trophic niche of larval and juvenile *Pleuragramma antarcticum* in the Western Ross Sea, Antarctica. *Polar Biology*, 32:369-382.
12. Guglielmo L., Donato P., Zagami G. and Granata A. (2009) Spatio-temporal distribution and abundance of *Euphausia crystallorophias* in Terra Nova Bay (Ross Sea, Antarctica) during austral summer, *Polar Biology*, 32: 347-367.
13. Mangoni O, Saggiomo M., Modigh M, Catalano G, Zingone A, Saggiomo V (2009). The role of platelet ice microalgae in seeding phytoplankton blooms in Terra Nova Bay (Ross Sea, Antarctica): a mesocosm experiment. *Polar Biol.*, 32:311–323.
14. Mangoni O, Carrada GC, Modigh M, Catalano G, Saggiomo V (2009) Photoacclimation in Antarctic bottom ice algae: an experimental approach. *Polar Biol* (2009) 32:325–335.
15. Pusceddu A., Dell'Anno A., Vezzulli L., Fabiano M., Saggiomo V., Cozzi S., Catalano G. and Guglielmo L (2009). Microbial loop malfunctioning in the annual sea ice at Terra Nova Bay (Antarctica). *Polar Biology*, 32: 337-346.

B – book chapters

1. Catalano G, Ravaioli M, Giglio F, Langone L, Budillon G, Accornero A, Saggiomo V, Modigh M, Povero P, Misic C, Mangoni O, Carrada GC, Ferla R, Azzaro M (2007) La pompa biologica del carbonio nel mare di Ross. In: *Clima e cambiamenti climatici, le attività di ricerca del CNR*. Carli B, Cavarretta G, Colacino M, Fuzzi S (Eds.). Consiglio Nazionale delle Ricerche, Roma, Italia, pag. 271-275.
2. Catalano G., Budillon G., La Ferla R., Povero P., Ravaioli M., Saggiomo V., Accornero A., Azzaro M., Carrada G.C., Giglio F, Langone L., Mangoni O., Misic C., Modigh M. (2010). The Ross Sea. In: Liu K.K., Atkinson L., Quinones R., Talaue McManus L. (Eds.). *Carbon and Nutrient Fluxes in Continental Margins: A Global Synthesis*. Springer-Verlag Berlin, Heidelberg, New York, Tokyo, pp.303-318.

C - proceedings of international conferences

1. Modigh M, Catalano G., Guglielmo L., Mangoni O., Misic C., Povero P. and Saggiomo V. (2007). A global budget of carbon and nitrogen in the Ross Sea (Southern Ocean). In: *Polar dynamics: monitoring, understanding, and prediction. Open science conference – Bergen (Norway)*, 29-31 august 2007: 77.

D – proceedings of national meetings and conference

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E – thematic maps

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F – patents, prototypes and data bases

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G – exhibits, organization of conferences, editing and similar

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H - formation (PhD thesis, research fellowships, etc.)

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Research units

Unita' Operativa	Responsabile	Personale in Base	Periodo di Permanenza presso la MZS
Oceanografia chimica Nutrienti	G. Catalano	G. Catalano(*) S. Cozzi	I-II (02/11/04–11/01/05) I (25/10/04–29/11/04)
Produzione primaria e coefficienti fotosintetici	V. Saggiomo	M. Modigh(*) F. Margiotta	I (25/10/04–29/11/04) I (25/10/04–29/11/04)
Pigmenti fotosintetici	G.C. Carrada	O. Mangoni (*)	I (25/10/04–29/11/04)
Ecologia Microbica	M. Fabiano	M. Guidetti (*)	I (25/10/04–02/12/04)
Ecologia dello Zooplancton e del Micronecton	L. Guglielmo	G. Arena (*)	I-II (25/10/04–11/01/04)

(*) responsabile in base

Date: 30 March 2010

Notes