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23. BIODIVERSITY, PHYLOGENY AND TROPHO-DYNAMICS OF AMPHIPOD CRUSTACEANS IN THE ANTARCTIC DEEP SEA

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Scientific background and objectives

Peracarid crustaceans, and in particular Amphipoda, are known to be by far the most speciose animal group in the Antarctic coastal and shelf communities, with a high percentage of endemic species. About 600 amphipod species have been recorded so far in the Southern Ocean s.s., mostly at shelf depths. The Antarctic deep sea remained virtually unknown until the ANDEEP I-III cruises in 2002 and 2005 revealed an overwhelming diversity and abundance of amphipod crustaceans in various deep-sea basins of the Atlantic sector. In terms of abundance, the ANDEEP I-III results showed that Amphipoda contributed up to 32 % of the large peracarid material collected by the epibenthic sledge (EBS), just after Isopoda (38 %) which are the usual dominant group in the deep sea. This is in sharp contrast with other deep-sea samples, where amphipods were usually much less abundant. In terms of species richness, the ANDEEP cruises collected about 200 species – mostly new – compared with only 72 Antarctic species previously known below 1,000 m.

Investigations on the trophic role of the rich and diverse amphipod taxocoenosis of the Antarctic shelf have revealed a rather large diversity of trophic types according to the results of detailed gut content analyses, confirmed by stable isotopes and fatty acid analyses. How far the trophic structure of the deep sea amphipod communities is similar to the shelf communities remains to be investigated.

Pioneering molecular studies (16s rRNA, 18s rRNA and CO1 data) on polar submergence in Antarctic isopods indicated several invasions into the deep sea from the Antarctic shelf, all of which occurred independently and may be related to the glaciation history in Antarctica. How far these trends may apply to amphipod crustaceans remains to be investigated. Can phylogenetic links be established between shelf and deep sea amphipod fauna and the origin of some World deep-sea taxa traced in the Antarctic shelf or in the deep Weddell Sea?

The present project will contribute to the ANDEEP-SYSTCO general aim by focusing on three main objectives:

Patterns and processes of amphipod biodiversity

- To pursue by a combined morphological and molecular approach the characterization of the composition of the amphipod fauna of the Antarctic deep sea and its relations with the Antarctic shelf fauna and the world abyssal fauna.
- To contribute taxonomical material, photographic records, distribution and ecological data to the ongoing "Synopsis of the Amphipoda of the Southern Ocean".

Ecomorphological and trophic characterization

- To document the ecological and ecomorphological traits (abundance, habitats, mode of life, size spectrum, etc.) of the Antarctic deep sea amphipod taxocoenoses on latitudinal and bathymetrical scales, in comparison with the Antarctic shelf fauna and the Atlantic deep-sea fauna.
- To characterize by digestive tract and stable isotope analyses the trophodiversity and the trophodynamic role of the Antarctic deep-sea amphipods in comparison with the shelf communities (as far as collected material will allow).

Molecular phylogeny and phylogeography

- To investigate the phylogeny and phylogeography of selected amphipod taxa (mostly Lysianassoidea) through parallel molecular and morphological approaches in an attempt to understand the colonisation history of deep sea taxa.

Work at sea

Benthic amphipods were collected using different gears: Agassiz trawl (AGT), Epibenthic sledge (EBS), autonomous baited traps (AT), and Rauschert dredge (RD. Tab.23). About 90 % of the amphipod collected during this cruise were sorted to species level. For each species sorted, a 50 % sample was fixed in cooled ethanol for further molecular studies and the other fraction was fixed in 4 % formalin for further morphological studies and proper identification.

Preliminary results

A total of 4502 individuals of amphipods were collected during this cruise.

Tab. 23.1: The number of individuals collected in each station, by every gear along with the depth at which these gears were deployed.

Station	Depth	Gear	Number of individuals
- PS 71/13	2990 m	AGT	20
	2995 m	EBS	24
	(+/-) 3000 m	Amphi trap	3
- PS 71/16	486 m	RD	165
- PS 71/17	2084 m	AGT	6
	2051 m	EBS	104
- PS 71/33	(+/-) 5300 m	Amphi trap	393
- PS 71/39	(+/-) 2150 m	Amphi trap	2104
- PS 71/47	1554 m	Amphi trap	723
- PS 71/48	602 m	AGT	146
	602 m	RD	813
- PS 71/90	(+/-) 4000 m	RD	1
			Total: 4502