2.5.2 Phylogeny, biodiversity and functional ecology of Amphipoda

(C. De Broyer, M. Rauschert, F. Nyssen)

Objectives

Weddell Sea amphipod crustaceans show high diversity, often high abundance and a remarkable ubiquity. These characteristics make them a model group for studying patterns and processes of biodiversity and biogeography. A large dataset on amphipod diversity and distribution obtained from previous "Polarstern" campaigns in the eastern Weddell Sea, the Peninsula and the Scotia Sea regions is presently being synthesized. Additional deep-sea data (ANDEEP) will allow to analyse the evolutionary relationships between the Antarctic shelf and deep-sea fauna.

First attempts to characterize the ecofunctional role of Antarctic amphipods revealed a rather large diversity of trophic types among the investigated species which, however, do not represent the full spectrum of trophic roles within the whole amphipod taxocoenosis. Quantitative estimates of the role of the amphipod community in benthic energy fluxes are missing.

Several complementary objectives are addressed here:

- Biodiversity:

(i) Composition and characteristics of the high Antarctic (Weddell Sea) amphipod fauna as compared to other Antarctic and Subantarctic zoogeographical sub-regions and to the deep slope and abyssal zones (ANDEEP). (ii) Photographic documentation of Antarctic benthos for the AWI Atlas of Antarctic Benthos in preparation by M. Rauschert. (iii) Contribution to the ongoing revision of the whole Antarctic amphipod fauna and to the preparation of new identification tools ("Antarctic Amphipodologist Network").

- Phylogeny and Phylogeography

Phylogeny of selected amphipod taxa (in particular Lysianassoidea) and their biogeographical history by a parallel molecular and ecomorphological study relying on both shelf and deep-sea (ANDEEP) material with emphasis on the polar submergence hypothesis.

- Trophic ecology

(i) Ecological characterization of the amphipod taxocoenosis, in particular the habitat diversity, the ecomorphological types and life styles. (ii) Detailed investigation of amphipod trophodiversity and trophodynamics. This study will involve: digestive tract analyses and feeding behaviour observations in aquaria, stable isotope ratios and fatty acid diet tracers.

- Metabolism

Analysis of trophic adaptive radiation in selected taxa by a morpho-functional approach coupled with a molecular identification of trophic homologies and analogies and molecular polarization of the ecomorphological adaptations.

Work at sea

Amphipods were sampled by Rauschert dredge, Epibenthic sledge, Agassiz trawl, Bottom trawl, and baited traps. Specimens were sorted, photographed and identified to the species on board. Live specimens were maintained in cool container aquaria. Samples for stable isotopes, fatty acids, and bacterial gut content studies were collected. Gut clearance experiments were carried out with 3 amphipod species (*Waldeckia obesa*, *Abyssorchomene plebs*,

Tryphosella murrayi) and 1 isopod species (*Natatolana* sp.), the experimental animals were fixed in formalin and will be analysed at home. With the collaboration of the T. Brey working group, respiration measurements have been performed with 4 species.

Preliminary results

- Material collected:

56 operations by Rauschert dredge (RD), Epibenthic sledge (EBS), Agassiz trawl (AGT), Bottom trawl (BT), Bentho-pelagic trawl (BPT) and baited traps (T) resulted in more than 11,000 amphipods. Additional material is expected from multibox corer (MG) samples.

- Biodiversity, biogeography and phylogeny:

229 amphipod (morpho)species belonging to 100 genera and 41 families were identified (Table 14). 31 species are probably new to science (but part of them has already been collected by some previous EASIZ or LAMPOS cruises).

Tab. 14 Preliminary list of sorted and identified amphipod species.

Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet	EWS
		I. GAMMARIDEA		
Acanthonotozomatidae	*Acanthonotozomoides*	*oatesi*		x
Acanthonotozomatidae	*Acanthonotozomoides*	sp.n. 1		x
Acanthonotozomatidae	*Acanthonotozomoides*	sp.n. 2		x
Acanthonotozomatidae	*Acanthonotozomopsis*	*pushkini*		x
Ampeliscidae	*Ampelisca*	*anversensis*		x
Ampeliscidae	*Ampelisca*	*cf. anversensis*		x
Ampeliscidae	*Ampelisca*	*barnardi*		x
Ampeliscidae	*Ampelisca*	*richardsoni*		x
Ampeliscidae	*Ampelisca*	spp.		x
Ampeliscidae	*Byblis*	sp.		x
Amphilochiidae	*Gitanopsis*	*inaequipes*		x
Amphilochiidae	*Gitanopsis*	*squamosa*	x	
Clarenciidae	*Clarencia*	*chelata*		x
Clarenciidae	*Clarencia*	sp.n.		x
Dexaminidae	*Polycheria*	*antarctica*		x
Dydimocheliidae	*Dydimochelia*	sp.		x
Epimeriidae	*Epimeria*	*annabellae*		x
Epimeriidae	*Epimeria*	*georgiana*		x
Epimeriidae	*Epimeria*	*grandirostris*		x
Epimeriidae	*Epimeria*	*cf heldi* (sp.n.?)		x
Epimeriidae	*Epimeria*	*inermis*		x
Epimeriidae	*Epimeria*	*cf. inermis*		x
Epimeriidae	*Epimeria*	*macrodonta*		x
Epimeriidae	*Epimeria*	*puncticulata*		x
Epimeriidae	*Epimeria*	*robusta*		x
Epimeriidae	*Epimeria*	*cf. robusta*		x
Epimeriidae	*Epimeria*	*rubrieques*		x

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Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet	EWS
Epimeriidae	*Epimeria*	*similis*		x
Epimeriidae	*Epimeria*	sp.		x
Epimeriidae	*Epimeria*	sp.		x
Epimeriidae	*Epimeriella*	*cf. truncata*		x
Epimeriidae	*Epimeriella*	*walkeri*		x
Epimeriidae	*Parepimeria*	*crenulata*	x	
Eusiroidea	*Atyloella*	*magellanica*	x	
Eusiroidea	*Atyloella*	sp.n.	x	
Eusiroidea	*Atyloella*	sp.		x
Eusiroidea	*Atylopsis*	*fragilis*	x	x
Eusiroidea	*Atylopsis*	*megalops*	x	x
Eusiroidea	*Atylopsis*	*orthodactylus.*	x	
Eusiroidea	*Atylopsis*	sp.		x
Eusiroidea	*Eusirus*	*antarcticus*		x
Eusiroidea	*Eusirus*	*cf. antarcticus*		x
Eusiroidea	*Eusirus*	*microps*		x
Eusiroidea	*Eusirus*	*perdentatus*		x
Eusiroidea	*Harpinioides*	*drepranocheir*		x
Eusiroidea	*Liouvillea*	*oculata*		x
Eusiroidea	*Liouvillea*	sp.n.		x
Eusiroidea	*Oradarea*	*edentata*		x
Eusiroidea	*Oradarea*	*rossi*	x	
Eusiroidea	*Oradarea*	*tricarinata*		x
Eusiroidea	*Oradarea*	*tridentata*		x
Eusiroidea	*Oradarea*	*walkeri*	x	x
Eusiroidea	*Paramoera*	*fissicauda*		x
Eusiroidea	*Paramoera*	sp.		x
Eusiroidea	*Paramoera*	*hurleyi*		x
Eusiroidea	*Prostebbingia*	*brevicornis*	x	
Eusiroidea	*Prostebbingia*	*gracilis*		x
Eusiroidea	*Rhachotropis*	*antarctica*		x
Eusiroidea	*Rhachotropis*	sp. *(hunteri?)*		x
Eusiroidea	*Schraderia*	*acuticauda*		x
Eusiroidea	*Schraderia*	*gracilis*	x	x
Eusiroidea	*Schraderia*	sp.1		x
Eusiroidea	*Gen. div.*	spp.	x	x
Hadzioidea	*Maera ?*	sp.		x
Hadzioidea	*Paraceradocus*	*gibber*		x
Hadzioidea	*Gen. nov.*	sp.n.		x
Iphimediidae	*Echiniphimedia*	*barnardi*		x
Iphimediidae	*Echiniphimedia*	*echinata*		x
Iphimediidae	*Echiniphimedia*	*imparidentata*		x
Iphimediidae	*Echiniphimedia*	*hodgsoni*	x	x
Iphimediidae	*Echiniphimedia*	sp.		x
Iphimediidae	*Gnathiphimedia*	*barnardi*		x
Iphimediidae	*Gnathiphimedia*	*cf. barnardi*		x
Iphimediidae	*Gnathiphimedia*	*fuchsi*		x
Iphimediidae	*Gnathiphimedia*	*macrops*		
Iphimediidae	*Gnathiphimedia*	*mandibularis*	x	x
Iphimediidae	*Gnathiphimedia*	*cf mandibularis*	x	

Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet	EWS
Iphimediidae	*Gnathiphimedia*	sp. (*cf. mandibularis*)	x	
Iphimediidae	*Gnathiphimedia*	*sexdentata*		x
Iphimediidae	*Gnathiphimedia*	*watlingi*	x	x
Iphimediidae	*Gnathiphimedia*	sp.1	x	
Iphimediidae	*Gnathiphimedia*	sp.2	x	
Iphimediidae	*Iphimediella*	*bransfieldi*		x
Iphimediidae	*Iphimediella*	*cyclogena*		x
Iphimediidae	*Iphimediella*	*microdentata*		x
Iphimediidae	*Iphimediella*	sp.		x
Iphimediidae	*Stegopanoploea*	*joubini*		x
Laphystiopsidae	*Prolaphystius*	*isopodops*		x
Lepechinellidae	*Lepechinella*	*drygalskii*		x
Lepechinellidae	*Lepechinella*	sp.		x
Lepechinellidae?	*Gen. n.*	sp.n.		x
Leucothoidae	*Leucothoe*	*spinicarpa*	x	x
Leucothoidae	*Leucothoe*	*spinicarpa*	x	x
Liljeborgiidae	*Liljeborgia*	*cf dubia*	x	
Liljeborgiidae	*Liljeborgia*	*georgiana*	x	x
Liljeborgiidae	*Liljeborgia*	sp.n.		x
Liljeborgiidae	*Liljeborgia*	sp.	x	
Liljeborgiidae	*Liljeborgia*	spp.		x
Lysianassoidea	*Abyssorchomene*	*charcoti*		x
Lysianassoidea	*Abyssorchomene*	*nodimanus*		x
Lysianassoidea	*Abyssorchomene*	*plebs*	x	x
Lysianassoidea	*Abyssorchomene*	sp.n.	x	
Lysianassoidea	*Abyssorchomene*	*rossi*		x
Lysianassoidea	*Ambasiopsis*	*uncinata*		x
Lysianassoidea	*Aristias*	*antarcticus*		x
Lysianassoidea	*Aristias*	*cf. collinus*		x
Lysianassoidea	*Cheirimedon*	*cf. crenatipalmatus*		x
Lysianassoidea	*Euonyx*	sp.n.		x
Lysianassoidea	*Figurella*	*tanidea*		x
Lysianassoidea	*Gainella*	*chelata*		x
Lysianassoidea	*Gen. nov.*	sp.n. („*Austroschisturella*")		x
Lysianassoidea	*Gen.*	sp.1	x	x
Lysianassoidea	*Gen.*	sp.2		x
Lysianassoidea	*Gen.*	sp.3		x
Lysianassoidea	*Gen.*	sp.4		x
Lysianassoidea	*Tryphosinae Gen.*	sp.		x
Lysianassoidea	*Hippomedon*	*kergueleni*	x	x
Lysianassoidea	*Hippomedon*	*cf. kergueleni*		x
Lysianassoidea	*Hippomedon*	*major*		x
Lysianassoidea	*Hippomedon*	sp.1		x
Lysianassoidea	*Hippomedon*	sp.2		x
Lysianassoidea	*Hirondellea*	*antarctica*		x
Lysianassoidea	*Hirondellea*	sp.n.1		x
Lysianassoidea	*Hirondellea*	sp.n.2		x
Lysianassoidea	*Kerguelenia*	*cf palpalis*		x
Lysianassoidea	*Kerguelenia*	sp.1		x

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Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet	EWS
Lysianassoidea	*Kerguelenia*	sp.2		x
Lysianassoidea	*Orchomenella*	*acanthura*		x
Lysianassoidea	*Orchomenella*	*cf. acanthura*		x
Lysianassoidea	*Orchomenella*	*cavimanus*	x	x
Lysianassoidea	*Orchomenella*	*cf. cavimanus*		x
Lysianassoidea	*Orchomenella*	*cf. kryptopinguides*		x
Lysianassoidea	*Orchomenella*	*pinguides*		x
Lysianassoidea	*Orchomenella*	*ultima*		x
Lysianassoidea	*Orchomenella*	*cf. ultima*		x
Lysianassoidea	*Orchomenella*	sp.	x	
Lysianassoidea	*Orchomenella*	spp.		x
Lysianassoidea	*Pachychelium*	*nichollsi*	x	
Lysianassoidea	*Parschisturella*	*carinata*		x
Lysianassoidea	*Pseudorchomene*	*coatsi*		x
Lysianassoidea	*Pseudorchomene*	sp.n.		x
Lysianassoidea	*Sophrosyne*	*sp.n.*		x
Lysianassoidea	*Stomacontion*	sp.n.	x	x
Lysianassoidea	*Tryphosella*	*cf analogica*		x
Lysianassoidea	*Tryphosella*	*bispinosa*		x
Lysianassoidea	*Tryphosella*	*cf. bispinosa*	x	x
Lysianassoidea	*Tryphosella*	*intermedia*		x
Lysianassoidea	*Tryphosella*	*cf. intermedia*		x
Lysianassoidea	*Tryphosella*	*macropareia*		x
Lysianassoidea	*Tryphosella*	*murrayi*		x
Lysianassoidea	*Tryphosella*	sp.n.		x
Lysianassoidea	*Tryphosella*	sp.1	x	x
Lysianassoidea	*Tryphosella*	sp.2		x
Lysianassoidea	*Tryphosella*	sp.3		x
Lysianassoidea	*Tryphosella*	sp.4		x
Lysianassoidea	*Tryphosella*	spp		x
Lysianassoidea	*Uristes*	*adarei*		x
Lysianassoidea	*Uristes*	*gigas*		x
Lysianassoidea	*Uristes*	*stebbingi*		x
Lysianassoidea	*Uristes*	sp.1		x
Lysianassoidea	*Uristes*	sp.2		x
Lysianassoidea	*Uristes*	sp.n.		x
Lysianassoidea	*Waldeckia*	*obesa*		x
Lysianassoidea	*gen.*	spp.		x
Melphidippidae	*Melphidippa*	*antarctica*	x	x
Melphidippidae	*Melphidippa*	sp.		x
Ochlesiidae	*Odius*	*antarcticus*		x
Oedicerotidae	*Oediceroides*	*calmani*		x
Oedicerotidae	*gen.*	spp.	x	x
Pagetinidae	*Pagetina*	*genarum*	x	
Pardaliscidae	*Halicella*	*parasitica*		x
Pardaliscidae	*Halicella*	*cf. parasitica*		x
Pardaliscidae	*gen.*	sp.	x	
Pardaliscidae	*gen.*	spp.		x
Phoxocephalidae	*gen. div.*	spp.	x	x
Pleustidae	*Parepimeria*	*crenulata*	x	
Pleustidae	*Parepimeria*	*minor*		x

Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet	EWS
Pseudamphilochiidae	*Pseudamphilochus*	sp.n.		x
Sebidae	*Seba*	*cf. antarctica*		x
Stegocephalidae	*Andaniotes*	*linearis*		x
Stegocephalidae	*Andaniotes*	*pseudolinearis*		x
Stegocephalidae	*gen.*	sp.1	x	
Stegocephalidae	*gen.*	sp.2		x
Stegocephalidae	*gen. div.*	spp.		x
Stenothoidae	*Antatelson*	*walkeri*	x	x
Stenothoidae	*Mesometopa*	sp.		x
Stenothoidae	*Metopoides*	sp.n. 1	x	
Stenothoidae	*Metopoides*	sp.n. 2	x	
Stenothoidae	*Metopoides*	sp.n. 3	x	x
Stenothoidae	*Thaumatelson*	*herdmani*		x
Stenothoidae	*Torometopa*	*antarctica*	x	
Stenothoidae	*Torometopa*	*antarctica*	x	
Stenothoidae	*Torometopa*	*cf. antarctica*		x
Stenothoidae	*Torometopa*	sp.n. 1		x
Stenothoidae	*Torometopa*	sp.n. 2		x
Stenothoidae	*Torometopa*	sp.n. 3	x	
Stenothoidae	*Torometopa*	sp. 1		x
Stenothoidae	*Torometopa*	sp. 2		x
Stenothoidae	*gen.*	sp.1	x	
Stenothoidae	*gen.*	sp.2	x	
Stenothoidae	*gen.*	sp. 3		x
Stenothoidae	*gen.div.*	spp.	x	x
Stilipediidae	*Alexandrella*	sp.n.1		x
Stilipediidae	*Alexandrella*	sp.n.2		x
Stilipediidae	*Alexandrella*	sp.n.3		x
Stilipediidae	*Alexandrella*	sp. 4		x
Stilipediidae	*Stilipes*	sp.		x
Stilipediidae	*gen.*	sp.	x	
Stilipediidae	*gen.*	sp.		x
Synopiidae	*Bruzelia*	sp.n. 1		x
Synopiidae	*Bruzelia*	sp.n. 2		x
Synopiidae	*Syrrhoe*	*nodulosa*		x
Synopiidae	*Syrrhoe*	*psychrophila*		x
Synopiidae	*Syrrhoites*	*anaticauda*		x
Synopiidae	*Tiron*	*antarcticus*		x
Synopiidae	*gen.*	sp.1		x
Synopiidae	*gen.*	sp.2		x
Synopiidae	*gen.*	sp.3		x
Synopiidae	*gen.*	sp.n.		x
Urothoidae	*Urothoe*	*cf falcata*		x
Urothoidae	*gen. 1*	sp.		x
Urothoidae	*gen.*	spp.	x	

Family or Superfamily
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Family or Superfamily	Genus	Species	ANT XXI-2 Bouvet EWS	
		II. COROPHIIDEA		
Corophiidae	*Gammaropsis*	*serricra*	x	
Corophiidae	*Haplocheira*	*barbimana*	x	
Corophiidae	*Haplocheira*	*cf barbimana*		x
Caprellidae	*Caprellinoides*	*tristanensis*	x	x
Podoceridae	*Neoxenodice*	*cf. hoshiaia*		x
Podoceridae	*Neoxenodice*	*cryophyle*		x
Podoceridae	*Podocerus*	*capillimanus*	x	
Podoceridae	*Podocerus*	*septemcarinatus*		x
Podoceridae	*Pseudodulichia*	*antarctica*	x	
Podoceridae	*Pseudodulichia*	sp.n. 1		x
Ischyroceridae	*Jassa*	*goniamera*	x	x
Ischyroceridae	*Jassa*	*thurstoni*	x	
Ischyroceridae	*Jassa*	sp.	x	x
Ischyroceridae	*Pseudericthonius*	*gaussi*	x	x
Ischyroceridae	*Pseudericthonius*	*hesperidesi*	x	x
Ischyroceridae	*Pseudericthonius*	sp. *(cf.gaussi)*		x
Ischyroceridae	*Ventojassa*	*georgiana*	x	x
Ischyroceridae	*gen.*	sp.	x	
Ischyroceridae	*gen.*	spp.		x
		III. HYPERIIDEA		
Hyperiidae	*Hyperiella*	*dilatata*		x
Hyperiidae	*gen.*	sp.		x
Scinidae	*Scina*	*rattrayi rattrayi*	x	
Vibiliidae	*Cyllopus*	*lucasi*		x

Four trawling and dredging operations as well as one trap deployment were performed on the poorly known bottoms around Bouvet Island. These operations resulted in more than 67 amphipod species (several probably new), compared to only 5 benthic amphipod species known for this site before the cruise. The biogeographical affinities of the Bouvet amphipod fauna as presently known are shown in Figure 44. The biogeographical links with the West Antarctic fauna (Antarctic Peninsula and Scotia Arc, excluding South Georgia) appear to be the strongest (24% of Bouvet species also occur in the West Antarctic), followed by the Weddell Sea (18%) and the other East Antarctic fauna (16%).
Samples for molecular phylogeny studies comprise 52 lysianassoid species (including several new species) belonging to 17 genera and 7 families and 37 species from 18 other amphipod families. Particular attention was paid to the selection of potential cryptic species.

- Photographic documentation of living crustaceans and benthos:
About 750 digital pictures (including 600 amphipod pictures) of live specimens of macrobenthos were taken to complete the photographic documentation of the Weddell Sea fauna for the Atlas of the Antarctic Benthos (M. Rauschert, in prep.). More than 1800 slides were taken from about 350

different invertebrate species of the following taxa: Porifera, Cnidaria, Mollusca, Polychaeta, Chelicerata, Crustacea, Pterobranchia, Echinodermata and Ascidiacea.

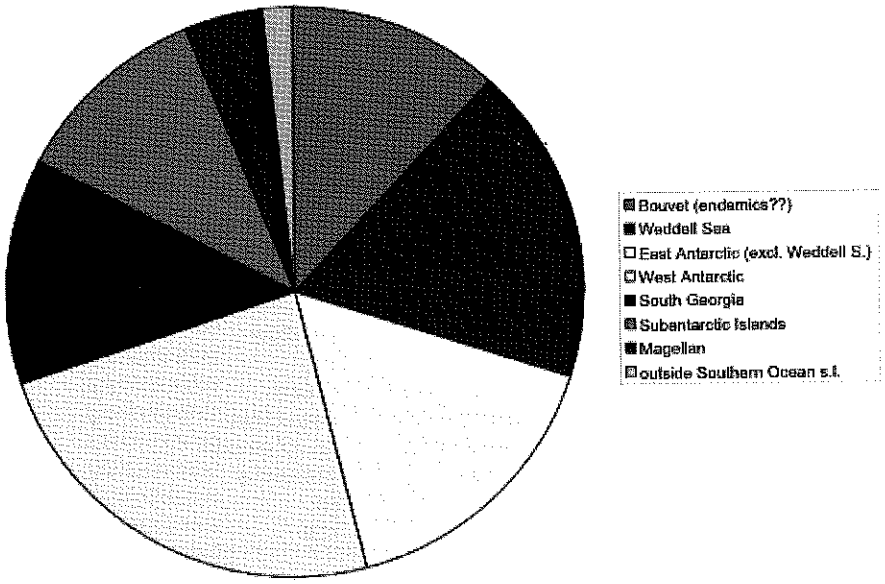

Fig. 44 Biogeographical affinities of the Bouvet amphipod fauna (45 spp.), starting 12 o'clock, clockwise

- (Micro)habitat characterization:
New data on associated amphipods were collected. At station 248, several adult and juvenile specimens of *Aristias collinus* and one stegocephalid were discovered inside the tentacles and pharynx of the actiniid *Hormathia* sp. *A. collinus* and *Ambasiopsis uncinata* were found in the pharynx of another sea anemone *Epiactis cf georgiana* at station 274. Several specimens of the dexaminid *Polycheria antarctica* were recorded in holes at the surface of a demosponge at station 232. *Clarencia* n.sp. was recorded on a hydrozoan species.

- Breeding cycles and reproduction in late spring
Pre-mature, mature and ovigerous females were sampled systematically to establish their reproductive status in late spring at the beginning of the primary production bloom season in the eastern Weddell Sea. Preliminary observations showed that some species (e.g. *Hippomedon* sp.1) had ripe gonads or a marsupium with probably freshly laid eggs at the first stage of development (showing close-packed yolk cells but no trace of embryo). Some species (e.g. *Uristes "pseudoalbinus"*) were bearing eggs at the first segmentation stage. Other species carried fully grown embryos ready to be released (e.g. the predator *Eusirus cf antarcticus*) or late embryos almost completely developed (stage 4) with already pigmented eyes (e.g. *Ampelisca richardsoni*, *Parschisturella carinata*). In one species, *Abyssorchomene*

Tab. 15 Specimens caught with baited traps.

Station & Gear	Depth (m)	Duration (h)	Amphipoda	Isopoda	Mysidacea	Ostracoda	Gastropoda	Pisces
			N spp/ ind	N spp/ ind	N spp/ind	N spp/ ind		Nspp/ ind

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Tab. 15 Specimens caught with baited traps.

Station & Gear	Depth (m)	Duration (h)	Amphipoda	Isopoda	Mysidacea	Ostracoda	Gastropoda	Pisces
			N spp/ ind	N spp/ ind	N spp/ind	N spp/ ind		Nspp/ ind
14 Trap/A	515	22	3 (>1000)				1 (15)	
103 Trap/F	378	102	17 (520)	2 (?)		1 (19)		1 (1)
+104 Trap/F	372							
167 LND	392	70	12 (251)	2 (166)		1 (76)		
195 Trap/F	305	55	7 (960)					
+196 Trap/F								
238 Trap/F +239 Trap/F	245	48	14 (640)	1 (2)				
240 LND	406	48	8 (80)	1 (8)		1(2)		
288 Trap/F	846	84	11 (371)	1 (3)	2 (2)			3 (4)
289 Trap/F	515	86	13 (>5000)	2 (553)				
290 LND	518	85	8 (>1140)	1 (126)				
Total			32 (>9000)	2 (858)	2 (4)	1? (97)	1 (15)	3 (5)

- Trophic ecology

Thirteen baited trap deployments (amphipod traps AT, fish traps FT and NIOZ Lander LN) provided 32 scavenger amphipod species (all Lysianassidae), 2 species of isopods (Natatolana, Cirolanidae), 2 mysids, 1 ostracod, 1 gastropod (Chlanidota densesculpta (Martens, 1885)) and three fish species (Zoarcidae: Pachycara brachycephalum; notothenoids) (Table 15). Part of the collected animals was kept in aquaria for further feeding experiments and metabolism measurements. 32 amphipod species were collected with baited traps: 30 lysianassoid species, one iphimediid and one melphidippid.

During the BENDEX expedition gut contents of some amphipod species already analysed during previous expeditions were re-examined for seasonality in their feeding strategy. Other species were collected for the detailed study of trophic features (Table 16).

Tab. 16 Species collected for gut content (GC), stable isotope (SI) and fatty acid (FA) analysis.

AMPHIPODA					
FAMILY	SPECIES	N	GC	SI	FA
EUSIRIDAE	*Atyloella* sp	1	X	X	
	Eusirus antarcticus	10		X	X
IPHIMEDIIDAE	*Echiniphimedia hodgsoni*	5	X	X	X
	Echiniphimedia barnardi	5	X	X	X
	Echiniphimedia echinata	10		X	X
	Gnathiphimedia mandibularis	4	E	X	X
	Gnathiphimedia watlingi	8	X	X	X
	Gnathiphimedia sexdentata	3	X	X	X
	Gnathiphimedia barnardi	3	X	X	X
	Gnathiphimedia cfr barnardi	10	X	X	X
	Iphimidiella brandsfieldi	2	X	X	X
	Iphimediella microdentata	10	X	X	X
	Iphimediella cyclogena	1	X	X	X
EPIMERIIDAE	*Epimeria walkeri*	2	X	X	X
	Epimeria inermis	4	X	X	X
LILJEBORDIIDAE	*Liljeborgia georgiana*	5	X	X	X
AMPELISCIDAE	*Ampelisca richardsoni*	20	X	X	X
OEDICEROTIDAE	*Oedicerotides calmani*	13	X	X	X
STEGOCEPHALISAE	*Stegocephalidae*	5	X	X	X
PHOXOCEPHALIDAE	*Phoxocephalidae*	15	X	X	X
STILIPEDIDAE	Stilipedidae	4	X	X	X
LYSIANASSIDAE	*Tryphosella murrayi*	4	E	X	X
	Uristes adarei	15	X	X	X
	Uristes gigas	8	X	X	X
	Parschisturella carinata	20	X	X	X
	Aristias antarcticus	3		X	X
	Waldeckia obesa	2	X	X	X
	Orchomenella ultima	20		X	X
ISOPODA					
CHAETILIIDAE	*Glyptonotus antarcticus*	1		X	X
CIROLANIDAE	*Natatolana* sp.	100	X	X	X

Several species of detritivorous and necrophagous amphipods have also been collected for assessing the share of bacteria in their diet. They will be analysed in collaboration with Dr C. DeRidder from Brussels University (ULB).

- Maintenance of live animals for uptake/loss experiments:
Selected amphipod and isopod species were maintained alive for further experiments, in particular for uptake/loss experiments with thorium and polonium radioactive markers planned at the EAAE Marine Environment Laboratory (Radioecology) in Monaco.

- Metabolism
4 amphipod species were chosen for respiration measurements: *Eusirus perdentatus* (macropredator, highly active), *Gnathiphimedia mandibularis* (micropredator, feeding on bryozoans and sponges), *Echiniphimedia hodgsoni* (micropredator, feeding on sponges) and *Waldeckia obesa* (scavenger, motionless). We measured metabolic rates of whole animals in an intermittent-flow respirometer equipped with a state-of-the-art oxygen optode sensor measurement system. The results will be treated in the AWI in collaboration with Dr T. Brey.

2.5.3 Biogeography, speciation and biodiversity of Antarctic Asellota
(M. Raupach)

Objectives

The Isopoda and especially the Asellota are one of the most numerous and important elements of the benthos in all oceans. They are the dominating taxon among crustaceans in the deep sea. Little is known about Antarctic Asellota, and no molecular data are available. Numerous deep-sea Asellota were collected during the ANDEEP expeditions (2002, ANT XIX/3+4) and preserved for molecular studies. Preliminary results of ssu rDNA-gene analyses indicate a multiple colonization of the Antarctic deep sea. This ecosystem has to be considered as a special case. It was colonized not only by Asellota from the neighbouring deep-sea basins but also by shelf forms. The relatives of some blind deep-sea forms, e.g. the Acanthaspidiidae, possess eyes and are endemic to the Antarctic shelf. Hence some deep sea species may have evolved from immigrating shelf forms, a phenomenon called "polar submergence". Interestingly, a great number of typical deep-sea species can also be found on the Antarctic continental shelf ("polar emergence"). Submergence events can be found within other isopod suborders, too: first studies on serolid isopods (Sphaeromatidea) indicate several independent invasions of the deep sea. Since both emergence and submergence can be observed in Antarctica, the evolution of the shelf fauna is closely related to the adjacent deep sea. With additional asellote species from the shelf we will be able to reconstruct the phylogeny of the Asellota and the colonization of the Antarctic deep sea in more detail.

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Edited by Wolf E. Arntz and Thomas Brey
with contributions of the participants

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