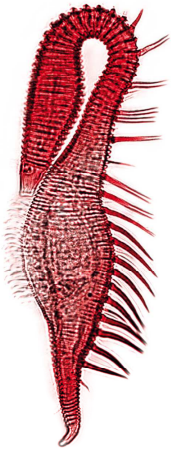
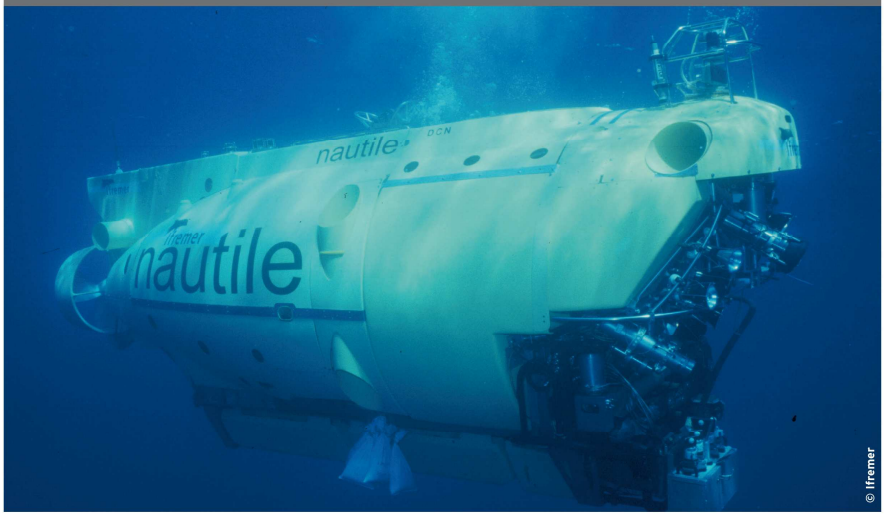
MeioScool 2013



Meiofauna international Workshop

Plongée dans un univers microscopique

A dive in a microscopic world



CONFÉRENCES & SÉANCE D'AFFICHES
Conferences & poster session

26•27 Novembre 2013
Amphi A, Institut Universitaire Européen de la Mer
Rue Dumont d'Urville,
29280 Plouzané (France)

TRAVAUX PRATIQUES
Practical sessions

28•29 Novembre 2013
Centre de découverte des océans
Océanopolis Port de plaisance du Moulin Blanc
29210 Brest (France)

http://meioscool2013.sciencesconf.org/

Scientific and Organising Committees

Conference organisers

Daniela Zeppilli and Jozée Sarrazin (Ifremer, EEP)

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Emmanuelle Omnes (Ifremer, EEP)

Tuesday 26	**Amphi A (IUEM)**		
08:15-0900	Welcome Coffee/Registration		
0900-0910		Treguier AM	Conference Opening
0900-0930		Zeppilli D & Sarrazin J	Welcome to MeioScool Housekeeping announcements
Session 1 Meiofauna: biodiversity and ecosystem functioning			
0900-0930		Zeppilli D & Sarrazin J	Welcome to MeioScool Housekeeping announcements
0930-1015	**Invited Speaker**	**Leduc D**	**Deep-sea nematodes from down under: diversity patterns and relationship with ecosystem function**
1015-1030		Baldrighi E	Meiofauna vs macrofauna communities in the deep Mediterranean sea: an insight into alpha-, beta- and trophic diversity of two benthic components
1030-1100	Coffee Break		
Session 1 Meiofauna: biodiversity and ecosystem functioning			
1100-1145	**Invited Speaker**	**Sørensen M**	**The Scalidophora: Biodiversity, systematics and geographic distribution**
1145-1200		Sönmez S	An investigation on the diversity and distribution of interstitial and phytal Miraciids (Crustacea, Copepoda, Harpacticoida) of Turkey
1200-1215		Cabria R	Ecological structure of the meiofauna from a sandy beach of Valencia (Spain, western Mediterranean)
1215-1315	Free lunch on site		
Session 2 Meiofauna from Polar Regions			
1315-1400	**Invited Speaker**	**Vanreusel A**	**Nematodes from the Southern Ocean to the central Arctic: aspects of functional and structural diversity in a context of global change**
1400-1415		Ostmann A	Meiofauna communities around Iceland
1415-1430		Górska B	Vertical patterns of meiofauna distribution in Arctic deep-sea surface sediments (HAUSGARTEN, Fram Strait)
1430-1530	**Invited Speaker**	**Wassmann P**	**Shelves of the Arctic Ocean: Plankton dynamics, Carbon flux and climate change**
1530-1600	Coffee Break		
Session 3 Meiofauna: biodiversity and biogeography			
1600-1645	**Invited Speaker**	**Fontaneto D**	**Spatial patterns in microscopic organisms: new scenario in biogeography?**
1645-1700		Pereira I	Understanding the Regional Marine biodiversity pattern along the Indian coast using Meiobenthic Nematoda and Harpacticoida as a proxy
1700-1715		Chandrabhotla A	Composition and distribution of meiobenthos off Pudimadaka, East Coast of India
1715-1800	Free discussion		
1800-1930	Poster session + Cocktail		
1930-2000	Awards ceremony of Photography Competition		

Wednesday 27	**Amphi A (IUEM)**		
Session 4 New discoveries in meiofauna			
0900-0945	**Invited Speaker**	**Kristensen R**	**Celebrating 30 years after the description of Loricifera: What have we learned with these enigmatic animals?**
0945-1000		Neves R	Shira larva? A new larval type in phylum Loricifera
1000-1015		Stefanoudis P	Novel monothalamous benthic Foraminifera associated with planktonic shells and mineral grains from the Porcupine Abyssal Plain
1015-1045	Coffee Break		
Session 5 Meiofaunal response to anthropogenic impacts			
1045-1130	**Invited Speaker**	**Arbizu PM**	**Meiofauna and deep-sea environmental protection**
1130-1145		Singh R	Ferromanganese Nodule and sediment associated Meiofauna from the Central Indian Ocean
1145-1200		Grzelak K	Nematode communities from chemical munitions dumpsites (Baltic Sea)
1200-1330	Free lunch on site		
Session 5 Meiofaunal response to anthropogenic impacts			
1330-1345		Grego M	The impact of fish farming on a benthic copepod community in the northern Adriatic
1345-1400		Guidi-Guilvard L	The effect of Ostreopsis cf. ovata, a toxic benthic dinoflagellate, on phytal meiofauna from the coastal NW Mediterranean
1400-1415		Rasha S	Structural and functional composition of mangrove meiofauna in relation to human disturbance with special reference to free-living marine nematode assemblages
Session 6 Deep-sea meiofauna			
1415-1500	**Invited Speaker**	**Gooday A**	**Benthic foraminifera – a dominant faunal element on the deep ocean floor**
1500-1530	Coffee Break		
Session 7 Meiofauna in chemosynthetic ecosystems			
1530-1615	**Invited Speaker**	**Yvanenko S**	**Overview of crustacean copepods of the deep sea hydrothermal vents**
1615-1630		Plum C	The epizootic copepod community associated with tubeworm and mussel aggregations at a natural oil seep in the Gulf of Mexico (Green Canyon)
1630-1645		Zeppilli D	Unveiling the hidden biodiversity: colonization of meiofauna in deep-sea hydrothermal vents
1645-1700	Free discussion		

Thursday 28	**Océanopolis (room Paul-Émile Victor)**	
	Lesson	Tutor
0900-0915	Sampling and extraction methods Forams	Gooday/Fontanier
0915-0930	Quantitative extraction methods Nematode	Leduc
0930-0945	Extraction methods Loricifera, Tardigrada, Kinorhyncha	Sørensen/Kristensen
0945-1015	SEM/TEM methods	Sørensen/Kristensen
1015-1045	Coffee Break	
1045-1115	Confocal microscopy	Arbizu
1115-1145	Molecular methods	Fontaneto
1145-1200	Isotope analyses	Leduc
1200-1330	Free lunch on site	
1330-1400	Introduction to Foraminifera	Gooday/Fontanier
1400-1430	Introduction to Nematoda	Leduc
1430-1500	Introduction to Copepoda 1	Arbizu
1500-1530	Introduction to Copepoda 2	Yvanenko
1530-1600	Coffee Break	
1630-1700	Introduction to Rotifera	Fontaneto
1700-1730	Introduction to Scalidophora	Sørensen
1730-1800	Introduction to Tardigrada	Kristensen
1930-2300	Social Dinner at La Base Restaurant (85 quai Eric Tabarly, Brest)	

Friday 29	**Océanopolis (rooms Paul-Émile Victor and Albert Lucas)**
0900-1000	Parallel Practical Identification Sessions
1000-1030	Coffee Break
1100-1230	Parallel Practical Identification Sessions
1230-1400	Free lunch on site
1400-1700	Parallel Practical Identification Sessions
2030-2330	Nuit Microscopique at Océanopolis with D. Desbruyeres and Improinfini

N	**Poster**		
1	*Session 1*	Gracia A	Methodological design for the study of meio-epifaunal communities in Costa Rica
2	*Session 1*	Cabria R	Meiofauna biodiversity from a sandy beach of Valencia (Spain, western Mediterranean)
3	*Session 1*	Cheng-Ann C	Seasonal variability in free-living marine nematode community structure in a sandy and mangrove area in Teluk Awar, Sarawak, Malaysia
4	*Session 1*	Kamra A	Relationship between meiofaunal assemblage and their microbial food (Bacteria) along Alexandria Coast, Egypt
5	*Session 1*	Ortega Kohatsu ME	Tardigrades of the Queñoa Polylepis tomentella woodlands of Chaviña District (Ayacucho - Perú)
6	*Session 2*	Grzelak K	From 'benthos-dominated' to 'zooplankton-dominated' mode-biological backgrounds of the Face2Face project
7	*Session 3*	Mevenkamp L	Selective settlement of deep-sea and intertidal meiofauna - an experimental approach
8	*Session 4*	Köroğlu N	A new species of Leptocaris T. Scott, 1899 (Copepoda: Harpacticoida Darcythompsoniidae) from the Aegean Coast of TurkeyFROM THE AEGEAN COAST OF TURKEY
9	*Session 4*	Sönmez S	A new species of the genus Schizopera Sars, 1905 (Copepoda: Harpacticoida: Miraciidae) from the Mediterranean coast of Turkey
10	*Session 4*	Durucan F	New record of the ciliate Praethecacineta halacari (Ciliophora: Suctorea) epibiont on Copidognathus halacarid mite (Acari: Halacaridae) from Portugal
11	*Session 4*	Durucan F	Halacaropsis hirsuta (Acari: Halacaridae): first record for the Turkish fauna
12	*Session 5*	Capecci S	Previsions of ecosystem states of the sandy intertidal in the North Adriatic Sea in response to extreme weather events: is meiofauna a good predictor?
13	*Session 5*	Zangrilli MP	Analysis of meiobenthic response at different level of anthropogenic impacts in the intertidal zone of the Northen Adriatic sea
14	*Session 5*	Parretti P	Maerl beds & associated benthic communities: a scenario of the effects of climate change on an important biogenic habitat
15	*Session 5*	Alvarez L	Effect of the pH in in the spatial and vertical distribution of the kinorhynchs in the Wagner and Consag Basins, Gulf of California, Mexico
16	*Session 5*	Carriço R	Can meiofauna be a good biological indicator of the impacts of eutrophication caused by green macroalgal blooms?
17	*Session 5*	Mouawad R	Study of meiofauna community composition on a sewage-polluted Lebanese sand beach
18	*Session 5*	Fontanier C	Assessing the environmental impact of Tōhoku tsunami off Hachinohe (NE Japan): a multidisciplinary approach
19	*Session 6*	Caballero W	Meiofauna associated to OMZ on the continental shelf off central Chile (Valparaiso Bay)
20	*Session 7*	Zeppilli D	Deep-sea hYdrothermal Vent nematodes as potential source of new Antibiotics (DYVA project)
21	*Inter-session*	IUEM M1 students	Climate change, biodiversity and ecosystem functioning, extreme environments and response to anthropogenic impacts: four ecological ‘hot” topics from a meiofaunal point of view.

Pr. Daniel Leduc

National Institute of Water and Atmospheric Research, Private Bag 14-901, Wellington, New Zealand

Deep-sea nematodes from down under: diversity, function, and their relationship

Nematodes dominate deep-sea benthic communities, both in terms of abundance and diversity. This profusion of specimens and species in an otherwise depauperate ecosystem represents both a challenge and an opportunity for ecologists interested in understanding the mechanisms driving diversity patterns, and how diversity might be linked to ecosystem function. In this talk I examine some of the most recent advances/challenges to our understanding of deep-sea nematode diversity and its possible links with ecosystem function based on research conducted in the Southwest Pacific region. Our understanding of the contribution of different spatial scales to deep-sea nematode diversity, for example, has improved, but will require changes to sampling methodologies if it is to progress further. Understanding both the role of nematodes in benthic food-webs and their contribution to overall metabolism will be crucial in order to appreciate the mechanisms behind any biodiversity-function relationship. The existence of a potentially important link between nematodes and upper trophic levels is discussed based on new data and observations from the New Zealand continental slope.

Pr. Martin V. Sørensen

Natural History Museum of Denmark, Universitetsparken 15, 2100 Copenhagen, Denmark

The Scalidophora: Biodiversity, systematics and Geographic Distribution

Scalidophorans constitute a putatively monophyletic group of ecdysozoans, that all are characterised by having a head, consisting of a retractable mouth cone and an eversible introvert equipped with sensory and locomotory appendages – the so-called “scalids”. The clade Scalidophora includes three groups: The entirely meiofaunal phyla Kinorhyncha and Loricifera, and the Priapulida that includes both meiofaunal and macrofaunal organisms. Of the three phyla, Priapulida is the smallest one with only 20 described species. Even though the size of the species ranges with over a magnitude of 100 from the smallest, Meiopriapulus fijiensis, to the largest one, Halicryptus higginsi, the overall morphology in meio- and macrofaunal species is surprisingly similar. Priapulids also accommodates a rich fossil fauna that dates back to the Cambrian, and together with the two other scalidophoran clades, they might very well be the key to understand early ecdysozoan evolution. The second scalidophoran clade, Loricifera, is one of the most recently discovered animal phyla. We have known loriciferans for less than 40 years, but despite their minute size and the limited number of described species, these animals have provided some of the most interesting discoveries in modern invertebrate research. For instance, they have the capability to develop a very broad range of life cycles, ranging from species with rather simple ones with development through a short series of larvae, to extremely complex lifecycles that involves paedogenesis, parthenogenesis, ghost larvae and hermaphroditism. Recently it was also shown that some species of Loricifera are among the very few metazoans that are adapted to live in complete anoxia. Kinorhyncha is the third, and with 207 described species, also the most diverse scalidophoran phylum. They have been known for more than 150 years, but through time only very few researchers have dedicated their interest to these spined and segmented microinvertebrates, hence, kinorhynch research is in many way still on a pioneer stage. Hence, much research is still focused on taxonomy and geographic distribution, in order to understand the group’s biodiversity. Currently, only the kinorhynch fauna along the US East Coast, around the Korean and Iberian Peninsulas, and in the Mediterranean can be considered relatively well-examined. Also the kinorhynch interrelationships are still uncertain, and the first phylogenetic analyses based on combined molecular and morphology information are currently being carried out.

Pr. Ann Vanreusel

Ghent University, Department Biology, Marine Biology research group, Krijgslaan 281 S8, B-9000 Ghent, Belgium

Nematodes from the Southern Ocean to the central Arctic: aspects of functional and structural diversity in a context of global change

Free-living marine nematodes are associated with the seafloor worldwide and show specific characteristics in terms of standing stock and structural and functional composition depending on the physical and biochemical features of their substrates. Furthermore nematode communities show a tight link with food input both in terms of quality and quantity. These associations make nematodes a good indicator of changes in the marine environment. Subtle changes in sediment composition, physical disturbance, and shifts in food input causes major changes in the nematode communities. However nematodes are also very persistent and therefore they may quickly recolonize heavily disturbed environments. By means of examples from both experimental and field studies mainly from polar regions, the response of nematodes to changes in their environment will be demonstrated from regional processes (ice berg scouring) to large scale events (surface productivity). Through the combination of field and experimental observations our insight on these responses is growing. However more integrated studies, which combine interactions between different taxonomic, size or functional groups, are required too. Interaction with macrofauna definitely has its impact on nematodes, an aspect which is often neglected in meiofauna studies.

Pr. Paul Wassmann

Institute of Arctic and Marine Biology, Faculty of Biosciences, fisheries and economy
University of Tromsø – Norway's Arctic University, N-9037 Tromsø, Norway

Shelves of the Arctic Ocean: C flux, climate change and what has to be done in the European sector?

Primary and secondary production on the Eurasian shelves and the Barents Sea were investigated through the physically-biologically coupled, 3D SINMOD model. We tested the effect of how retreating ice cover in the forthcoming century may affect the productivity in the Arctic Ocean by forcing the model with the IPPC climate scenarios A2 (+3.7°C at 2100). Transition to ice-free areas is abrupt and is accompanied with large interannual variability. Changes in ice conditions suggest a great impact on the physical environment of the Arctic Ocean by altering water mass composition. There is a great variability in primary production in the present seasonal ice zone. There will also be changes in the geographical position of seasonal ice zone and less variability in areas that no longer has a seasonal ice cover. The model predicts that annual primary production increases in general, but decreases in areas dominated by Atlantic Water. The change is mainly driven by decrease of nutrient content of inflowing Atlantic Water and by reduced mixing caused by increased thermal stratification. The model indicates that Gross Primary production (GPP) increases along the temperature gradient both in the Arctic Basin and along the Eurasian shelves from 10 to 40 and 30 to 60 g C m-2 y-1, respectively. In contrast, GPP in the Barents Sea stayed more or less constant (100 g C m-2 y-1), with decrease in the south and increase in the north. The interest to use the northern Barents Sea and adjacent Arctic Ocean economically in the near future induces the question how this development can take place in a sustainable manner. As in the southern Barents Sea that is characterised by probably the Words best fishery and environmental management, activity in the north has to be based upon detailed and thorough investigations of the physical, chemical and biological environment. As this knowledge is not present for the time being plans have to be made how this could be approached.

Plenary Session

Pr. Diego Fontaneto

National Research Council, Institute of Ecosystem Study (CNR-ISE), 28922 Verbania Pallanza (VB), Italy

Spatial patterns in microscopic organisms: new scenario in biogeography?

All organisms studied so far denote patterns, structures and peculiarities in their geographical distribution. That is so obvious that the analysis of these patterns is the field of biogeography and macroecology. Apparently, organisms smaller than 2 mm, with easily dispersed dormant propagules, seem to be without any spatial structure, cosmopolitan and without limiting factors in their distribution. This ubiquity assumption has been challenged and recent empirical evidence may show a new picture emerging for microscopic animals. They show spatial patterns in their distribution at all scales, and can thus be used as an empirical system to test principles of biogeography.

Pr. Reinhardt Møbjerg Kristensen

Natural History Museum of Denmark, Universitetsparken 15, 2100 Copenhagen, Denmark

Kristensen R.M., Neves R.C.[1], Danovaro R.[2]
[1]*Biozentrum, University of Basel, Klingelbergsstrasse 50, CH-4056 Basel, Switzerland*
[2]*Department of Marine Science, Faculty of Science, Polytechnic University of Marche, Via Brecce Bianche, 60131 Ancona, Italy*

Celebrating 30 years after the description of Loricifera: What have we learned with these enigmatic animals?

The first Loricifera was described in 1983 (Kristensen 1983) from low water oxic sediments off the coast of Roscoff (France). Adult loriciferans are bilaterally symmetrical marine metazoans and between 98-485 µm long. The body is divided into four regions: head (mouth cone + introvert), neck, thorax and abdomen. The first loriciferans ever observed were found in the 1970's, but the first species, Nanaloricus mysticus was described only in 1983 from shell gravel collected off the coast of Brittany, France. The reason why it took so much time from the discovery to description of Loricifera is because these microscopic animals have a very complex life-cycle, with a larval stage (Higgins-larva) which looks totally different from the adults. Furthermore a new technique by freshwater-shocking (few minutes) large samples of sediments was developed in order to release the meiofauna animals from the bottom sediments. Indeed, both the larvae and the adults of Loricifera may adhere strongly to the sand grains or gravels by adhesive glands. However, in 2011 both larvae and adults of Armorloricus and Nanaloricus were video recorded while still alive (Neves et al. 2013). These observations were again from Roscoff. Most surprising was that the adults could jump. Only 33 species of loriciferans have been been described, but today more than 100 different species had been collected. All known species are marine, microscopic, and live within the bottom sediments as adults. The larva may have very large swimming-toes (flippers) and have been taken free in the plankton. In several species of the genus Rugiloricus the larva gets a mature ovary (neoteny) and develops 4-12 larvae inside the old larva exuvium after a moult. The neotenous larvae look exactly as the larva coming out of the free-laying egg. The Rugiloricus-larvae may be found the most part of the year and outnumbered the adults to 1:100. Free living postlarvae, when they are present (it seems to be only a thin cuticle in Pliciloricus), do not possess toes, and setae and locomotory spines on the abdomen are also absent. In general the postlarva appears very similar to the adults, though it has always fewer scalids and a thinner lorical cuticle and it lacks the gonads. The fine structure of the mouth cone, the introvert and the circumenteric brain indicates that the phylum is a monophyletic group of meiofaunal animals, related to Kinorhyncha and Priapulida – the so called Scalidophora. Further, the annulations of the flexible buccal tube, the telescopic mouth cone and three rows of placoids in the triradiated pharynx bulb are only found in Tardigrada and Loricifera.

However, these similarities between tardigrades and loriciferans may be considered as convergent. The evolutionary relationships of Loricifera within Metazoa are still controversial, however new molecular data show that loriciferans and nematomorphs may be phylogenetically related. The study of the loriciferan body plan at the morphological and molecular level is thus essential to better understand the evolutionary history of phylum Loricifera. More than 90% of the ocean biosphere is deep (> 3000 m water depth) and most of this complex realm remains totally unexplored.However, it was unexpected to find the first evidence of a metazoan life cycle spent permanently in anoxic sediments (Danovaro et al. 2010). During the last ten years we have explored and studied the living fauna in the sediments of the deep anoxic hypersaline L'Atalante Basin (3,363 – 3,600 m depth) in the Mediterranean Sea. We recently reported three species of Loricifera new to science that inhabit the totally anoxic sediments of the L'Atalante basin. Using radioactive tracers, biochemical analyses, quantatitive X-ray microanalysis and infrared spectroscopy, scanning and transmission electron microscopy observations on ultrathin sections, we provided evidence that the new species of loriciferans are metabolically active and show specific adaptations to the extreme conditions of the deep L'Atalante Basin. For instance, these loriciferan species lack mitochondria and rather possess a large number of hydrogenosome-like organelles, and are associated with endosymbiotic prokaryotes. Furthermore, it seems that these loriciferans lack chitin and have chitosan in the cuticle. In our new research project we will compare the low water loriciferans from Roscoff, which possess chitin in the cuticle and mitochondria, with those loriciferans found at the L'Atalante Basin. We will test two hypotheses:
1) Have the L'Atalante loriciferans lost their mitochondria secondarily?
or
2) Did the first ancestor of loriciferans lack mitochondria.
In relation to these two questions, the materials of a corset-like fossil Siriloricus carlsbergi Peel, 2010 from the Cambrian Sirius Passet Lagerstätte of North Greenland has been investigated. The discovery of Loricifera living in permanently anoxic conditions - perhaps already in the Cambrian Period - opens new perspecitives for the study of origin of life on Earth. Metazoans may have inhabited sediments lacking molecular oxygen before Early Cambrian.

Pr. Pedro Martinez Arbizu

Deutsches Zentrum für Marine Biodiversitätsforschung - Senckenberg, Suedstrand 44, D-26382 Wilhelmshaven, Germany

Meiofauna and deep-sea environmental protection

The deep sea is a vast and remote ecosystem. It is characterized by relatively constant environmental conditions over large geographic and temporal scales. Only few human activities go deeper than 3000m so one may believe that deep-sea ecosystems are pristine and largely protected from anthropogenic impacts. But this may change quite rapidly in near future. Increasing demand of mineral resources is the consequence of a steadily increasing human population and increasing industrializations of countries. Technological development creates a high demand for rare earth elements for which no marked existed one decade ago. The industry is searching for alternative Lagerstätten and marine minerals will become a realistic target in near future. Deep-sea mineral deposits are located mainly in three habitat types: the manganese nodules, hydrothermal vents and seamounts. Exploitation of any of these deposits will cause some negative impact to the deep-sea communities. Different projects are now in place in order to define these impacts and to propose mitigation procedures. Meiofauna will be one of the target organism groups that will be used to assess environmental impacts during and after mining operations and to describe the recovery of ecosystems after mining. The present contribution will present a review of the status quo regarding deep-sea mining and will present some results of the response of meiofauna communities to deep-sea mining activities.

Pr. Andrew J. Gooday

National Oceanography Centre, University of Southampton Waterfront Campus, European Way,Southampton SO14 3ZH, UK

Benthic foraminifera (Protista, Rhizaria) - a dominant faunal element on the deep ocean floor

Abstract. Foraminifera are an immensely successful and diverse component of deep-sea benthic communities, encompassing an extraordinary range of morphotypes and ecological traits. They are the only taxon to span all sizes classes from the nanobiota (<30 µm) to the megafauna (>10 cm), occur in all marine environments from intertidal salt marshes to the deepest ocean trenches, and are often a dominant component of the meio- and macro-fauna. Bathymetric and geographic distributions are strongly influenced by organic-matter fluxes and carbonate dissolution. Calcareous taxa generally predominate on continental margins (bathyal depths) but with increasing water depth the proportion of species with agglutinated tests ('shells') increases and below the carbonate compensation depth (CCD) faunas are almost entirely agglutinated or organic walled. Particularly in the abyss (>3,500 m), the larger size fractions are dominated by komokiaceans and other 'primitive' taxa with unusual morphologies that were only recognized as foraminifera fairly recently. Giant foraminifera (xenophyophores) several centimeters or more in size, are often the dominant large organisms visible on the deep oceanfloor. In contrast to the calcareous taxa, komokiaceans, xenophyophores and similar forms are largely undescribed and have little fossilization potential. The ecological role of deep-sea foraminifera is undoubtedly important. In some continental margin settings, experimental evidence suggests that calcareous species occupying shallow infaunal microhabitats are important in the short-term processing of labile organic matter derived from surface production. Some can tolerate severe hypoxia (oxygen deficiency) and are very abundant in oxygen minimum zones. Such species are often able to store and respire nitrate, allowing them to survive in the absence of oxygen, at least until the nitrate reserves are exhausted. On the other hand, komokiaceans and other agglutinated taxa that predominate at abyssal depths are probably less metabolically active than the calcareous species, although their sheer abundance on a global scale ensures their importance in carbon cycling, as well as in creating habitat structure for other organisms. Although our knowledge has increased substantially in recent years, much remains to be learnt about the ecology and diversity of these remarkable protists, particularly in remote deep-sea habitats.

Pr. Viatcheslav Ivanenko

Biological faculty, Lomonosov Moscow State University, Moscow, Russia

Overview of crustacean copepods of the deep sea hydrothermal vents

Diverse unknown or rare crustacean copepods representing over 20 families in 7 orders are found last years in different samples from deep sea hydrothermal vents (Mid-Atlantic Ridge, East Pacific Rise, New Ireland Fore-Arc system, and Gorda Ridge) obtained during in situ colonization experiments, by sediment traps or through direct sampling (suction samplers and arm grabs). Among many finding one of the most remarkable is the discovery of abundant and diverse nauplii, adults, and subadults of new and rare copepods in 63 µm fraction of the samples from the Mid-Atlantic Ridge. The finding of diverse vent specific copepods at different developmental stages suggests an essential role of benthic copepods in both structuring and functioning of the communities present in the extreme deep-sea environment. The role of most copepods in the vent food web remains to be resolved but seem to be linked to microbial mats and their invertebrate hosts. Access to new methods of study and sampling, improvement of sorting effort will lead to better knowledge of different aspects of biology of copepods living in deep sea hydrothermal vent ecosystems.

Oral Communications

Meiofauna vs macrofauna communities in the deep Mediterranean sea: an insight into α-, β- and trophic diversity of two benthic components.

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Deep-sea ecosystems represent the largest biome in our planet. Being highly complex and still unknown, the comprehension of spatial variability of biodiversity and processes shaping species distribution and diversity is one of the main ecological challenge. Up to now, many studies tried to document the presence and the causes of spatial patterns (e.g. longitudinal and bathymetric) in the distribution and diversity of the Mediterranean deep-sea meiofauna and macrofauna, but sporadically collecting them in a simultaneous manner. In the present study, I investigated the α-, β- and trophic diversity patterns on a large (> 1000s km) spatial scale of two of the major deep-sea benthic components: the meiofauna and macrofauna. The two different benthic size communities were synoptically sampled from different slope areas along the deep Mediterranean sea, from the west (WM-1; WM-2; WM-3) to the east basin (CM-1; CM-2 and EM in the central and eastern basin respectively), at three main depths: 1200, 1900, 2400-2700 m. Several benthic community descriptors were considered: taxa composition; macrofaunal and nematodes species richness (ESn), equitability; trophic diversity and turnover diversity along longitudinal and bathymetric axes. The aims of this study were: 1) to elucidate the meio- and macrofauna α- and β-diversity longitudinal and bathymetric patterns and the presence of a significant relation between the diversity of the two benthic components; 2) to investigate spatial changes in their structural and functional diversity (i.e. trophic diversity) and the relationship between biodiversity and functional diversity; 3) to discuss the influence of putative food sources and heterogeneity of the substrate in regulating the variability of the two benthic size classes. Results from the present study showed that the α-diversity of nematodes and macrobenthic organisms decrease moving eastward. Furthermore, macrofaunal diversity was negatively effected by depth, but nematodes diversity. The equitability indices showed opposite trends with longitude. Both benthic components were characterized by high rates of turnover diversity at different longitudes and depths. The macrofaunal β-diversity was even higher, despite its lower α-diversity when compared to that of nematodes. Nematodes and macrofaunal diversity appeared to be slightly related only at a level of turnover diversity. Meio- and macrofaunal community and trophic structures changed mostly with longitude rather than with depth. Both components were dominated by organisms with a feeding strategy strictly linked to the sediment (detritivores 1A+1B and surface deposit feeders for nematodes and macrofauna, respectively). Nevertheless, an insight into feeding strategy of macrobenthic nematodes showed that they constituted a separated functional community from that of meiobenthic nematodes. The nature of the relationship between biodiversity and trophic diversity changed across different size classes, even when the same taxon was considered (i.e. Nematoda). Different descriptors of quantity and quality of food sources and the heterogeneity of the substrate were involved in explaining meio- or macrofaunal variability, but for both benthic components a high percentage of that variability remained unexplained.

Keywords: Meiofauna, macrofauna, diversity, trophic diversity.

An Investigation on the Diversity and Distribution of Interstitial and Phytal Miraciids (Crustacea: Copepoda: Harpacticoida) of Turkey

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The marine harpacticoid fauna of Turkey is poorly known despite the fact that the country has a vast coastline of about 8,300 kilometres. Therefore, phytal and interstitial miraciids inhabiting along the Turkish coasts were investigated in order to determine the distribution and species diversity of the family. For this purpose samples were collected from a total of 265 stations along the beaches of Black Sea (66 stations), Aegean Sea (110 stations) and Mediterranean Sea (89 stations). Intersititial samples were collected using Karaman-Chappius method and phytal samples were taken from supralittoral rocks by hand. As a result 21 species and 1 supspecies

belonging to 14 genera were identified. Eight of the identified species (Saramphiascus kawamurai, Schizopera pratensis, Psammotopa vulgaris, Amonardia phyllopus, Robertgurneya smithi, Paramphiascella robinsoni, Diosaccus tenuicornis and Metamphiascopsis hirsutus bermudae) were recorded for the first time from Turkish marine waters and 4 species were also described as new to science. All species were photographed using multi-focus ("stacking") technique and described in detail.

Keywords: interstitial, fauna, Turkey, taxonomy, Harpacticoida.

Ecological structure of the meiofauna from a sandy beach of Valencia (Spain, western Mediterranean)

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With the aim of improving the scientific knowledge on the meiofauna inhabiting sandy beaches in the Gulf of Valencia (Western Mediterranean) samples of sediments were taken during the winter along a perpendicular transect to the shoreline. The transect included five sampling stations: one in the supralittoral, two in the intertidal and two in the infralittoral. Sediment in each station was obtained to a depth of 20 cm with a hand-corer divided into four 5-cm-deep samples. Fauna present in each sample was extracted in the laboratory and posteriorly studied. A total of 1538 individuals were obtained, belonging to 25 different taxa. The distribution of the meiofauna was analysed amongst the different samples and some interesting insights could be retrieved on its distribution along the longitudinal transect, as well as on its into the sediment. Distribution of samples according to the environmental factors considered as well as to the faunistic composition was studied. Finally, BIO-ENV analyses were carried out to determine which environmental factors best explain the distribution of the meiofauna, at higher and lower taxonomic level (Taxonomic Sufficiency). The results obtained show that the combined Eh and depth, at lower taxonomic level, and Eh, depth and Kurtosis, at the higher taxonomic level, offer the best explanation.

Keywords: Mediterranean Sea, ecological structure, meiofauna.

Session 2. Meiofauna from Polar Regions

Meiofauna communities around Iceland

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The abundance, diversity and distribution of benthic organisms is affected by various variables like temperature, salinity, sediment grain size and food availability. Characterized by negative temperatures in the north (Arctic waters) and positive temperatures in the south (Atlantic waters), Iceland is very interesting for ecosystem studies. Topographical features like the Greenland-Iceland-Scotland ridge (GIS ridge), extending from west to east, and the Reykjanes Ridge, a part of the Mid -Atlantic Ridge, are natural barriers for water mass exchange and similarly for the distribution of benthic fauna. During a cruise (August-September 2011) within the IceAGE project, 218 samples were taken at 24 stations around Iceland in water depth between 170-3000 meters. In total, 26 meiofaunal taxa were found at the stations where 10 was the lowest number and 19 was highest per station. meiofaunal abundance differed from 187-3131 individuals per 10cm², with nematodes always dominating the community structure with about 90% followed by copepods (~4%) and other meiofaunal groups like annelids, kinorhynchs and ostracods. We could analyze sandy sediments in the southwest (50-80%), and silty sediments at the other stations (max. 20% sand). Based on main taxa, we could identify differences in community structure. However, more work need to be done. First, we will identify the species of selected copepods to see if we find differences in species distribution north and south of the GIS ridge. Second, we want to establish an ecosystem model for species distribution for which we need more sediment data.

Keywords: meiofauna, Iceland, community, distribution, diversity.

Vertical patterns of meiofauna distribution in Arctic deep-sea surface sediments (HAUSGARTEN, Fram Strait)

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Compared to terrestrial and coastal marine systems the deep-sea floor is the largest ecosystem on this planet, but knowledge of its structure and function remains incomplete. Deep-sea benthic communities and their structural and functional characteristics are regulated by surface water processes, which are expected to mirror climate change. Nowadays, when climate changes occur, investigations of these deep-sea ecosystems, especial in polar regions, seem to be of major importance. Our study was focused on the patterns of vertical distribution of meiofauna in sediments along the bathymetric gradient from 1 200m to 5 569m, in the region which is highly exposed to environmental changes - the Marginal Ice Zone of the Fram Strait. The samples of meiofauna (upper 5 cm sediment, cut into 1 cm layers) were collected every summer season from 2005 to 2009 within the scope of Hausgarten monitoring. In comparison to other polar regions large inflow of organic matter to the sea floor translates into relatively high meiofaunal densities in this region. Densities along bathymetric gradient range from approx. 2 400 ind./10cm2 at 1200 m water depth to approx. 300 ind./10 cm2 at 4000 m water depth. Differences in meiofaunal distribution among the sediment layers (vertical profile) were stronger than among stations (bathymetric gradient). At all stations highest meiofaunal density and highest number of taxa were observed in the surface sediment layer (0-1 cm) and decreased with increasing sediment depth. However, the shape of the decline pattern differed among stations. At stations 1200-2000 m (continental slope) and 5500 m (Molloy Deep depression) the fauna was more evenly distributed among sediment layers than at the other stations, where even up to 75% of all meiofauna was concentrated in surface layer. Based on meiofaunal community structure investigated stations can be divided into three groups: first group consists of 'shallow' stations (1200-2000 m depths), second group form mid-water depth stations (2500-3500m), and third group is formed by the deepest located stations. At all sediment layers nematodes were the most abundant organisms (60-98%). Environmental factors best correlated to vertical patterns of meiofaunal community were sediment-bound chloroplastic pigments, indicating phytodetrital matter (i.e. food) at the seafloor. Summing up, the results of the study showed that the patterns of meiofauna vertical distribution in sediments are shaped by the water depth related differences in food supply.

Keywords: meiofauna, Arctic, deep-sea, vertical patterns.

Session 3. Meiofauna: biodiversity and biogeography

Understanding the Regional Marine biodiversity pattern along the Indian coast using Meiobenthic Nematoda and Harpacticoida as a proxy

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Biological communities differ in a highly regular fashion along geographic gradients of latitude, elevation, isolation and habitat. Reasons for this distribution are varied and understudy. Understanding of large scale patterns in marine organisms aids in setting up conservation priorities for biodiversity hotspots, eco-regions and key areas and also minister to our understanding of the myriad ecological and evolutionary processes in the sea. In the present study we have used two meiofaunal groups to broaden our understanding of the biogeography along the Indian coast. Nematoda and Harpacticoida are the most dominant groups of the meiofaunal community. Although nematodes have huge taxonomic diversity, mixed feeding types and life history characteristics, presents a mottled ecological study as species identification is a task. While harpacticoid copepods distribution from the tropics is restricted hence validates as a specimen for this study. Data for the present study was collected from the marine biodiversity database of India, biosearch.org. The data was checked for errors and later subjected to statistical analyses using Primer E. A total of 177 nematode species belonging to 108 genera and 38 families have been recorded in this region. Most nematode species belonged to Desmodoridae (24 species) and the Xyalidae (21 species) family. Thirty-two families were represented by one to five species. The cluster analysis based on Jaccard similarity showed two groups (1) Andaman and Nicobar Islands, Lakshadweep Islands and Bay of Bengal and (2) The southern states of Kerala and Tamil Nadu. On the other hand, a total of 285 marine harpacticoid species belonging to 107 genera and 32 families have been recorded from the Indian coast. The family, Miraciidae having the

highest (54 species) number of species followed by the Laophontidae (40 species). Ten families were represented by one to three species and thirteen families by four to seven species. The Jaccard similarity analysis clustered the study area into four groups (1) The Islands of Andaman and Nicobar and Lakshadweep, (2) Central west coast states of Goa and Maharashtra, (3) Gujarat and Kerala, (4) The eastern states of Andhra Pradesh and West Bengal. To the best of our knowledge, the present study is the first to report the distribution pattern of two important meiofaunal groups along the Indian coast. The observed variation may be related to ocean circulation patterns and seafloor topography. An important output of the study is that it allowed us to identify the lacunae in the meiofaunal study along the Indian coast which will be helpful in the future research plans.

Keywords: Biogeography, Indian coast, marine biodiversity, meiofauna.

Composition and distribution of meiobenthos off Pudimadaka, East Coast of India

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A base line study on the taxonomy and community structure of meiobenthic fauna was undertaken during three cruises (June 2008, October 2008 and March 2009).Ten stations at water depth between 10 and 40 m off Pudimadaka in Visakhapatnam District (Lat.17 ^{o}29′ 12″ N and Long. 83^{o}00′ 09″), east coast of India, were investigated. At each location (replicate) samples were collected using a van Veen grab (0.1 m2) and data on sediment texture, organic content, salinity and dissolved oxygen were obtained synchronously according to standard protocols. Sixty-nine species that represented 3 major (meiofaunal) taxa namely foraminifera (2) copepoda (9) and nematoda (58) were encountered. Overall, meiofaunal (mean) abundance ranged from 2 individuals (st.5, June 2008) to 63 individuals 10cm-^{2}(st.1, October 2008) with an average value of 24.3 nos.10cm-2. Over-all biomass (mg.10cm-2) varied between 0.135 (st.5) to 0.48 mg.10cm-2 (st.8) with an average value of 0.27±0.12. On the whole, nematodes constituted an overwhelming 73.62% of the total meiofauna in terms of numerical abundance. Shannon –Wiener index values were 2.053±0.64 (June, 2008), 2.477±0.177 (October 2008) and 2.2815±0.24 (March 2009). The evenness component (J) varied in conformity with H'. Multivariate analyses were used to define the most important (determining) taxon in nematode assemblages. Three nematode associations could be recognized off Pudimadaka coast, namely Laimella longicaudata, Euchromodora vulgaris and *Sabatieria elongata* assemblage (June, 2008); *Catanema sp.* and *Leptosomatum sp*. assemblage (October 2008) assemblage; *Sabatieria sp.* and *Setosabatieria sp*. assemblage (March 2009). Canonical correspondence analysis (CCA) showed that temperature, organic matter, silt and mean particle diameter (MPD) were important in controlling nematode community structure.

Keywords: taxonomy, meiobenthos, nematoda, copepoda, canonical correspondence analysis.

Session 4. New discoveries in meiofauna

Novel monothalamous benthic Foraminifera associated with planktonic shells and mineral grains from the Porcupine Abyssal Plain

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Monothalamous (single-chambered) Foraminifera have traditionally been neglected in deep-seabenthic studies due to their obscure morphology and the lack of distinctive taxonomical features. However, they may constitute an important component of the benthic foraminiferal fauna at abyssal depths. The purpose of this study is to address the importance of agglutinated monothalamids.We focus on those that live attached to or are lodged between planktonic shells or mineral grains, with the aim of providing an informal morphology-based classification framework. Sediment samples were collected using a multiple corer at two sites on the Porcupine Abyssal Plain. Site A (4818 m) and site B (4330 m)represent topographically low (flat seabed) and high (seamount peaks) areas, respectively. Site B has a higher percentage of coarser sediment. Foraminifera were picked from the >300μm and 150-300 μm size fractions of the 0-1 cm sediment layer. Sieve residue were stained with Rose Bengal and sorted for Foraminifera in water under a binocular microscope. The monothalamids constitute 42% and 30% of the total 'live' (stained) faunas from the >300 μm and the 150-300 μm size fraction respectively. The corresponding percentages for the dead

assemblage are 65% and 21%. A small proportion (<5%) of specimens, usually containing brown stercomata, cannot reliably be identified as live. Therefore, they are termed as '?live'. In total, 16morphotypesare identified from both sites. Among them,8 are defined as species, while the rest are considered as collections of morphologically similar organisms. The two most abundant species are: i) a taxon consisting of a chamber between planktonic shells, with one or more flimsy tubes, and ii) a taxon made of a single dome attached to large planktonic Foraminifera shells with a much smaller planktonic shell sitting on top of the dome, like a hat. Monothalamid morphotypes with tests made from, or including mineral grains, are only present at the high site , reflecting the coarser sediment at this station. More work is necessary in order to refine these morphotypes and to recognize morphologically coherent types that can be regarded as distinct species. The current study will hopefully set the basis for future work with this virtually unknown component of abyssal foraminiferal faunas from North Atlantic.

Keywords: Foraminifera, monothalamids, deep-sea benthos, diversity, morphotypes.

Shira larva – a new larval type in phylum Loricifera

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Phylum Loricifera is characterized, among other features, by a complex life cycle that involves a succession of several adult and larval stages. The body of both adult and larval stages is divided into a head (mouth cone and introvert), neck, thorax and abdomen. The most prominent larval stage of Loricifera is the so called Higgins larva, which possesses a distinctive pair of posterior toes. Here, we describe a new type of loriciferan larval stage, the Shira larva. The overall anatomy of this larva is generally similar to that of the Higgins larva, e.g., both larval types have a pair of posterior toes. However, the Shira larva possesses a number of unique features, namely (i) a single pair of anteroventral setae is present in the most anterior region of the abdomen, (ii) the bases of the anteroventral setae are very large and swollen, (iii) the thorax and abdomen are thinner than the introvert and (iv) the abdominal region is divided into five sub-regions. The new larval type is described as Tenuiloricusshirayamaigen. nov.et sp. nov. and is placed in a new family, Tenuiloricidae. We discuss the new findings in a comparative perspective with the Higgins larva as well as with the fossil of a putative loriciferan larval stage from the Middle Cambrian.

Keywords: life cycle, morphology, taxonomy, systematics, evolution.

Session 5. Meiofaunal response to anthropogenic impacts

Ferromanganese Nodule and sediment associated Meiofauna from the Central Indian Ocean.

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The nodule associated meiofaunal assemblages of the Indian mining claimed area in the Central Indian Ocean Basin (CIOB) was investigated. Nodule and sediment sampling was performed at 8 stations using a modified USNEL spade box corer (0.25 m^2 area) between the 12020' to 13000' S latitudes and 740 18' to 750 30' E longitudes in the water depth of 5000 to 5300 m. The abundance of nodule varied from 45 to 109 nodules 0.25 m2. The weight of the individual nodule varied from 1-185g. The nodules encountered in the study area were of the ellipsoidal, botryoidal and polynucleated in shape. The total average density of meiofauna associated with nodules from nodule rich and poor areas was 13.25 ±2.1 ind/10 cm^2 and 8.25 ±1.0 ind/10 cm^2 respectively. Among all the nodule samples at nodule rich area the association meiofauna was recovered from 48% of the nodules and at nodule poor areas the association meiofauna was recovered from 30 % of the nodules. Our results clearly exhibit that the crevices of the botryoidal type manganese nodules are quite rich in meiofauna. Possibly these benthic communities are supported by microbial biomass and nutrients derived from the labile organic matter in the sediment. Thus it is appropriate to attribute the abundance of meiofauna to food availability. However, the sediment samples got more density as compared to polymetallic nodules. Nodule rich area has supported with higher density 54.07 ±3.7 ind/10 cm^2 and more number of groups then from nodule poor areas 31.25±1.7 ind/10 cm^2 and also have higher biomass then from nodule poor areas. The results of the present

study suggest that the abundance of meiofaunal assemblages inhabiting the deep-sea sediments of the CIOB is typically lower than values reported from other oceans at the same depths. However the average value of meiofauna biomass (21.6±3.1/10cm^2 at nodule rich area) (12.4±1.0 /10cm^2 at nodule poor areas) was quite comparable to other deep sea sites. This is the first study carried out from CIOB with exclusive focus on meiofauna abundance, biomass from sediment as well as polymetallic nodules. The data presented here could serve as baseline information on nodule fauna and will aide in technology development for deep-sea nodule mining.

Keywords: deep-sea, ferromanganese nodule, associated meiofauna, mining, Central Indian Ocean.

Nematode communities from chemical munitions dumpsites (Baltic Sea)

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After the Second World War dozens thousands tonnes of chemical munitions were dumped in the Baltic Sea. Despite increasing number of investigations carrying out at official and unofficial dumping sites uncertainty still exists about qualities and quantities of chemical weapons (CW), their environmental impact and potential effect on biota.Therefore the Chemical Munitions Search & Assessment EU project (CHEMSEA) is currently examining the risks and potential threats associated with CWs dumped in Bornholm Deep, Gotland Deep and Gdansk Deep. One of the tasks is assessment of ecological effects to infaunal organisms. Hence, meiofaunal communities were chosen as main target in ecological assessment, with special attention paid to nematodes, which are applicable as good indicators of environmental quality.
Three Baltic deeps and reference area located between the dumping studied regions were investigated during several surveys in 2011-2013.Results showed that meiofaunal communities of dumping sites are very poor in case of abundance and number of taxa in comparison to the reference area. At the dumping sites, with hypoxic and/or anoxic conditions, well-adapted to harsh environment organisms were present. Nematodes communities at those stations were dominated by mud-dwelling nematodes like Sabatieria, Terschellingia and Halomonhystera species. The latter, Halomonhysteradisjuncta, exhibited an ovoviviparous reproductive mode. Females with juvenile stages in their bodies were commonly observed at investigated dumping stations. Internal development of juveniles is an adaptation for securing the survival and growth of the brood, what confirm unfavorable conditions occurring at dumping area. Sediments from reference stations harboured more diverse nematode assemblages, with genera less resistant to environmental stress factors. Presented results are first observations of nematode assemblages from Baltic chemical munitions dumpsites, as well asfrom central and southern Baltic deep basins.

Keywords: nematodes, meiobenthos, Baltic Sea, munitions dumpsite

The impact of fish farming on a benthic copepod community in the northern Adriatic

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We examined the impact of a fish farm on the meiofauna under production cages rearing sea bass, *Dicentrarchus labrax*, in the northern Adriatic. Sampling was performed in two contrasting seasons: in spring when fish were fed once daily, and in summer when fish were fed five times daily. Samples were collected under the centre of the cage (0 m) and along a transect at 6, 20 and 100 m from the centre of the cage. The density of the harpacticoid copepods significantly decreased under the fish cage. At copepod species level, a delineated 'under the cage community' and a 'control community' at 100 m from the cage were distinguished by means of multidimensional scaling (MDS). This difference was evident in both seasons, thus the community did not recover during winter. The harpacticoid family Miraciidae was predominant throughout the study area. Further on, we identified the species with a similar distribution pattern by the R-mode cluster analysis. The dominant species Bulbamphiascus sp.1 represented at least 75 % of overall harpacticoid abundance under the centre of the cage. At 6 m from the centre of the cage its abundance was markedly lower. Harpacticoid species richness was 3-7/10 cm^2 under the centre of the cage and 17-25/10 cm^2 at a 100 meters away from the cage.

Harpacticoid species with a higher individual body mass were observed beneath the cage in contrast to the surrounding area. In addition to structural changes in biodiversity, we also detected a functional response as harpacticoid copepods were more depleted in 13C under the fish cage than 100m away (-25.3 vs -20.8 ‰ δ13C), pointing at a shift in the main food source. Utilizing the different approaches (density of copepods, diversity of copepods, individual body mass of copepods and the stable isotope signal of copepods) we can evaluate the extent of fish farm impact at different study sites.

Keywords: harpacticoid copepods, fish farming impact.

The effect of Ostreopsis cf. ovata, a toxic benthic dinoflagellate, on phytal meiofauna from the coastal NW Mediterranean.

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Ostreopsis cf. ovata is a tropical toxic benthic dinoflagellate that recently occurred in the shallow coastal Northwestern Mediterranean where it's blooms have caused health problems on humans in contact with the cells whether epiphytic, planktonic or in sea spray. As part of the MediOs 2 project within the French research program Liteau III, we investigated the possible effects of this toxic microalga on the meiofauna (i.e. metazoans ranging from 40 µm to 1 mm in size) inhabiting the very common brown macroalga Halopteris scoparia. The macroalga was sampled in triplicates at 0.5 m depth in 6 stations along the French and Italian coasts on 7 occasions in 2008. Toxic cells bloomed in summer in 3 out of the 6 stations with concentrations ranging from 2.5 to 6.6 105 cells g-1 macroalgal wet weight. Metazoan meiofauna densities ranged from 1274 to 8646 individuals g-1 macroalgal spin-wet weight. Statistical analyses revealed that high concentrations of Ostreopsis were associated with changes in the community structure of the phytal meiofauna. The most affected group was that of the nauplii suggesting a negative impact of Ostreopsis on copepod reproduction.

Keywords: toxic dinoflagellate, phytal meiofauna, Mediterranean Sea.

Structural and functional composition of mangrove meiofauna in relation to human disturbance with special reference to free-living marine nematode assemblages

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Disturbance is an important factor in structuring ecological communities either directly through changes to the physical environment e.g. sediment characteristics and nutrient supply; or indirectly through Changes to benthic communities such as species composition. In this study, we examined the response of meiofauna and nematode assemblages to mangrove clearance. Meiofauna and nematode abundances, diversity and community composition were investigated along the water gradient in three contracting habitats. We specially focused on nematode assemblages to detect human-induced disturbances to mangrove by examining community biomass and trophic structure as well as constructing nematode biomass size spectra (NBS) and abundance biomass curves (ABC). Several environmental variables were evaluated to investigate the relationship between these variables and the observed pattern in meiofaunal and nematode community structure. Results indicated that sediment composition and nutrient concentration varied significantly between habitats. Meiofauna and nematode abundances were higher in the cleared mangrove than in the intact mangrove and the bare sand flat, but diversity was higher in the intact mangrove habitats. The cleared and intact mangrove had similar higher biomass compared to the bare sand flat, but NBS differ significantly between different water levels, except for the high water levels, in these habitats. Low NBS peaks were observed in the bare sand flat, while high peaks were observed in the intact mangrove. The cleared mangrove showed an intermediate NBS distribution between the bare sand flat and the intact mangrove with the predominance of tolerant genera such as Daptonema and Desmodora. ABC suggested that the high-water level at the cleared mangrove was the most disturbed habitat. Functional characteristics of nematodes indicated predominance of non-selective deposit and predatory/omnivores feeders in the cleared mangrove, while intact mangrove showed an increased diversity of functional groups due to increased proportions of selective deposit feeders and epistrate feeders. This was further confirmed by the results of trophic diversity (ITD) which showed higher trophic diversity in the intact mangrove. Total meiofauna abundance was positively

correlated to clay and C/N, and negatively correlated with sand. Meiofauna and nematode communities showed significant relationships with grain size composition and sediments nutrients. This study suggested the significant impact of mangrove clearance on meiofauna and nematode communities and their trophic structure.

Keywords: mangrove, meiofauna, nematode; community structure, anthropogenic disturbance.

Session 7. Meiofauna in chemosynthetic ecosystems

The epizootic copepod community associated with tubeworm and mussel aggregations at a natural oil seep in the Gulf of Mexico (Green Canyon)

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Cold seeps are chemosynthetic-based ecosystems on active and passive continental margins throughout the world's oceans. These ecosystems are typically characterized by the presence of large megafauna aggregations such as siboglinid tubeworms or bivalves related to those find at hydrothermal vents. These organisms form biogenic structures that serve as habitat for meiofauna organisms such as copepods. While most of the copepod studies from chemosynthetic environments refer to infaunal communities from sediments underneath bacterial mats or megafauna species, the epizooic copepod communities directly associated with foundation species such as siboglinid tubeworms or bivalves have rarely been investigated so far. To study the abundance, diversity, and community structure of copepods associated with vestimentiferan tubeworms and bathymodiolin mussels, a total of six quantitative samples was collected at three sites located in the Green Canyon at 1400 m depth. The total abundance of epizoic copepods were very low, ranging from 0.22 to 5.16 ind. per 10cm2 sample area. However, the mussel bed samples showed higher abundaces (3.27 to 5.16 ind. per 10cm2) than the tubeworm samples (0.22 to 2.66 ind. per 10cm^2). The obtained adults from all six sites were assigned to 16 families, 29 genera and 52 species. Copepod diversity and community composition were significantly different between associated tubeworms and mussels demonstrating strong effects of megafauna distribution on epizootic copepod communities. Four copepod species were determined as typical epizootic species previously found at hot vents and whale falls indicating an overlap in species composition between different chemosynthetic habitats.

Keywords: biodiversity, community structure, cold seeps, deep sea, meiofauna, distribution.

Unveiling the hidden biodiversity: colonization of meiofauna in deep-sea hydrothermal vents

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Extreme natural environments such as Hydrothermal Vents (HV) offer unique opportunities to investigate the adaptation of organisms to severe abiotic conditions and the effects of these conditions on biodiversity. While mega- and macrofauna in HV have been intensively studied since their discovery, meiofauna, in spite of its ecological relevance, have only recently been included in HV ecological studies. The picture emerging from the few meiofaunal investigations points to a vent meiofauna which is low in abundance and diversity. In addition, the meiofauna inhabiting deep-sea HV shows low correspondence to neighbouring deep-sea sites and reveals a high endemism. What is less known are the colonization mechanisms and interconnectivity of HV meiofauna. The objective of this study is to understand the interconnectivity and colonization processes of meiofauna in HV sites. The experiments implied the deployment of 3 different substrata in four areas characterized by contrasted levels of hydrothermal activity. The first experiment set up was deployed during the MoMARETO cruise in 2006 and recovered in 2008 (after 2 years). The second was deployed during the first MoMARSAT cruise in 2010 and recovered in 2011 (after 1 year). Results will be discussed in order to understand the potential influence of fluid flow on newly arriving meiofauna and its potential preference in

colonizing different organic and inorganic substrata.

Keywords: meiofauna, hydrothermal vents, colonization, deep sea.

Poster Communications

Session 1. Meiofauna: biodiversity and ecosystem functioning

Methodological design for the study of meio-epifaunal communities in Costa Rica

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Cold seeps are environment characterized by sulfidic conditions where a wide range of species exhibit symbiotic associations with sulfide-oxidizing and methane-oxidizing bacteria. In this environment there also are meiofaunal communities linking bacterial and macrofaunal food webs. Although, ubiquitous and more abundant compared to larger-sized invertebrates, meiofaunal communities are one of the least studied and understood components of chemosynthetic ecosystems. The Costa Rican continental margin has heterogeneous areas with different substrates associated with methane seepage and wood falls and chemosymbiont-bearing foundation species. These may influence microscale diversity through supply of substratum, food, refuge, and various biotic interactions. This research employs mensurative and manipulative experiments to investigate the species richness, abundance, community structure, and the influence of suitable substrates and habitats of metazoan meio-epifauna, in active and inactive areas off Costa Rica. The goal is to better understand the meio-epifaunal community assemblages in the deep sea and controls on their presence and functions. The methodological design involves examining meiofauna (> 42 □m) from carbonate rocks collected from active and inactive sites between 376 and 1402 m in a range of biogenic habitats including mussel beds, tube worm bushes, bacterial mats and clam beds. Meiofaunal will also be examined from 10-month colonization experiments involving authigenic carbonate, wood, shell, and tube substrata deployed on active and inactive areas on Mound 12. Community structure comparisons will be made to macrofaunal trends on ambient carbonates and colonization substrates.

Keywords: deep sea, cold seeps, substrates, meio-epifauna, Pacific Ocean.

Meiofauna biodiversity from a sandy beach of Valencia (Spain, western Mediterranean)

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With the aim of improving the scientific knowledge on the meiofauna inhabiting sandy beaches in the Gulf of Valencia (Western Mediterranean) samples of sediments were taken during the winter at five sampling stations along a perpendicular transect to the shoreline. The transect included five sampling stations: one in the supralittoral, two in the intertidal and other two in the infralittoral. Sediment in each station was sampled to a depth of 20 cm with a hand-corer and divided into four 5-cm-deep segments. Meiofauna present in each sample was extracted in the laboratory, preserved and studied. A total of 1538 individuals were obtained, belonging to 25 different Taxa. Due to the taxonomic difficulty some taxa could not be identify at species level. The major groups in relation to the number of taxa were Nematoda (8), Foraminifera (6), Polychaeta (4), Copepoda (2), Gastrotricha (2), Turbellaria (1), Ostracoda (1) and Mystacocarida (1). Some of the taxa found represent new records for the area, and a few could constitute new species to science.

Keywords: Mediterranean Sea, interstitial, meiofauna, biodiversity.

Seasonal variability in free-living marine nematode community structure in a sandy and mangrove area in TelukAwar, Sarawak, Malaysia.

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The coastal areas of Sarawak experience a rainfall regime of one maximum and one minimum. The seasonal variation of the tropic is not similar as the temperate countries that

experiencing the four seasons. This study is aimed to investigate the seasonal changes in nematode community of a sandy and mangrove area in TelukAwar (South-West Coast of Borneo, Sarawak, Malaysia) in relation to some environmental variables (i.e seasonal rainfall, physico-chemical parameters). Two stations (sandy and mangrove) were chosen for this seasonal study where samples were collected monthly for 16 months. The results of ANOVA showed that all the parameters were significantly different among months ($p < 0.05$) for both study stations. The results of the sandy station showed that the mean densities of the marine nematode were at the highest peak during dry season while the lowest was during raining season. Higher nematode densities were recorded during the interval of dry and wet season for the mangrove station. Two-dimensional MDS analyses (stress level of 0.22 and 0.01) indicated that the monthly densitieswere clustered into a few groups. SIMPER test showed that the marine nematode of genera Viscosia and Daptonemawere the dominantfor sandy station whileHaliplectusand Terschellingiawere mostly observed in all study months for the mangrove. Results of the BioEnvindicated that several environmental parameters were affecting the seasonal distribution of marine nematode community of sandy and mangrove area in TelukAwar.

Keywords: seasonal, marine nematode, rainfall, Borneo, Malaysia.

Relationship between Meiofaunal assemblage and their Microbial Food (Bacteria) along Alexandria Coast, Egypt

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Temporal and spatial distribution of meiofaunal assemblages, especially nematodes and their microbial food (benthic bacteria), were studied in two impacted, El- Mex & Abu Qir, and one reference, North Coast, sites along Alexandria coast, Egypt. Samples were collected monthly from November 2012 to August 2013. A total of 60 meiofaunal samples were taken monthly from each site (4 profiles * 5 stations * 3 triplicate samples). Samples were taken with hand held core of surface area 5.3 cm^2 and a depth of 11 cm. A total of 20 Bacterial samples were taken in accordance with meiofaunal samples (4 profiles * 5 stations). The study aimed to investigate whether the bacteria represents an essential food for meiofauna and its components taxa. Three way Anova was applied to test for significant variations among months, areas, profiles, stations and their interaction. Pearson correlation, linear regression analysis and Principal component analysis were applied to test for significant relationships among Bacteria and different meiofaunal taxa. Preliminary data revealed that the meiofaunal assemblage consists of eight taxa dominated with Nematoda , Harpacticoida, Turbillaria , Polychaeta , Ostracoda , Foraminifera , Halicardia and Archiannelida. Total meiofaunal abundance ranged from 18320 individual /10 cm^2 in El-Mex and 5.3 individual /10 cm^2 in North Coast. There were significant variations among areas & months and their interactions for meiofauna , nematoda & Bacteria . Results from Pearson correlation, linear regression analysis and PCA revealed contradictory correlation between Bacteria on one side and different meiofaunal taxa on the other indicating that bacteria is not the only food source for some meiofaunal taxa.

Keywords: meiofauna, bacteria, Alexandria.

Tardigrades of the Queñoa *Polylepis tomentella* woodlands of Chaviña district (Ayacucho - Perú).

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Tardigrades, commonly called "water bears" are microinvertebrates (0.1-2.0 mm long) found in marine, freshwater and terrestrial habitats, as long as their bodies are surrounded by a water film. The name "il Tardigrado" (slow steps) was proposed by Lazzaro Spallanzani in 1776 to describe its slow movement. In South America there is almost no existing information about these organisms, prompting the investigation of this phylum. Polylepis woodlands are vulnerable ecosystems that are under strong anthropogenic pressure (logging and overgrazing), resulting in a large gap of biological information because of habitat loss. The present study aims to contribute to the knowledge of the biodiversity of tardigrades in epiphytic mosses present in queñoa *Polylepis tomentella* of Chaviña, Ayacucho-Peru. Mosses were collected and placed in paper bags to maintain their integrity. The samples were rehydrated in laboratory with mineral water for 24 hours. The tardigrades were isolated under a stereoscopic microscope and extracted for mounting with Hoyer's medium + KI. For taxonomic identification, we used

specialized literature and morphological observations were made through optical microscope. From study material, we found the specimens belong to the class Eutardigrada, family Macrobiotidae. We found two genera: Paramacrobiotus and Macrobiotus. This is the first record of tardigrades in the epiphyte flora of *Polylepis tomentella* woodlands for Chaviña, Lucanas-Ayacucho-Peru.

Keywords: tardigrades, *Polylepis tomentella*.

Session 2. Meiofauna from Polar Regions

From 'benthos-dominated' to 'zooplankton-dominated' mode-biological backgrounds of the Face2Face project

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Arctic ecosystems and their food webs are particularly vulnerable to climate-related changes and warmer climate may lead to shift from 'benthos-dominated' to a 'zooplankton-dominated' mode. We therefore propose a project that will be focused on several aspects of functioning high-latitude fjords ecosystem and will study wide range of pelagic and benthic components. We hypothesize that in Arctic coastal waters the structure of pelagic assemblages, which are conditioned by inflowing water masses characteristics, determine organic matter flux and export to the seabed, what leads to enhanced benthos abundance and functionality. Results will allow determining how benthic communities reflect water column processes in the two model Arctic fjords, which are differently exposed to present warming: Hornsund fjord is mainly dominated by the cold arctic waters derived from Barents Sea, while Kongsfjorden is to a larger degree influenced by warm Atlantic waters. Preliminary results showed that differences in hydrography between studied fjords largely determined the horizontal distribution patterns of the zooplankton. In Atlantic influenced Kongsfjorden, the total zooplankton abundance was up to 2-3 times higher in comparison to Arctic Hornsund, with 'boreal' and 'ubiquitous' species more numerous in Kongsfjorden. Opposite pattern was observed for abundance of meiobenthic fauna. Compared with Hornsund, in Atlantic influenced Kongsfjorden, meiofaunal abundances were significantly lower. Mean total meiofauna densities ranged between 1 632 ind/10cm2in Kongsfjorden and 8 392ind/10cm^2 in Hornsund. Nematodes were numerically dominant in both fjords, however, in Hornsund other taxa such as Harpacticoida and Kinorhynchacontributed significantly to total density. Decrease in benthic abundance and biomass in Kongsfjorden may be a consequence of the top-down control of algal biomass by diverse and abundant Atlantic zooplankton grazing. Large part of the production is probably retained in the upper layer and reduce vertical flux of organic matter is reduced. Analyses of other pelagic (pico, nano and microplankton) and benthic (bacteria, macrofauna) components comprise ongoing works and will allow to verify project assumptions.

Keywords: benthos, meiofauna, zooplankton, Arctic, climate change.

Session 3. Meiofauna: biodiversity and biogeography

Selective settlement of deep-sea and intertidal meiofauna - an experimental approach

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The cosmopolitan distribution of many meiofaunal organisms raises questions about their dispersal. The small size and the lack of a planktonic life stage in many taxa suggest that passive dispersal is the main factor determining distribution and colonization patterns. This study investigates the settling behaviour of meiofauna in an undisturbed water column. Two ex-situ settling experiments were conducted with (1) macrophyte associated meiofauna from an intertidal flat and (2) meiofauna of microbial mat sediments from the deep-sea Håkon Mosby mud volcano (HMMV). Containers (126L) filled with sieved seawater were used as settling chambers and five different substrates, placed on the bottom of the containers, were offered to the descending meiofaunal assemblage. The substrates used in the intertidal experiment were agar with bacteria, agar with Fucusspiralis, sulfidic agar medium, bare agar and an empty Petri dish. For the deep-sea experiment azoic sediment with algae, azoic sediment with bacteria, a sulfidic medium, azoic sediment and an empty Petri dish were used. The experiments were run for 12 hours. Nematodes and nauplius larvae showed

fourfold higher densities in the Fucus treatment compared to the controls in the case of the intertidal experiment. Deep-sea nematode and harpacticoid copepod densities in the sulfide treatment differed from all other treatments by a factor of five. Proportions of harpacticoid copepods were increased in the treatments of the deep-sea experiment compared to the reference sample. Nematode assemblages in the treatments showed no significant differences to the reference samples. These findings suggest that meiofauna can selectively settle once they are suspended in the water column and therefore actively contribute to their dispersal. In both experiments meiofauna was increased in substrates similar to their original habitat and proportional differences in harpacticoid copepods suggests a more efficient settlement compared to nematodes. The observed active settling behaviour may be very advantageous for the organisms in finding suitable habitat patches in heterogeneous environments. This study confirms previous research and adds important information to the understanding of meiofaunal dispersal mechanisms.

Keywords: HMMV, nematodes, active dispersal.

Session 4. New discoveries in meiofauna

A new species of Leptocaris T. Scott, 1899 (Copepoda, Harpacticoida, Darcythompsoniidae) from the Aegean Coast of Turkey

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The marine harpacticoid fauna of the Turkey is poorly known despite the fact that the country has a vast coastline of about 8,300 kilometers. Here we contribute to the knowledge of the copepod biodiversity in Turkey by describing Leptocaris. sp. nov from the Turkish coasts. Both sexes of Leptocaris sp. nov. are described in detail based on intertidal material collected from the Aegean coast of Turkey. The new species can be distinguished from its congeners by the structure of P5, by the ornamentation on the body surface, by the setae of the caudal ramus. On the basis of published data and with the results of this study, the number of harpacticoid species that have been recorded so far from Turkey has reached to 133. This study was funded by TÜBİTAK under project number 111T576.

Keywords: Leptocaris, Darcythompsoniidae, Harpacticoida, Copepoda, Aegean Sea.

*Halacaropsis hirsuta (*Acari: Halacaridae): first record for the Turkish fauna

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The marine halacarid mite genus Halacaropsis (Bartsch, 1996) currently represented five species from the Mediterranean, southern Africa, northern Atlantic, and Australia. A new record, Halacaropsis hirsute (Trouessart, 1889) was collected from *Ulva lactuca* (Linnaeus, 1753) algae found (3-4 m) from the rocky shores of northern coast of Marmara sea. This is the first record of the genus Halacaropsis from Turkey.

Keywords: Halacaropsis hirsuta, acari, new record, Marmara sea*, Ulva lactuca*

A new species of the genus Schizopera Sars, 1905 (Copepoda: Harpacticoida: Miraciidae) from the Mediterranean coast of Turkey

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Genus Schizopera is one of the 52 genera of the family Miraciidae and comprises 96 valid species/subspecies. Members of the genus are mostly marine and benthic but they also inhabit brackish water and a wide spectrum of freshwater habitats. In the present study, we contribute to the diversity of marine meiofauna of Turkey by describing male and female of *Schizopera karanovici sp. nov.,* which are collected from the intertidal zone of Alata beach, located at the Mediterranean coast of Turkey. The new species is closely related to *S. minuta, S. langi, S. lagrecai* and *S. variseta* but can easily be differentiated from its congeners by width/length ratio and setal organisation of caudal rami and P5.
Keywords: meiofauna, new species, Turkey, taxonomy, Harpacticoida.

New record of the ciliate *Praethecacineta halacari* (Ciliophora: Suctorea) epibiont on *Copidognathus* halacarid mite (Acari:Halacaridae) from Portugal

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The present study report a new record of the suctorian species *Praethecacineta halacari* (Schulz, 1933) on a *Copidognathus* loricifer (André, 1946) collected from Albufeira, Portugal. The genus Copidognathus is also first reported here to have the epibiont *P. halacari*.

Keywords: Praethecacineta halacari, *Copidognathus loricifer*, suctorian ciliate, Portugal.

Session 5. Meiofaunal response to anthropogenic impacts

Adriatic Sea in response to extreme weather events: is meiofauna a good predictor?

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The present work was carried out as part of the European project "THESEUS" (Innovative technologies for safer Europeans coasts in a changing climate) whose main goals are to provide adequate integrated methodologies for strategic planning of sustainable coastal defence. It is therefore important, in a perspective of preservation and management, understanding how coastal ecosystems and the goods and services that they provide respond to anthropogenic impacts and to the predicted sea level rise due to global climate changes. For this purpose we tried to investigate whether the meiofauna communities could work as a good indicator to monitor. We analyzed meiofaunal communities of the intertidal zone of two sandy beaches along the coast of Emilia-Romagna region. Being contiguous, they are similarly exposed to wind, currents and wave impact but are differently managed for erosion problem with consequences on sedimentary structure. The studied beaches were: i) "Lido di Spina", with permanent touristic resorts and subjected to annual nourishments; and ii) "Bellocchio" a wild beach with a brackish salt-marsh behind and naturally subject to erosion and subsidence. Primarily, meiofauna was analyzed to assess any difference between the communities of the two beaches, and after an innovative predictive approach was applied to the data: a fuzzy naïve Bayes compiler, named "Fuzzy Bayesian Ecological Model" (FBEM), a recursive algorithm able to estimate parameters of a fuzzy generative model. For each beach 8 transects, perpendicular to the shoreline, were randomly chosen; at each transect and at two tidal levels, high (H) and low (L) respectively, 4 replicate biotic samples were taken and abiotic variable measured. The two beaches resulted very different as for the major environmental variables like slope, BDI, TOM%, and granulometry. Also meiobenthic assemblages appeared diverse, in conformity with the different environmental characteristic of the beaches, showing to be able to reflect different ecosystem states. The main taxa responsible for this difference were found to be Nematoda, Gastrotrichia and Turbellaria. Meiofaunal abundances and number of recorded taxa were tentatively treated with FBEM against the entire set of environmental characteristics. Thus we were able to represent the evolution of the present ecological situation toward that which probably could occur in the foreseen scenario of the most serious sea level rise (0,22 cm in the 2080, from IPCC), as it will go on increasing the intensity of flooding. These results suggests that meiobenthic assemblages may be used as a descriptors of the ecological changes in coastal areas and a probable good predictor to assess the effects of flooding and of sea level rise as well as the most appropriate management strategies to be implemented.

Keywords: meiofauna, sandy beach, ecological modelling, fuzzy, Bayes, management.

Analysis of meiobenthic response at different level of anthropogenic impacts in the intertidal zone of the Northen Adriatic sea

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Sandy beaches are physically dynamic habitats inhabited by specialized biotic assemblages that are structured mainly by physical forces. These habitats are highly productive environments because it hosts a wide range of benthic communities of a significant and specific ecological relevance. Beach ecosystems are under threats ranging from recreational activities, to nourishment and coastal engineering, to climate change. Thus, becomes important in a perspective of preservation and sustainable management, understand how the sandy coastal ecosystems and the goods and services they provide, will respond to these environmental changes.The growing interest in ecosystems of sandy beaches has recently highlighted the importance of the ecological role of meiofauna, emphasizing the need to develop studies aimed to conservation as well as to the use of these organisms as descriptors of the environmental status. In this context, the present study investigates the structure and composition of meiobenthic assemblages inhabiting the intertidal zone in four beaches along the Northern Adriatic coast of Emilia Romagna.The four sites are different for the level of human impacts and for the different management interventions against coastal erosion. For this study were chosen two sites managed (nourishment and bulldozing) and two sites not managed (Natural Reserve). The analysis of biotic and abiotic variables revealed different responses probably due to site-specific characteristics of the investigated sites. The ecological role of the main taxa found in the sites investigated, corresponds to the physical characteristics of the different habitats. In particular, managed sites are characterized by homogeneous fine sediment and by the dominance of taxa as Nematoda, Nemertea and Turbellaria. The sites not subject to management show greater heterogeneity in physical characteristics which also reflect the diversity of meiobenthic communities. The main taxa found are Gastrotricha and Harpacticoid copepods in the form “slender” typical of interstitial habitats. Therefore it appears to be possible to consider the response of meiofauna to environmental and anthropogenic stressors as supplementary information to the responses of macrobenthic communities, which have been, until now, widely recognized and used as syncretic indicators of the ecosystem status

Keywords: sandy intertidal beaches, meiofauna, ecological indicator, management.

Maerl beds & associated benthic communities: a scenario of the effects of climate change on an important biogenic habitat

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Global ocean models predict surface pH reductions of 0.3-0.5 units by the year 2100 due to the uptake of anthropogenic CO_2 ; while sea surface temperature is projected to increase by up to 7°C under the most extreme CO_2 emission scenarios. Little is known about how marine organisms will be affected by both long and short term seawater acidification and increased temperature. Particularly vulnerable are those organism which rely on the production of calcified skeletons for survival, e.g. corals, molluscs, crustaceans and calcified algal species including maerl. Maerl beds are free-living structures composed mostly by nongeniculate living and dead coralline red algae. Rhodoliths beds (maerl) are considered major benthic producers of calcium carbonate in temperate marine environments, which harbors a high diversity and abundance of associated species. To date most studies on maerl beds have focused on rhodolith species distribution, composition, morphology and carbonate production, and their susceptibility to climate change. Significantly less attention has been dedicated to the characterization of the rhodoliths-associated macrobenthic fauna or the effects of climate change on these communities. In spite of its relevance, meiofauna biodiversity has not been investigated before for the lack of meiofauna taxonomist devoted to maerl studies. In order to fill the gap in our knowledge on the maerl-associated meio and macrofauna, we will combine studies on biodiversity, trophic ecology and ecosystem functioning. This will be accomplished by comparing two different maerl ecosystems from the Atlantic Ocean: the well-known Brittany maerl beds and the less explored Azorean maerl beds. Furthermore this project also intends to conduct a combination of laboratory and in situ experiments to evaluate the response on the

macro and meiofauna community to the climate change scenario predicted for 2100. For each maerl site, environmental parameters including description of the site, temperature, pH and organic matter contents will be measured. Benthic diversity (macrofauna and meiofauna) will be investigated by means of classical and molecular techniques. Trophic dynamic of benthic community will be unveiled through biomass, radioisotopic labeling for analyzing food transfer, high and low highly unsaturated fatty acids contents. Mesocosm experiments will be performed to simulate pH and temperature variations in maerl beds. The experiments will be conducted in the LEMAR laboratory in Brest. In situ experiments will be performed to assess the response of maerl communities to a rapid pH changes (7.8 - 7.9). The experiment will be conducted using the natural laboratory OceanA-Lab in the Azores. The results of this project will give a tangible and original contribution to increase the awareness about the existence of the maerl ecosystem and its possible evolution with changing climatic conditions.

Keywords: maerl; macrofauna; meiofauna; acidification; climate change.

Can meiofauna be a good biological indicator of the impacts of eutrophication caused by green macroalgal blooms?

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In Brittany, the eutrophication of coastal river waters leads to the development of harmful green macroalgal blooms that affect numerous sandy beaches. For the monitoring of coastal ecosystems the most widely used benthic ecological indicators are derived from macrofauna, seagrass populations parameters and epiphytes communities. Meiofauna has been a neglected component of the benthos mainly due to the small size of its component and the associated difficulty for species identification, so far. However this benthic compartment, and especially its dominant group, nematodes, has, in other circumstances shown many advantages as a biological indicator. In this study we investigate the impacts of green tides on meiofauna. Two beaches have been selected in the bay of Douarnenez (south of Finistère, France): the beach of Saint-Nic (impacted beach) and the cove of Dinan (un-impacted beach). We observed large differences in assemblage composition and diversity of meiofauna comparing the impacted and the un-impacted beaches. This study suggests that meiofauna could be a useful tool as biological indicator of the impacts of eutrophication caused by green macroalgae blooms.

Keywords: meiofauna, nematodes, biological indicator, eutrophication, macroalgae blooms.

Study of meiofauna community composition on a sewage-polluted Lebanese sand beach

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The response of meiofaunal communities to organic pollution was investigated in nine points separated by a distance of 10 m along Antelias sandy beach during May and June 2013. Physico-chemical parameters and granulometry were measured during the sampling period and meiofauna distribution and abundance were compared with these measured parameters. Meiofaunal community composition showed a high variability between stations and between sampling periods. Meiofauna was primarily represented by Nematoda during May and by Oligochaeta during June. Samples taken during Juin showed significantly higher abundance than those taken during May. Meiofaunal abundances ranged between 35 and 18909 ind./10 cm2. The results showed a significant trend: Meiofaunal densities and number of major taxa increase along with salinities from the river mouth to the farthest station.

Keywords: Lebanese sandy beach, pollution, meiofauna, nematode.

Assessing the environmental impact of Tōhoku tsunami off Hachinohe (NE Japan): a multidisciplinary approach

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On March 11th 2011 the Japanese East coast was hit by a tsunami, which killed more than 18.000 people, caused major devastation in the coastal zone and the meltdown of 3 nuclear reactors. A Mw 9.0 on the Richter scale earthquake offshore Sendai resulted in Tsunami waves reaching heights of up to 40.5 meters, which travelled 10 kilometers inland. Whereas the devastation on land is clearly visible, underwater impact is more difficult to assess. Here we present an overview of the multidisciplinary approach used to describe the benthic ecosystems off Hachinohe (NE Japan), 5 months after the Tōhoku-Oki earthquake. Middle height (~4m) of Tsunami also came to the coastal area of Shimokita Peninsula. An oceanographic cruise (cruise KT11-20– aboard R/V TANSEI MARU, AORI/JAMSTEC) took place in August 2011. An international group of Japanese, French and Dutch oceanographers, all specialists in marine ecology and marine biogeochemistry, joined this scientific mission in order to describe benthic ecosystems and fossilizing foraminiferal faunas. 4 scientific tasks were defined. The sedimentological investigation has consisted in the identification of all sedimentary evidences (physical structures and radionuclides) that illustrate hydrosedimentary processes at the seafloor (erosion, sediment gravity flow deposition). The geochemical investigation has consisted in the optimal characterization of geochemical conditions prevailing in the benthic ecosystems. A special attention has been addressed to the dissolved species (oxygen, nitrate…) in the bottom and pore water, the organics buried in the sediment and the nature of solid phases. The faunal investigation has consisted in the ecological study of benthic foraminifera (living and dead faunas). This study has given reliable information about the response of benthic life to environmental constraints related to tsunami. The future investigation will consist in the geochemical study of trace elements in the foraminiferal shells (i.e. tests). Those overall observations should enlighten scientific community on the effect of the Tōhoku tsunami on marine ecosystems off Hachinohe, and on the potential resilience of benthic communities.

Keywords: benthic foraminifera, tsunami, oxygen-depleted margin; multidisciplinary approach

Session 7. Meiofauna in chemosynthetic ecosystems

Meiofauna associated to OMZ on the continental shelf off central Chile (Valparaiso Bay)

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As part of the Research Project: “Fondecyt Nº 11121487 “Soft bottom macrobenthos responses to organic enrichment and oxygen minimum zone on continental shelf of Central Chile: a case of study at Valparaíso Bay”, the soft bottom meiofaunal taxonomic composition and abundance, was determined. Sediment samples were collected on March 2013 from three oceanographic stations at different depths: station 3 (80 m), station 4 (100 m) and station 5 (128 m), using a gravity core of 50 mm internal diameter. Two replicate samples were collected in each station using core tubes of 30 mm internal diameter. The first six centimeters of these sediment columns were processed and subdivided into three horizontal layers (0-2, 2-4 and 4-6 cm). All samples were fixed in 10% formalin buffered with sodium borate (bórax). A 63 µm mesh sieve was used and meiofauna were extracted by density gradient centrifugation as a flotation medium. Nematodes were clearly the dominant group of the assemblage (>95%). They recorded highest densities of 370 ± 65 ind 10 cm^{-2} on mean continental shelf (station 3) and lowest densities of 299 ± 97 ind 10 cm^{-2} on outer continental shelf (station 5). Other taxa, namely copepods, gastrotrichs, ostracods, nauplii, tardigrades, kinorhynchs and collembola, were regularly found in all stations but in very low abundances with densities around 2 individuals 10 cm^{-2}. Vertical distribution profiles showed a dominance of nematodes (95%) at each level in all stations. The rest of meiofauna groups did not reach densities higher than 5 ind 10 cm^{-2} at each

level. The composition, abundance and distribution of the meiofauna in this study could be influenced by the presence of an oxygen minimum zone placed on the continental shelf off central Chile.

Keywords: meiofauna communities, oxygen minimum zone, central Chile.

Deep-sea hYdrothermal Vent nematodes as potential source of new Antibiotics (DYVA project)

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Archaea, that were believed to be exclusively extremophiles until a few years ago, are nowadays commonly considered mesophilic. The detection of anaerobic Archaea in the human microbial flora demonstrates their ability to colonize the human host. Despite the information emerging about archaeal genomes, structures and functions, much remains unknown. Peptides or protein antibiotics have been discovered in all domains of life, and their production is nearly universal. Compared to the tremendous number of antimicrobial molecules identified in eukaryotes and bacteria, only eight archaeocins (seven halocins and one sulfolobicin) have been partially or fully characterized, whereas hundreds of them are suspected to exist. Terrestrial nematodes such a *Caenorhabditis elegans* represent extensively used models for the study of the molecular basis of antimicrobial defence. To date the immune aspect of marine nematodes has yet to be investigated. Interestingly, Archaea and nematodes are both very abundant in hydrothermal vent ecosystems where they co-habit. We suspect that their interactions might be supported by a communication network of small signalling molecules amongst them we could find antimicrobial substances. The objectives of the DYVA project are to: (i) identify the relationships between Bacteria/Archaea and nematodes in vent ecosystems; (ii) provide first insights into the secretome of nematode species living in extreme environments and (iii) search for peptides or proteins with microbial activity produced by Archaea. The originality and the overall impact of the DYVA project should bring a greater understanding of the tripartite interaction between nematodes Bacteria and Archaea in deep-sea ecosystems. These results may be fundamental in identifying how microbes (beneficial and pathogenic) interact with other higher metazoans. The natural products isolated during the DYVA project might be exploited through therapeutic applications in aquaculture and/or medicine.

Keywords: nematodes, archaea, hydrothermal vents, secretome, antibiotics.

Effect of the pH in the spatial and vertical distribution of the kinorhynchs in the Wagner and Consag Basins, Gulf of California, Mexico

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The Wagner-Consag Basin complex, Gulf of California, Mexico is characterized by possible mud volcanoes and gas vents at shallow depths. Therefore, this study aims to investigate the spatial and vertical distribution of the meiofauna in the Wagner-Consag Basin in relation with physicochemical variables (temperature, salinity, water pore pH and dissolved oxygen), including the sediment composition (mud and gravel content), nutrients, sediment disturbance, the seabed morphology and depth. In this study we focus on the effect of the water pore pH on the spatial and vertical distribution of the kinorhynchs. Samples were collected at 40 soft bottom sites on board of the R/V "El Puma", (WAGNER - 02 Expedition) during July – August 2010 with a Smith McIntyre grab and a syringe corer. At each station physicochemical variables were measured including pore water pH (using a glass 238 electrod). In this study Kinorhyncha represented 2.64% of the total meiofauna, and it ranked fourth in dominance

after Nematoda, Copepoda and Polychaeta. Regression Tree (RT) analyses were performed to identify the main environmental (pH, temperature, salinity, depth and sediment texture) factors affecting the kinorhynch density. Kinorhynch densities ranged from zero to 24 ind/10cm ^{2}. Sediment composition was the main factor affecting the kinorhynch distribution followed by the water pore pH and depth. Kinorhynchs were mainly concentrated in the upper layers, with about 84% in the first four centimetres. Kinorhynchs were present in stations with pore water pH values below seven (6.06–6.8 pH), still densities were low compared to stations with pore water pH above seven. This study represents the first study of kinorhyncha phylum in relation of seep environments in Mexico marine ecosystems.

Keywords: Kinorhynchs, vents, Gulf of California.

Climate change, biodiversity and ecosystem functioning, extreme environments and response to anthropogenic impacts: four ecological "hot" topics from a meiofaunal point of view

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Our planet is changing, and the biggest debate of the scientific community aims to understand how the ecological community will respond to these changes. From terrestrial to marine environments, from coastal to deep-sea ecosystems, the ecological research is going deeper and deeper to find models to predict the future of life on our planet. All the domains has been used in these researches, but meiofauna offer several advantages. Meiofauna are ubiquitously distributed and show high diversity and abundance in marine sediments. Meiofauna have an important role in marine benthic food chains, not only as consumers (they feed upon detritus, diatoms and algae, and prey other small metazoans) but also as producers (they are a food source for macrofauna and for commercially important fish). Meiofauna make an important contribution to the biodiversity of benthic communities and in the setting of the macrofauna community by recruiting the larva of several macrofauna taxa. In the present study we use meiofauna as a key to investigate: 1) climate change, 2) biodiversity and ecosystem functioning, 3) extreme environments and 4) response to anthropogenic impacts.

Keywords: meiofauna, climate change, biodiversity, ecosystem functioning, extreme environments, anthropogenic impacts.

Authors Index

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