ForBio and MEDUSA course: Evolution and Diversity of Meiobenthos

13–16 September 2021, White Sea Biological Station (MSU) / University Museum of Bergen (UiB)

Virtual symposium

Time zone: GMT+2

Keynote speakers:

Torsten Struck, Natural History Museum, University of Oslo

Vadim Mokievsky, Shirshov Institute of Oceanology, Russian Academy of Sciences

Alexei Tchesunov, Department of Invertebrate Zoology, Moscow State University

Andreas Schmidt-Rhaesa, Center of Natural History, University of Hamburg

Rony Huys, Natural History Museum, London

Martin Vinther Sørensen, Natural History Museum of Denmark, University of Copenhagen

Jon Norenburg, National Museum of Natural History, Smithsonian Institution

Katrine Worsaae, Marine Biological section, University of Copenhagen

Lesya Garlitska, Shirshov Institute of Oceanology, Russian Academy of Sciences

Alexandra Savchenko, Department of Invertebrate Zoology, Moscow State University

Anna Zhadan, White Sea Biological Station, Moscow State University

Daria Portnova, Shirshov Institute of Oceanology, Russian Academy of Sciences

Alejandro Martinez Garcia, Water Research Institute, National Research Council of Italy

Katharina Jörger, SNSB-Bavarian State Collection for Zoology

Alexander Kieneke, German Center for Marine Biodiversity Research

Niels Van Steenkiste, University of British Columbia - Vancouver

Łukasz Michalczyk, Jagiellonian University, Institute of Zoology and Biomedical Research

Lenke Tödter, University of Hamburg

Alexander Tzetlin, White Sea Biological Station, Moscow State University

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Organizers:

Nataliya Budaeva, University Museum of Bergen, University of Bergen

Alexandra Savchenko, Department of Invertebrate Zoology, Moscow State University

Glafira Kolbasova, White Sea Biological Station, Moscow State University

ForBio
Forskerskole i Biosystematikk
Research School in Biosystematics

13 September **GENERAL TOPICS**

Chair: Nataliya Budaeva

08:50	**Nataliya Budaeva.** Welcome and short overview of the course
09:00	Lecture: **Andreas Schmidt-Rhaesa.** History of meiofaunal research
09:40	**Minibreak (10 min)**
09:50	Lecture: **Anna Zhadan & Alexander Tzetlin.** Methods of collection and extraction of meiofauna
10:45	**Minibreak (10 min)**
10:55	Lecture: **Torsten Struck.** Cryptic species and their evolutionary and ecological importance.
11:50	**Lunch (40 min)**

Chair: Alexander Tzetlin

12:30	Student: **Sunil Kumar Padhi.** An insight into the low density meiofauna community structure in the nodule covered area of the Central Indian Ocean Basin
12:45	Student: **Soraia Vieira.** Combining metagenomics with morphology-based approaches to understand microbiome –meiobenthos interactions
13:00	Student: **Olena Uzun.** Meiobenthos on hard substrates in the nearshore of the Odessa marine region (Black Sea)
13:15	**Minibreak (10 min)**
13:25	Lecture: **Andreas Schmidt-Rhaesa.** Meiofauna paradox on distribution and dispersal
14:05	**Minibreak (10 min)**
	CNIDARIA
14:15	Lecture: **Lenke Tödter.** Meiofaunal cnidaria
14:55	**Break (20 min)**
15:15	**Social event:** Meiofaunal quiz in teams. The winning team gets special prizes from the White Sea Biological Station. (*Moderators*: *A. Savchenko and G. Kolbasova*)

14 September **ECDYSOZOA (Harpacticoida, Nematoda & Tardigrada)**

Chair: Alexandra Savchenko

09:00 Lecture: **Rony Huys.** Introduction to harpacticoid diversity, morphology and systematics

09:55 **Minibreak (10 min)**

10:05 Lecture: **Lesya Garlitska.** Ecology and biogeography of marine Harpacticoida: a brief review

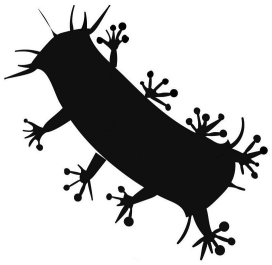
11:00 **Minibreak (10 min)**

11:10 Student: **Karim Md Abdul.** Characterization of meiofauna assemblage with combined morphology and DNA barcoding approach with special reference to free living marine nematodes in the Jiaozhou Bay, China

11:25 Student: **Neelima Vasu.** Some information on the epibenthic Harpacticoid copepods from lagoon waters of Agatti and Kavaratti of Southeastern Arabian Sea

11:40 **Lunch (40 min)**

Chair: Lesya Garlitska



12:20 Lecture: **Alexandra Savchenko.** Tantulocarida

13:00 **Minibreak (10 min)**

13:10 Lecture: **Łukasz Michalczyk.** Tardigrada

13:50 **Minibreak (10 min)**

14:00 Lecture: **Alexei Tchesunov.** Free-living nematodes as a major part of marine meiofauna

14:55 **Minibreak (10 min)**

15:05 Student: **Cessa Rauch.** Hyperbenthic copepods (HYPCOP) in Norwegian waters

15:20 Student: **Aleksandr Novikov.** New data on the diversity of Harpacticoida and Cyclopoida on sponges in the Kara Sea, the Laptev Sea and the Barents Sea

15:35 Student: **Jannik Schnier.** Diversity of Arctic deep-sea nematodes from the LTER observatory HAUSGARTEN

15:50 **Minibreak (10 min)**

16:00 Lecture: **Vadim Mokievsky.** Ecology and biogeography of nematodes

15 September **LOPHOTROCHOZOA**

Chair: Anna Zhadan

09:00	Lecture: **Torsten Struck** Lophotrochozoan phylogeny
09:55	**Minibreak (10 min)**
10:05	Lecture: **Katrine Worsaae.** Evolution of interstitial Annelida
11:00	**Minibreak (10 min)**
11:10	Student: **Kimi Kim.** Research on Rhabdocoela in Korea - the record of the past two years
11:25	Student: **Jima M.** Assortment of Meiobenthic Foraminiferal species in the fjords of Svalbard
11:40	**Lunch (40 min)**

Chair: Glafira Kolbasova

12:20	Lecture: **Katharina Jörger.** Meiofaunal molluscs
13:15	**Minibreak (10 min)**
13:25	Lecture: **Alexander Kieneke.** Gastrotricha
14:30	**Minibreak (10 min)**
14:40	Lecture: **Martin Sørensen.** Gnathostomulida
15:20	**Minibreak (10 min)**
15:30	Student: **Ivan Voltski.** Novel elphidiid foraminifer from the high Arctic: the enigmatic phylotype S15
15:45	Student: **Ole Bjørn Brodnicke.** Impact of small winnowing fish on the meiobenthos community of coral reef sediment
16:00	**Minibreak (10 min)**
16:10	Lecture: **Jon Norenburg.** Meiofaunal Nemertea

16 September **HABITATS**

Chair: Vadim Mokievsky

09:00 Lecture: **Alejandro Martinez.** Meiofauna in flood caves and other weird places as potential eco-evolutionary models

09:55 **Minibreak (10 min)**

10:05 Lecture: **Daria Portnova.** Meiofaunal communities from marine ice biotopes (with the focus on nematodes)

11:00 **Minibreak (10 min)**

11:10 Student: **Anna Timchenko.** Sympagic fauna and nematodes community in seasonal sea ice in the Velikaya Salma Strait (White Sea), in the northern Barents Sea and western Kara Sea

11:25 Student: **Finn Corus.** Antarctic meiofauna communities reflect sea-ice cover situations even on small scales

11:40 Student: **Vanessa Pitusi.** The biodiversity of sympagic meiofauna in Svalbard

11:55 **Lunch (1h 5 min)**

ECDYSOZOA (Scalidophora)

Chair: Andreas Schmidt-Rhaesa

13:00 Lecture: **Andreas Schmidt-Rhaesa.** Introduction to Scalidophora. Priapulida

13:40 **Minibreak (10 min)**

13:50 Lecture: **Martin Sørensen.** Kinorhyncha & Loricifera.

14:45 **Minibreak (10 min)**

14:55 Student: **Abril Anguas-Escalante.** New records and new species of Kinorhyncha in two marine regions of Mexico

ACOELOMORPHA & PLATYHELMINTHES

15:10 Student: **Petra Kovacikova.** Use it or lose it: elusive neoblast-like cell population in nemertodermatid species *Meara stichopi*

15:25 **Break (20 min) - discussion of student awards**

15:45 Lecture: **Niels Van Steenkiste.** Platyhelminthes

16:40 Final remarks and student awards

13 September, 12:30 GMT+2

An Insight into the low density meiofauna community structure in the Nodule covered area of the Central Indian Ocean Basin

Sunil Kumar Padhi and Sabyasachi Sautya

Laboratory for benthic ecological trait analysis (LBETA), National Institute of Oceanography, Regional Centre, Mumbai, India

The Deep sea bed, an extreme environment due to high pressure, low temperature and unavailability of light, is the largest ecosystem on earth appears to be a major reservoir of biodiversity and potential minerals. The environmental parameters in this extreme environment are quite stable and any subtle change may have a great influence in the benthic community. The data collected during the Cruise SSD-062(RV Sindhu Sadhana, 2018-19) along with previously published meiofauna data from the region shows a less diverse and density in community composition as compared to other similar environments of the world Ocean. In the present study 11 taxa were recorded with a faunal density of 3.93-8.45 Ind./10cm^2, whereas previous studies in that region recoded a faunal density of 6.7-7.97 Ind./10cm^2 (Zeng et al., 2017), 2.96-19.11 Ind./10cm^2 (Zeng et al., 2017), 7.76 Ind./10cm^2 (Wand et al., 2012), 8-52 Ind./10cm^2 (Ingole et al., 2000), 54-85 Ind./10cm^2 (Ansari et al., 2000). The high density recorded by Ansari et al.(2000) and Ingole et al. (2000) might be due the sampling strategy as they collected pseudo-replicates from the box-core. In the present study nematodes are the most abundant species numerically, which constitutes (73.50 ± 3.92)% followed by Copepod (24.6 ± 4.5)%, Acari (2.6 ±0.22)% and Nemertea (1.86 ±1.13)% . Terdigrada is the least abundant groups with a percentage share of (0.11 ± 0.1)% followed by Isopoda and Amphipoda (0.12± 0.12)% each. The vertical distribution suggests maximun meiofaunal assemblage was found on the upper 2cm of the sediment (~74%) and the faunal distribution is restricted to 6cm of the sediment depth. Considering all the environmetal conditions of the region the present study suggest the upper low productive pelagic water, low chlorophyll concentration, high stratified water column, bottom topography and fast bottom current which has an adverse impact on the organic carbon deposition and bacterial growth (the primary food source of meiofauna), are the attributes to the low meiofaunal density and diversity in the CIOB.

13 September, 12:45 GMT+2

Combining metagenomics with morphology-based approaches to understand microbiome –meiobenthos interactions

Soraia Vieira[1], Kasia Sroczyńska[1], Marta Martins[2], Maria Helena Costa[2], Joana Neves[2], Helena Adão[1] and Claúdia Vicente[3]

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[2]MARE – Marine and Environmental Sciences Centre, Department of Environmental Sciences and Engineering, NOVA School of Science and Technology (FCT NOVA), 2829-516 Caparica, Portugal.
[3]MED – Mediterranean Institute for Agriculture, Environment and Development, Instituto de Investigação e Formação Avançada, University of Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.

Sediment microbiome has an essential role in regulating ecosystem functions, not only regulating primary productivity and nutrient cycling but also shaping trophic interactions with higher trophic levels. While the importance of microbiome in terrestrial soil systems is highly recognized, its role in marine aquatic environments remains much less studied. Microbiome can be highly affected by bottom up (abiotic factors) and top down (predation by meiofauna) effects. Understanding the interaction effect between abiotic and biotic factors on microbiome communities will be an essential step for future predictions of ecosystem stability. To address this knowledge gap we studied the interactions among microbiome diversity and nematode communities in highly heterogenous Sado Estuary, SW Portugal. The samples were taken from three contrasting sites with varying sediment characteristics and human impact degrees. From each site, three replicate samples for sediment characterization (total organic matter, granulometry, total C and N), microbiome (*sensu lato*) and nematode community were taken. Total DNA from sediment was extracted using DNeasy Power Soil kit® (MOBIO, Qiagen) and processed for Illumina MiSeq platform sequencing targeting the V3-V4 region of 16S rRNA gene. Sediment characterization indicated heterogeneity between sites with distinct levels of contamination, which resulted in contrasting microbial communities. All sites showed a high α-biodiversity with predominance of Proteobacteria phylum, particularly Woeseiaceae, Desulfobacteraceae and Rhodobacteraceae families. Beside this heterogeneity in microbiome community, β-diversity was demonstrated to be very high, greatly discriminating among all three sites. Although nematode and microbial assemblages followed different patterns highlighted the important role of the sediment characteristics. Combining abiotic sediment characteristics with metagenomics and morphological identification of higher trophic level communities might certainly contribute to the understanding of complex benthic interactions in marine ecosystems.

13 September, 13:00 GMT+2

Meiobenthos on hard substrates in the nearshore of the Odessa marine region (Black Sea)

Olena Uzun, Lyudmila Vorobyova, Iryna Kulakova, Valentyn Portianko

Institute of marine biology of the National academy of Sciences of the Ukraine

Meiofauna is a food source for larvae and juvenile of macrofauna and fishes (gobiides, blenniides, anchovies, grey mullets, etc.). Complex structure of epibenthos of hard substrate supports higher protection for meiobenthos and increase species diversity and abundances. Meiofauna of soft bottoms are generally dominated by nematodes, whereas hard substrates are generally dominated by crustaceans (copepods, isopods, amphipods etc.). Nematodes, harpacticoids and ostracods in meiobenthos play a significant role in meiobenthic assemblages of organisms and can be used as bioindicators of the ecological state of the environment.
In the nearshore area of the Odessa Gulf (north-western part of the Black sea) samples were collected twice per year in spring and autumn during 2019-2020 by the use of standard techniques. The meiobenthos was collected from two types of substrate: soft bottom and hard substrates, overgrown by the mussels and macrophytes species *Ceramium elegans* (Ducluzeau, 1806), *Cladophora vagabunda* (Hoek, 1963), *Ulva intestinalis* (Linnaeus, 1753).
Analyze of meiobenthos community abundance of samples by nMDS shown strong differences between all hard-substrate stations, covered by algal species and mussels, and sandy-shell bottom samples. The density and biomass of the total meiobenthos on the hard substrate was bigger. The nematode assemblage, associated with the hard-substrate stations, were represented by 21 species. The most abundant species were non-selective deposit feeders (1B): *Monhystera rotundicapitata* Filipjev 1922, *Daptonema oxycerca* (de Man, 1888), *Sabatieria pulchra* (G. Schneider 1906), *Axonolaimus ponticus* Filipjev 1918 (1354); predators/omnivores (2B): *Metoncholaimus demani* (Zuz Strassen 1894) and epistratum feeders (2A): *Paracanthonchus caecus* (Bastian 1865), *Metachromadora cystoseirae* Filipjev 1918.
Harpacticoid fauna of the hard substrates was prevailed by species *Ectinosoma melaniceps* (Boek, 1865), *Harpacticus littoralis* (Sars G. O., 1910), *Harpacticus obscurus* (Scott T., 1895) and *Tisbe bulbisetosa* (Volkmann-Rocco, 1972). The most widespread species of the ostracods on the hard substrates were *Xestoleberis cornelii* Caraion, 1963, *Hemicytherura bulgarica* (Klie, 1937), *Paradoxostoma intermedium* Müller, 1894, *Cytherois cepa* Klie, 1937.
Complexity of the hard substrates provide favorable conditions to form diverse assemblage by meiobenthos in the nearshore zone of the Odessa marine region.

14 September, 11:10 GMT+2

Characterization of meiofauna assemblage with combined morphology and DNA barcoding approach with special reference to free living marine nematodes in the Jiaozhou Bay, China

Karim Md Abdul[1], Zhou Hong[2]

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The study investigated the meiofaunal abundance and biomass and their relationships with environmental factors, and explored the species composition and community structure of free living marine nematodes through traditional morphology and DNA barcoding in the Jiaozhou Bay, china. A total of 14 meiofaunal taxa were identified among which nematodes were the most dominant group in both abundance and biomass. The main environmental factors affecting meiofauna community in the Jiaozhou Bay were salinity and sediment characteristics. Based on morphology and DNA barcoding of 57 randomly selected nematode specimens from three stations, a total of 10 genera and 23 species were identified, among which 21 specimen belonged to *Parodontophora*, which is the most dominant genus of free living marine nematodes in the Jiaozhou Bay. Combined use of COI-5P and 18s rDNA partial sequences as DNA barcoding markers and morphological characters greatly enhanced the reliability of identification of nematodes and could serve as a tool for the accurate assessment of nematode species diversity.

14 September, 11:25 GMT+2

Some information on the epibenthic Harpacticoid copepods from lagoon waters of Agatti and Kavaratti of Southeastern Arabian Sea

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Indian waters were generally ignored from harpacticoid assemblage pattern studies. Centered on the investigation carried out during the winter monsoon (WM) 2015 and spring intermonsoon (SIM) 2016 in Agatti and Kavaratti lagoons of Lakshadweep Island, the habitat preference of harpacticoid copepods was being hypothesized. The research also aimed to investigate the community structure of harpacticoid copepods epibenthic adaptability to exist in three environments of the Lakshadweep lagoon waters. The study indicated that epibenthic assemblages, showed maximum density of 2484 ind m^{-3} in Agatti lagoon and 2074 ind m^{-3} in Kavaratti lagoon. A total sixteen groups of epibenthic fauna were recorded and enumerated at higher taxon level and harpacticoid copepods were identified to species level. Twenty-three species of harpacticoids were identified belongings to 19 genera in 11 families. The study primarily recorded *Onychocamptus armiger* from Indian Ocean; *Porcellidium fimbriatum,* ***Oculosetella gracilis,*** *Esola* sp. and *Tegastes* sp. from Lakshadweep waters; Epiphytic *Metis jousseaumei,* meiobenthic *Robertsonia* sp. and planktonic *Euterpina acutifrons*, *Macrosetella gracilis*, ***Oculosetella gracilis***, *Microsetella norvegica, Ectinosoma melaniceps* and *Clytemnestra scutellata* were primarily recorded in Agatti lagoon; Epibentic *Quinquelaophonte* sp. *Ectinosoma melaniceps, Tegastes* sp. and *Esola* sp. were also primarly recorded in Kavaratti lagoon respectively. Among the identified harpacticoid species, epibenthic *Onychocamptus armiger* and *Quinquelaophonte* sp. were recorded only in coral area in Agatti; true phytal dwelling *Eudactylopus fasciatus* and *Peltidium intermedium* in inner lagoon, highlights the habitat and environmental preference of Harpacticoids. Here we present the current knowledge on the diversity of harpacticoid taxa with special references to the different habitat of harpacticoid copepod with conspicuous meiofaunal representatives. This study provides first information on spatiotemporal variability in the abundance and diversity of harpacticoids from Lakshadweep waters of the Indian Ocean.

14 September, 15:05 GMT+2

Hyperbenthic Copepods (HYPCOP) in Norwegian waters

Cessa Rauch [1], Francisca C. Carvalho [1], Jon A. Kongsrud [1] Anders Hobæk [2] Tone Falkenhaug [3]

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Copepoda are small crustaceans that are found all over the world in both marine and freshwater habitats. Species can be planktonic (drifting in the sea water) or can be parasitic and a large diverse group of them live on algae in the hyperbenthic (living near the bottom) zone. Copepoda are very important food source for many organisms like small fish, and an important link between primary producers and higher trophic levels. Copepods also have a significant role in vertical flux of carbon and may contribute to the bentho-pelagic coupling. Despite being so important, we have limited knowledge about the biodiversity and taxonomy of these animals, especially the species that live near the bottom (hyperbenthos). In order to unravel the biodiversity and taxonomy of hyperbenthos copepods, Artsdatabanken is funding the new project HYPCOP (Hyperbenthic Copepods). With special focus on the species in the group Harpacticoida that live in the water masses just above or near the bottom. Copepods will be collected in shallow waters in the coastal areas and deeper waters in the fjords and the continental shelf. The Institute of Marine Research (IMR), Natural history museum of Bergen (UiB), Norwegian Institute for water research (NIVA) and the Norwegian Barcode of Life (NorBoL) are working together to survey the diversity of marine copepods in Norwegian waters and expect to find and describe species that are new to science and new for Norway. Currently some of the taxonomic competence in Norway is lacking, but through collaboration with foreign experts this knowledge will increase among Norwegian researchers and students. HYPCOP will run from 2020 until 2023.

14 September, 15:20 GMT+2

New data on the diversity of Harpacticoida and Cyclopoida on sponges in the Kara Sea, the Laptev Sea and the Barents Sea

Aleksandr Novikov, Grigori Morozov

Kazan Federal University

For the first time, a study of Harpacticoida and Cyclopoida living on sponges in the Kara Sea, the Laptev Sea and the Barents Sea was carried out. Our results show a low level of knowledge about the fauna of these seas, as well as a high potential of using sponges for collecting material on benthic copepods. In total, out of 34 samples, we collected 539 harpacticoid individuals belonging to 70 species and 13 families. Among them, a large percentage (33 out of 72 – 45%) was new to science. Also found 7 individuals of Cyclopoida belonging to 2 species.
The most interesting finds include 2 species of *Argestoides*, *Bodinia* sp. 1, *Heteropsyllus spongiophilus*, *Mesopsyllus glacialis* and *Mesopsyllus* sp. 1. Also noteworthy are the species in the family Ectinosomatidae Sars GO, 1903, especially 3 species from the genus *Sigmatidium* Giesbrecht, 1881, 2 species *Halophytophilus* and one new species from a new genus, probably close to *Sigmatidium*. Probably, at least some of these species are obligate inhabitants of sponges, therefore, they were not previously found in the studied seas.

14 September, 15:35 GMT+2

Diversity of Arctic deep-sea nematodes from the LTER observatory HAUSGARTEN

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The LTER (Long-Term Ecological Research) observatory HAUSGARTEN in the Fram Strait between NE Greenland and Svalbard is influenced by processes in the Marginal Ice Zone (MIZ). Since 1999, an annual multidisciplinary sampling program is carried out at 21 stations, following a depth transect from 250m off the Kongsfjorden to over 5500m in the Molloy Deep, the deepest depression in the Arctic Ocean. As part of the time series, virtually undisturbed sediment samples are taken with a multiple corer for the analysis of various biogenic compounds and the inhabiting meiofauna. Nematodes are typically the most abundant metazoan meiofaunal group in deep-sea sediments. This is also reflected in the samples from the HAUSGARTEN, where usually over 90% of all metazoan meiofauna consists of nematodes, which promotes them as an ideal taxon to study the deep-sea response to the rapidly changing Arctic Ocean. Via density gradient centrifugation and the preparation of permanent specimen slides, a morphological light microscopic determination, at least to genus level is carried out, while also measuring the organism sizes to determine the biomass of the nematodes. Based on the buccal morphology, nematode feeding types are determined, allowing for a general assumption of their ecological function and role. At the deep-sea stations, the mean nematode density and biomass is highest in the upper bathyal between 1200m and 2000m water depth and generally decreases with increasing depth. A significant increase in density compared to the other deep stations is found at the deepest station in 5500m depth. In total 124 genera from 30 families have been identified, also decreasing in diversity with increasing water depth. Nematode biomass and diversity strongly correlate with the availability of food sources (e.g., settled phytodetritial matter, indicated by sediment-bound chloroplastic pigments) and the exo-enzymatic activity of sediment-inhabiting bacteria. The warming Arctic Ocean alters the extend of the MIZ and thus also the extend and timing of the primary production in the area. The ongoing time series at the LTER-HAUSGARTEN allows to monitor the impact of altered food input on deep-sea meiobenthic communities and contributes to a better understanding of climate change effects in the deep-sea.

15 September, 11:10 GMT+2

Research on Rhabdocoela in Korea_the record of the past two years

Kimi Kim [1], Niels Van Steenkiste [2], Jongwoo Jung [3]

[1] Division of EcoScience, Ewha Womans University, Republic of Korea
[2] Departments of Botany and Zoology, University of British Columbia, Canada
[3] Department of Science Education, Ewha Womans University, Republic of Korea

Dr. Niels Van Steenkiste of UBC, Canada, visited Korea at the invitation of the National Institute of Biological Resources of the Republic of Korea in July 2019 and taught me how to study rhabdocoels while going samplings in the Yellow Sea and East Sea of South Korea. His visit was the starting point for research on the diversity of rhabdocoel flatworms in Korea. Rhabdocoels belong to meiobenthos with a length of only 0.05 to 1 mm, and swim freely in the space between sand particles. Without carapaces or cuticles, they have a very soft body with no skeleton. When treated with a fixative such as ethanol or formalin, a rhabdocoel hardens, and the internal structure of the body is not visible, and the species cannot be identified. Therefore, after the unfixed sand was transported to the laboratory in its freshest state, the rhabdocoels living on the sand were sieved. To study the internal structure of the rhabdocoels in detail, pictures were taken using a camera attached to a microscope and short videos were recorded. The following results are a record of some of the more than 20 species of rhabdocoela discovered in over 30 samplings on beaches in South Korea, such as Taeanhaean National Park and Jeju Island, over the past two years. 5 species in 5 different genera belonging to the family Polycystididae, *Alcha sinensis*, *Palladia nigrescens*, *Scanorhynchus forcipatus*, *Gyratrix hermaphroditus* and *Polycystis* sp. were discovered. In addition, three species, *Cheliplana setosa*, *Cheliplana evdonini* and *Baltoplana* sp. were identified in the family Cheliplanidae along with three species of the family Promesostomidae, *Promesostoma alaskanum*, *Promesostoma ensifer*, and *Promesostoma dipterostylum*. *Utelga* sp. of the family Koinocystididae, *Diascorhynchus* sp. of the family Diascorhynchidae, and *Neognathorhynchus* sp. of the family Gnathorhynchidae were also discovered. Among the species above, *Alcha sinensis* Wang & Hu, 2019 is listed on the National Species List 2020 published by the National Institute of Biological Resources of Korea after a taxonomic paper in the Journal of Species Research was published.

15 September, 11:25 GMT+2

Assortment of Meiobenthic Foraminiferal species in the fjords of Svalbard

Jima M, S. Bijoy Nandan, P.R. Jayachandran

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Fine Arts Avenue, Kochi 682 016, Kerala, India

The diversity of meiobenthic Foraminifera in the High Arctic fjords of the Svalbard archipelago was evaluated by reviewing all the available literature published since 1984. In addition, field-based studies conducted from the Arctic Krossfjord during 2017 and 2018 were also considered. In total, 324 meiobenthic foraminiferal species belonging to 141 genera and 68 families have been reported from the fjords of Svalbard. In this study, Svalbard fjords were divided into four geographical regions: South West Fjords (SWF; 208 species), North West Fjords (NWF; 196 species), South East Fjords (SEF; 112 species), and North East Fjords (NEF; 96 species). In the western part of the Svalbard archipelago, the documentation of foraminiferal species is relatively good compared to the eastern side. Based on the Bray-Curtis similarity analysis, all four regions of the Svalbard archipelago are grouped into a single cluster with the highest similarity (69.4%) between SWF and NWF and overall similarity of 44.6%. The Kulczynski-2 similarity and βw diversity indices also confirms the uniqueness of western Svalbard fjords. The Svalbard archipelago is influenced by cold Arctic waters and warm Atlantic water masses. However, the literature and the present study on meiobenthic foraminiferans clearly showed that western Svalbard fjords are more influenced by warm Transformed Atlantic waters, as indicated by the dominance of Atlantic species *Nonionellina labradorica* and *Adercotryma glomeratum*. On the other hand, eastern side showed dominance of typical Arctic shelf species, notably, *Islandiella helenae*, which prefer a high food supply associated with the sea-ice margin. This study forms the baseline for future studies, understanding the foraminiferal diversity and assemblage composition around the Svalbard Archipelago, and could contribute to formulating conservation plans for this region in the context of global climate change.

15 September, 15:30 GMT+2

Novel elphidiid foraminifer from the high Arctic: the enigmatic phylotype S15

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The Elphidiidae represent a large family of benthic foraminifera within the order Rotaliida, class Globothalamea, and are very common across marine shelves worldwide. The type genus *Elphidium* is characterized by calcareous, planispirally coiled, multichambered test, a spiral umbilical canal system, and "bridges" crossing the deeply incised "sutures" (intraseptal interlocular spaces). Complex test morphology and high morphological plasticity obscures the species boundaries of many elphidiids. This, augmented by the high diversity, and the taxonomic history dating back to the XVIIIth century, makes this group a true "nightmare for taxonomists".

In the Arctic, over fifteen elphidiid morphospecies are distributed from the intertidal zone to the shelf break. Among them is the one designated 'phylotype S15' in recent SSU rDNA phylogenies, which has not yet been formally described despite its wide occurrence. Many live specimens were found on the outer shelf of the East Siberian Sea (expedition TransArctic 2019), while some earlier collections brought specimens with similar sequences from the Kara Sea and from off Svalbard, providing an excellent material to characterize this new species with morphological and molecular tools. Interestingly, many specimens were found firmly attached to tests of larger agglutinated foraminifera (e.g. *Hormosina pilulifera*). The unnamed 'Phylotype S15' species is closely related and shares morphological similarities with common, circumpolar species *Cribroelphidium bartletti*, *C. frigidum*, and represents another peculiar, widely distributed high-arctic elphidiid possibly indicative of the seasonally to perennially ice-covered outer shelf environment.

15 September, 15:45 GMT+2

Impact of small winnowing fish on the meiobenthos community of coral reef sediment

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Several tropical fish are known to feed by winnowing sand. However, little is known about this feeding behaviour in marine ecosystems, how it impacts meiobenthos, which morphological adaptations enable effective winnowing, and how this feeding contributes to the trophodynamics of reef ecosystems. In this study we investigated this knowledge gap through controlled quantitative aquaria-based experiments and morphological examinations of two winnowing cryptobenthic reef gobies; *Valenciennea sexguttata* and *V. strigata*. Through a 6-day experiment, we investigated the impact of winnowing on meiobenthic density, diversity, and community composition. Furthermore, the feeding apparatus (branchial basket and pharyngeal jaws) of both goby species were morphologically assessed with scanning electron micrographs and gut content analyses revealed their diets. The results clearly showed that both goby species significantly reduced the density of meiobenthos, with no significant interspecific differences. Meiobenthic diversity was not impacted and changes in community composition of the meiobenthos were driven by the most abundant taxa; copepods, ostracods, annelids and nematodes. Collectively, this indicates that these sand winnowing gobies are generalists that graze on the most abundant prey. Morphological analyses of the feeding apparatus revealed specialized adaptations to sand winnowing such as several protruding papillae, large gill rakers, mucus glands in pharyngeal jaws and bendy pharyngeal teeth. Though the internal mechanisms are not clear, we propose that these structures enable effective extraction of minute prey from sediment. The high abundance of tastebuds likely aids in detection of sand patches rich in meiobenthos, rather than selecting for specific prey. Our findings show that *V. sexguttata* and *V. strigata* through winnowing exerts short-term top-down control on meiobenthos as their specialized feeding apparatus morphology enables feeding on the highly productive meiobenthos. Small winnowing fishes feeding on the high-energy resource of meiobenthos play an essential role in trophodynamics as they connect low and high trophic levels, as they are prey to piscivores.

16 September, 11:10 GMT+2

Sympagic fauna and nematodes community in seasonal sea ice in the Velikaya Salma Strait (White Sea), in the northern Barents Sea and western Kara Sea

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The complex structure of branched brine channels and pores of sea ice provides microhabitats for a variety of sympagic organisms, such as algae, bacteria, protozoan and metazoan organisms. In turn, with metazoan species between 20–500 μm in size and living within sea ice known as sympagic (ice-associated) fauna, this includes nematodes, acoel flatworms, rotifers, copepods, and some meroplankton. The aim of the study investigates the abundance, diversity and pathways of sympagic fauna in seasonal sea ice in the Velikaya Salma Strait (White Sea), in the northern Barents Sea and western Kara Sea. Sampling of full sea-ice cores, sediment, plankton and algae in different seasons (before ice formation, during ice formation and after ice melting) throughout the year in the White Sea made it possible to study the different types of sea ice and the vertical distribution of the fauna inhabiting sea ice; how the abundance and diversity change with the seasons; and how the composition of nematodes differs from the coastal zone to more open parts of the sea. Of greatest interest of component of sea-ice fauna are nematodes that inhabit sea ice annually. Ice nematodes of three species are widespread throughout the sea ice of the Arctic seas: *Theristus melnikovi*, *Cryonema crassum* and *C.tenue*. In turn, several species such as *Hieminema obliquorum*, *Halomonhystera* sp., *Daptonema* sp. appear in sea ice locally in semi-enclosed seas or bays. Nematodes associated with sea ice are a subject of a comprehensive study involving molecular phylogenetic analysis (based on molecular markers, one mitochondrial gene COI and one nuclear ribosomal gene 18S), and morphometrics. In this connection, one of the goals of this work is to provide morphological and molecular genetical survey of ice nematodes from the White and Kara seas, and also compare with ice data from Svalbard.

16 September, 11:25 GMT+2

Antarctic meiofauna communities reflect sea-ice cover situations even on small scales

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Global warming alters the Antarctic marine ecosystem. Ecosystems and benthic communities which depend on sinking food from the water column are impacted by changing sea-ice cover and duration. During my internship I studied how different sea-ice cover situations affect the composition of meiofauna communities in the North-Western Weddell Sea. During RV *Polarstern* expedition PS118, sediment samples for meiofaunal analysis were taken with the Multicorer (MUC). Three stations were chosen based on differences in sea-ice cover and similarity of sediment grain size. Meiofauna higher taxa such as Nematoda and Copepoda were extracted from the sediment samples and counted. The parameter "9-year sea-ice cover" influences the abundance and composition of meiofauna most. Antarctic meiofauna is most abundant in regions with seasonal sea-ice cover. On the investigated small regional scale, the relationship between environmental factors that impact food availability and meiofauna communities resembles the situation observed on a larger scale in the Weddell Sea. The strong correlation between sea ice and meiofauna on two different geographical scales stresses the importance of assessing the effects of climate change on the Antarctic marine ecosystem.

16 September, 11:40 GMT+2

The biodiversity of sympagic meiofauna in Svalbard

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Sea ice offers a unique habitat to a diverse community of microscopic flora and fauna. The metazoan component of this community is called sympagic meiofauna ("ice-associated" animals), which encompasses animals in the size range of 20-500 µm. This includes nematodes, polychaetes and copepods, among others. Much interest in this meiofauna exists as Arctic sea ice conditions are changing and we do not know what biodiversity we are losing. Sympagic meiofauna in Svalbard is not widely studied and with this area of the Arctic warming faster than any other, it is of high priority to map their biodiversity fauna to understand what role sea ice plays in their life cycle. This talk will give insights into some of the data collected over the past 7 years in Svalbard and compare it to what we know about other Arctic regions.

16 September, 14:55 GMT+2

New records and new species of Kinorhyncha in two marine regions of Mexico

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Kinorhynchs are microscopic animals, inhabiting the upper centimeters of marine sediments. Although their distribution seems to have a wide world range, many geographic areas have been scarcely addressed or remain unexplored. The kinorhynchs in the Mexican marine regions have remained unexplored until 2015. Currently eight species are known for the Gulf of California, Gulf of Mexico, and caves from the Yucatan Peninsula. The present study was carried out in the southern Quintana Roo, Caribbean Sea and in Marias Islands, Pacific Ocean, off the Mexican west coast. In Quintana Roo state two places were sampled: Xahuaxol (18°30'N, 87°45'W) and Xcalak (18°21' N, 87°48'W). The sediment was collected with a PVC corer (10 cm internal diameter, 10 cm length). In the Marias Islands (21°31'55.5"N 106°27'37.5"W), the sediment sample was collected on board Dr. Jorge Carranza Fraser Research Vessel with a dredge (52 cmx 35 cm wide and 26 cm high) at 18 sampling stations. All sediment samples were processed by decantation method and the supernatant was filtered through a 45µm sieve. Permanent slides were made with 100% glycerin. Organisms were identified using an Axio Lab A1 Carl Zeiss light microscope and a JEOL JSM-6335F Field Emission Scanning electron microscope. A total of 41 samples were examined: 36 from Marias Islands, four from Xcalak and one from Xahuaxol. The total abundance of kinorhynchs was 55 individuals, 45 for Xcalak, eight for Islas Marias and two for Xahuaxol. The taxa records correspond to one morphotype of the Pycnophyidae family, *Cristaphyes* sp. and two new species of *Echinoderes*. *Echinoderes* sp. nov. 1 differs from other species by lack middorsal spines and Segment 2 with lateroventral tubes and subdorsal tubes. *Echinoderes* sp. nov. 2 is characterized by lateroventral tubes in segment 2, middorsal spines on segments 4 to 8 and lateral terminal spines very short, and stout. Different species were observed between the studied sites and the reports in nearby geographical areas. The results found here emphasize the importance of studying both poorly explored sites and species distribution patterns.

16 September, 14:55 GMT+2

Use it or lose it: Elusive neoblast-like cell population in nemertodermatid species *Meara stichopi*

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Nemertodermatids are meioscopic marine worms that together with Acoela and Xenoturbellida form clade Xenacoelomorpha. Because of their constantly debated phylogenetic position – a clade within Deuterostomes vs a sister group to Nephrozoa – they present an essential group in our understanding of the evolution of characters. Previous work in several acoel species showed the presence of pluripotent cells, similar to neoblasts, involved in regenerative processes and germline development. However, no such cell population has been described in their sister group, nemertodermatids. In this study, we focus on one of the two nemertodermatids amenable to research, *Meara stichopi*.
Meara can be found seasonally as a symbiont in the sea cucumber *Parastichopus tremulus*. By labeling dividing cells during homeostasis vs after an amputation or naturally occurring loss of the posterior part, we show the induction of the cell division at the blastema site. We explore the initial stages of the wound healing process further, using the immunohistochemistry with the common markers for the muscles and neurons. To discriminate between regenerative and developmental role, we visualized the proliferating cells in different life stages – hatchling, juvenile, adult. The comparison suggests that this population is very dynamic, giving rise to many different cell types throughout development, finally persisting until the adulthood. This differentiation potential is reflected in the transcriptomic data that we collected and hints at the later origin of the germline.
Our preliminary results indicate that there is a cell population reminiscent of neoblasts in nemertodermatid *Meara stichopi*, their regenerative capacity, however, seems to be rather limited, implying greater contribution to differentiation trajectories. The “faithfulness” of a neoblast-like phenotype needs to be further investigated, in part the relationship with the germline, as it will provide the cues for the evolution of regeneration in Acoelomorpha.