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**DEPARTMENTAL SEMINAR
INTEGRATIVE ZOOLOGY
Winter Term 2015**

Programme and Abstracts

Tuesdays, 10-11:30 hrs

SR 3, UZA1, Althanstraße 14, 1090 Wien



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Matrotrophy in invertebrates: distribution, structure, evolution.

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In contrast to the common view – matrotrophy, or direct parental supply of nutrients during gestation – widely distributed not only among chordates, but also among invertebrates. Proved or inferred, matrotrophy and its most elaborate form – placentation – reported in 21 of 34 phyla. Distribution of the major patterns of sexual reproduction across phyla suggests that embryonic nutrition evolved about 170 times in animals in all major superclades. Matrotrophy is associated with viviparity in 20 phyla whereas with brooding in 10. In nine phyla, both matrotrophic incubation types were recorded and in two phyla they are present in one life-cycle. Among six nutritive modes (phagocytosis, oophagy, adelphophagy, histophagy, histotrophy and placentotrophy) histotrophy and placentotrophy are most wide-spread whereas phagocytosis is met only in Porifera. Evolution of matrotrophic structures demonstrates numerous examples of convergence on all levels – positional, structural and physiological. Respectful their taxonomic affinities, matrotrophic animals – chordates and invertebrates – for embryonic nurishment use the same set of pre-existed or ‘specially constructed’ chambers (body cavities, sexual ducts or body wall folds and invagination), employing similar ways to increase the total secreting and absorbing surfaces (by various appendages and envelopes – again, ‘ready’ or evolved exclusively in connection with matrotrophy) and being based on the same trophic methods and mechanisms (ingestion and absorption based on diffusion, active transport and endocytosis). In most elaborated instances placental analogues of the lower chordates and invertebrates (salpae, onychophorans and some gastropod molluscs and arthropods) mimic the simplest placentas in vertebrates. The latter have generally more complex nutritional structures, but matrotrophic adaptations of invertebrates are more diverse. In both, chordates and invertebrates evolution toward the

“substantial matrotrophy” was accompanied by the corresponding reduction of vitellogenesis. It seems that this shift in the resource allocation evolutionary occurs via intermediate phase of so-called “incipient matrotrophy” combining relatively large amount of yolk accumulated during oogenesis and small to moderate degree of nourishment during embryonic incubation.

Research Ethics in Horizon 2020

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In recent times, there is hardly any issue of one of the top scientific journals where scientific misconduct or other ethical missteps aren't discussed. Such cases have tremendous implications not only for the individual involved, but also for the whole working group and the institution. It must therefore be a prime interest for individuals and institutions to engage in research ethics as a preventive measure.

I argue that here are at least five different reasons why individual students should be interested in research ethics. Those reasons can be framed in the context of a responsible scientist, societal integration of science, lawfulness as well as publication and funding requirements.

A comprehensive ethics appraisal approach is currently implemented by the European Commission in its framework programme Horizon 2020. It addresses in a comprehensive way key areas of ethics, ranging from human embryos and other tissues, to human subjects in research, personal data protection, animal testing, third country involvement, environmental ethics, health, safety, dual use and misuse. The appraisal is not only comprehensive with regard to the material issues at stake, it is also comprehensive with regard to stakeholder involvement, as it involves researchers, ethicists, institutional administrators and the funding agency. Today there is a continuous push to reduce ethical consideration in research based on the argument of bureaucracy and the neutrality of

science. Whereas the first might hold some merit and there is a need to reduce bureaucratic burden, the second is misleading. Science is never neutral as the recent case of revoking the honorary doctor degree of Konrad Lorenz by the University of Salzburg tells us. In order to make sure that science and society go hand in hand, and thereby making the scientific enterprise sustainable, we are well advised to honour research ethics as a key facilitator - investments in research ethics are at the same time long-term investments into science.

In conclusion, without simultaneous investments in ethics the vision for increased scientific excellence will be a short lived one and hopefully not end in a similar disaster that surrounds Konrad Lorenz and his role in providing scientific justification for the Aktion T4.

The freshwater bryozoan *Pectinatella magnifica* in the Czech Republic.

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Pectinatella magnifica is a freshwater bryozoan which can develop into large colonies. It is native to North America but it has been invading Europe and East Asia. It is spreading through the Czech Republic and in some areas it has recently reached a character of an invasion. We have been studying this species with a detailed focus on the Protected Landscape Area (PLA) and Biosphere Reserve (BR) Trebonsko (South Bohemia, Czech Republic). It frequently occurs in the reservoirs which are used for recreation and sport fishing, as a water-supply, in flooded gravel sandpits or in ponds. The goal of this study is to analyse the reproductive strategy and spreading of *Pectinatella magnifica*. One part of my work is to culture and study *Pectinatella* in the laboratory. So far, culturing this bryozoan in the aquarium has never been achieved for more than a few days. It was possible to hatch a number of zooids from the statoblasts with a life span extending several weeks but

without any development of colonies. In addition, it was also experimentally tested how mature colonies will thrive under laboratory conditions. Currently different abiotic and biotic conditions are tested in order to find out what could be the determining factors for hatching of the zooids and the subsequent creation of the colony. Because the potential ecological risks of this species are similar to other invasive species, further studies are necessary.

A Dozen is Not Enough: Reconciling the Phylogeographic Patterns and Species Diversity of Phoronid Worms.

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Despite conflicting evolutionary interpretations for more than a century, the lophophore-bearing invertebrate animals (ectoprocts, phoronids, and brachiopods) are currently supported as a monophyletic group. In this seminar, I will summarize some of the recent work from my laboratory on phoronids involving several undergraduate and graduate students. The known species diversity of phoronid worms is low (two genera and 11 accepted species with cosmopolitan distributions) when compared to ectoprocts, brachiopods, and many other marine invertebrate groups. As such, my lab group seeks to better estimate phoronid species diversity, detect cryptic species, and discern phylogeographic patterns in select lineages using mitochondrial, ribosomal, and nuclear genes. Previous phylogenetic work by Santagata and Cohen (2009) found only weak congruence between the morphological and molecular-based analyses. Our improved phylogenetic analysis based on six genes and additional phoronid specimens shows better concordance with adult morphology and reproductive traits. Combined with sequence data gathered from phoronid larval types, this dataset also sheds new light on phoronid species diversity as well as the taxonomic status of some

debated species. Results from mitochondrial genes suggest that these markers have been subjected to purifying selection among phoronid species. However, specific lineages (e.g., *Phoronis pallida*) exhibit divergent cytochrome c oxidase subunit I (COI) haplotypes. It is plausible that these genetic differences are the result of adaptive selection originating from this species' commensal relationship with thalassinid mud shrimps. Haplotype clade frequencies among populations of *P. pallida* from sites in the Pacific northwest of the USA differ and contain significantly divergent haplotypes that may suggest these populations are also undergoing sympatric incipient speciation. Further investigations of intra- and inter-population genetic variation present in *P. pallida* are especially important considering the recent population decline of thalassinid shrimps in the Pacific northwest of the USA due to an introduced species of parasitic isopod.

Quantity or quality, local or landscape scale – what determines species richness of dry grassland fragments in Eastern Austrian agricultural landscapes?

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Habitat fragmentation is a ubiquitous phenomenon that has characterised man-made landscapes around the globe. With increasing agricultural land use, species dependent on natural or semi-natural conditions get increasingly isolated in small habitat patches. Species can survive in fragmented landscapes when recolonisation rates are sufficiently high to counterbalance population extinction in the patches. With a low recolonisation rate, the species is doomed long before the last population becomes extinct. The theory of island biogeography suggests that increasing the size and reducing the isolation of patches in a given

landscape can benefit species survival in such habitat fragments (the 'area-and-isolation paradigm'). By contrast, conservation practice has typically ignored landscape structure and focused on habitat quality, in the case of grasslands by grazing or mowing management. We related the influence of size, isolation and quality of patches to their species richness in a set of 50 dry grassland fragments in agricultural landscapes of eastern Austria. We studied two plant taxa (vascular plants, bryophytes) and 11 invertebrate taxa (gastropods, spiders, springtails, grasshoppers, true bugs, leafhoppers and planthoppers, ground beetles, rove beetles, butterflies and burnets, ants and wild bees). We distinguished 3 target variables of species richness: (1) species richness of dry grassland specialists, (2) of all grassland species and (3) of all species. Using regression and hierarchical partitioning techniques, we found that total species richness (3) was highly influenced by spillover from adjacent biotopes. Grassland species richness (2) was determined mostly by landscape heterogeneity parameters. The area-isolation paradigm was applicable only for dry grassland specialists (1). When analysing specialists of all taxa together, species richness was significantly related to historical patch size but not to current patch size, indicating an extinction debt. At the landscape scale, the quality descriptor 'short-grass area' was a better predictor than the variable 'area of extensively used landscape elements', indicating the importance of habitat quality at the landscape level. 'Distance to mainland' was a good predictor for specialists of mobile animal taxa. Plant specialists showed a pronounced dependence on quality parameters at the patch scale and at the landscape scale, whereas animal specialists were influenced by patch size, patch quality, landscape quality and isolation measures. None of the taxa benefited from linear structures in the surroundings. Consequently, conservation practice appears to be doing the right thing in maintaining or achieving a high level of habitat quality both within the patch and in the surroundings. A network of high quality patches at limited distances from each other should be maintained or achieved to conserve biodiversity in human-influenced landscapes.

The importance of individual and habitat characteristics on habitat use in Dalmatian tortoises (*Testudo hercegovinensis*).

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The Dalmatian Tortoise is considered to be a subspecies of the Hermann's Tortoise (*Testudo hermanni*) and only exists along the coast of Bosnia and Herzegovina, Croatia and Montenegro. It is characterized by a small body size, bright spots on the back of its head and inhabits dry or slightly humid mediterranean areas. Due to wildlife trade and habitat loss or fragmentation, the population of this species, which naturally shows a small range, decreased in the past few years. In order to provide sufficient conservation measures, it is crucial to study the behaviour and ecological needs of this species. In May 2014 and 2015 the following data was collected in a defined area in Pirovac, Croatia: morphological measurements, behavioural variables, presence and type of injuries, sex, habitat type and GPS coordinates. This allows an insight in life history and habitat choice and possible threats (injuries) of the population. So far, preliminary analyses indicate, that females outnumber both juveniles and males and tend to be bigger than assumed. Based on capture and re-capture data, we assume, that, as long as the extensive farming keeps maintained, the population can be considered as stable.

Bumblebee populations in intensively-used agricultural landscapes in the Weinviertel and Waldviertel of Lower Austria.

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Approximately 47 bumblebee species can be found in Austria, of which about 10 species belong to the *Bombus (Psithyrus)* type, and 16 of them are considered as endangered. As for many other insects it is assumed, that the bumblebee populations suffer due to intensively-used agriculture, which reduces and fragmentises their habitats. This study is about to determine the influence of intensive agriculture on the population size of Austrian bumblebee species. For this matter, the status of bumblebee populations in the Waldviertel and Weinviertel of Lower Austria was investigated. At first 13 habitats were selected. Most of them were ruderal vegetation in agricultural-used landscapes. During the summer of 2014 the population sizes of different bumblebee species have been observed in the 13 habitats by visiting each habitat at least two times. For that purpose the transect method was used. The different plant species have also been determined, as well as abiotic parameters like temperature, air pressure and humidity. The data should enable to point out the status of bumblebee occurrence in intensively-used agricultural landscapes and make it possible to interpret their status in the future and forecast their development in the analysed regions.

The vestibular system of Red-eyed Treefrog (*Agalychnis callidryas*) embryos as a sensor for snake attacks.

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Embryos of the red-eyed treefrog, *Agalychnis callidryas*, are able to hatch early to escape a number of threats. They are able to use vibrations in the clutch to detect snake attacks. Little is known about the sensory systems that mediate vibration sensing in embryos and their quick response to snake attacks. The vestibulo-ocular reflex (VOR) can be used as an indicator of vestibular function. These are eye movements that compensate for head movements in order to stabilize the visual field. We hypothesized that *A. callidryas* embryos use the vestibular system to sense vibrations and predicted that the onset of vestibular function would coincide with the onset of hatching response to snake attacks. To demonstrate this, we evaluated VOR development. We induced hatching in embryos of various ages within the period of hatching plasticity (3-7 days) and then placed them in a device designed to rotate them 180° along their body axis in each direction. We photographed the embryos and quantified the rotation of the eyes. From these measurements we constructed VOR response curves. Embryos early in the period of hatching competence at 3 days did not show VOR. The initial response at 4 days was weak and variable and from 5 days on the response became stronger and more consistent. Previous research on embryo escape responses to snake and wasp attacks has shown similar response patterns, with onset at 4 days. Our results support the hypothesis that *A. callidryas* embryos use the vestibular system to sense vibrations and detect predator attacks.

Carotenoids and health status in Viennese kestrels.

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Kestrels (*Falco tinnunculus*) are the most common birds of prey in the city of Vienna, where they breed in very high densities due to the great number of available breeding cavities on buildings. In rural landscapes, they feed their chicks mainly with voles, a resource which is scarce in urban habitats. Therefore, city-dwelling kestrels have been found to show more generalist hunting strategies, including more birds and insects in their diet than their rural counterparts do. Contrary to their apparent adaptation to life in the city though, kestrels' reproductive success decreases with an increasing soil sealing factor towards Vienna's inner city. To examine whether this relationship is due to differences in individual health status between chicks growing up in differing habitats along an urban gradient, I measured several health indicators of kestrel nestlings. The concentration of carotenoids – important micronutrients and antioxidants – is one of these individual quality indices and can easily be detected through the colouration of feather-free skin of tarsus and cere. As measuring colours is anything but trivial, I used photospectrometry to validate the results achieved with the colour chart method which can be biased by the subjectivity of the observer. I also counted ectoparasites found on the nestlings' body and took bloodsamples to estimate the birds' exposure to environmental stressors. Combining these and other health indicators with body condition and sex of the nestlings, I aim at revealing the implications of city life on the wellbeing of an abundant aerial predator.

ABOL (Austrian barcode of life) pilot study parasitic worms: DNA-Barcoding of fish parasites.

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The aim of the "Austrian Barcode of Life" initiative (ABOL) is the creation of DNA barcode sequences of all animal-, plant- and fungi species in Austria. The sequences are freely available, submitted in an online database. The project starts with four pilot studies: the DNA-barcoding of parasitic worms, molluscs, butterflies and vertebrates.

The focus of my master thesis is the DNA-barcoding of spiny-headed worms (Acanthocephala) and their identification on species level. Therefore, we will use different methods. The worms were obtained through dissection of different species of fish. Overall, in 116 examined fish we found 277 parasites, 259 thereof belonging to Acanthocephala. We will also proceed further dissections. For the morphological determination at species level, the worms are brightened with glycerol (Reichnow, Vogel, Weyer 1969) in combination with a borax carmine staining (Romeis 1968).

An approximately 650 base pair long section of the mitochondrial cytochrome c oxidase subunit I (COI) serves for the molecular identification. Until now, a PCR was performed with 7 individuals of Acanthocephala. The DNA-barcodes of 2 individuals of *Pomphorhynchus* sp. don't match with our morphological determination, therefore it is still unclear to which species the animals belong.

In addition to the DNA barcoding, I will perform a series of experiments to investigate the effect of glycerol, formol and borax carmine on DNA extraction by considering different intervals.

The collection of pseudoscorpions in the NHM – a tribute to Max Beier.

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The collection of arachnids in the Natural History Museum Vienna (NHM) harbours over 40,000 objects. Some of them date back to the early 19th century. The collection of pseudoscorpions is one of the most important ones in the world with over 7,000 series and an estimated amount of 800 type specimens. This is due to the long lasting activity of Max Beier (1903-1979), who worked at the NHM from 1927 on, first as entomologist, later he specialized in pseudoscorpions. He published over 200 papers in that field only and provided the first comprehensive work on the modern systematics of the pseudoscorpions in 1963.

Taxonomical and biogeographical studies on the pseudoscorpion fauna of the Carpathian Basin.

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Pseudoscorpions (Arachnida: Pseudoscorpiones) are one of the four meso-diverse orders of the Arachnida, including more than 3500 species. They are small-sized predators inhabiting various habitats and can be found all over the world except the polar regions. My PhD

research is the investigation of the pseudoscorpion fauna of the Carpathian Basin from taxonomical, biogeographical and faunistical point of view. Recently we know more than 80 pseudoscorpion species from this area. The pseudoscorpion species-composition of several national parks and lower mountains are listed from the Carpathian Basin. During these investigations twelve species proved to be new for Hungary and one new for the fauna of Romania. In reasonable cases the taxonomical status of some species was changed. Biogeographical concerns are also discussed.

Organogenesis in the budding process of *Fredericella sultana* and *Plumatella casmiana*.

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Bryozoans as well as phoronids and brachiopods represent a superphylum called lophotrochozoans. Bryozoans comprise the chiefly marine Stenolemata and Gymnolemata as well as Phylactolemata which colonize freshwater habitats. Marine and freshwater bryozoans can be discriminated by the shape of their lophophore. All marine bryozoans are characterized by a circular lophophore, whereas most freshwater bryozoans feature horseshoe-shaped lophophores. However, the freshwater colonizing Fredericellidae possess circular lophophores. Because of this exceptional trait, the family Fredericellidae has long been considered as an ancient group of the Phylactolemata. Nowadays, this family is regarded as the most modified family within the freshwater bryozoans. Phylactolemata reproduce both asexually and sexually. Colony growth is achieved by budding, whereas new colonies are established by the settlement of sexually reproduced larvae. Regardless of the reproduction mode, all polypids originate from a bud. The

reconstruction of the organogenesis during the budding process in *Fredericella sultana* (Fredericellidae) compared to *Plumatella casmiana* (Plumatellidae) will provide insights into the degree of modification of Fredericellidae. Highly modified traits would include the presence of a horseshoe-shaped lophophore in the early larval stages of *F. sultana*.

Effects of environmental enrichment on the behaviour of captive ring-tailed lemurs (*Lemur catta*).

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Nowadays, Zoos no longer serve to simply exhibit exotic animals for the pleasure and entertainment of their visitors but play an important role in education, research and conservation. Therefore the visitors need to get a good impression of the animals and the quality of their lives is very important too. To reach these goals, environmental enrichment is a fixed part in modern zoos in the world. This study observed two groups of ring-tailed lemurs (*Lemur catta*) in two different zoos. As enrichment methods served on the one hand a cognitive demanding puzzle the lemurs had to solve to get a reward, and on the other hand a clicker-training. To analyse the effects of these enrichment methods the observations with the two differing methods were compared with observations without enrichment. In addition, faeces of the lemurs were collected to analyse possible differences in the stress-level of the animals via a cortisol-analysis. First results show an effect of both enrichment methods in the way that the ring-tailed lemurs are more active with enrichment. These results confirm a positive effect of environmental enrichment on captive ring-tailed lemurs.

Morphology and climate change: A case study of aerial predators in Central Europe.

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Many studies postulate that changes in morphology could be a response to global warming. This study tried to find out if five common aerial predators (*A. gentilis*, *A. nisus*, *B. buteo*, *F. tinnunculus* and *S. aluco*) show changes in morphology over the period from 1880 – 2015 and due to rise of temperature over the last 135 years. All measured study skins have been provided by the NHM and Landesmuseum ÖO. Altogether there have been measured 7 morphological traits of 1080 individuals. Sample size was split in 4 categories (male, female, adult, juvenile) and using Pearson correlation coefficient, we analysed dependences between individual and year, individual and temperature as well as correlations between all measured morphological traits. The results show no correlation neither between individual and year nor between individual and temperature. Four of the five species show significant correlations between morphological traits. This could be an indicator of different reasons for morphological changes in birds than global warming. Future studies should consider alternative hypotheses for change.

Feeding kinematics in *Cavia porcellus* (Linnaeus, 1758) - A comparison between hard and soft food.

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Wnt signaling proteins are highly conserved molecules that play key roles during metazoan development. They bind to transmembrane family receptors such as frizzled, LRP and tyrosine kinases and subsequently trigger the transcription of several Wnt target genes. Studies on *Drosophila*, *Xenopus* and zebrafish show that Wnt signaling activity is involved in processes such as gastrulation and patterning of the body axis. Unfortunately, there is still a considerable gap in knowledge concerning the expression and the role of Wnt genes in the protostome superphylum Lophotrochozoa that includes diverse groups such as the annelids or mollusks. The latter are particularly interesting due to their vast diversity of body plans as well as life cycles.

We retrieved transcripts of members of 12 Wnt subfamilies from transcriptomes of three different mollusks: *Dreissena polymorpha* (Bivalvia), *Acanthochitona crinita* (Polyplacophora) and *Antalis entalis* (Scaphopoda) and corroborated their identity through a phylogenetic analysis. Currently, in situ hybridization experiments are carried out in order to document the Wnt expression profile during development. Preliminary results show that Wnt1 is expressed in the most posterior body region in the polyplacophoran, a condition that is similar to other bilaterians and congruent with the notion that Wnt genes are primarily involved in patterning the bilaterian anterior-posterior axis. In the scaphopod, the expression of certain Wnt genes is confined to specific organ systems such as the prototroch and the dorsal mantle margin around the opening. A comparative analysis of Wnt gene expression in the above-mentioned mollusks might reveal shared as well as diverging expression domains among class-level taxa and may contribute to understand the evolution of molluscan body plans.

Fo(u)r fish: Morphology and molecular phylogeny of the endemic arabian barb *Garra barreimiae* [Teleostei: Cyprinidae].

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The cyprinid fish *Garra barreimiae* is endemic to the northern Oman and the United Arab Emirates where it lives in rivulets, wadis and artificial falaj systems. Currently, three subspecies have been described based on slightly different morphological features: *Garra barreimiae barreimiae* (Fowler & Steinitz, 1956), *Garra barreimiae shawkahensis* (Banister & Clarke, 1977) and *Garra barreimiae gallagheri* (Krupp, 1988).

Based on the mitochondrial control region at least 4 different clades, which follow a biogeographic pattern around the omanese Hajar mountains, have recently been identified (Kirchner et al., unpublished data). Their distribution does not reflect the differentiation of the subspecies. The genetic distances between the clades range between 6 and 10% in a fragment of the mt COI gene. Comparison with GenBank data questions the monophyly of the species.

A comprehensive morphological analysis of the four mitochondrial clades of *G. barreimiae* was executed by traditional morphometric and meristic methods as well as Micro-Chromatography. The phylogeny based on the nuclear gene RAG-1 confirms prior mitochondrial investigations.

Myoanatomy of *Pectinatella magnifica* and *Cristatella mucedo* (Bryozoa, Phylactolaemata).

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Bryozoans are filter feeding invertebrates inhabiting freshwater and marine habitats. The Phylactolaemata occur exclusively in freshwater and are commonly regarded as the earliest branch within bryozoans which makes them important for reconstructing the general bauplan of the phylum. In this study the myoanatomy of *Pectinatella magnifica* and *Cristatella mucedo* is analysed by means of histology, immunocytochemical staining, confocal laserscanning microscopy and 3D- reconstructions in order to gain a better understanding of muscular systems in Phylactolaemata. Two prominent bundles of longitudinal muscles form the retractor muscles. All musculature of the digestive tract is circular. The lophophore shows three types of musculature: musculature of the epistome, frontal and abfrontal longitudinal muscle bands in the tentacles, and longitudinal muscles in the lophophoral arms. The epistome musculature differs in *Cristatella* and *Pectinatella*. In *Cristatella* smooth muscle fibers form a muscular basket, whereas *Pectinatella* shows additional fibers that traverse the coelomic cavity. The tentacle sheath possesses longitudinal and circular musculature. The bodywall in *Cristatella* has an outer circular layer and an inner longitudinal layer whereas *Pectinatella* might possess a third layer. In general the muscular system of both species is very similar with differences merely in the bodywall and epistome. Additional stainings

and analyses will complement to current progress of this study and yield a better understanding of the myoanatomy of these animals and their evolution.

Nervous system diversity in interstitial Syllidae (Annelida: Phyllodocida).

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Syllidae are a species-rich family of annelids comprising up to 70% of polychaete diversity in certain substrates. Many species are adapted to an interstitial life resulting in small body size and specialized reproductive strategies. The family Syllidae is considered monophyletic, but its relationships to other taxa of the Phyllodocida remain uncertain. Syllidae comprise five subfamilies: Syllinae, Exogoninae, Eusyllinae, Autolytinae and Anoplosyllinae. Except for Eusyllinae all subfamilies are regarded as monophyletic. The subfamilies are easily identifiable, but genus and species identification is difficult and the value of autapomorphic characters remains under discussion. So far little is known on the nervous system of Syllidae, apart from a detailed study on the microanatomy of the brain and some general features published in a recent review. As annelid phylogeny is in constant flux, additional information on morphological data of more taxa could add to the discussion. Immunohistochemical stainings and confocal laser scanning microscopy is employed to reconstruct the nervous system of 6 species belonging to three subfamilies of Syllidae to evaluate the differences in nervous system anatomy among species and subfamilies and to identify correlations to an interstitial lifestyle in the nervous system. To this point data on the serotonin-like and α -tubulin-like immunoreactivity in the nervous system of four species (*Syllis gerlachi*, *Syllis garciai*,

Plakosyllis brevipes and *Prosphaerosyllis marmarae*) is available. Differences in the number of connectives in the ventral nerve chords were found between species. The arrangement of segmental nerves differs between the species. Both *Plakosyllis* and *Prosphaerosyllis* possess ganglia on the segmental nerve following the parapodial nerve, which are missing in the *Syllis* species. *Prosphaerosyllis marmarae* is the only species possessing conspicuous cell clusters behind the brain. The nervous system of different species seems to be surprisingly variable. So far predictions on the phylogenetic value of observed characters are premature, as differences in nervous system anatomy may be correlated to lifestyle rather than phylogenetic relationships.

Life in a tube: Morphology of *Hypophorella expansa* (Bryozoa, Ctenostomata).

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Bryozoans are a large lophotrochozoan clade of colonial aquatic filter-feeders. *Hypophorella expansa* is a boring ctenostome bryozoan originally described by Ehlers in 1876 that has not been investigated for nearly 140 years. It belongs to ‘stoloniferan’ ctenostomes whose colony is composed of elongated, branch-like stolons and autonomous autozooids. *Hypophorella expansa* is unique in that its colonies inhabit parchment-like tubes of polychaetes. Originally it was described from tubes of *Lanice conchilega*, but it was reported to occur in the tubes of *Chaetopterus* sp. Last summer live colonies were encountered in

the tubes of the latter. In order to gain more insight into adaptations and peculiarities of this unique bryozoan, immunocytochemical stainings combined with CLSM and 3D-reconstruction techniques are used.

First observations confirm that the colony forms elongated branch-like stolons and laterally attached autozooids. This resembles the general bauplan of a 'stoloniferan' ctenostome. The stolons show regular wrinkles in their cystid wall; a feature not known from any other stolonate ctenostome. Autozooids possess two fronto-lateral spherical structures of unknown function. So far no muscular or nervous elements could be found in the latter. In between of the spheres lies the apertural area which shows teeth-like structures that possibly facilitate movement/penetration of the tubes. Further studies will particularly focus on the wrinkled stolons and the fronto-lateral spheres.

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