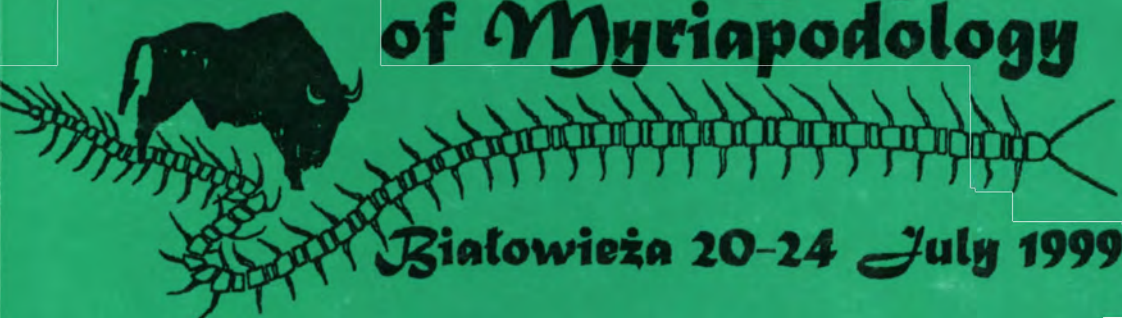


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11th International Congress of Myriapodology



Białowieża 20-24 July 1999

ABSTRACTS

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11th International Congress of Myriapodology

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ABSTRACTS

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the Zoological Committee of the Polish Academy of Sciences

Joachim ADIS*, Sergei I. GOLOVATCH**, Lars WILCK* and Berit HANSEN*

On the identities of *Muyudesmus obliterated* KRAUS, 1960 versus *Poratia digitata* (PORAT, 1889), with some biological observations (Diplopoda: Polydesmida: Pyrgodesmidae)

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There has been a lot of confusion concerning the identity of these species and their respective genera. *P. digitata* has largely been considered parthenogenetic, only represented by females with 19 body segments at least in European hothouses. Although supposedly conspecific samples, both male and female (hence bisexual) with 19–20 segments, had long been reported from Amazonia (SILVESTRI 1923, SCHUBART 1934, 1947), KRAUS (1960) disagreed with the identity of the Neotropical samples and erected a new genus, *Muyudesmus*, to incorporate both *M. insularis* KRAUS, 1960 (the type species) and *M. obliterated*. The latter taxon was given a name of its own, and well redescribed, to emphasize that it had nothing to do with the (formally) European *Poratia digitata*. In other words, before the discovery and description of a topotypic (= European) male of *P. digitata*, the type species of *Poratia*, the confusion concerning the identity and status of *Poratia digitata* vs. *Muyudesmus obliterated*, and of *Poratia* vs. *Muyudesmus* in general, was bound to remain unresolved. Live cultures of *P. digitata* (from two hothouses in Germany) and *M. obliterated* (bisexual from Peru and Brazil, parthenogenetic from the Kiel hothouse) have been created and maintained at Plön. The first, apparently residual males of *Poratia digitata* obtained show that *Poratia* and *Muyudesmus* are indeed distinct genera, same as their constituent species as revealed by their peripheral and genital structure, tegument microsculpture (using SEM technique), life histories, behaviour, etc. Both *Muyudesmus* and *M. obliterated* are formally new to the fauna of Germany and of Europe in general.

LECTURE

A spinning apparatus documented in *Polydesmida* for the first time

Max-Planck-Institute for Limnology, Tropical Ecology Working Group, Postfach 165, D-24302 Plön, Germany

Observations of live cultures of *Muyudesmus obliterated* KRAUS, 1960, from Peru and Brazil, and of *Poratia digitata* (PORAT, 1889) from hothouses in Germany, revealed that the four long setae at the tip of the pre-anal ring represent a spinning apparatus only used by juveniles and subadults. Each seta is located in a pit and separated from the others by a surrounding cuticular wall. All immature stages first build a moulting chamber of soil and/or bark material with their mouthparts. Inside the sealed chamber they produce a silken cocoon inside which they moult. Adult females were not observed to produce silk material during construction of their egg chamber. Our observations represent the first record of spinning ability in Polydesmida, something hitherto thought to be restricted in Diplopoda only to the orders Polyxenida, Chordeumatida, Callipodida and Stemmiulida.

Joachim ADIS*, Ulf SCHELLER**, José Wellington DE MORAIS*** and José Maria G. RODRIGUES***

Abundance, species composition and phenology of Pauropoda (Myriapoda) from a secondary upland forest in Central Amazonia

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The 6,878 pauropods collected within 12 months in the soil (0-7 cm depth) of a secondary upland forest ($1,085.7 \pm 42.3$ ind./m²/month) near Manaus were represented by 41 species of the Pauropodidae (Order Tetramerocerata). The Pauropodinae were represented by 31 species, the Polypauropodinae by 6 species, and the Scleropauropodinae by 4 species. About half of all pauropod specimens obtained inhabited the organic soil layer (0-3.5 cm depth) compared to the mineral subsoil (3.5-7 cm). Abundance of pauropods in the soil was twice as high in comparison to the Symphyla from the same study site. The lack of a distinct reproductive period in eudominant and dominant pauropod species and the presence of juveniles and adults throughout the year indicate a plurivoltine mode of life. Only in one species was the monthly catch of adults positively correlated with maximum temperatures of the soil. Pauropods obtained from the soil of four other upland forests in Central Amazonia (0-14 cm depth) accounted for 1.1-4.4% of the total soil arthropods. A possible parthenogenesis found in three pauropod species is discussed.

LECTURE

Szczepan M. BILIŃSKI, Anna JABŁOŃSKA, Teresa SZKLARZEWICZ and Monika KUKIELKA

Structure of ovaries, oogenesis and rDNA amplification in *Symphyla*

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The structure of symphylan oocytes at successive stages of oogenesis was investigated using electron microscopy and histochemical methods (AgNOR technique, DNA and RNA detection). The paired ovaries of *Symphyla* are tube-shaped and localised on either side of the alimentary tract. The ovaries are surrounded by an internal basement lamina and an external epithelial sheath and filled with synchronously developing oocytes that are covered by a simple follicular epithelium. Young, previtellogenic oocytes contain large, roughly spherical nuclei (germinal vesicles). In their karyoplasm, numerous aggregations of coarse-granular material are present. Histochemical tests revealed the occurrence of RNA and AgNOR proteins in these aggregations. These findings suggest that the aggregations represent multiple nucleoli formed as a result of rDNA amplification. The ooplasm contains cisternae and vesicles of rough endoplasmic reticulum, numerous ribosomes and large accumulations of mitochondria. The latter are often localised in the vicinity of the germinal vesicle. During vitellogenesis, large yolk spheres and lipid droplets accumulate in the ooplasm. At the onset of choriogenesis a thick, homogenous envelope is formed on the oocyte surface. Simultaneously, PAS-positive cortical granules are formed in the peripheral ooplasm.

POSTER

Claudia BROCKMANN*, Renate MUMMERT**, Hilke RUHBERG* and Volker
STORCH**

**The female genital tract of *Epiperipatus biolleyi* (Bouvier 1902): an
ultrastructural study (Onychophora, Peripatidae)**

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Two accessory organs of the female genital tract are found in the Onychophora, the receptacula seminis and the ovarian funnel. An varialtrichter occurs only in the Peripatidae, whereas receptacula seminis may also be present in the Peripatopsidae, the only other family in the Onychophora. The female genital tract of the Neotropical peripatid *Epiperipatus biolleyi* is examined using transmission and scanning electron microscopy. The ovarian funnel of *E. biolleyi* are thin-walled and closed from the hemocoel. This is the same in *Epiperipatus trinidadensis* (SEDGWICK, 1888) and *Macroperipatus torquatus* (KENNEL, 1883) (KENNEL J. 1884. Arb. zool. Inst. Würzbg 7: 95). Other peripatids have ovarian funnel which appear to open into the hemocoel (WALKER M. H., CAMPIGLIA S. S. 1998. J. Morph. 237: 127). A previously discussed function of the ovarian funnel as a "receptaculum ovarum" was not confirmed by the results of our study. The female investigated contained one unstalked cleavage embryo in each uterus-horn. Two features of the uterus were found to be unique to *E. biolleyi*: (1) a second cell layer overlying the uterine epithelium with a pronounced secretory activity, (2) embryos are enclosed in a non-cellular coat interspersed with numerous transport vesicles. The presence of spermatozoa both in the receptaculum seminis and in parts of the uterus of the female examined in this study supports the hypothesis that in *E. biolleyi* insemination of subadult females occurs directly via the genital opening.

POSTER

**Studies on the development of ovoviviparous onychophorans,
Austroperipatus eridelos REID, 1996 and *Peripatoides novaezealandiae*
(HUTTON, 1876) (Peripatopsidae, Onychophora)**

Abt. Niedere Tiere I. Zoologisches Institut und Zoologisches Museum der Universität Hamburg,
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The development of ovoviviparous onychophorans was studied in *Austroperipatus eridelos* (Australia, North-Queensland) and *Peripatoides novaezealandiae* (New Zealand, near Wellington). Living specimen of both species were kept in captivity in the laboratory in Hamburg. Female reproductive tracts were examined together with embryos by means of light and scanning electron microscopy. Besides, living specimens were observed.

A. eridelos and *P. novaezealandiae* are typical representatives of the ovoviviparous reproductive mode: fertilized eggs are retained in the female genital tract, where embryonic development is completed. Developing embryos feed exclusively upon yolk supplies, there are no feto-maternal structures (e. g. a placenta, "yolk-sac" or "trophic vesicle") providing nutriment. Juveniles hatch soon after deposition.

Both species have got large, yolky ovarian eggs (*P. novaezealandiae*: 0,5 mm. max., *A. eridelos*: 1,3 mm. max.) in an exogenous position, i. e. the ova project freely into the haemocoel. Seminal receptacula as well as additional pouches are well-developed. Few embryos (up to 10) were found in uteri of *P. novaezealandiae*, located one after another like a string of pearls. All embryos were at the same developmental stage. The developing embryos of *A. eridelos* lay in cavities of the uterus, each of these containing a single embryo. Up to 100 embryos were found in the genital tract of a single female, in individual uteri at successive stages of development. In *A. eridelos* the mature fetus is covered by an embryonic cuticle that is moulted soon after birth. In *P. novaezealandiae* an embryonic cuticle was not traceable.

Juveniles of *A. eridelos* were born from March to September. Birth could be documented in one case, the extrusion lasting only 20 seconds. In *P. novaezealandiae* juveniles were born in March and April in batches of 3-5 animals.

Amazonas CHAGAS-JUNIOR

Catalogue of the type specimens of Scolopendromorpha in the myriapodological brazilian collections

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It was at the turn of the 20th century that studies of Brazilian myriapods started with the works by Meinert, Humbert and Saussure, Goeldi, Brölemann and Chamberlin. Nevertheless, the most important contribution to studies of the Brazilian centipede fauna was given by Bücherl (between 40's and 70's). Very little has been published about this group during the last twenty years. The absence of myriapodologists in Brazilian museums has caused an impoverishment of collections. This work aimed to verify the quality of conservation of the type specimens of Scolopendromorpha in Brazilian collections. From a total of 60 taxa (specifics/subspecifics) of Scolopendromorpha, described from material collected in Brazil, 63% can be found in Brazilian collections, (Museu de Zoologia da Universidade de São Paulo, Coleção de Artrópodos Peçonhentos do Instituto Butantan, Museu Nacional do Rio de Janeiro e Museu de História Natural Capão da Imbuia). Of those 76% are considered to be in satisfactory conditions of conservation, 19% are damaged and 5% have not been located. Work has been done together with the curators of such collections in order to locate disappeared specimens.

POSTER

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Per DJURSVOLL*, Sergei I. GOLOVATCH** and Bjarne MEIDELL*

**Phylogenetic relationships within *Polydesmus* sensu Hoffman (1979), I:
Development of a character matrix.**

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The aim of our study is to work out a phylogeny of the family Polydesmidae. HOFFMAN (1979) stated: "At the present time, the palearctic fauna of this family is in complete chaos. Nothing short of an overall revision will bring any kind of order." At present 29 subgenera and genera are lumped together within *Polydesmus* sensu HOFFMAN 1979. This includes the subgenus *Absurdodesmus* MRSIC, 1988 as well as *Polydesmus* s.str. LATREILLE 1802/03.

Members of these 29 taxa, preferably their type species, are at present under analysis. Specimens from 13 taxa have so far been available for investigation, while the remaining 16 taxa have been included based on published data. In addition 7 species have been included, supplementing the 13 taxa already represented by specimens. Initially more than 100 characters were taken into consideration, ending up with 42 that showed variation within the group of species under study. A list of characters, the different states they show, and their distribution within the 37 species under study, are presented.

Per DJURSVOLL, Kjell Arne JOHANSON and Bjarne MEIDELL

**Phylogenetic relationships within *Polydesmus* sensu HOFFMAN (1979), II:
A cladistic analysis and a preliminary revised classification.**

Museum of Zoology, University of Bergen, Muséplass 3, N-5007 Bergen, Norway.

Based on a character matrix under development, including representatives from all nominal subgenera known to date, a cladistic phylogenetic analysis is carried out using PAUP 3.1.1 (SWOFFORD 1993). Thirty-seven taxa (including two outgroups) and 42 characters are included. Results are discussed and a preliminary revised classification with diagnosis and comments, is presented.

Six taxa are at present recognised at the genus level: *Polydesmus* LATREILLE, 1802/03; *Brembosoma* VERHOEFF, 1931; *Propolydesmus* VERHOEFF, 1895 (stat. n.); *Pseudomastuchus* CEUCA, 1966 (stat. n.); *Soleurus* MANFREDI, 1957 (stat. n.); *Brachydesmus* HELLER, 1858.

Synonyms (or possible subgenera) of *Polydesmus* LATREILLE 1802/03: *Spanobrachium* ATTEMS, 1940; *Merioceratium* VERHOEFF, 1931; *Basicentrus* ATTEMS, 1940; *Hormobrachium* ATTEMS, 1940; *Nomarchus* ATTEMS, 1940; *Perapolydesmus* BROLEMANN, 1916; *Goniodesmus* COOK, 1895; *Mastuchus* ATTEMS, 1940.

Synonyms (or possible subgenera) of *Brachydesmus* HELLER, 1858: *Bosniodesmus* VERHOEFF, 1929; *Chromobrachydesmus* ATTEMS, 1912; *Schizobrachydesmus* VERHOEFF, 1926; *Stylobrachydesmus* ATTEMS, 1912; *Troglobrachydesmus* ATTEMS, 1951; *Absurdodesmus* MRSIC, 1988; *Kerkodesmus* Lang, 1935; *Eubrachydesmus* Attems, 1912; *Bosporodesmus* VERHOEFF, 1940; *Kerkosoma* VERHOEFF, 1929; *Haplobrachydesmus* LOHMANDER, 1929, *Lophobrachydesmus* ATTEMS, 1912.

Incertae sedis: *Peltogonopus* VERHOEFF, 1943; *Tolosanius* ATTEMS, 1952.

LECTURE

Henrik ENGHOFF

Millipede phylogeny: how much do we know and what it is good for?

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Speculations about phylogeny of millipedes have been offered by several diplopodologists over the years. In the last few decades, the cladistic/Hennigian method has been applied to millipedes, or to subgroups of millipedes, and has provided a number of more or less well substantiated hypotheses. We are still waiting for significant molecular phylogenies of millipedes but these will surely come.

Hypotheses about phylogeny are an interesting achievement *per se*, but more importantly they allow much better insights into the geographical and biological history of the study group.

In the lecture, an overview of published phylogenetic analyses of millipedes will be presented, as well as examples of how the phylogenetic hypotheses have or can be used to elucidate millipede biogeography and evolutionary history.

INVITED LECTURE

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Alfred ERNST

**Structure and function of different cuticular sensilla in the centipede
Geophilus longicornis LEACH**

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The following 5 types of sensilla on the antennae, maxillae and maxillipedes were investigated by means of scanning- and transmission-electron-microscopy, and their distribution was registered. 1. **Sensilla trichodea:** Long (30-120 μM) hair-shaped s. trichodea (1100-1300/antenna, 44 on maxilla II) consist of a movable hair shaft, one biciliate mechanoreceptive and 14-16 uniciliate chemoreceptive sensory cells (5-8 in the maxillary sensilla). They are typical contact chemoreceptors. 2. **Sensilla microtrichodea:** Bimodal s. microtrichodea (80-114/antenna) arranged in 3 rows at the base of most antennal segments possess a movable hair shaft (7-17 μ), 2 biciliate mechanoreceptive and 5-7 uniciliate chemoreceptive sensory cells. They are proprioceptors, which register changes in the positions of antennal segments. 3. **Sensilla brachyconica:** 7 s. brachyconica concentrated on the top of the terminal segment of each antenna consist of an immovable sensory cone (14-18 μ), one uniciliate and 2 biciliate sensory cells. The requirements for humidity and temperature of *G. longicornis* and the top position of the sensilla suggest that the s. brachyconica are thermo- and/or hygroreceptive. 4. **Sensilla basiconica:** 36-53 peg-shaped s. basiconica are found in 2 lateral situated depressions of the terminal segment of each antenna. They possess an immovable, multiporous sensory peg (10-14 μ) and 3 uniciliate sensory cells. The pores do not reach the peg lumen. The thin dendritic outer segment forms a cytoplasmatic tube in the peg around both thick dendritic outer segments. The pores of the s. basiconica show two olfactory sensilla. 5. **Sensilla coeloconica:** 55-65 s. coeloconica concentrated on each poison claw of the maxillipedes consist of a short cone (1.8-1.9 μ) in a small pit and 3-8 uniciliate sensory cells. Both are connected by a long cuticular channel (20-90 μ). It is supposed that in connection with prey catching the s. coeloconica have thermo- and/or hygroreceptive functions. The above ultrastructural findings will be compared with those found in millipedes and insects.

POSTER

Phylogeny of geophilomorph centipedes: old wisdom and new insights from morphology

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We performed a cladistic analysis of morphological characters of geophilomorph species representing all traditional family-group taxa, together with suitable outgroups. The data matrix was analysed using the HENNIG86 programme. A preliminary report of this work is FODDAI (1998).

Our cladograms confirm some 'traditional' views but also suggest new interesting affinities, especially for several problematic taxa.

Mecistocephalidae branch out basally, as recently suggested by molecular evidence (GIRIBET et al. 1999), and quite basal are also, in the order, the branches representing Aphilodontidae, Dignathodontidae and Neogeophilidae. All extreme polypodous geophilomorphs, up to date classified in Oryidae, Gonibregmatidae + Eucratonychidae, Himantarüdae and Eriphantidae, form a single clade. The genus *Strigamia* (Linotaenüdae) comes out in the same clade as all conventional Geophilidae + Chilenophilidae, very far from *Henia* and *Dignathodon*.

Very peculiar is the isolated position of the Neotropical genus *Macronicophilus* (originally described as a member of Gonibregmatidae, later moved to Geophilidae). It comes out as a member of a large clade, also including Ballophilidae + Schendylidae and Geophilidae, but not nested within any of them. *Macronicophilus* is distinctly identified by several autapomorphies, e.g. 4 articles in the telopodite of II maxillae and labrum with a double row of teeth.

LECTURE

Giuseppe FUSCO and Alessandro MINELLI

Developmental stability in geophilomorph centipedes

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In so far as evolution is the change of ontogeny with time, developmental stability, as a property of the dynamics of developmental processes, can help in understanding the relationship between the genotype, environment and phenotype in evolution.

In this study we deal with the developmental stability of segment differentiation. While investigating segmental patterns in some species of geophilomorphs, we found individual specimens with great local disparity between contiguous segments, these irregularities resembling random perturbations of a basic pattern. This variation has at least two components: a) a population level polymorphism affecting segment specification and b) developmental noise, eventually producing a developmental instability comparable to that somehow recorded by fluctuating asymmetry (random and not inheritable deviations from bilateral symmetry) but working along a different axis.

We develop a morphometric analysis specifically devised for evaluating developmental stability in segmented animals. In two geophilomorph species, we compare the variability in segmental differentiation with the degree of developmental stability estimated by measures of fluctuating asymmetry. The within-population variability of segmental patterns for several metric traits of metameric structures (trunk tergites and sternites) exhibits species-specific behaviour.

LECTURE

Jean-Jacques GEOFFROY

Dynamics of millipede populations in forest litter

CNRS, Muséum National d'Histoire Naturelle, IEGB, Laboratoire d'Écologie Générale, 4, avenue du Petit Château, F-91800 Brunoy, France. E-mail: geoffroy@mnhn.fr

The specific richness and biodiversity of a millipede community were investigated over a period of several years in a temperate forest area near Fontainebleau (France). Some changes in the organization and spatio-temporal composition of the diplopod population were identified and discussed. Yearly and seasonal differences in the relative abundance of specific populations can be taken into account and compared with the results regarding the activity cycle of the dominant species : *Glomeris marginata* (Glomeridae), *Polydesmus angustus* (Polydesmidae), *Cylindroiulus punctatus* and *Allajulus nitidus* (Julidae). These investigations form part of a long-term research programme investigating the functional biodiversity of diplopod populations in forest ecosystems.

Some of the results are presented here.

LECTURE

<http://rcin.org.pl>

Jean-Jacques GEOFFROY

The French Centipede Survey, Fauna Gallica Chilopoda: check-list, distribution, conservation

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During recent years, field investigations have been carried out in various ecosystems, providing original taxonomical and zoogeographical data that have to be added to overviews dealing with up-to-date centipede check-list and distribution in France. This brings the total number of species/sub-species to 117 for all centipede taxa. Recent zoogeographical trends in Europe show that centipede biodiversity studies, monitoring, mapping, and the preservation of special sites will be of interest for the future.

FAUNA GALLICA CHILOPODA is a database whose aim is the management and monitoring of the distribution and biodiversity of centipedes in France. It is developed on a "4th dimension SGBD" data base and enables integration of 14 data files organized around the checklist of species. The main data files deal with localities and samples. Such a data-base must be as precise and complete as possible but, in order to be of easy use for different partners, it must be quite simple and clear. In order to avoid useless complexity, it seems advisable to select only a restricted number of species categories and ecosystem types. On the one hand, we have to consider species showing a wide-ranged distribution; on the other hand, species closely related to either Mediterranean, Atlantic and Northern influences, or peculiar environments such as halophilous sea-coasts, high mountain and caves or any other deep subterranean biotope. Regarding this, provisional checklists of species highly interesting for natural patrimony have been proposed. They obviously are of special interest both to those studying biogeography and to those interested in evolutionary and paleological history of lineages and territories. These species and their habitat could be embraced by conservation projects in order to maintain the present biodiversity level of these groups on a national and European scale.

The FRENCH CENTIPEDE SURVEY and FAUNA GALLICA CHILOPODA are tools for this purpose.

LECTURE AND POSTER

<http://rcin.org.pl>

Insights into the biology of a millipede-mite association

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Millipedes are host to a highly diverse mite fauna, most of which are very poorly known. The focus of this study is a new U.S. species of Heterozercoridae associated with *Narceus* (Spirobolida). Observations have yielded surprising strategies that suggest a close relationship.

While Heterozercoridae wander actively on the millipedes they exhibit a general site specificity. Males can often be found huddled beneath the antennae, neatly fitting in the depression. Alarm behavior, including response to millipede defensive chemicals, is very specific, involving a rapid retreat between the host's legs.

Only adult heterozercorids possess posterior "suckers" supposedly for attachment purposes. They are the only life stage found on the millipede. Immatures, previously undescribed for the entire infraorder, are not found on the millipede. They are predators of small mites and collembola and are free-living. The immatures are extremely fragile and secondary associations with millipede created habitat could be possible.

Sergei I. GOLOVATCH* and Richard L. HOFFMAN**

**On the millipede taxa and availability of type material of J. F. Brandt
(Diplopoda)**

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Between 1833 and 1841, J. F. Brandt (1802–1879), one of the pioneers of myriapodology, described 15 genera and 79 diplopod species, mostly exotic. A complete relevant bibliography of Brandt's works is provided as well as a complete list of his millipede generic and specific names, with indication of extant type material, its provenance and, when possible, the present-day identities. Many of the types are still available in the collection of the Zoological Institute of the Russian Academy of Sciences in St. Petersburg, the institution Brandt headed since its creation in 1830. Several enigmatic species from that collection are redescribed and illustrated, mostly with the aim of matching them with other available material/species.

INVITED LECTURE

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Kazimiera GROMYSZ-KALKOWSKA, Aneta UNKIEWICZ-WINIARCZYK
and Ewa SZUBARTOWSKA.

The influence of environmental contamination on respiratory metabolism and humoral immunity in *Cylindroiulus burzenlandicus* VERHOEFF, 1907. (Diplopoda).

Department of Animal Physiology, Institute of Biology UMCS, Akademicka 19, 20-36 Lublin, Poland

The experimental material consisted of adult *Cylindroiulus burzenlandicus*. Millipedes collected in the forests of the Chelm Forrest District. In the laboratory, the control animals were maintained on uncontaminated litter, and the experimental animals were maintained on litter contaminated with sulphuric acid, cadmium chloride and deltamethrin at concentrations producing mortality of about 25 %.

Oxygen consumption was measured every other day for one month by micro-respirometric method at a temperature of 22°C. Prior to beginning measurements, the animals were adapted to experimental conditions for 20 min. Oxygen use was measured for 2.5h. Results were expressed as mm³/g of fresh body weight/h.

Lysozyme type protein activity and anti-*E. coli* activity were measured in the animal hemolymph by cup agar-diffusion technique. Hemolymph samples were placed in Petri plate wells prepared for the assays of the lysozyme activity and antibacterial activity of cecropins (and incubated at 28°C for 48h, after which the zone of lysis was measured accurate to 0.5mm. Activity levels of proteins in hemolymph were expressed in µg/ml.

Generally speaking, all the tested toxins reduced oxygen usage and the sporadically noted increase in respiratory metabolism was not statistically significant. Reduction in oxygen metabolism is associated with decreased feeding activity and oxygen metabolism increase is a result of the initiation of feeding activity. Increased oxygen consumption can also indicate mobilisation of the organism and initiation of detoxication mechanisms. Low levels of respiratory metabolism observed during the terminal phase of the experiment are probably an effect of the destructive activities of the tested contaminants on respiratory structures and respiratory enzymes.

The experimental animals were characterised by low innate levels lysozyme-type proteins both in summer and winter. Anti-*E. coli* protein activity in the native hemolymph was noted in summer only. Basically, the tested contaminants did not increase protein levels, which indicates that mechanisms of humoral immunity in millipedes are not completely developed and that the basic line of defense is associated with cellular immunity.

Patterns of speciation and distribution in Southern African *Doratogonus* (Diplopoda; Spirostreptidae).

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The twenty previously known, and an additional five new species of *Doratogonus* were recently revised. This genus is largely confined to Africa south of the Zambezi and Kunene Rivers. In order to investigate relationships between the species, and their biogeography we used Hennig 86 to produce a cladogram based on male morphological characters. We then used this and Geographic Information System analysis to make a preliminary assessment of the relative contribution of abiotic and biotic factors to speciation in *Doratogonus*. We considered the following factors: vegetation biome, edaphic (geological) biome, minimum winter temperature, mean annual rainfall, CV of annual rainfall, altitude and latitude. Factors were classified at the 1/4-degree square level from a range of sources. Each species was listed in phylogenetic order and corresponding values for each biotic and abiotic factor were included based on the locations of collected specimens. The analysis reveals the relative importance of each factor for speciation in *Doratogonus*. In addition, this analysis allows predictions to be made regarding distributions of under-collected species, and provides insight into taxonomically problematic "species".

Joseph T. HANNIBAL

A new millipede from the Mazon Creek, Illinois, fauna (Carboniferous, North America), with prominent paranota and about 60 body segments

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During a survey of Mazon Creek fossils in the collection of the Field Museum of Natural History, Chicago, a new species of helminthomorph millipede was identified. This species has conspicuously keeled diplotergites much like those of extant polydesmids. It also tapers anteriorly and has long legs with (?) six segments. However, these millipedes have about 60 body segments, many more than do polydesmids. The metazonite is covered by two transverse rows of longitudinally oriented ornamentation separated by a transverse sulcus. The dorsal side of the metazonite is strongly tuberculate, with the tubercles irregularly and longitudinally arranged, and the area below the paranota is ornamented by elevated longitudinal ridges. This ornamentation is somewhat similar to those of callipodids and cambalids. The sternal area is narrow. The millipede is a very rare form; only two specimens are known. This species represents a new family, at least. Based on its prominent paranota and anterior tapering, it belongs in the wedge ecomorphological group.

LECTURE

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Harald HAUSER

Heterodactyly in the genus *Craspedosoma* (Diplopoda, Chordeumatida, Craspedosomatidae): an observation error.

Staatliches Museum für Naturkunde Görlitz, PF 300154, 02806 Görlitz, Germany

The number of described species, subspecies and varieties in the genus *Craspedosoma* is immense. Many of these were separated on the basis of differences regarding the characters of the back gonopods, the so-called podosternite. Heterodactyly means that the processes of the podosternits may have very different lengths, not only within one species but also within the same population. Genital morphological examinations of a large series of *Cr. rawlinsii* (LEACH, 1815) from the whole distribution area did not reveal any differences regarding the length of the podosternit processes. Analysis of the spatial structure of the podosternit showed that different perspectives of the same podosternit produce projections which look like brachy-, meso- and macrodactyl forms. This result suggests that heterodactyly is not a natural phenomenon but an error of observation. Consequently, a considerable part of the described taxa that are based on such perspective observation errors have to be deleted.

LECTURE

Angela HUTH

Defensive secretions of millipedes: more than just a product of melting point decrease?

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Juliformian millipedes are known to produce secretions dominated by methyl-1,4-benzoquinone (Me-BQ) and 2-methoxy-3-methyl-1,4-benzoquinone (2-MeO-3-Me-BQ). Up to now the apparent absence of solvents in almost all of these defensive exudates has been explained by referring to the phenomenon of melting point decrease: Mixing 2-MeO-3-Me-BQ with Me-BQ reduces the melting point of the former compound thus rendering the mixture liquid.

But is the only function of the segmental glands of millipedes really to produce the two quinones at an optimal ratio to achieve an effective defense?

Recent gas chromatography-mass spectrometry (GC-MS) analyses of the secretions of some European Julidae have not confirmed this suggestion. Most species investigated produce a mixture of several quinones accompanied by minor amounts of some solvent compounds. This modification makes the secretions more individual and probably changes their chemical properties and biological activity, too.

Moreover quantitative GC-analyses proved that the ratio of 2-MeO-3-Me-BQ and Me-BQ in some species is significantly different even between males and females. This result does not fit in with the concept of an evolutionary improved defensive system based upon melting point decrease. But it could indicate an additional inter- and intraspecific function of the repugnatorial glands of millipedes.

LECTURE

Jan JAROSZ* and Grzegorz KANIA**

**The question of whether intestinal microflora of the millipede
Ommatoiulus sabulosus could function as a threshold to food infections**

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**Department of Biology and Parasitology, Medical University, Radziwiłłowska 11, 20-080 Lublin, Poland

The presence of antimicrobial substances in the insect gut produced by indigenous microbial flora might be detrimental to the development and multiplication of the ingested bacteria. The sterilizing effect due to *Streptococcus faecalis* in the gut of the greater wax moth *Galleria mellonella*, especially with regard to the production of antimicrobials, has been well documented. Since diplopods are considerably similar to insects in terms of their biochemistry and physiology it was of interest to determine if a similar barrier to food infections could occur in the millipede *Ommatoiulus sabulosus*. Evidence obtained in this study indicates that the enteric bacteria group predominates in the intestinal tract of most *Ommatoiulus* individuals. The gut content obtained from the test animals revealed no significant differences in the number and types of enterococci present: *Escherichia coli*, *Enterobacter agglomerans* and *Klebsiella* sp. occurred frequently in large populations (from 3.84×10^8 *E. coli*/individual to 1.09×10^9 *E. agglomerans*/individual) in the diplopod guts. Accidental microflora represented by *Pseudomonas fluorescens*, *Sarcina*, *Micrococcus* and spore-forming bacilli belonging to *Bacillus* sp. was not numerous. Occasionally, yeast-like fungi and moulds were detected in small populations only. When the individual contained larger populations of *Enterococaceae*, other morphologically different forms constituted only a very limited percentage of the microorganisms present. This specific composition of microflora suggested that intestinal bacteria have the ability to produce one or more compounds with antibacterial activity.

The predominant types of bacteria present in the guts of *O. sabulosus* were unable to produce any bacteriolytic activity contributed to lysozyme-like enzymes, colicins or other antibiotic substances. Some other competition mechanisms must, therefore, be active since the predomination of enteric bacteria in *Ommatoiulus* intestines cannot be explained simply by antibiosis. The lack of contaminating microflora could rather result from unfavourable biochemical environment of the midgut juice and little or no competition for the predominant bacteria that through rapid colonization and overgrowth of the millipede intestines eliminate microbial contaminants adsorbed with food.

POSTER

The diplopod community of alder forests in Beskid Niski mountain chain, Poland.

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A community of millipedes was studied in four alder forests belonging to the plant associations: *Alnetum incanae* (Ai), *A. incanae* with *Alium ursinum* (AiAu), *A. incanae* with *Fraxinus excelsior* (AiFe), *A. incanae* subjected to anthropogenic pressure (Aiap). These are swampy forests growing along streams and occurring characteristically in the valleys of watercourses, with lush ground cover arranged in clumps and patches. The millipedes were sampled for 2 years in spring, early summer and early autumn. In the forests habitats, litter siftings were used as the most efficient method for collection of millipedes representing the edaphic component in the fauna.

A total of 24 millipede species were recorded in the alderwoods of Beskid Niski mountain chain (physiographic unit of the Carpathians), with 20 species in Ai, 15 species in AiAu, 5 species in AiFe and 6 species in Aiap. Two ecological indicators were used to evaluate the Diplopoda community: an index of dominance and an index of constancy of occurrence. It was established that the community included 5 different zoogeographical factors, with Carpathian and Central European species prevailing. High indices of dominance and constancy of occurrence in the community were registered for the species: *Glomeris connexa* C. L. KOCH, *Trachysphaera acutula* (LATZEL), *Leptoiulus trilobatus trilobatus* (VERHOEFF), *Leptophyllum transsilvanicum* VERHOEFF, *Polyzonium germanicum* BRANDT. During the investigations new locations were identified for some unique Diplopoda species in Poland, namely *Trachysphaera gibbula* (LATZEL), *Beskidia jankowskii* (JAWŁOWSKI), *Microiulus carpathicus* (VERHOEFF).

Grzegorz KANIA

Susceptibility of *Ommatoiulus sabulosus* (Diplopoda, Julida: Julidae) to invasion with nematodes

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This investigation concentrated on studying the mechanism of cell-mediated immune response in nematode invasions of larvae of the millipede *Ommatoiulus sabulosus* and the greater wax moth *Galleria mellonella*. The target arthropods were exposed to infective juveniles of two entomopathogenic rhabditid nematodes *Steinernema carpocapsae* and *Heterorhabditis bacteriophora* and to the free-living saprophagous nematode *Rhabditis* DUJ.

As can be seen from laboratory bioassays both *Ommatoiulus sabulosus* and *Galleria mellonella* were highly sensitive to invasions of insect-pathogenic nematodes *S. carpocapsae* and *H. bacteriophora*, and nearly 100% of the millipedes had perished two weeks post-invasion. In general, entomopathogenic nematodes quickly killed the greater wax moth with typical symptoms of nematode parasitism. Life cycle in *Galleria* was completed and new generations of infective entomopathogenic nematodes appeared normally. The parasitic nematodes were not encapsulated in the body cavity of *O. sabulosus* and *G. mellonella*. In conclusion, in *O. sabulosus* encapsulation was only seen in the case of the free-living nematode *Rhabditis* DUJ. Entomopathogenic nematodes are highly pathogenic for *G. mellonella* and for *O. sabulosus*.

POSTER

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Chris KETTLE*, Wallace ARTHUR*, Trevor JOWETT** and Alessandro
MINELLI***

**Description of a homeotically transformed specimen of *Strigamia
maritima* (LEACH, 1817)**

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The coastal geophilomorph *Strigamia maritima* is distributed along European coasts from Norway to France. In Britain, there are many populations, some of them very dense. In routine sampling from a population at Whitburn in NE England, a male specimen was discovered that exhibited a complete transformation of the 'intermediate segment' into a repeat of the final trunk segment. This transformation gives the affected individual two pairs of specialized back legs and, in total, an even number of pairs of legs (48), which is unique. The transformation is reasonably symmetrical, and so may well be genetic in origin - i.e. due to a homeotic mutation. Nothing is yet known about geophilomorph *Hox* genes, but by comparison with other arthropods a possible cause of the transformation observed is a change in the domain of expression of the *Abdominal-B* gene. Here we describe the specimen in detail. We also describe the extent of variation in segment number in the source population, and the habitat in which that population lives.

Desmond KIME

Present knowledge of the distribution of European millipedes (Diplopoda).

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The amount of detailed information available concerning the distribution of millipedes in the different regions of Europe is outlined and summarised. It results from twenty years of investigations, mainly into the large amount of published literature, but also in the field. Apart from recording the distribution of the taxa in forthcoming atlases, this assessment has two principal objectives. The first is to pick out those geographical areas where more work is needed to complete our knowledge of the taxa present. Secondly, to arrive at a position where it is possible to relate the distribution of the different taxa to their ecological needs and to the history of the Continent. The distributions of the various orders and the patterns of millipede diversity are briefly discussed in this context. In view of taxonomic revision on the one hand, and the continuing discovery of new species on the other, the number of species of European Diplopoda is not certain, but is supposedly the best part of two thousand.

LECTURE AND POSTER

<http://rcin.org.pl>

Millipedes (*Diplopoda*) in litter of xerothermic oak forests in Bulgaria

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The litter fall of mixed broad-leaved forests in the temperate climatic zone is actively settled by specific complexes of millipedes. In ten oak communities (*Quercus cerris* L., *Q. frainetto* TEN. and *Q. virgiliana* (TEN.)) were investigated the litter-inhabiting diplopods in three climatic zones-submediterranean, transcontinental and continental. The oak communities are in 30-50 age-old structure and their litters are composed of some or all of the three Ao layers on the soil mineral horizons.

The field investigations were connected with hand-sorting and sieving the animals from the leaves. In the laboratory analyses was included the photothermoextraction by Berlese apparatus, too. The different methods for the extraction of the animals were selected depending on the landscape peculiarities of the forests. These analyses were provided in the period of more than 10 years.

The millipede species of genders *Glomeris*, *Poydesmus*, *Megaphyllum*, *Allaiulus* and *Leptoiulus* are predominated in these mixed oak forests. There are species with eurytopic distribution like *Megaphyllum transsilvanicum* (VERHOEFF) and *Leptoiulus trilineatus* (C.L.KOCH). The other one, like *Allaiulus abaligetanus* VERHOEFF, is stenotopic in the southeastern forests of Bulgaria

Zoltán KORSÓS*, Erzsebet HORNING**, Zsuzsa CSABA** and Gyuzu SZÉL*

Diplopoda of riparian forests affected by the Gabčíkovo-Nagymaros Barrage System

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**Department of Ecology, University of Veterinary Science, Rottenbiller u. 50, H-1071 Budapest, Hungary

In the framework of the environmental assessment of the Gabčíkovo-Nagymaros Barrage System, NW Hungary, Diplopoda assemblages were compared to show the effect of changes in soil water supply of different forest habitats.

Five plots, including *Salix*- and *Quercus*-dominated soft- and hardwood riparian forests, were sampled by pitfall trapping in 1998. Ten species of diplopods were found altogether.

Based on the preliminary data, a hierarchical cluster analysis resulted in the separation of habitat '2' that is supposedly most influenced by the decreasing water table due to the diversion of the old Danube river in the Szigetköz area in 1992. The softwood and hardwood forests are pairwise grouped together because of their similar species diversity and relative abundance values.

Annual activity cycle and age groups of the two most abundant polydesmid species (*Polydesmus complanatus* (LINNAEUS) and *Polydesmus denticulatus* C. L. KOCH) are also described.

Further data evaluation and long-term monitoring activity are necessary to follow successional changes in the area.

George KOZULKO

**Some aspects of the occurrence of *Glomeris connexa* C. L. Koch, 1847
in Belovezha Primeval Forest**

State National Park "Belovezhskaya Pushcha", 225063, Brest region, Republic of Belarus

Glomeris connexa is a rare species included in the Belarus Red list. The studies on the distribution of the species in natural ecosystems of Belovezha Primeval Forest (the Belarussian part) were conducted in 1988–93, on 17 permanent plots, in 12 most typical forest types, using the standard method of soil samples. In total, 2488 samples were taken and 598 specimens of *G. connexa* were collected.

G. connexa is a common, sometimes numerous and dominant species among Diplopoda in Belovezha Primeval Forest. The density of *G. connexa* in different forest types varies rather considerably from 0 to 42.8 ind./m². The highest density of the species has been registered in wet pine stands: 11.3–42.8 ind/m². The density of the species in birch stands is 5.0–14.8 ind/m² but reaches very low values or falls to 0 in other types of forest with hardwood trees.

The correlation analysis has shown an absence of a close dependence on any environment factors. It is explained by the effect of the excessive number of wild ungulates that cause significant changes to the environment of Belovezha Primeval Forest.

POSTER

Dmitry A. KRIVOLUTSKY

Myriapods as bioindicators of radioactive pollution

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Myriapods are a sensitive group of bioindicators in areas of radioactive contamination. A long-term analysis of ecological after-effects, biodiversity changes and effects of natural protection regulations on soil animal communities was carried out in Russia, Ukraine and Kazakhstan in 1968-1998. Contaminated areas were investigated in Chernobyl, South Urals, Semipalatinsk, Novaya Zemlya and North Urals. An initial sharp reduction in animal biodiversity and community structure of soil fauna was observed and was followed by a long-time process of the system returning to the initial parameters. Secondary changes and side-effects were registered for active migrant forms and for trophically connected species. Myriapods disappeared in soils subjected to more than $1000 \text{ Ci/km}^2 \text{ Sr}^{90}$ contamination. An increase in the rate of anomalies and population variability on the polluted plots has been noted in two geophilid species.

LECTURE

The ovary structure and oogenesis in diplopods.

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The ovary in diplopods is a single, tubular organ extending along the body axis between the alimentary canal and the central nervous system. The lumen of the ovarian tube is filled with numerous, distinct subunits termed "ovarian sacs". Each ovarian sac is made up of a germ cell (oocyte) covered by simple, squamous epithelium. The epithelial cells of the ovarian sac play an exclusively structural role: they do not seem to contribute to either vitellogenesis or the formation of egg envelopes and thus can not be referred to as follicular cells. Each ovarian sac is connected with the site of germ cell origin by epithelial cells. Comparative histological and ultrastructural analyses of the diplopod ovary structure showed a few significant differences between the primitive penicillates and the more advanced chilognathans. The main differences are in the location of the initial stages of germ cell differentiation. In the penicillates the gonial cells and early meiotic oocytes differentiate within a single, lens-shaped germarium zone, where the germ cells remain connected by intercellular bridges. In the chilognathans the germ cells at the initial stages of their development can be found within the dorso-lateral parts of the ovarian wall. They form groups of separate cells (germ nests) which are invested by somatic tissue. In contrast to the single germarium zone in the penicillates, the germ nests of the chilognathans are numerous and occur in pairs.

Małgorzata LEŚNIEWSKA

Centipedes (Chilopoda) communities of three beech forests of Poland

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The communities of centipedes of three beech forests have been compared. The forests are situated in different zoogeographical regions of Poland, namely Wielkopolska, Roztocze and Pieniny. 30 Chilopoda species were recorded in the habitats studied. 19 species were found in Wielkopolska, 17 in Pieniny and 13 in Roztocze. The following 6 species occurred in all three regions: *Lithobius mutabilis* L. KOCH, *L. forficatus* LINNAEUS *L. erythrocephalus* C. L. KOCH, *L. piceus* L. KOCH, *L. lapidicola* MEINERT, *Strigamia acuminata* (LEACH). The average densities of Chilopoda were: in Roztocze - 17,4 ind./m², in Wielkopolska - 51,5 ind./m², in Pieniny - 111 ind./m². Frequency and abundance analyses were carried out.

POSTER

John G. E. LEWIS

Antennal characters in centipedes with particular reference to scolopendromorphs (Myriapoda, Chilopoda).

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Variation in antennomere number in the Chilopoda is summarised and possibility of a common developmental pattern discussed. During the anamorphic development of many lithobiids the antennomeres increase from 7 to 11 then to 14 (the number in the Geophilomorpha) and 17 (the basic number in the Scolopendromorpha and probably *Craterostigmus*). It is suggested that the presence of specialised sensilla on antennomeres 2, 5, 9 and 13 reported for a number of Geophilomorpha reflects the developmental pattern of the antenna from the 7 to the 14 antennomere stage in larval Lithobiomorpha.

Scolopendromorpha with a fixed number of antennomeres (17) cannot repair antennal damage by antennomere division, only by their elongation and antennomere number may be used to separate groups of species.

With the notable exception of the Geophilomorpha antennal morphology has largely been ignored. The antennae of scolopendromorphs could provide data that might shed some more light on the relationships between the scolopendromorph genera. Such characters are the extraordinary trichoid sensilla of *Scolopocryptops* with their columnar sockets and variety of sculpturing of the antennal cuticle as between *Scolopendra* and *Asanada* and *Otostigmus*.

LECTURE

<http://rcin.org.pl>

Mirosław ŁUCZYŃSKI*, Wallace ARTHUR** and Jolanta WYTWER**

Allozyme electrophoretic study of genetic variation within, and relatedness between, *Strigamia maritima* (LEACH, 1817) and *Lithobius forficatus* (LINNAEUS 1758)

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Samples from natural populations of *Lithobius forficatus* (an inland lithobiomorph) and *Strigamia maritima* (a coastal geophilomorph) from several sites in Poland and Britain were studied by allozyme electrophoresis. Allele frequency data derived from electrophoretic separation of the enzyme products (AAT, ADH, CK, G3PDH, GPI, IDDH, IDHP, LDH, MDH, MEP, PGDH, PGM, SOD) of respective genetic loci provided data on the kind and amount of genetic polymorphism existing within examined samples as well as on the genetic relatedness between populations and species. Although our data are limited, they provide a considerable extension of current knowledge on genetic variation in centipedes at the allozyme level, as only one previous study has dealt with this subject.

POSTER

A millipede meets termite mounds: *Archispirostreptus tumuliporus* (KARSCH 1881) in the West African savanna (Diplopoda, Spirostreptida, Spirostreptidae)

Theodor-Boveri-Institute (Biocenter), University of Würzburg, Zoology III, Am Hubland, D-97074 Würzburg, Germany

Archispirostreptus tumuliporus is the largest species in a diverse millipede community of the Guinea savanna in West Africa. Ecology and behaviour of this spirostreptid were studied in the Comoé National Park, Ivory Coast, over seven rainy season onsets.

A. tumuliporus occurs in a variety of habitats and is found in the open savanna as well as in the gallery forest. For a study on dispersal and home site tenacity, all larger specimens which were found along a savanna transect of about 2 km length were individually marked and released. The transect was resampled during consecutive nights. About 90% of all 300 labeled *A. tumuliporus* were associated with mounds of *Macrotermes bellicosus* where recaptured specimens were also exclusively found. In the savanna, macrotermite mounds are very densely distributed and they seem to be important shelters, rendez-vous areas, breeding sites and ‚kindergartens‘ for *A. tumuliporus*. They also serve as ‚stepping-stones‘ for dispersers.

In the gallery forest, *A. tumuliporus* also preferred vertical elevations like termite mounds or river banks as retreats. Recapture rates of specimens marked during feeding were highest at sites with food of high quality (e.g. fungi).

Groups of small *A. tumuliporus* which were regularly observed at certain sites were considered to be brothers and sisters. From these groups, repeated measurements of body size were taken over several seasons, allowing the estimation of some life history parameters of these long-lived arthropods.

Svetlana MAKSIMOVA

Millipede (Diplopoda) fauna of forest biogeocenoses of Polesky Radio-Ecological Reserve (Belarus)

Institute of Zoology of NAS of Belarus, 220072, Minsk, Belarus

The main goal of the study was to investigate the effect of a high radioactive background on Diplopoda fauna in various forest biogeocenoses. The material was collected in the Gomel region within 30 km from CNPP in 1986-1996, using soil samples and soil traps. At present the Polesky Radio-Ecological Reserve with a contamination level of up to 1500 kBq x m⁻² is located at that site. Similar biotopes within the "Pripyatski" National Park, located 150 km to the west of the study area, were chosen as a control.

Considerable differences were found in the species number between biogeocenoses with different level of contamination. All 12 species of Diplopoda have been identified in the contaminated biogeocenoses (compared to 20 in the control group). Radioactive contamination disturbed the process of normal reproduction of Diplopoda and their age structure. A higher radionuclide content was found to result in suppression of Diplopoda, manifested by a decrease of density and zoomass.

Our results may demonstrate the effect of radiation on millipede after the Chernobyl accident.

LECTURE

Millipedes as colonizers in a glacier foreland (Austrian Central Alps) (Diplopoda)

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Most glaciers in the Alps have been retreating continuously since the mid-19th century, when they attained their maximum postglacial extension. The deglaciated area in the forefield of the "Rotmoosgletscher" near Obergurgl (Ötztal Alps) is about 2 km long (2250-2450 m a.s.l., 46°50' N, 11°03' E) and represents a chronosequence of successional stages. Pitfall traps were employed to investigate the immigration rate of millipede species from the surrounding alpine vegetation zones into deglaciated land and their present distribution. Five julid species (*Ophiulus nigrofuscus*, *Leptoiulus alemannicus*, *L. simplex*, *L. saltuagus* and *Ommatoiulus sabulosus*) and five chordeumatids (*Trimerophorella nivicomis*, *Haasea fonticorum*, *Iulogona tirolensis*, *Dactylophorosoma nivisatelles* and *Ochogona caroli*) have already invaded across the moraine into the glacier foreland. *T. nivicomis* (a high-alpine endemic species) and *H. fonticorum* (a south alpine species, whose distribution is usually limited by the summits of the Central Alps) have advanced 1400 m into the glacier foreland up to the pioneer vegetation stages and established breeding populations there. Seven species (*L. simplex*, *L. alemannicus*, *L. saltuagus*, *D. nivisatelles*, *O. caroli* and *O. nigrofuscus*) occurring outside the glacier foreland from the timberline up to the open lichen heath and the high alpine sedge mats live in plant assemblages of still early successional stages that have been ice-free for at least 50 years. The widespread euryoecious *O. sabulosus* invaded only 250 m across the 1850-moraine to more favourable initial grasslands, particularly on the valley slopes exposed to the SW.

From previous investigations by JANETSCHKE (1949) in a comparable area in the Central Alps it can be concluded that the immigration rate of millipedes amounts to approximately 500 m over the last 50 years.

LECTURE

Elena V. MIKHALJOVA

Some peculiarities in the distribution and ecology of Diplopoda in Siberia and the Far East of Russia

Institute of Biology and Pedology, Far East Science Centre, Russian Academy of Sciences,
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Siberia and the Far East of Russia are currently known to support ca. 100 millipede species from 27 genera and 16 families. Most of the species and genera, and even a few families, are endemic there, largely rooting in and/or confined to several montane lands (Altai, Sayan, Khamar-Daban, Sikhote-Alin etc.) at the southern periphery of the region. Diplopoda are predominantly forest-dwellers, almost totally absent from the permafrost parts of tundra and taiga as well as from the southern steppes. The forest-steppe belt appears to be populated by diplopods only marginally, yet none of the species is endemic there. A family most characteristic and species-rich (taking up about a half of the regional list) is the Diplomaragnidae, with the erstwhile sole constituent genus *Diplomaragna* Attems, 1907 obviously meriting splitting into a whole number of genera.

POSTER

<http://rcin.org.pl>

A soil population of *Polyxenus lagurus* (LINNÉ, 1758) in a Mediterranean forest (Diplopoda, Penicillata: Polyxenidae)

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This work was performed in an experimental plot in the Parc Natural de Sant Llorenç de Munt (Barcelona, Spain), in a sclerophilous forest of Mediterranean climate. This forest is made up mainly of *Quercus ilex* and *Pinus halepensis*; the most important bush species in it is *Arbutus unedo*. The litter is of the leptomoder type, with a mean pH of 5.88 (measured in 1:2.5 water).

Field sampling was performed for 24 months in a row in order to quantify the density of edaphic arthropods. In the experimental plot (40 x 40 m), three horizons were sampled: L+F, H, and A (leaf litterfall, humus, and the first five cm of the mineral layer). A 0.36m-diameter cylindrical corer (equivalent to 0.102 m²), was used as sampling device. Five replicate samples were obtained at each sampling.

The study material included a remarkably abundant population of *Polyxenus lagurus* which comprised males and females. Density fluctuations of this species as well as its horizon preferences were analyzed throughout the period of study. Mean density in the whole profile was 374.4 ind./m² with a notable value of 191.5 ind./m² in horizon H. Values of Usher index suggested also a preference for this horizon and overall for organic levels. Correlation of their phenology against soil and climate parameters (water content in soil, temperature and rainfall) showed that *Polyxenus lagurus* is a thermophilous species.

Andrej MOCK

Millipedes (Diplopoda) of the West Carpathian caves - a preliminary review.

East-Slovak Museum, Hviezdoslavova 3, SK-041 36 Košice, Slovakia

The millipede fauna in West Carpathians, in comparison with cave fauna in the neighbouring Alps or South (Meridional) Carpathians, is poor because of the effect of the last glaciations. Only one troglobite species, *Typhloiulus polypodus* (LOKSA, 1960), is known from this region. *Allorhiscosoma sphinx* (VERHOEFF, 1907) is a troglophile species endemic to the central mountains of the West Carpathians. *Trachysphaera costata* (WAGA, 1858), *Haasea flavescens* (LATZEL, 1884), *Brachydesmus superus* LATZEL, 1884, *Polydesmus complanatus* (LINNAEUS, 1761), *P. denticulatus* C.L.KOCH, 1847, *Nopoiulus kochii* (GERVAIS, 1847), *Boreoiulus pallidus* (BRADE-BIRKS, 1920), also found in caves, are widespread species and could be regarded as local troglophiles. The other records have troglonexic character. Cold entrances of some caves are relic habitats for several subalpine or alpine species. Published data are reviewed. The latest biospeleological research indicates that our knowledge about the millipede cave fauna of West Carpathians is not complete.

LECTURE

A new species of the genus *Bicoxidens* ATTEMS, 1928 from Gokwe, Zimbabwe (Diplopoda, Spirostreptida, Spirostreptidae)

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Bicoxidens gokwi n. sp. is described from four males. *B. gokwi* was collected in Nyamuroro mountains, north of Gokwe near Kuwirirana Business Centre, west of Harare, Zimbabwe. The new species differs from the other five valid members of the genus in many aspects. *B. gokwi* differs from congeneric species by having yellow antennae and a large rounded flask shaped process midlength aborally on the lateral lamella. The telocoxite lacks prominent lateral processes other than that which touches, but not overlaps, the opposite process. Like descriptions of other valid species within the genus *Bicoxidens*, the anterior gonopods of *B. gokwi* form the basis of this description.

Monique NGUYEN DUY - JACQUEMIN

**Redescription of *Polyxenus albus* POCOCK, 1894 (Diplopoda, Penicillata),
an addition to the French fauna.**

Laboratoire de Zoologie (Arthropodes), Museum National d'Histoire Naturelle. 61 rue Buffon F-75231 Paris, France.

A sixth French species of Penicillata was found on the Mediterranean islands of Porquerolles and Corsica. This species was identified as *Polyxenus albus* POCOCK, 1894, based on an examination and redescription of the types from Genoa. Its pale yellow colour readily distinguishes it from the brown *Polyxenus lagurus*. Other morphological characters are similar to these of *P. lagurus*, except for a lower and invariable number (3) of sensilla basiconica on the VIth antennal article, present from the larval stadium II; the number of sensilla basiconica varies from 5 to 10 in adults of *P. lagurus*. *P. albus* must be considered a mediterranean species because it was collected on several islands: Ponziane (Italy), Krk and Plavnik (Croatia), Corfu, Crete, Zante and Karpathos (Greece).

LECTURE

<http://rcin.org.pl>

Millipede community of Hůrka u Hranic National Nature Reserve

Dept. of Ecology, Faculty of Science, Palacky University, Svobody 26, 77146 Olomouc, Czech Republic

Hůrka u Hranic National Nature Reserve is situated south of Hranice na Moravě (northern Moravia, Czech Republic) on the right bank of the River Bečva. The millipede community of a beech-oak-hornbeam forest was sampled for 2 years.

From June 1995 to June 1997 a programme of continuous pitfall trapping was undertaken by the Agency for Nature Conservation and Landscape Protection of the Czech Republic. The traps were emptied every three weeks in the vegetative season and every six weeks in the winter season.

A total 511 millipede individuals of 13 species (5 orders, 7 families) were recorded. *Megaphyllum projectum* (VERHOEFF, 1907) (29.55% of the captures) and *Leptoiulus trilobatus* (VERHOEFF, 1894) (16.63%) were found to be the dominant species. Activity was greatest in May and in October.

The research in this region is still in progress.

Zygmunt PIRÓG and Włodzimierz JAŚKIEWICZ

Taxonomical analysis of Diplopoda distribution in Poland

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The aim of the study was a chorological analysis of Diplopoda distribution in Poland. Informational – weight taxonomic method was used (PIRÓG, 1990).

Physiographic units of the area of Poland were treated as operational taxonomic units OTU. Diplopoda species observed in the individual OTU areas were used as distinctive features (characters).

The results were presented as a dendrogram, dividing Poland into four regions of diplopod occurrence. Region A – Karpaty and Roztocze. Region B – Wzgórza Trzebnickie, Górny Śląsk, Wyżyna Małopolska, Góry Świętokrzyskie, Kotlina Sandomierska, Podlasie and Puszcza Białowieska. Region C - Sudety. Region D – Areas N & NW of Poland and, Dolny Śląsk, Krakowsko – Częstochowska and Lubelska highlands.

The areas (ranges) of these regions and their biogeographic character strongly suggest that the distribution of Diplopoda was determined by geographical and geobotanical conditions which arose from geological processes and then ecological changes associated with anthropoppression.

POSTER

Predation strategy of some sympatric lithobiid species (Lithobiomorpha, Chilopoda)

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The strategy of predation or the nutrition habits of three lithobiids has been examined. These three species represent the dominant centipedes in mixed forests of Slovenia. They live in the same communities, frequently on the same microlocation. Specimens (*Eupolybothrus tridentinus* (FANZAGO), *Lithobius forficatus* (LINNAEUS) and *Lithobius validus* MEINERT), were fed with three kinds of prey (enchytraeids, mealworms, crickets), representing three morphologically different types of prey, which differed in size, anatomic structure as well as in moving speed. A comparison of various parameters of predation among the male of *E. tridentinus*, *L. forficatus* and *L. validus* and among male, female and young female within *E. tridentinus* has been made. There were no differences in the time of catching for certain categories the various types of prey. But the biggest differences in the activity of the predator in the presence of a certain type of prey were found with male *L. validus*, where characteristic differences in activity in the case of all prey types were discovered. It was established for all the three species that the number of prey encounters with specimens which attacked is significantly lower than the number with the ones which did not. The number of encounters with mealworms at hunting individuals differ among certain categories. As for predation similarities among certain categories, the biggest similarity was established between adult female of *E. tridentinus* species and male of *L. validus*. Studying the predatory habits, it was discovered that regarding mobility there is only one type of predation with regard to all individuals of different prey types but belonging to a certain category. Differences exist in swallowing time with respect to certain prey types as well as certain categories. On the basis of these results conclusions were made about the different preferences regarding prey among these species, leading to smaller competition and enabling coexistence of the various species or of specific groups of individuals within the same species.

POSTER

Carol-Constantin PRUNESCU and Paula PRUNESCU

**Comparative histology of the genital systems of *Anopsobius SILVESTRI*
and *Scutigera L.* (Chilopoda)**

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The genital system in the representatives of the order Scutigermorpha is characterised by the presence of two genital tracts. Each one of these tracts is formed of a distal vesicle – the macrotestis and of a proximal deferent canal named the microtestis because microspermatogenesis takes place there.

The genital system in the representatives of the tribe Anopsobiini (Fam. Henicopidae, Ord. Lithobiomorpha) is characterised by the presence of two genital tracts. One of these tracts is rudimentary, unfunctional. The other genital tract is constituted by a macrotestis and a microtestis.

The male genital system from two representatives of the tribe Henicopini and from numerous representatives of the Fam. Lithobiidae is made up of a unique median testis, formed by the fusion of two genital tracts during the larval development.

This paper presents in parallels, the histologic structure of the macrotestis and the microtestis of the *Scutigera coleoptrata* LINNAEUS. and *Anopsobius neozelandicus* SILVESTRI, as well as the structure of the rudimentary gonad of *Anopsobius*.

The weakness of interpreting of the rudimentary gonad in the tribe Anopsobiini as a case of gynandromorphism are discussed and revealed.

The presence of a genital system constituted by a macro- and microtestis on both sides of the phylogenetic abyss that separates the subclass Notostigmophora and Pleurostigmophora represents a character of exceptional phylogenetic importance.

LECTURE

***Peripatoides* n. sp. - a new taxon of ovoviviparous onychophorans from Kapiti Island, New Zealand (Peripatopsidae, Onychophora)**

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The onychophoran fauna of New Zealand is much more diverse than indicated so far in the literature. Several attempts are currently being made to investigate peripatopsid biodiversity. Amongst these is the author's endeavour to revise the New Zealand Onychophora in the light of new collections that have become available. New approaches towards a modern monographic account of the Peripatopsidae are considered, but this present study is based mainly on morphological, ecological, biogeographical and behavioural data. A newly discovered species from a Nature Reserve (Kapiti Island, near Wellington, NZ) indicates that there is allopatric speciation in remote areas. Other possible interpretations will be discussed.

Of four specimens collected on Kapiti Island in March 1997, two were cultured in the laboratory in Hamburg (1 female, 1 male). Amongst other data their growthrate and behaviour were monitored. More than 30 juveniles were born in captivity in batches of two, between early December 1998 and late January 1999.

The close relationship between the new 'Kapiti'-species and *Peripatoides novaezealandiae sensu stricto* is obvious. The problematic taxonomy of the latter species will be outlined and suggestions are made to resolve this difficulty.

Arkady A. SCHILEYKO

A unique homoplasy between two pairs of eyeless scolopendromorph genera and its taxonomic importance

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The main purpose of this work is to improve our knowledge about the interrelationships between some eyeless genera of scolopendromorph centipedes in order to continue revision of classification of the order Scolopendromorpha.

As has already been shown (SCHILEYKO & PAVLINOV, 1997), the representatives of "blind" scolopendromorph subfamilies Cryptopinae, Scolopocryptopinae and Newportiinae seem to form a monophyletic group of 12 genera. However, it is now difficult to speak definitely about the real interrelationships between genera traditionally included in these subfamilies. Thus, data on homoplasies between any of these 12 genera are of considerable taxonomic and phylogenetic interest.

According to the results of a preliminary cladistic analysis (SCHILEYKO & PAVLINOV, 1997), only such two pairs of genera as *Cryptops* (more than 100 species) + *Paracryptops* (2 species) and *Newportia* (36 species) + *Tidops* (3 species) seem to be monophyletic group (whereas other genera are scattered within that (monophyletic?) group and mixed with each other in various combinations).

The two pairs of genera mentioned (which are central for the subfamilies Cryptopinae and Newportiinae, respectively) were studied in an investigation of about one thousand specimens. There is extreme similarity between these pairs and the main clear difference, established for both pairs, is the length of maxillipede tarsungula (at the moment no analogies of such a situation are known in eyed scolopendromorphs). This example of a unique homoplasy is analyzed in detail and some conclusions about adaptations and the taxonomical importance of some morphological characters are given.

LECTURE

<http://rcin.org.pl>

The effects of habitat islands and land use management on centipede and millipede fauna of agroecosystems

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The investigations concern the effects of agricultural land-use management and habitat islands on the distribution pattern of Centipedes and Millipedes. The study was carried out in the biosphere reserve Schorfheide-Chorin, Northern Brandenburg, Germany during the vegetation period of 1995, 1996 and 1997. The sampling sites included representative land-use systems (cereal fields, fallows, different grassland types) and as non managed habitat island a shrubbed pile of stones and a vegetation belt of a kettle hole (small pond formed by the postglacial retreat of glaciers). Animals were sampled by using pitfall traps, ground photoelectors and soil extractions. In addition, pitfall trap transects from both habitat islands into cereal fields were established.

Despite the high number of agrarian habitat types studied, the millipede and centipede assemblage was poor in species numbers and abundance. Some species were limited to the habitat islands. *Cylindroiulus caeruleocinctus* (WOOD, 1864) was the most common one. Interaction between the non managed habitat islands and cereal fields were low. Juvenil stages also occurred in the cultivated fields.

Counts of posterior-row ocelli and number of segments did not show significant differences between the age stadia of *C. caeruleocinctus* within different habitat types investigated.

Jörg SPELDA

Phylogeny of the family Craspedosomatidae (Diplopoda: Chordeumatida)

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Under this heading, by the example of the family *Craspedosomatidae*, the general problem of phylogenetic reconstruction will be treated. It will be shown that HENNIG'S (1982) method will work only under special conditions and that several of his assumptions are simply not true. An alternative method developed by WOAS (1990) will be introduced and the results of both methods will be compared.

Special reference will be given to speciation. On the example of the genus *Rhymogona* it will be shown how complete (or incomplete) speciation can be detected by methods of multivariate statistics (discriminant analysis). Patterns of speciation induced by former hybridisation of subspecies will be shown.

LECTURE

<http://rcin.org.pl>

The Myriapod collection in the Natural History Museum in Vienna - with special reference to the life-work of Carl Attems.

Naturhistorisches Museum Wien, 3. Zoologische Abteilung, Burgring 7, 1014 Wien, Austria

The Myriapod collection of the Natural History Museum in Vienna is one of the largest and most important collections in the world. Carl Graf Attems - without doubt one of the greatest specialists for Myriapods - was active there from 1894 till his death in 1952. He examined material from nearly all parts of the world, described more than 1500 new species and published 138 papers, monographs and textbooks.

Apart from the core of Attems' types the collection contains many specimens donated by Verhoeff and several donated by Brölemann, Carl, Silvestri. Attems corresponded with other specialists in Europe and exchanged material.

As early as the beginning of the 19th century the zoological department of the Viennese Museum was a scientific institution of international significance. In 1869 the whole myriapod collection, about 362 lots, was on loan to A. Humbert and H. de Saussure in Geneva. They designated some types, stored in the Viennese Museum now. In 1884 and 1919, the museum received the great and important collection of Robert Latzel, about 550 lots, most of them types.

The basic important role of natural history museums in many fields of biological sciences is discussed.

Vladimír ŠUSTR

Saccharidases in the gut of millipedes.

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Millipedes play an important role in the decomposition processes of dead plant material. Owing to their own enzymes and the presence of gut microflora, millipedes are able to utilize several components of ingested food. About ten papers have dealt with the presence of digestive enzymes in these animals to date. The aim of this contribution is to add some new data to the present database of digestive enzymes in millipedes and to make a short review dealing with this problem.

The presence of digestive enzymes active against some saccharides (maltose, cellobiose, sucrose, trehalose, cellulose, xylan, starch and laminaran) was tested in *Glomeris pustulata* (LATREILLE, 1804), *Cylindroiulus boleti* (C. L. KOCH, 1847), *Megaphyllum projectum kochi* (VERHOEFF, 1907), *Unciger transsilvanicus* (VERHOEFF, 1899) and *Strongylosoma stigmatosum* (EICHWALD, 1830). Dissected guts, including gut content, were homogenized in cold Britton-Robinson buffer (pH 6). Enzyme activity was tested using chromolytic substrates (amylase, xylanase and laminarinase) or by means of a method based on the determination of glucose by oxochrom-glucose method. Cellulase activity was discovered in the gut of *U. transilvanicus* and *G. pustulata*. Published tests of activity of saccharidases in millipedes are reviewed and tabulated.

POSTER

Noel N. TAIT and Jennifer M. NORMAN

**Novel mating behaviour in *Floriceps stutchburae* n.gen., n.sp.
(Onychophora: Peripatopsidae)**

Department of Biological Sciences, Macquarie University, Sydney 2109, Australia.

While mating behaviour in onychophorans has been documented in only a few species, it would appear that male reproductive strategies are as diverse as those of the females. The male strategies range from dermal to vaginal insemination. To add to this diversity, the males of many newly described species of Australian onychophorans display distinctive head structures. In some species, these structures have been shown to carry spermatophores. Here we describe *Floriceps stutchburae*, a species possessing a unique head structure. We have included an account of its mating behaviour. The male's everted head structure is placed against the female's gonopore and held there by the claws of the female's reduced last pair of legs. After the pair separated, we observed a spermatophore covering the female's genital opening and histological sections of the female's reproductive tract showed that sperm had been released.

This presentation also includes a review of the mating behaviour in onychophorans with a discussion of the correlation between sperm accumulation in the female's seminal receptacula and the female's reproductive cycle.

LECTURE

Karel TAJOVSKÝ

Millipede succession in abandoned fields

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A long-term survey of millipede assemblages in four different successional stages of abandoned fields and a subclimax forest was started in 1986. After the first two years, when soil sampling and heat extraction of animals were used monthly, the study continued extensively four times per year up to 1995. A second series of intensive monthly investigations of the same plots in 1997-1999 made it possible to compare in detail the changes in millipede assemblages after 11-12 years.

Depending on previous agricultural management, species numbers and densities of millipedes subsequently increased in abandoned fields up to the 3rd or 7th year of succession, when they culminated, and slightly decreased later on. The development of shrub vegetation in young fallow caused a new temporary population increase. Representatives of Polydesmida and Julida predominated at the field and young fallow stages. In the following years of succession, they were subsequently replaced by *Glomeris hexasticha* BRANDT, the initially frequent species of millipede in the subclimax oak forest. A marked development of its population was observed in a 18-year-old fallow with a maximum density of 274 ind.m⁻². On the contrary, the defoliation of trees in the subclimax forest led in the recent years to a decrease in the densities of *Glomeris hexasticha* BRANDT and to their increase in *Mastigona mutabilis* (LATZEL) and *Polydesmus complanatus* (LINNAEUS).

LECTURE

Morphometrics in *Parafontaria tonominea* species complex (Diplopoda, Xystodesmidae)

Tokushima Prefectural Museum, Hachiman-cho, Tokushima 770-8070, Japan

I performed morphometric analyses of geographic variation in *Parafontaria tonominea* and related species using seventy-five populations obtained in the Kansai district, Japan.

Methods: (1) Landmarks of genitalia were digitized from all specimens. Body size was also measured. (2) Based on the landmark data, morphological differences of genitalia were broken down into size, linear component, and nonlinear component using thin-plate spline and GLS. (3) Morphological similarity among populations was examined by body size plots and relative warp analyses based on each shape component of genitalia.

Results and discussion: Populations were continuous in morphology, and could not clearly divided into any morphological subgroups. The study group included nine pairs of sympatric populations with distinct morphology, suggesting that the group is composed of more than one biological species. Our analyses, however, failed to detect any distinct genitalic-reproductive units or body size-reproductive units. In other words, the degree of divergence in both genitalic morphology and body size did not correspond to that of the establishment of reproductive isolation. I also could not recognize any distinct genitalic-geographic units or body size-geographic units in the study populations.

Przemysław TROJAN

The meaning and measurement of species diversity

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Studies of species diversity give rise to a number of questions related to theoretical aspects and methodology. The questions deal with 1) estimation of the number of species inhabiting an area, 2) the measurement of species diversity by means of statistical indices, 3) the relation between changes in diversity and the structure of animal communities, 4) estimation of diversity in succession series of biocenoses, 5) defining species diversity in a landscape, 6) reduction in species diversity due to anthropogenic pressure. The application of quantitative measurements that afford precise answers to these questions has given contemporary students of fauna tools with which to evaluate habitat quality and produce evidence-based directives for nature conservation

IVITED LECTURE

<http://rcin.org.pl>

Communities of centipedes in three floodplain forests of various age in Litovelské Pomoraví

Dept. of Ecology, Faculty of Science, Palacky University, Svobody 26, 77146 Olomouc, Czech Republic

Litovelské Pomoraví Protected Landscape Area forms a narrow belt along the Morava River between the towns of Olomouc and Mohelnice. Adjoining the river there is a complex of natural floodplain forests and damp meadows. Litovelské Pomoraví is in the Ramsar convention register of wetlands of international importance.

During the years 1998-99, communities of centipedes were investigated in three forests of various age in Litovelské Pomoraví PLA: a 3-year-old *Quercus petrae* tree nursery (3 year old in 1998), 30-year-old forests with *Fraxinus excelsior* as the dominant tree and 80-year-old forests with *Quercus petrae*. The animals were collected by pitfall trapping and soil sampling.

1530 centipede individuals of 12 species (2 orders, 4 families) were collected in total.

The centipedes *Lithobius mutabilis* L. KOCH and *L. forficatus* LINNAEUS represented most dominant species in pitfall traps. The most dominant species in soil samples were *Geophilus flavus* (DE GEER) and *Schendyla nemorensis* (C. L. KOCH) (*Sch. nemorensis* only in the 30- and 80-year-old forests).

Forest age was shown to have a great influence on densities and dominance structures of communities, number ratio of Geophilomorpha vs Lithobiomorpha in soil samples and period of peak of epigeic activity.

Helena LESAR URBAS and Ivan KOS

**Some morphological characteristic of *Geophilus flavus* (DE GEER, 1778)
(Geophilidae) from Slovenia**

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The study presents the variation in some morphological characters and their correlation with the size of *Geophilus flavus*. Animals were collected in two different regions of Slovenia, from Prekmurje and Dolenjska.

The width of the coxofemoral condyle (male: 0,223–0,801 mm; female: 0,207–0,810 mm) was used to describe the size of individuals.

The width of the cephalic plate (male: 0,303–0,980 mm; female: 0,288–1,134 mm), length of cephalic plate (male: 0,378–0,938 mm; female: 0,360–0,994 mm), width of the first antennae-segment (male: 0,094–0,252 mm; female: 0,076–0,270 mm) and width of the seventh trunk-segment (male: 0,146–0,423 mm; female: 0,060–0,486 mm) are quite clearly correlated with the width of the coxofemoral condyle.

The length of the seventh trunk-sternite (male: 0,130–0,414 mm; female: 0,064–0,504 mm), the number of pores on the seventh trunk-segment (male: 10–47; female: 7–64) and the number of coxal pores on the last trunk-segment of each coxa (male: 1–8; female: 1–11) are less closely correlated with the width of the coxofemoral condyle. The number of trunk-segments (male: 45–51; female: 47–55), the number of pores on the first trunk segment (male: 1–8; female: 3–8), the occurrence of compact metasternite pore-groups (male: 11–15. sternite; female: 11–16. sternite), the number of trunk-segments which show a carpophagus fossae, the number of trunk-segments which show a carpophagus peg, the number of clypeal setae and number of teeth of labrum mid-pieces are not correlated with the size of animals.

A statistical significance was established for some characters between groups of individuals from Prekmurje and Dolenjska.

**The margins of the tergites in the taxonomy of Sphaerotherium
(Diplopoda, Sphaerotheriidae): a SEM approach**

Royal Museum for Central Africa, Invertebrate Section, 3080-Tervuren, Belgium

Descriptions of the Sphaerotheriidae species which have been published over the years are of unequal value and in most cases insufficient for the recognition of the species. An extensive revision of the type material and all described species has been started using the structure of the margins of the tergites as the main character for determining the species. The observation of the marginal bristles reveals the occurrence of undescribed species among the South African material.

Virginia VAN DER LANDE

The story behind the specimen: Onychophora (Peripatidae) in the Himalayas

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The eyeless, but non-cavernicolous peripatid *Typhloperipatus williamsoni* was discovered in 1911 during a military expedition in the Assam hills in the Indian sub-continent, at latitude 28^o, ie significantly N of the Equator. Peripatids also occur in the Malay Peninsula, but there is no continuity between the two. A Gondwanaland origin is supported by geological evidence. The circumstances leading to the discovery of the species are described. The speaker visited the type locality in Arunachal Pradesh, only recently accessible to outsiders, and obtained evidence of their continuing existence.

LECTURE

Karin VOIGTLÄNDER

The life cycle of *Lithobius mutabilis* L. KOCH

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The life cycle of the centipede *Lithobius mutabilis* was studied during the period 1993 to 1998. Specimens caught in a deciduous forest at the Neiße valley near Görlitz (East Germany), as well as those laboratory-reared, were observed and changes in the following morphological characters in different stages are described: body-length, head-length and width, ratio body-length/head-length, length and width of tergite 3, number of coxal pores, antennal articles and ocelli. The measurements were made in living individuals under CO₂-anaesthesia.

Information concerning the egg-laying period, mean numbers of eggs, stages in which eggs were laid and hatching is provided as well as on results of duration of the different stages and their total number. On this basis it is possible to draw conclusions of the mean and the maximal life age of *L. mutabilis* in the laboratory.

The observations are compared to those of other species and with the results of other authors.

LECTURE

Christian S. WIRKNER and Günther PASS.

Morphology and evolution of the circulatory system in Chilopoda

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The recently revived debate on the relationships among major arthropod groups necessitates re-evaluation of the phylogenetic status of most morphological traits.

Description of the circulatory system (CS) in Chilopoda is still sketchy and information on its phylogenetic development largely missing. Focus here is mainly on Craterostigmomorpha and on Geophilomorpha. In addition, Scutigermomorpha, Lithobiomorpha and Scolopendromomorpha were re-investigated with regard to some controversially-discussed traits. Representative specimens have been examined at light-microscopical level by semithin serial sections and in *in vivo* observations of hemolymph flow.

In all investigated chilopod species, the CS consists of two major longitudinal vessels: the dorsal vessel (DV) and the ventral vessel (VV). In the first body segment, the maxilliped arch connects these two vessels. Both the DV and the VV are made up of two components each: the DV of the heart and the cephalic aorta, the VV of the supraneural vessel and the ventral cephalic vessel. Differences amongst the groups lie mainly in peripheral arteries that branch off these four longitudinal vessels. Results are discussed along the different new concepts of arthropod evolution.

LECTURE

Chilopoda communities of Białowieża Forests

Museum and Institute of Zoology, PAS, Wilcza 64, 00-679 Warszawa, Poland

Chilopoda communities were studied in five plant associations of Białowieża Forests: fresh pine forest (Peucedano-Pinetum), pine-spruce mixed forest (Calamagrostio arundinaeae-Piceetum), linden-oak-hornbeam forest (Tilio-Carpinetum typicum), ash-alder flood plain forest (Circaeo-Alnetum) and a bog-alder forest (Carici elongatae-Alnetum). The study forests were populated by varying numbers of centipedes. Abundance values, estimated on the base of soil samples material, ranged from 3.25 ind./m² in the fresh pine forest to 24.00 ind./m² on bog hummocks in the bog alder forest. The values of a trapability index did not show such high differences because of reduced centipede activity in the inundated forests. 6-9 species were registered in each type of forests. Most species occurred in the linden-oak-hornbeam forest, whereas only ten species of centipedes were found in the study forests altogether. 8 species were lithobiids. Two of them: *Lithobius mutabilis* L. KOCH and *Lithobius curtipes* C. L. KOCH were dominant in the communities of the first four plant associations listed, with the exception of the community of the bog-alder forest, where *Geophilus proximus* C. L. KOCH occurred as a subdominant with *Lithobius curtipes* as the most abundant species. High similarity of species composition (0.56-0.78 according to Soerensen index) and dominance structure (0.82-0.99 according to Morisita index) was found for the Chilopoda communities of the study forests.

POSTER

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