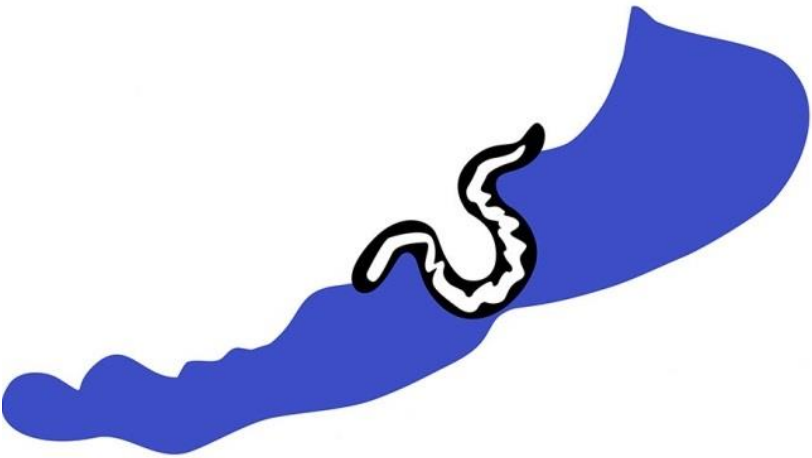
Avoidance behaviour and survival of two annelid oligochaetes exposed to two fungicides

Sylvain Bart

Book of abstracts

12th International Symposium on Enchytraeidae



June 27–29, 2016

Tihany, Hungary

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Foreword

Dear Colleagues and Friends,

It is a great pleasure to welcome you to our beautiful and historical institute with the mesmerizing background of Lake Balaton to participate the 12th International Symposium on Enchytraeidae.
ISE is held in every two years since 1994 to bring together people working on enchytraeids all around the world. Just like in previous meetings, this Symposium focuses to taxonomy and ecology of enchytraeids in many different subjects. Their complex relationships are far more difficult and challenging and this meeting will give us an opportunity for interesting discussions sharing our knowledge and experience, and meeting new colleagues. We will have interesting oral presentations, poster session and taxonomic workshop.
The symposia include talks, posters, and a taxonomic workshop. It has a traditional focus on taxonomy and applied soil ecology, but actually it covers all aspects of the biology of enchytraeids, including developmental biology, physiology, phylogeny, and ecotoxicology. A peer-reviewed Proceedings volume, the "Newsletter on Enchytraeidae" is published usually within less than one year.

We hope you will all enjoy the meeting and the Lake Balaton!

With kind regards,

Gergely Boros
Chair of the Scientific Committee

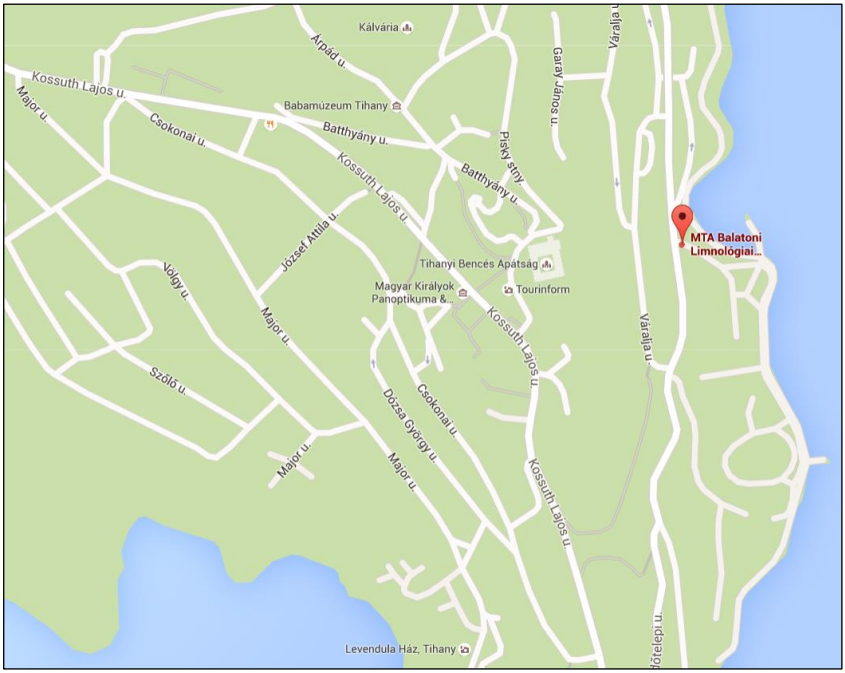
Information

Meeting venue and accommodation

The Event will take place in the Balaton Limnological Institute, Center for Ecological Research of the Hungarian Academy of Sciences, which is situated next to the Lake Balaton, under the spectacular volcanic hill of Tihany settlement.

The "Guest house" was booked for the participants of the meeting. It is placed next to the main building of the Institute.

Overview map of Tihany



Meeting Program

Day 1, June 27 (Monday)

07:30 – 08:30 Breakfast

12:30 – 14:00 Registration

14:00 – 14:30 Welcome

14:30 – 16:30 Session 1

- 14:30 – 15:00 Jiří SCHLAGHAMERSKÝ: Enchytraeids along two terrestrial environmental gradients and in soil of an abandoned settlement on the Arctic island of Spitzbergen
- 15:00 – 15:30 Anneke BEYLICH: Annelids of Woodruff-Beech wood: A comparison of two forest reserves on basaltic bedrock in Germany
- 15:30 – 16:00 Martina BÍLKOVÁ: Microannelids of Western Carpathian spring fens: Do hydro- and pedobiological methods yield different results?
- 16:00 – 16:30 Jiří SCHLAGHAMERSKÝ: Two different enchytraeid assemblages within 10 m distance in a deciduous forest in the southern Appalachians (Georgia, USA)

16:30 – 17:00 Coffee break

17:00 – 18:30 Session 2

- 17:00 – 17:30 Klára DÓZSA-FARKAS: The enchytraeid fauna (Enchytraeidae, Clitellata) of Rax mountain (Austria). Two new species and comparison of *Fridericia discifera* Healy, 1975 and *F. alpica* sp. n.
- 17:30 – 18:00 Svante MARTINSSON: Is *Stercutus* really monotypic?
- 18:00 – 18:30 Rüdiger M. SCHMELZ: New species of *Hemienchytraeus* from Paraná, Brazil, and key to species of the genus

19:00 – Dinner

Day 2, June 28 (Tuesday)

07:30 – 08:30 Breakfast

09:00 – 10:30 Session 3

09:00 – 09:30 Joël AMOSSÉ: A field study to assess pesticide effects on oligochaetes and soil functioning

09:30 – 10:00 Sylvain BART: Avoidance behaviour and survival of two annelid oligochaetes exposed to two fungicides

10:00 – 10:30 Agnieszka JÓZEFOWSKA: The influence of shelterbelts on enchytraeids abundance in soils

10:30 – 11:00 Coffee break

11:00 – 12:30 Poster Session (with 5 minutes summary talks)

Ulfert GRAEFE: *Enchytronia pygmaea* sp. n. (Enchytraeidae, Clitellata), a widespread species in European soils

Ulfert GRAEFE: Microannelids as indicators of topsoil formation: a case study from forest sites in Estonia

Yong HONG: Check-list of the Enchytraeidae species of Korea (Annelida: Clitellata)

Rüdiger M. SCHMELZ: Enchytraeids from first order streams in São Paulo State, Brazil

13:00 – 14:00 Lunch

14:00 – 16:30 Taxonomic Workshop

17:00 – 19:00 Guided Tour in Tihany (Benedictine monastery, crater lakes, historical village)

19:30 – Conference dinner and wine tasting (Koczor Winery, Balatonfüred)

Day 3, June 29 (Wednesday)

07:30 – 08:30 Breakfast

09:00 – 10:30 Session 4

09:00 – 09:30 Yulia ZVEREVA: Some Preliminary Results of Ecological Studies on *Mesenchytraeus bungei* Michaelsen, 1901 in Splash Zone of Bolshie Koty Bay, Lake Baikal

09:30 – 10:00 Jörg RÖMBKE: Oligochaetes (Lumbricidae, Enchytraeidae) and litter decomposition at six forest sites in Germany and Portugal, differing in site and climate properties

10:00 – 10:30 Gergely BOROS: The effects of forestry treatments on enchytraeid worms (Annelida, Oligochaeta) in a Hungarian sessile oak-hornbeam forest

10:30 – 11:00 Coffee break

11:00 – 12:00 Closing remarks

12:00 – 13:00 Lunch

(Minibus leaves at 13:30 to the airport.)

Taxonomy training and consultation

June 29 (Wednesday)

14:30 – 18:00 (with breaks)

June 30 (Thursday)

8:30 – 11:00 (with breaks)

(Minibus leaves at 12:00 to the airport than to Budapest city.)

Abstracts of Presentations

O-1

Enchytraeids along two terrestrial environmental gradients and in soil of an abandoned settlement on the Arctic island of Spitzbergen

Jiří Schlaghamersky[1], Miloslav Devetter[2]

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[2] *Institute of Soil Biology, Biology Centre of the Czech Academy of Sciences, České Budějovice, Czechia*

In the Arctic, Enchytraeidae (Annelida) are a dominant group of soil fauna. Arctic ecosystems still include phenomena not yet examined with regard to soil fauna. In 2012–2014 we studied enchytraeids along two environmental gradients on Spitzbergen, the main island of the Svalbard archipelago: 1. four transects down-slope from the foot of cliff faces occupied by nesting sea birds; 2. three transects leading from the glacier face towards areas of the moraine that had been ice-free for an increasing time period. Each transect included four sampled distances from its origin. Additionally, soil was sampled at Pyramiden, an abandoned coal-mining town, searching for introduced species (recently reported from Barentsburg, a similar settlement). Each site was sampled once during the summer, including sampling for soil chemistry analyses. Enchytraeids were extracted using the water funnel method and identified alive. In total, 624 specimens of 10 species were obtained (bird cliffs 478, moraines 41, Pyramiden 105 specimens). In the bird cliff transects, nutrient concentrations did not always decrease with distance from the cliffs as expected. 17.4% variability in enchytraeid data were explained (CCA) by site (transect), 5.4% by the within-transect position. Due to clustered distribution, only trends were found:

Enchytraeids were most abundant at the foot of the bird cliffs. *Fridericia bulboides* was only found here and at the next position. Effects were shown for soil nitrogen and calcium. *Marionina argentea* s.l. was most abundant down-slope, probably because of wetter conditions caused by seepage water. This species was also dominant in the moraine assemblage. Only the two positions farthest from the glacier hosted enchytraeids, four species in total. Five species were found in lawn soil from Pyramiden, all common on the island.

O-2

Annelids of Woodruff-Beech wood: A comparison of two forest reserves on basaltic bedrock in Germany

Anneke Beylich and Ulfert Graefe

IFAB Institut für Angewandte Bodenbiologie GmbH, Hamburg, Germany

More than 700 strict forest reserves (Naturwaldreservate) have been established in Germany in order to study their natural development in the absence of human intervention. We investigated the annelid fauna of the Hessian forest reserve Weiherskopf (Vogelsberg) which was affected by extensive windthrow due to several heavy storms in 1990. Whereas the fallen trees were left to decay at the strictly protected reserve, they were removed from an adjacent reference area. The aim of the study was to find out differences in the soil fauna resulting from the diverging treatment more than 20 years ago. The sampling took place in April 2014. A species-rich assemblage of microannelids and earthworms was found at both the reserve and the reference area, indicating slightly acid to moderately acid soil conditions. The Sørensen index for species similarity between the annelid assemblages of the two sites was 83%. A long-term impact of windthrow and deadwood management on the earthworm and microannelid fauna was not observed.

Looking for comparable data from other sites, we found strong similarity to the results of our investigation at the forest reserve Nonnenstromberg (Siebengebirge) in North Rhine-Westphalia performed from 1991 to 1993. Both reserves have the vegetation type (Woodruff-Beech wood = *Galio odorati-Fagetum*) and the

bedrock (basalt) in common. Dominating annelid species at both forest reserves is the terrestrial polychaete *Hrabeiella periglandulata*. Another conspicuous component is the epigeic earthworm *Dendrobaena pygmaea*. The overall similarity between the annelid assemblages (Sørensen index) amounts to 81%. We conclude that the assemblage is typical of an intermediate stage between calcareous sites with Mull humus and more acidic sites with Moder humus forms.

O-3

Microannelids of Western Carpathian spring fens: Do hydro- and pedobiological methods yield different results?

Martina Bílková, Jana Schenková, Vendula Polášková and Jiří Schlaghamerský

Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czechia

Annelids are represented by several families, abundant and of ecological importance both in soil and freshwater sediments. In particular in one family, Enchytraeidae, there is substantial overlap between the annelid fauna of aquatic and terrestrial habitats. However, annelids are usually studied either as part of the aquatic community or as part of the soil community. The traditionally employed methods differ substantially. In difference to other oligochaetous clitellates, enchytraeids are often not identified to species in hydrobiological studies. In the present contribution we present a comparison of microannelid assemblages as reflected by hydrobiological and pedobiological methods of sampling and sample processing. In 2015, annelids were sampled in 14 spring fens (and adjacent grasslands) in the Western Carpathians (Czechia and Slovakia) using pedobiological methods. A few years earlier, the spring fens at these sites had been sampled using a hydrobiological sampling method, and annelids from these samples had been identified. At each site two microhabitats, i.e. spring brook sediments and waterlogged substrate (vegetation/peat), were sampled taking one sample of substrate (625 cm^2, 5 cm depth) once in spring and once in autumn. Samples were fixed in formaldehyde and oligochaetes

were manually sorted out and identified. The pedobiological sampling included sampling for earthworms and for microannelids. Here we focus on the latter: Per site, five cores of waterlogged substrate were taken in spring and another five in autumn using a soil corer (17 cm^2, 12–15 cm depth). Each core was subdivided in 3-cm layers and these stored in plastic bags and kept cool during transport and storage. Microannelids were extracted for 48 hours by the wet funnel method without heating and identified alive. The sampled fens covered all four types distinguished along the mineral rich-poor gradient, but 8 of the 14 sites were mineral-rich fens with tufa formation, whereas the other three types were represented by two to three sites only. Therefore, most comparisons will focus on these 8 sites. The densities obtained by the pedobiological methods were much higher than those obtained by the hydrobiological one (but mind that samples were taken in different years). Employing pedobiological methods, enchytraeids made up for over 87% and 77% and naidids only 9% and 21% of microannelid individuals (Aeolosomatidae excluded) in spring and autumn, respectively. Using hydrobiological methods, enchytraeids made up for 16% and 8% and lumbriculids 78% and 60% (as above) in the fen substrate with standing water. In the brook sediments Lumbriculidae were even more dominant. Due to the very different representation of taxa "uncovered" by the different methods, and the higher number of enchytraeid species found in 2015, assemblages found by the pedobiological and hydrobiological methods were very different. The assemblages in the spring brook sediments showed a somewhat intermediate position between the assemblages found by the two methods in the identical waterlogged fen habitat. The study yielded several noteworthy faunistic records, such as first records of *Parergodrilus heideri* ("Polychaeta") for Slovakia.

0-4

Two different enchytraeid assemblages within 10 m distance in a deciduous forest in the southern Appalachians (Georgia, USA)

Jiří Schlaghamersky

Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czechia

Compared to the level of knowledge about European enchytraeid fauna, information on enchytraeids in North America is poor and few papers provide qualitative data on entire assemblages. From the southern Appalachians or their foothills, some data on assemblages of forest and arable field sites in Georgie had been published before the present study, but these were limited to the genus level. The present study had the aim to increase our knowledge on the species composition and structure of Appalachian terrestrial enchytraeid assemblages. It is based on sampling conducted on July 3, 2014 at Dicks Creek Gap, ca. 20 km west of the town of Clayton in northern Georgia (USA). Two ecologically distinct sites adjacent to each other were sampled in a broadleaved forest at an elevation of ca. 770 m a.s.l.: the floodplain along a very small creek and the sloped terrain above this floodplain. At each site, ca. 10 m apart, 11 soil cores were taken within plots of 20 m^2. Soil pH (in water and 0.01 m $CaCl_2$ solution) and conductivity were measured in soil taken directly at these two sites. Whereas pH was the same (H_2O: 4.7, $CaCl_2$: 4.3), conductivity was higher in the soil from the slope (108 µS/cm vs. 76.5 µS/cm). The 12 cm deep soil cores were subdivided into four 3-cm-thick

layers. From these, enchytraeids were extracted by the wet funnel method without heating. In total, 414 enchytraeids and 6 other microannelids were obtained and identified alive to species as far as possible. Enchytraeid density on the floodplain was almost twice as high (ca. 12 000 ind./m^2 ± 1 500 SE) as on the slope (ca. 7 200 ind./m^2 ± 800 SE). On the floodplain, 78% of individuals were present in the upper three 3 cm of soil, formed by a moist organic horizon including partially decomposed leaf litter. On the slope, vertical distribution was more even, with 40% individuals in the upper-most layer, but even here only 5% were extracted from the 9–12 cm layer. However, species richness was substantially higher on the slope (14 vs. 9 enchytraeid species). Almost half of the individuals from the floodplain soil were identified as *Cognettia sphagnetorum* s.l. (i.e. a member of the *Cognettia/Chamaedrilus* species complex). On the slope the assemblage was dominated by an *Achaeta* species (not yet described) and the genus *Fridericia*, respresented by four species. Both assemblages were composed of species known also from Europe and such probably endemic to North America. Species of the genera *Hemienchytraeus* and possibly *Guaranidrilus* represented subtropical elements. The number of ca. 16 enchytraeid species found in total (some new to science, taxonomic issues remain to be resolved) and the striking differences of the assemblages found in the two adjacent mesohabitats, shows that there is substantial diversity deserving further exploration.

O-5

The enchytraeid fauna (Enchytraeidae, Clitellata) of Rax mountain (Austria). Two new species and comparison of *Fridericia discifera* Healy, 1975 and *F. alpica* sp. n.

Klára Dózsa-Farkas[1] and Tamás Felföldi[2]

[1] *Department of Systematic Zoology and Ecology, Eötvös Loránd University, Budapest, Hungary*

[2] *Department of Microbiology, Eötvös Loránd University Budapest, Hungary*

The unknown enchytraeid fauna of the Rax mountain range (Austria) were investigated in this study. Samples were taken from five different habitats: under *Pinus mugo*, under *Picea abies*, *Laryx decidua* fom mixed forest (*P. abies* + *Betula pendula*) and alpine meadow.

42 enchytraeid species were found representing 11 genera and additionally a terrestrial polychaeta, *Hrabeiella periglandulata*. Beside the very frequent species *Fridericia discifera*, an another species were also observed, which had very similar spermathecae but differed in some other traits. These enchytraeids could be separated into two distinct species (*F. discifera* Healy, 1975 and *F. alpica* sp. n.) based on both morphological and molecular methods. Results obtained in this study provided the first record of the enchytraeid fauna of Rax Mountain and the description of two new *Fridericia* species (*F. alpica* sp. n. and *F. raxiensis* sp. n.)

This research was financed by the National Research, Development and Innovation Office (108582 NKFIH). Tamás Felföldi was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences.

O-6

Is *Stercutus* really monotypic?

Svante Martinsson

University of Gothenburg, Gothenburg, Sweden

Stercutus is a small genus of Enchytraeidae, including only a single species *S. niveus*, widespread in Europe. In order to test if *Stercutus* is really monotypic, here we use molecular methods to test the species limits in this genus based on specimens manly from North Europe (Sweden and Norway). Three genetic markers, the mitochondrial COI, and the nuclear ITS and H3, were sequenced. The COI data set was used to preliminary delimit lineages further tested using the Bayesian multi-loci method implemented in the program BPP. Based on the analysis we can conclude that *Stercutus* is not monotypic, but instead include a number of genetically well delimited species. However, as most studied specimens are immature we do not attempt to formally describe the species until more material is found.

O-7

New species of *Hemienchytraeus* from Paraná, Brazil, and key to species of the genus

Rüdiger M. Schmelz[1,2] and Jörg Römbke[1]

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[2] *Laboratory of Animal/Plant Biology and Ecology, Science Fac., University of A Coruña, Spain*

In the framework of the German-Brazilian project SOLOBIOMA ('Soil biota and biogeochemistry in the Southern Atlantic rainforests of Brazil'), soil invertebrates were sampled in different regeneration stages of forest: pastures, young, medium and advanced secondary forests as well as old-growth forests. Thirty-nine study sites were located in two private nature reserves situated in neighbouring regions of the southern Atlantic Forest (Mata Atlântica) in Paraná, Brazil. All sites were characterized in terms of climate, history of use (age), vegetation, and soil properties. Additional qualitative samples included urban parkland and village pastures. More than 60 species-taxa of Enchytraeidae were distinguished during investigation of specimens in vivo, most of them new to science. The enchytraeid fauna of the region is dominated by species of the genera *Achaeta*, *Guaranidrilus* and *Hemienchytraeus*. Here we report on the diversity of *Hemienchytraeus,* present at all sampled habitat types, from old-growth forest to urban parkland. The descriptions are based on light-microscopical investigation and they combine observations on specimens in vivo and as stained whole mounts. Diagnoses are compared with those of known species, and a key to all known species of the genus is provided, in order to facilitate studies in other regions of the world.

O-8

A field study to assess pesticide effects on oligochaetes and soil functioning

Joël Amossé, Alexandre Pery, Sylvain Bart and Céline Pelosi

UMR ECOSYS, INRA, AgroParisTech, Université Paris-Saclay, Versailles, France

Agriculture intensification and in particular pesticide use can affect soil fauna and its related ecological functions (e.g. organic matter decomposition). In our study, we tested the effects of two fungicides (the copper and the dimoxystrobine, used respectively in organic and conventional agriculture) on oligochaetes (Lumbricidae and Enchytraeidae) and on the feeding activity (bait lamina method). The trial consisted on four replicates of five experimental treatments (control, copper and dimoxystrobine at 1× and 10× the agronomic dose) in a meadow located near the Versailles castle (France). After one month of experiment, we compared the species composition of annelids and the feeding activity between treatments. We made the assumption that enchytraeid and earthworm diversity and community structure vary in plots treated with pesticides leading to lower consumption rate.

O-9

Avoidance behaviour and survival of two annelid oligochaetes exposed to two fungicides

Sylvain Bart, Céline Laurent, Joël Amossé, Alexandre Pery and Céline Pelosi

UMR ECOSYS, INRA, AgroParisTech, Université Paris-Saclay, Versailles, France

The use of pesticides in crop fields may have negative effects on soil biodiversity. Earthworms and enchytraeids are annelid oligochaetes involved in the evolution of soil organic matter and structure at different complementary scales. This study focused on the impact of two pesticides, an organic fungicide widely used to protect cereal crops in conventional agriculture and copper, a fungicide widely used in organic agriculture on fruit trees, vine or solanaceae to prevent spore germination. We assessed impacts of these fungicides using acute toxicity tests and avoidance behaviour tests on an earthworm and an enchytraeid species, separately, under controlled conditions of temperature and moisture. A natural soil from a fallow was used for the experiments. The results in terms of mortality and ability to detect and avoid different range of fungicide concentrations were discussed comparing species. These results support the need to test impacts of pesticides on enchytraeids, in addition to earthworms, in order to understand ecotoxicological effects of pesticides under field conditions.

O-10

The influence of shelterbelts on enchytraeids abundance in soils

Agnieszka Józefowska and Ryszard Mazurek

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Sustainable farming involves carrying out agricultural activities while taking into account the presence of trees on land used for agricultural purposes. Shelterbelts entails a decrease in crop yields in the ecotone zone, which is associated with the competitive interaction between trees and crops, but shelterbelts are important from the ecological point of view e.g. to enhance biodiversity. The aim of this paper was to investigate the effect of shelterbelts on the enchytraeids abundance.

The study was carried out on crop field which is situated in the Vistula Lowland, Poland. The samples were collected in 2010 and in 2015 from the field adjacent to shelterbelts of black alder *(Alnus glutinosa* L.*).* Study area was rectangle 20 × 24 m with its short side adjacent to the trees was established. The area was divided into 12 zones with a width of 2 m, situated at a growing distance from shelterbelt. The enchytraeids density, the organic carbon content, the temperature, the pH value and the moisture were measured.

The density of enchytraeids noted in 2010 was increased from 9 thousand per m^2 in 0–2 m zone until 25 thousand per m^2 in 12–14 m zone and was higher than in the second part of the field (14–24 m zone) where were 6000 per m^2 of enchytraeids. In the 2015 the highest density of enchytraeids was recorded in the

0–4 m zone (40000 per m^2) and was three-times higher than on the remaining area (4–24 m).
Variation coefficient calculated based on the enchytraeids abundance amounted 85% in 2010 and 119% in 2015. The positive influence of shelterbelts on the enchytraeids density, the carbon content and the temperature was statistically confirmed by the nonparametric *Spearman* Rank *correlation* coefficient which was -0.381, -0.500 and 0.322, respectively and *were significant at the 0.001 level*.

O-11

Some Preliminary Results of Ecological Studies on *Mesenchytraeus bungei* Michaelsen, 1901 in Splash Zone of Bolshie Koty Bay, Lake Baikal

Yulia M. Zvereva and Oleg A. Timoshkin

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Baikal oligochaete fauna is characterized by unusual species richness and high degree of endemism, but family Enchytraeidae is still one of the most insufficiently known oligochaete families (Semernoy, 2004). There are only two nominal species of Enchytraeidae for the lake: *Mesenchytraeus bungei* Michaelsen, 1901 and *Cognettia* (*Enchytraeoides*) *aliger* (Michaelsen, 1930) (Semernoy, 2004), but 'Enchytraeidae gen. sp.' constantly was found in the lake both in the surf zone (Kozhov, 1962) and in the abyssal depths (Semernoy, 2004).

Special attention should be paid to *M. bungei* as to the species occurring all-the-year-round (Veinberg & Kamaltynov, 1998) and reaching a huge biomass in the splash zone of Lake Baikal (Zvereva *et al.*, 2012). *M. bungei* predominance is the reason the present work deals with researching of ecological characteristics of the species in the splash zone, like its abundance, respiration rates and feeding.

Study site was in Bolshye Koty Bay located 20 km north-east of Listvyanka village, South Baikal. Material for this investigation was taken during 2010–2015 years. Field samples were taken with modified 'stone unit' method (Stork & Nakashizuka, 2002). Respiration and oxygen uptake was measured experimentally in

vessels with uncirculating water and portable oxygen sensor (see Zvereva *et al*., 2015). Feeding of *M. bungei* was studied by means of its pellets content examination.

Enchytraeids are common inhabitants of marine and lakes coastal zone where they are recorded in a huge mass (Dózsa-Farkas, 1998; Giere, 2009). We found out *M. bungei* dominates in abundance (92% of total number) in splash zone of Lake Baikal (Zvereva *et al*., 2012). Enchytraeids swarm in detritus accumulated on the lake's shores and their number is measured up to 39 000 spec./m^2.

We established that one mature *M. bungei* specimen (12.4 mg) consume 0.11 mg O_2 per 24 h. The respiration value of the 'average' *M. bungei* specimen is 0.45×10^{-2} mg O_2/spec./h and the rate of oxygen uptake is 0.36 mg O_2/mg/h (Zvereva et al., 2015).

Seasonal dynamics of *M. bungei* feeding spectrum was investigated. Diverse components in different ratio were found, namely green algae, higher plants debris, diatoms and varying animals' remains. Plant material appeared to be a dominant component (up to 55%) in almost all seasons. Our analysis showed that *M. bungei* is a detritophage with a preference to phytogenous detritus. We intend to complete *M. bungei* trophism research with the stable isotopes analyses to specify its trophic status.

Our ecological research supposed to be continued with taxonomical studying of this endemic enchytraeid species. *M. bungei* described in 1901 and nowadays evidently needs revision (Timm, 2003). Nevertheless our results may be regarded as the first ecological data for Lake Baikal enchytraeids. Funding of the work was provided by the grant № 16-34-00074 of Russian Foundation for Basic Research.

O-12

Oligochaetes (Lumbricidae, Enchytraeidae) and litter decomposition at six forest sites in Germany and Portugal, differing in site and climate properties

Jörg Römbke[1], Cornelia Bandow[1], Andreas Gerlach[3], Barbara Jaeschke[3], Rüdiger M. Schmelz[1,2], Tiago Natal-da-Luz[4], José Paulo Sousa[4] and David J. Russell[3]

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Current climate change scenarios for Europe project more extreme weather events during the next 50–100 years with intermittent very hot and dry summers. Due to drought events, some forests are already experiencing severe die-downs of native tree species. One approach to ensure future forestry activities in climatically threatened areas is the introduction of drought-resistant Mediterranean tree species. Litterfall from primary production represents a key resource for the terrestrial biogeochemical nutrient cycles. The complex interactions that take place between primary production, soil, soil animals and soil microorganisms during the process of organic decomposition have developed over evolutionary time under specific habitat conditions. As a result, it is currently not possible to predict whether or how these processes will persist when climatically

'foreign' litter sources are introduced into a particular habitat. Therefore, the effects of southern European oak species (*Quercus ilex, Q. frainetto* and *Q. pubescens*) on soil-animal communities, in particular oligochaetes, have been studied, together with the decomposition of this litter in local soils under different climate conditions.

In autumn of 2008, a monitoring program was initiated at, in total, six forest sites (two in southern Hesse, two in eastern Saxony (both Germany) and two in Central Portugal, thus representing different site and climate conditions. Existing litter decomposer communities (i.e. Lumbricidae, Enchytraeidae) were sampled two to four times at each sites, using standard ISO methods. Litterbag experiments in the field measured decomposition rates and vectors of the different litter species in areas with decreasing soil moistures and increasing average ambient temperatures of 2°C and 4°C.

These conditions are within the range of predicted temperature increases in Germany and Portugal. The results of these experiments will allow the assessment and prediction of the decomposability of the southern European oak litter in local soils, which will subsequently be incorporated into an integrated evaluation of the sustainable establishment of these oak species in domestic forests as a response to climate change in Germany.

O-13

The effects of forestry treatments on enchytraeid worms (Annelida, Oligochaeta) in a Hungarian sessile oak-hornbeam forest

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The experiment investigates the effect of different forest management practices on forest site conditions, regeneration and biodiversity. The following treatments were carried out in a homogeneous stand of mature sessile oak-hornbeam forest using six replicates in a randomized complete block design: preparation cutting, gap creation, micro clear-cut, retention tree group within the clear-cut and control. Microclimate and topsoil variables will be measured during the experiment.

As belowground invertebrate indicators enchytraeid worms were monitored around permanent quadrates. Three quantitative soil samples are taken in every quadrate (90 samples) 2 times per year with a soil corer. Samples were divided into 3 levels (0–4 cm, 4–8 cm, 8–12 cm) to estimate the vertical effect of the treatments. Each mature enchytraeid individuals were identified till species level. Before the treatments the original forest site conditions, enchytraeid diversity and density were surveyed for one year (2014). The treatments were carried out in January–February 2015.

One year after the treatments serious decrement of density was found in in clear-cuts and retention tree group. The latter phenomena means that retention groups of 10–12 trees were not able to buffer the original assemblage for these small sized Annelids. In vertical distribution decrease of individuals were detected in the upper and middle layers. The species composition has improved for smaller geophages species (eg. *Achaeta*) compared to bigger size litter consumer species (eg. *Fridericia*).

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12th ISE

Abstracts of Posters

P-1

Enchytronia pygmaea sp. n. (Enchytraeidae, Clitellata), a widespread species in European soils

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Enchytronia pygmaea sp. n. is described from soils in Germany (North Rhine-Westphalia, Schleswig-Holstein, Hamburg, Brandenburg) and Estonia. The most characteristic feature of the new species is its extremely small size (1.5 mm long, number of segments 17–19). With other *Enchytronia* species it shares the shape and arrangement of chaetae (absent laterally from VI), of pharyngeal glands and of the clitellum (open dorsally and ventrally). Main distinguishing characteristics are the posteriorly rounded brain and a singular pair of preclitellar nephridia at 7/8. The species is occurring predominantly in slightly acid, sandy soils under crop, grass and forest, where it inhabits the deeper layers of the topsoil.

P-2

Microannelids as indicators of topsoil formation: a case study from forest sites in Estonia

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During the scientific excursion of the international conference 'Humus forms and biologically active compounds as indicators of pedodiversity' (27–28 August 2012, Tartu, Estonia) we had the opportunity to take soil samples from the visited observation sites for analyzing biological features of the topsoil. The selected sites were pine forest on Podzol, mixed pine-spruce forest on Retisol and spruce forest on Sapric Histosol (Drainic, Eutric). Microannelids (mainly enchytraeids) were used as indicator group for the biological state of the topsoil. Measured parameters were species composition, abundance and vertical distribution of the assemblage. Soil sampling was done with a soil corer to a depth of 15–20 cm. The soil column was devided into subsamples of 5 cm depth intervals starting at the top of the organic layer. Microannelid extraction from soil samples was performed according to ISO 23611-3 (2007). The results are represented as humus activity profiles contrasting the abundance and vertical distribution of species in juxtaposition with the morphological humus profile. The species composition of the three sites exhibits significant differences which are summarized using knowledge-based indicator values according to Graefe & Schmelz (1999). The biological features will be discussed in relation to the topsoil/humus form designations of the Estonian, the German and a WRB-adapted classification system.

P-3

Check-list of the Enchytraeidae species of Korea (Annelida: Clitellata)

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Terrestrial enchytraeids are diverse and abundant in litter layers and soils in natural forests. Recently, several new Korean species have been described by Dózsa-Farkas & Hong (2010) and new additions increased the number of species recorded for Korea (Christensen & Dózsa-Farkas 2012; Dózsa-Farkas *et al.* 2015).

The present list of Korean enchytraeids comprises 24 species belonging to nine genera; *Achaeta* Vejdovský, 1878, *Enchytraeus* Henle, 1837, *Fridericia* Michaelsen, 1889, *Globulidrilus* Christensen & Dózsa-Farkas, 2012, *Hemifridericia* Nielsen & Christensen, 1949, *Hemienchytraeus* Černosvitov, 1934, *Henlea* Michaelsen, 1889, *Marionina* Michaelsen, 1890, and *Mesenchytraeus* Eisen, 1878. Among them there are 11 endemic species including a new genus (*Globulidrilus* Christensen & Dózsa-Farkas, 2012).

Korean Oligochaeta fauna have been studied repeatedly, but the work is not yet complete since much area remained to be explored. There is little overlap between the area sampled for this study and areas covered by previous studies of Korean Enchytraeidae. In all probability, other mountains and other islands have diverse faunas as well, thus the number of endemic species known in Korea will increase even more.

P-4

Enchytraeids from first order streams in São Paulo State, Brazil

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Aquatic oligochaetes were collected in first order streams in the 'Parque Estadual Campos do Jordão', São Paulo State, Brazil, during several sampling campaigns in 2006 to 2008. Work was carried out in the framework of the project BIOTA/FAPESP, 'Research Program on Biodiversity Characterization, Conservation, Restoration and Sustainable Use' (www.biota.org.br). A small percentage of the collected material consisted of enchytraeids. Eight species taxa were distinguished, and three of them could be named. Almost half of the specimens belonged to *Achaeta singularis* Schmelz, 2008, described from sites in the Mata Atlântica in Paraná, some 250 km southwest. Presence of adult specimens allowed to complete the redescription of that species, which belongs to the plesiomorph sub-group with lateral spermathecal pores and no pyriform glands. All adult or subadult specimens had the gonadal region shifted two segments anteriad. The curious crystals in the coelom, originally described and present in this material, may consist of oxal acetate. A single specimen agreed in all observable details with *Marionina deminuta* Rota, 2013. Four taxa of *Guaranidrilus* were distinguished but not named. The high percentage of *Achaeta singularis* in the collection suggests that the species' natural habiat is in or close to the rivers. Other species may be accidental finds from the adjacent terrestrial enchytraeid fauna

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