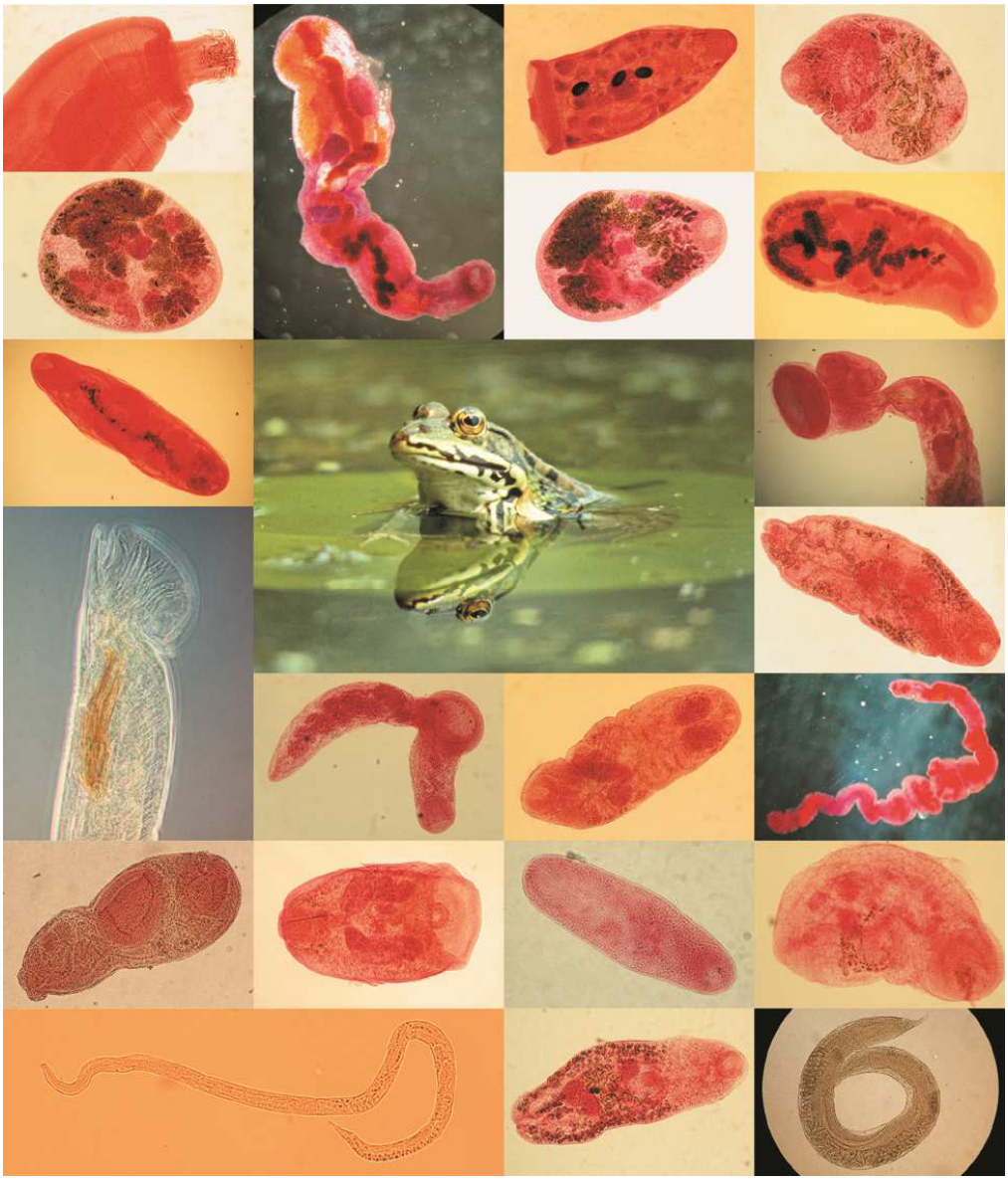
Marz, 23 May 2014
Werkstatt Natur

ÖGTPM
Österreichische Gesellschaft für Tropenmedizin, Parasitologie und Migrationsmedizin

PARASITOLOGISCHE FACHGESPRÄCHE 2014
PARASITOLOGICAL DAY 2014

"PANNONISCHE PARASITEN"
"PANNONIAN PARASITES"



Programme/Abstracts[1]

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[1] Abstracts in chronological order

ÖGTPM
Österreichische Gesellschaft für Tropenmedizin, Parasitologie und Migrationsmedizin

PROGRAMM / *PROGRAMME*

PARASITOLOGICAL DAY 2014

"PANNONIAN PARASITES"

Wann/*When* 23. Mai 2014 / *May 23, 2014*
Wo/*Where* **Werkstatt Natur,** Lehrnertal 3, A-7221 Marz

09.30 – 09.40 **WELCOME ADDRESS**
Andreas DUSCHER (Secretary of the Burgenländischer Landesjagdverband)
Julia WALOCHNIK (President of the ÖGTPM)

09.40 – 11.00 **PARASITES IN AN AQUATIC ENVIRONMENT**
Chair: Michael SCHABUSS

09.40 – 10.00 **Franz JIRSA**, Daniel Pirker, Regina Krachler, Bernhard K. Keppler: Mercury in sediments, macrophytes and fish from Lake Neusiedl, Austria

10.00 – 10.20 **Franz JIRSA**, Kerstin Krojer, Christa Frank-Fellner: Intestinal helminths of selected fish species from Lake Neusiedl, Austria

10.20 – 10.40 **Michael SCHABUSS**, Clive R. Kennedy, Robert Konecny, Britta Grillitsch: A long term investigation of the endoparasite community of eel, *Anguilla anguilla*, from Lake Neusiedl, Austria

10.40 – 11.00 Elisabeth Singer, **Helmut SATTMANN**: Helminths of frogs from Lake Neusiedl, Austria

11.00 – 11.30 *Coffee break*

11.30 – 13.00 **SNAILS, MOSQUITOES & SMALL MAMMALS AS HOSTS**
Chair: Anja JOACHIM

11.30 – 11.45 **Christoph HÖRWEG**, Larissa Gaub, Anna Sophia Feix, Julia Walochnik, Helmut Sattmann: Digeneans in freshwater snails in Burgenland with special reference to cercarial dermatitis

11.45 – 12.05 **Gábor MAJOROS**: An exotic *Schistosoma* species in Central Europe: what are their intermediate snail hosts?

12.05 – 12.25 **Hans-Peter FÜHRER**, Herbert Auer, Katja Silbermayr, Georg Duscher: *Dirofilaria repens* and *Dirofilaria immitis* in Austria

12.25 – 12.40 Timo Baumann, Anja Joachim, **Barbara HINNEY**: Endoparasites in Austrian badgers

12.40 – 13.00 **Gábor FÖLDVÁRI**: Wildlife in the city: hedgehogs, ticks and pathogens

13.00 – 14.00 *Lunch break*

14.00 – 15.45 **PARASITES OF DEER & BOAR**
Chair: Georg DUSCHER

14.00 – 14.20 **Martin SCHEBECK**, Armin Deutz, Thomas Guggenberger: On the tick fauna of wildlife species in Eastern Austria

14.20 – 14.40 Lukas Schwarz, Cornelia Silaghi, Georg Duscher, **Steffen REHBEIN**: Molecular analysis indicates the presence of different *Dictyocaulus* lungworms in cervids in Germany and Austria

14.40 – 15.00 Christoph Hörweg, Larissa Gaub, Anna Sophia Feix, Julia Walochnik, **Helmut SATTMANN**: Alpine-Carpathian Corridor for invaders: Will *Fascioloides magna* invade the Alps via the Leitha Mountains?

15.00 – 15.20 **Peter PAULSEN**: Recent findings of *Alaria alata* mesocercariae in wild boars in Austria, Hungary and the Czech Republic

15.20 – 15.45 **FINAL DISCUSSION**

16.00 Guided tour through the location by Andreas DUSCHER (BLJV)

Mercury in sediments, macrophytes and fish from Lake Neusiedl, Austria

Franz Jirsa, Daniel Pirker, Regina Krachler, Bernhard K. Keppler

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Between May and September 2011 a total of 361 samples of water, sediment, macrophytes and fish tissues from the shallow, slightly alkaline Lake Neusiedl, Austria were measured for their total mercury content using cold vapour atomic absorption spectroscopy (CV-AAS). This is the first report of mercury levels from this lake. The Hg content of the filtered (0.45µm) water was below the LOD of 0.1 µg/L. Sediments displayed contents between 0.025 and 0.113 µg/g dw, significantly correlated with the proportion of organic components. Although these results point to a small anthropogenic impact on the lake´s mercury content, considerable amounts of mercury were measured in fish samples and macrophytes. Both investigated submerged plant species, - *Potamogeton pectinatus* and *Myriophyllum spicatum* - show a high potential for bioaccumulation of Hg, presenting mean values of 0.245 ± 0.152 and 0.298 ± 0.115 µg/g dw respectively. Biomagnification was evident when comparing muscle samples of the planktivorous fish species rudd *Scardinus erythrophthalmus* (n = 10, mean = 0.084 µg/g ww) with the piscivorous perch *Perca fluviatilis* (n = 21, mean = 0.184 µg/g ww) or pike-perch *Sander lucioperca* (n = 9, mean = 0.205 µg/g ww). Significantly lower values were measured in the muscle of the piscivorous pike *Esox lucius* (n = 25, mean = 0.135 µg/g ww) in which no strong correlation between fish age expressed in length and Hg content occurred. The muscle/liver ratio of Hg in pike was significantly lower than in the other fish species, pointing to a different Hg metabolism in pike, perhaps under the specific slightly saline conditions. Hg concentrations in fish could pose a risk to fish consuming birds in this protected wetland system.

Intestinal helminths of selected fish species from Lake Neusiedl, Austria

Franz Jirsa[1], Kerstin Krojer[2], Christa Frank-Fellner[3]

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During summer of 2011 a total of 92 specimens belonging to the following fish species were recovered from Lake Neusiedl, Austria: *Rutilus rutilus* (n=8), *Blicca bjoerkna* (n=8) *Abramis brama* (n=11), *Lepomis gibbosus* (n=17), *Perca fluviatilis* (n=17), *Sander lucioperca* (n=7) and *Esox lucius* (n=24). Their livers and intestines were fixed in 4% formalin and after a few weeks dissected and screened for parasites. No parasites were detected in the livers. From the intestines the following parasite species could be identified: *Caryophyllaeus laticeps* (ex *A. brama*), *C. fennica* (ex *R. rutilus* & *B. bjoerkna*) *Triaenophorus nodulosus* (ex. *E. lucius*), *Rahphidascaris acus* (ex *E. Lucius* & *P. fluviatilis*), *Camallanus truncatus* (ex *P. fluviatilis* & *S. lucioperca*), *Acanthocephalus anguillae* (ex *A. brama* & *R. rutilus*) and *A. lucii* (ex *E. lucius*, *P. fluviatilis*, *L. gibbosus*). The overall prevalence of intestinal parasites was between 25% for *B. bjoerkna* and 75% for *R. rutilus* and all parasites occurred in rather low intensities, conforming to earlier publications from the lake. *C. truncatus* was documented for the first time from the lake and most probably was introduced with fish stock.

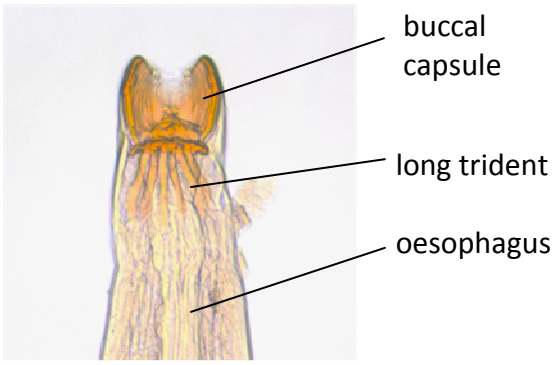

Fig. 1: Anterior end of *Camallanus truncatus* in glycerine, lateral view

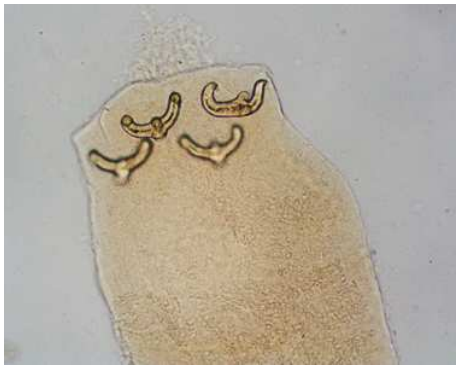

Fig. 2: Scolex of *Triaenophorus nodulosus* in Berlese-mixture with characteristic tridental hooks

A long term investigation of the endoparasite community of eel, *Anguilla anguilla*, from Lake Neusiedl, Austria

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The intestinal helminth parasite community of European eels, *Anguilla anguilla*, stocked into the shallow eutrophic Lake Neusiedl, Austria, was monitored from 1994 – 2009. A total of 1044 eels from two sampling sites (Illmitz and South) were examined. The parasite community showed characteristics similar to those in natural eel populations in Europe with only six species comprising the component community and a maximum infracommunity richness of four species. Between 1994 and 2004, the intestinal parasite community of the sampling site in Illmitz, which was originally dominated by *Acanthocephalus lucii*, changed. As levels of *Acanthocephalus anguillae* increased to a point at which it dominated the community, diversity increased whilst dominance of this species decreased. By contrast, the community in the southern sampling site remained rather constant with a continuously high infection level of *A. anguillae* and low abundance of *A. lucii*. Both acanthocephalan species exhibited higher infestation levels in larger eels and in different seasons of the year and the infestation parameters were significantly different between the years of study. After 2004, *A. lucii* was not found in either of the two sampling sites, which coincided with a drastic decline of its main final host *Perca fluviatilis*, whereas *A. anguillae* infestation remained at similar levels as before. Changes and differences in the fish communities of the two sampling sites and eel movements rather than interspecific competition are discussed as possible explanations for the differences in the parasite communities of the two sampling sites.

Helminths of frogs from Lake Neusiedl

Elisabeth Singer, Helmut Sattmann

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The helminth fauna of water frogs (52 *Pelophylax esculentus*, 25 *Pelophylax lessonae*) from Lake Neusiedl has been investigated in 2002 and 2003 by Elisabeth Singer in course of her diploma thesis. Differences in species diversity, prevalence and intensity of helminths in respect to host species, host age and host habitats have been analysed.

The frogs had been collected between 1958 and 1992 during scientific surveys of the region. *P. esculentus* were represented by adult frogs from two localities and juveniles from one locality. *P. lessonae* were represented by adults from one locality. *P. esculentus* were kindly provided from the herpetological collection of the Natural History Museum in Vienna and *R. lessonae* were kindly provided from Heinz Tunner from the University of Vienna. Frogs were preserved in 70% ethanol and have been studied by parasitological dissection. Helminths obtained were stored in 75% ethanol. For determination, nematodes were brightened with glycerine, digeneans and acanthocephalans were stained with borax carmine, lactic acid carmine or alaun carmine according to Reichenow (1969). Specimens have been determined according to the topical literature. Vouchers of the material are stored in the helminth collection of the Natural History Museum in Vienna.

In total 8.470 individual helminths representing 22 species, have been recorded from 77 host individuals. This concerns 18 species of Digenea, 3 of Nematoda and 1 Acanthocephala. Five species were evident only in *P. esculentus*, another five species occurred only in *P. lessonae*. The latter showed higher prevalence of nematodes and a lower prevalence of trematodes. Juvenile *P. esculentus* showed a significant lower prevalence in total helminth burden than adults. *P. esculentus* from the eastern shore of the lake had significantly higher helminth species diversity than those from the western side of the lake. Comparison of infection of sexes was not considered, as *P. esculentus* is represented in the region almost only by females, which can be attributed to the hybridogenesis and sexual parasitism of this peculiar species.

In total the high diversity of helminths is remarkable, especially the richness of digeneans. Due to its aquatic mode of life, water frogs are particularly susceptible to infection by water born symbionts/parasites/diseases. Accordingly most digeneans are transmitted by water molluscs and water insects. The little more terrestrial lifestyle of *P. lessonae* compared to *P. esculentus* is also mirrored in the slightly lower prevalence and diversity of digeneans and also in the higher prevalence and species diversity of nematodes. Differences in the parasitization of adult and juvenile frogs are known from the literature as a process of parasite change during the development. Some of the parasites recorded are known to prefer milder climatic conditions, like *Strongyloides spiralis* which was recorded here the first time for Austria. The same applies to *Opisthodiscus diplodiscoides,* a digenean of the large intestine. Lake Neusiedl as a shallow lake under mild Pannonian climate may favour their occurrence, but also climate warming might foster such thermophile species. It would be of interest to compare these results, which are dating back several decades, with the current

situation. Such an investigation might reveal changes in the helminth fauna due to globalisation, climatic changes and faunistic transformations.

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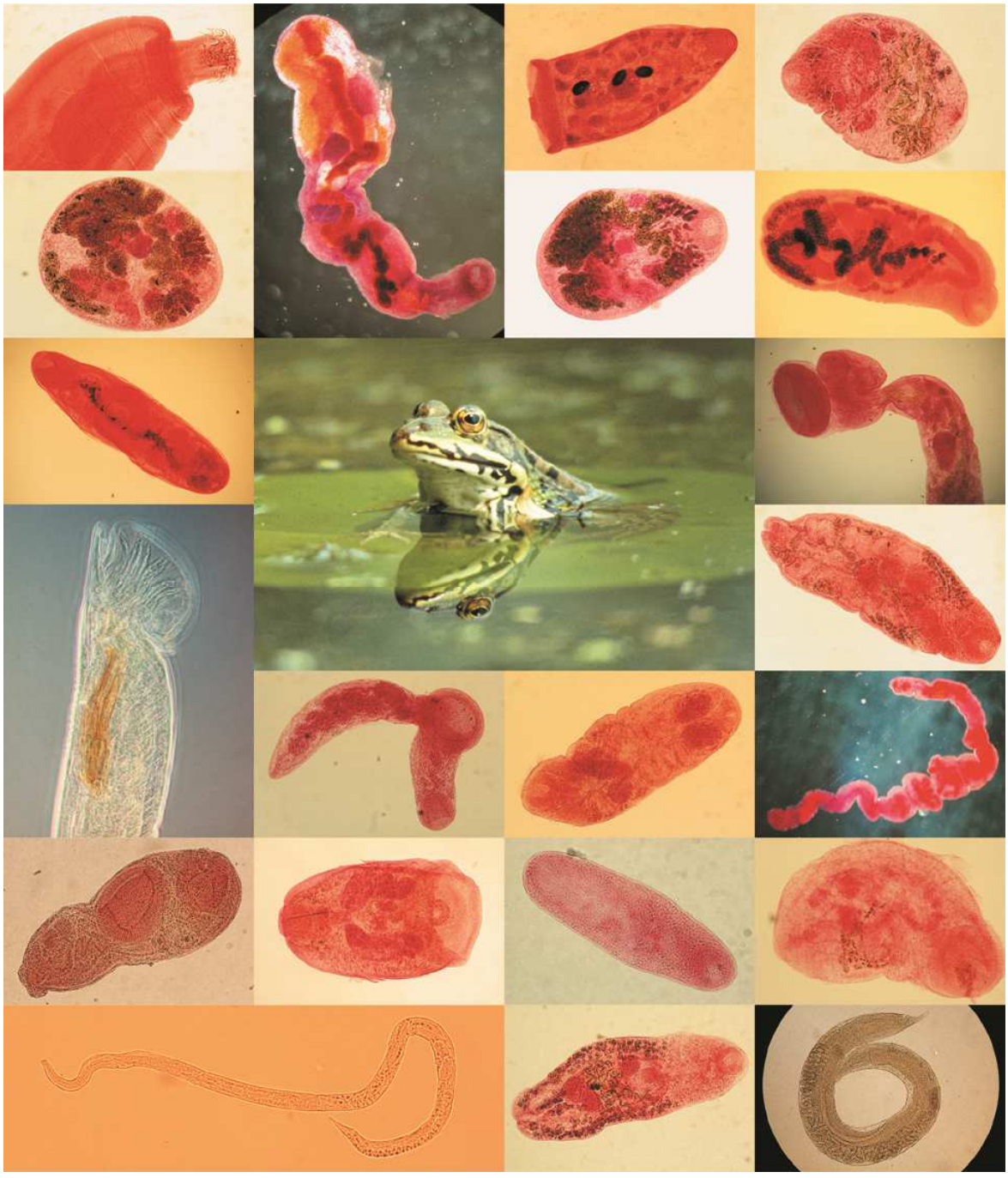

Figure: Diversity of frog parasites from Lake Neusiedl. Photo: NHMW

Digeneans in freshwater snails in Burgenland with special reference to cercarial dermatitis

Christoph Hörweg[1], Larissa Gaub[1,2], Anna Sophia Feix[1], Julia Walochnik[2], Helmut Sattmann[1]

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The first occurrence of cercarial dermatitis in Austria has been documented by Graefe 1971 in Burgenland from Lake Neusiedl in 1969. In Austria cercarial dermatitis occurs regularly nearly every summer. In Burgenland there have been some other confirmed cases of dermatitis and/or the occurrence of potential agents: in Lake Neusiedl in 1998 (*Bilharziella polonica* from *Planorbarius corneus*) and from the Burger Stausee (people affected with cercarial dermatitis) in the year 2005.
But now, 45 years after the first records, we finally have the molecular proof of the occurring species - *Trichobilharzia szidati* and *Bilharziella polonica*, both found at a pond near Rohrau.

The three main intermediate host snails for bird schistosomes are the great pond snail *Lymnaea stagnalis*, the great ram's horn snail *Planorbarius corneus* and pond snails of the genus *Radix*. Within a survey of water molluscs of the "Leitha-Auen" and the surrounding area over 40 locations have been investigated between April 2012 and July 2013. More than 1,800 water snails has been collected and screened for digeneans; 350 individuals of those three species and nearly 1,450 individuals of the liver fluke snail *Galba truncatula*.

No fasciolids were found yet, but some interesting other digeneans appeared, like *Paramphistomum* sp. in *Galba truncatula*, *Trichobilharzia szidati* in *Lymnaea stagnalis*, *Bilharziella polonica* in *Planorbarius corneus,* echinostomids and diplostomids in *Planorbis planorbis* and some others. An overview of the snails and digeneans found will be given.

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An exotic *Schistosoma* species in Central Europe: what are their intermediate snail hosts?

Gábor Majoros

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The mammalian blood-fluke, *Schistosoma turkestanica* (syn. *Orientobilharzia turkestanica*) was discovered in red deer (*Cervus elaphus*) in a very limited area of Hungary, along the bank of the Danube River in the southern part of the country. This fluke had been thought to be a native Asian species, and no other endemic mammalian blood-flukes had been known in Europe so far, the discovery caused a surprise. The close relationship of *S. turkestanica* to the human schistosomes is evident as the cercariae are able to penetrate human skin, causing the inflammatory condition cercarial dermatitis, which is now considered to be a zoonosis of public health concern in parts of Southern, Central and Western Asia. In Asia, *S. turkestanica* usually parasitizes horned ruminants (buffaloes, cattle, sheep), however to date in surveys from Hungary it has only been found in antlered game. Its larvae develop in the snail *Radix auricularia* in Hungary as in most parts of Asia. However, *R. auricularia* is not a very common species in Hungary and lives in marshy lakes and, to date, no other five lymnaeid snails that live in Hungary have been found that may act as intermediate hosts of *S. turkestanica*. Mitochondrial DNA sequences of the Hungarian *S. turkestanica* indicate that the parasite has been living in Central Europe for a very long time and represents a very separate lineage to the Asian populations. It looks that they retained their original intermediate host in the new continent, but they found a new definitive host. It is unlikely that Hungarian *S. turkestanica* would be unable to infect horned ruminants, but *R. auricularia* snails only occupy a few natural foci which would restrict them to only encounter deer. This illustrates the parasite's high fidelity to its intermediate host and the adaptability to widen definitive host range. This situation resembles other fluke populations such as South American *Fasciola hepatica* only parasitizing the snail species *Galba truncatula* and very close relatives of it, but establishing and maturing infections in llamas and guanacos as definitive hosts rather than cattle and sheep.

Dirofilaria repens and *Dirofilaria immitis* in Austria

Hans-Peter Fuehrer[1], Herbert Auer[2], Katja Silbermayr[1], Georg Duscher[1]

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Dirofilaria repens and *D. immitis* are filarioid helminths with domestic and wild canids as main hosts and mosquitoes as vectors. Both species are known to cause zoonotic diseases, namely pulmonary (*D. immitis*), ocular (*D. repens*) and subcutaneous (*D. repens*) dirofilariosis. Both *D. immitis* and *D. repens* are known as invasive species and their distribution is associated with climate change. Until very recently both species were known not to be endemic in Austria.

In Austria most cases of *Dirofilaria* sp. in humans and dogs are introduced. However, rarely infections with *D. repens* were discussed to be autochthonous. The introduction of *D. repens* to Austria was confirmed very recently – within a mosquito surveillance the parasite was examined in Burgenland for the first time in its vector.

The distribution of *Dirofilaria* sp. in Austria remains unclear. But the first findings of *D. repens* in mosquitoes have shown that the parasite is present in Eastern Austria. However, if the parasite is seen to be endemic, has to be discussed.

Endoparasites in Austrian badgers

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The badger (*Meles meles*) is the largest mustelid species in Central Europe, but its parasite fauna is poorly described so far. To get a first insight into the parasites of Austrian badgers, 20 adult animals (9 males, 11 females) from four eastern state provinces of Austria were included in this study. Animals were killed by accidents or hunting.
The gastrointestinal tract, urinary and gall bladder, liver, heart and lungs were removed and examined. The gastrointestinal tract was opened longitudinally and helminths were obtained by sieving the contents. Muscle tissue samples from tongue, diaphragm, and intercostal muscles were subjected to pepsin digestion, and faecal samples were examined by flotation with saturated sugar solution (specific gravity: 1.28).
All badgers were positive for helminths of at least one species, with nematodes being most common and diverse (Figure 1).

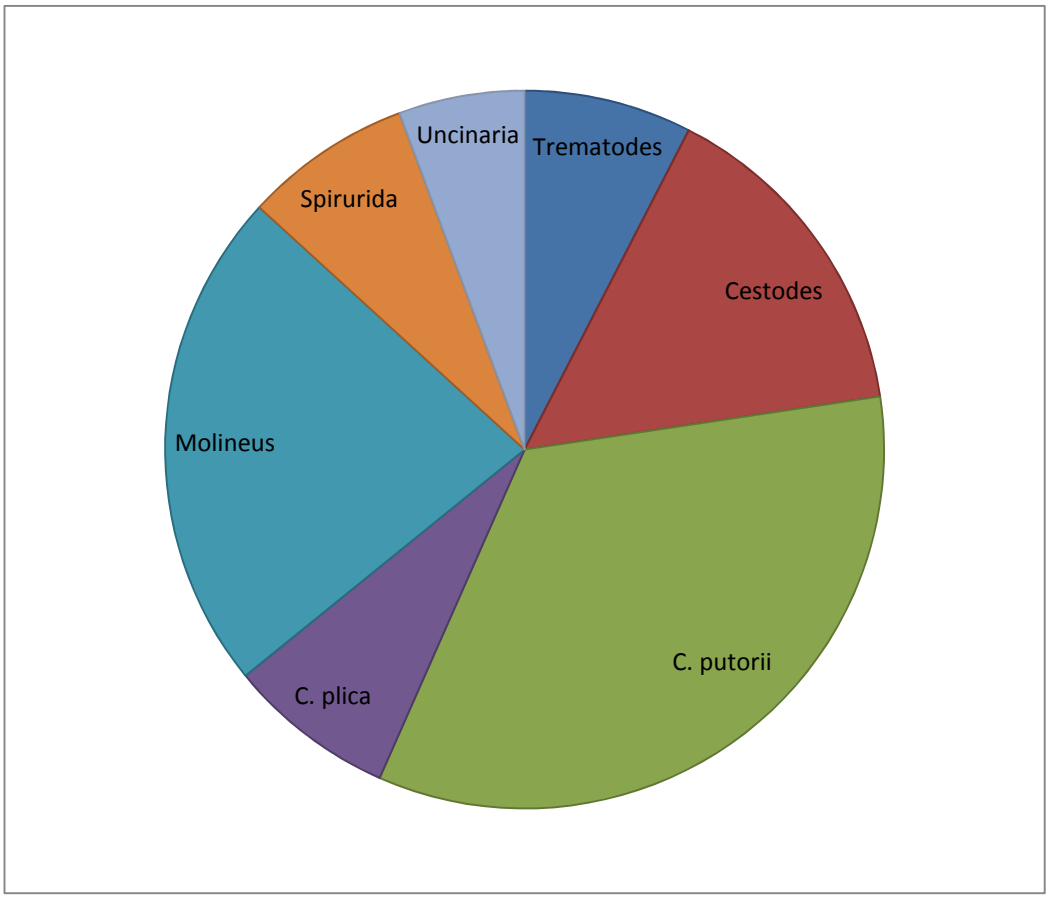

Figure 1: Prevalences of different helminths as determined by necropsy

Capillaria putorii was the most frequent species (90% of the badgers), followed by *Molineus* spp. (60%), *Capillaria plica* (22%), spirurids (20%), hookworms (15%), cestodes (families Anoplocephalidae and Mesocestoididae; 40%). The mean number of individuals of *C. putorii*

was 214/badger, with a maximum of 1,913 worms/animal. Most worms were located in the stomach, in some cases in the small intestines and in two badgers few individuals of *C. putorii* were also found in the large intestines. *Molineus* spp., by contrast, inhabited the small intestines with the exception of a single animal that has a gastric infection; most animals had low numbers of worms (29.8/badger) with a maximum of 133 worms/badger. The trematode *Euparyphium melis* was found in 3 animals, two individuals harboured flukes in the stomach /65 and 1 fluke/badger) and one in the stomach (10 flukes) and small intestines (141 flukes).

Differentiation of some helminths was unsuccessful in some cases due to maceration.

About half of the cases of nematode infections were also positive in the faecal examination (30% positive for gastrointestinal strongyles, 40% for *Capillaria*); in addition taeniid eggs (15%) and trematode eggs (5%) as well as coccidian oocysts (55%) were detected (Figure 2).

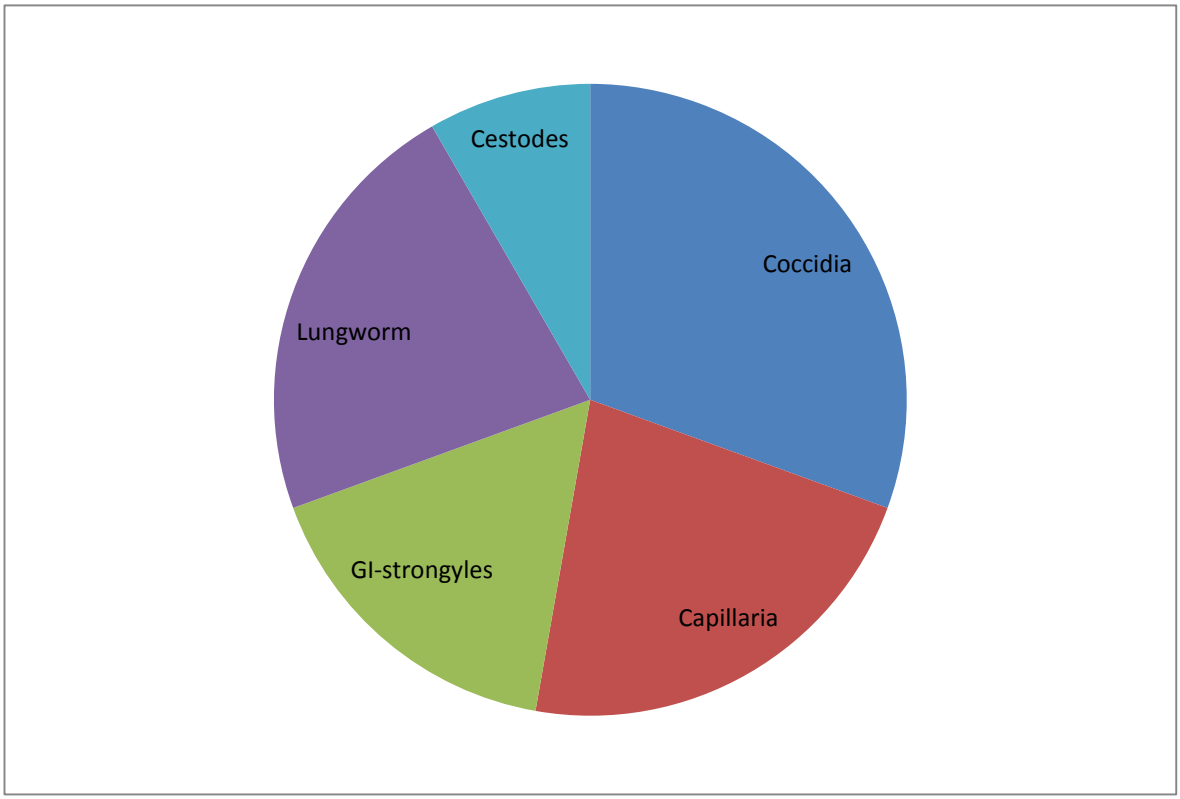

Figure 2: Prevalences of different parasites as determined by coproscopy

The helminth fauna of Austrian badgers appeared similar to that of badgers from Northern Germany. Differences between male and female animals with regard to infection intensity or extensity were not significant; only a tendency of male animals for higher infection rates for *Molineus* spp. was observed. Coccidia were found in high rates although the examined badgers were adult, so it can be assumed that coccidiosis can be a health issue in puppies as this age group is prone to clinical signs such as growth retardation and increased mortality.

Trichinella was not diagnosed, but the small number of samples does not permit definitive conclusions for the situation in Austria since infection rates in red foxes are also low. Nevertheless, the parasite fauna of the examined animals appears to have a low zoonotic potential. A larger number of samples from animals from different areas will be necessary to obtain a comprehensive picture of the Austrian badgers' parasites.

Wildlife in the city: hedgehogs, ticks and pathogens

Gábor Földvári

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We carried out an eco-epidemiological study of an urban population of the Northern white-breasted hedgehog (*Erinaceus roumanicus*) in a park of Budapest for three years. Our preliminary results showed that large number of ticks including imported tick species can survive in close proximity to humans if hedgehogs are present. Here we examined the role of hedgehogs in the urban ecology of Lyme borreliosis and two other emerging tick-borne bacteria.

Hedgehogs were live-captured and anesthetized; DNA was extracted from ear tissue samples and PCR, qPCR and sequencing was performed. Surprisingly 216/230 (94%) ear tissue samples were positive for the LB spirochete. Prevalence of *B. burgdorferi* s.l. in ticks flagged in the park was 33.15% (177/534). Sequencing showed the presence of *Borrelia afzelii, Borrelia spielmanii* and *Borrelia bavariensis* in hedgehogs and in questing ticks. *Candidatus* Neoehrlichia mikurensis was detected in 2.3% (2/88) and *Anaplasma phagocytophilum* in 76% (67/88) of tested hedgehogs. Prevalence of *A. phagocytophilum* and *Candidatus* N. mikurensis in questing ticks was 22.1% and 19.29%, respectively.

The recently emerged *Candidatus* N. mikurensis was detected for the first time in non-rodent hosts and this is the first report of *A. phagocytophilum* in *E. roumanicus*. Our data draw attention to the possible risk of human infection with these emerging bacteria in urban habitats. We hypothesize, however, that a significant difference exists in the tick density of open grassy areas (where visitors tend to spend their time) versus bushes with dense vegetation causing a lower real risk of human infections than expected.

On the tick fauna of wildlife species in Eastern Austria

Martin Schebeck[1], Armin Deutz[2], Thomas Guggenberger[3]

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Ticks (Ixodida) are, besides mosquitoes, the most important vectors of pathogens in Central Europe. They are temporary, obligatory ectoparasites of land living vertebrates. Mammals are relevant as reservoir of these pathogens, for maintenance and distribution of tick populations. Moreover, the occurrence of ticks depends on abiotic factors, especially on air temperature and humidity (there is less occurrence in periods with high temperature and low humidity). In this study, tick species infesting game (roe deer, red deer, wild boar, hare, and red fox) were observed, on one hand. On the other hand, the seasonal trend of the occurrence was described by box plots and by a generalised linear model. Moreover, this trend was correlated with climatic parameters by a multiple regression.

Three tick species were found on the observed game species: *Ixodes ricinus*, *Haemaphysalis concinna* and *Dermacentor reticulatus*.
There were higher infestation numbers with ticks from the beginning of May till the middle of June and from the end of September till the beginning of November (Fig. 1). Red deer showed the highest infestation rates.

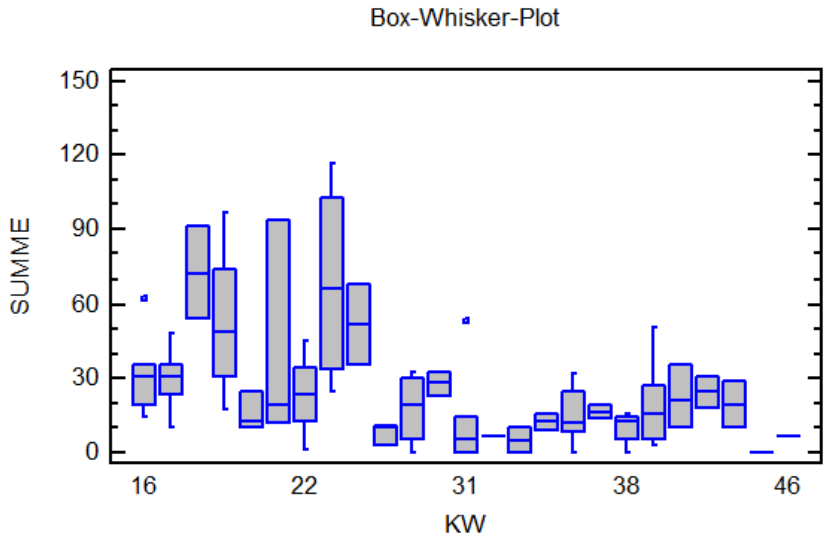

Fig 1: Mean infestation rates of roe deer per week [ticks/host] (KW = calender week, SUMME = sum).

There were no plausible correlations between the infestation rates and climatic parameters.
The ticks found in this study are known in the investigation area and the seasonal trend is similar to those found in other studies. Possible reasons for missing correlations with meteorological data may be the intrinsic phenology of the tick species, a too rough solution of the meteorological data (no microclimate) or less importance of climate factors after an infestation.
Moreover, the influence of climate warming on distribution patterns of ticks is discussed.

Molecular analysis indicates the presence of different *Dictyocaulus* lungworms in cervids in Germany and Austria

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Lungworms of the genus *Dictyocaulus* are important parasites of both domestic bovid ruminants and free-living and farmed cervids. Because of the lack of reliable morphological characters (including potential host-induced morphological variability) and conflicting results of experimental cross-infection studies, there has been an ongoing dispute over the species within the genus *Dictyocaulus*. While *D. viviparus* is commonly accepted as the lungworm of cattle, recently conducted molecular studies led to the identification of a number of species/genotypes which parasitize cervids as primary hosts. In Germany and Austria, lungworms isolated from cervids were identified previously either as *D. viviparus* or, more recently, collectively as *D. eckerti* mainly on the basis of the different morphology of the buccal capsule. A recently conducted study on the endoparasites of roe deer from an area in Austria determined the lungworms based on molecular identification as *D. capreolus*, a species described first in 2002 (Schwarz et al., 2011).

In order to add information on the *Dictyocaulus* lungworms parasitizing wild cervids, DNA was extracted from archived, ethanol-preserved adult *Dictyocaulus* worms obtained from roe deer (*Capreolus capreolus*, n=8), red deer (*Cervus elaphus*, n=14), sika deer (*Cervus nippon*, n=1) and fallow deer (*Dama dama*, n=3) originating from different locations in Germany (Springe/Lower Saxony, Möhnesee/North Rhine-Westphalia, Vogelsang/North Rhine-Westphalia, Schlitzer Land/Hesse, Oberpfälzer Wald/Bavaria) and Austria (Ostrong/Lower Austria, Karwendel/Tyrol, Kaunertal/Tyrol). The ITS2 gene was amplified using a conventional PCR protocol, the PCR products were sequenced, and the sequences were compared with sequences of *Dictyocaulus* specimens available in GenBank® (Schwarz et al., 2011).

Lungworms isolated from the roe deer and the one sika deer (living sympatric with roe deer) had ITS2 sequences corresponding to *D. capreolus*. The ITS2 sequences obtained from lungworms derived from red deer were either identical to *D. eckerti* as described previously from fallow deer in Germany (Epe et al., 1997), '*Dictyocaulus* sp. of red deer' or '*Dictyocaulus* sp. of fallow deer'. Lungworms isolated from fallow deer revealed ITS2 sequences corresponding either to '*Dictyocaulus* sp. of fallow deer' or '*Dictyocaulus* sp. of red deer'. *Dictyocaulus capreolus* (roe deer + sika deer), *Dictyocaulus* sp. of fallow deer' (red deer + fallow deer) and '*Dictyocaulus* sp. of red deer' (red deer + fallow deer) were recorded each from two cervid species.

In conclusion, the ITS2 DNA sequences of lungworms obtained from four cervid species allowed distinguishing four different sequence variants of *Dictyocaulus*. These results have broadened the knowledge concerning the lungworms of cervids in both Germany and

Austria and confirm the diverse nature of the *Dictyocaulus* lungworm fauna of cervids which was indicated in previous studies from Sweden and Spain (Divina et al., 2002; Höglund et al., 2003; Carreno et al., 2009). However, further systematic molecular studies of lungworms collected from sympatric cervids are needed for a better understanding of the epidemiology and phylogeny of the dictyocaulid lungworms.

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Alpine-Carpathian Corridor for invaders: Will *Fascioloides magna* invade the Alps via the Leitha Mountains?

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In spring 2014 a wildlife crossing over the highway A4 near Göttlesbrunn-Arbesthal has been built within the Alpine-Carpathian Corridor project.

The giant liver fluke *Fascioloides magna*, an invasive trematode (Digenea) species originating from North America, was recorded in Europe for the first time in 1875 in Italy. In Austria it was detected in the wild since the year 2000 at River Danube. The lesser pond snail *Galba truncatula*, an amphibious snail autochthonous and abundant in Austria, evidenced to act as snail intermediate host in Austria; cervids, particularly red deer, roe deer and fallow deer have been recorded as final hosts. Molecular data indicate that the parasite was imported from sources of infection in neighbouring habitats in Hungary or Slovakia. Similar to the cervid hosts, parasites seemed to be rather isolated until now, since the Danube floodplains between Vienna and Bratislava are fenced by highways, railroads, settlements and intensive land use.

Recently green bridges and other measures, initiated by EU joint projects, aim to connect populations of game which are now isolated, and to promote hence genetic exchange and to impede loss of genetic diversity. In particular a green bridge crossing the Highway East (A4, E58) will join the Danube floodplains with the forests aside Leitha River and subsequently with the Leitha Gebirge, the eastern Alps but also the Pannonian plains. These directions may resemble natural migrating route for deer. Thus it may also cause further dispersal of parasites and diseases of game animals.

For assessing the risks of spreading of the Giant Liver fluke it is essential to get data about abundance and ecology of hosts and about the epidemiology of worms. Besides final hosts, the availability of suitable intermediate hosts is essential for a successful invasion of the digenean parasite. For this reason a survey of water molluscs of the “Leitha-Auen” has been conducted recently and samples of the occurring snails have been investigated parasitological. Nearly 1,400 water snails (including 920 individuals of *G. truncatula*) have been investigated parasitological by dissecting. Morphology and genotyping was used for worm species delimitation.

Several water snail species evidenced to be occurring in the water bodies of Leitha River and its surroundings. Among them *G. truncatula* was recorded from several localities at the river shore, but obviously less abundant than it was found in a previous study in the Danube floodplains. Several other lymnaeid, planorbid and prosobranch snail species have been recorded. None of the snails was parasitized with *F. magna*, alike none was infected with *Fasciola hepatica*, the European Sheep Liver Fluke. Several other digeneans were recorded from those snails, among them *Trichobilharzia szidati* and *Bilharziella polonica*, agents of cercarial dermatitis.

Although up to now an infestation of snails with Giant Liver Fluke larvae has not been proofed at the surroundings of Leitha River, the habitat harbours suitable intermediate host species as well as final host species and hence the potential of successful completion of the cycle. Investigations on the distribution of freshwater snails and a parasitological monitoring of deer and snails at the Leitha Gebirge and at other habitats encompassing the migration routes of game animals will be continued.

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Recent findings of *Alaria alata* mesocercariae in wild boars in Austria, Hungary and the Czech Republic

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Since the 1880ies, motile parasitic objects have been reported in pork tissues, as an occasional finding during trichinelloscopy (Duncker´s muscle fluke). Similar objects have been described in frog legs in that time. Much later it became clear that these parasites are mesocercarial stages of *Alaria alata*, a trematode which infests the intestines of carnivores. Since the 1970ies, some reports on human disease through ingestion of mesocercariae have been reported, but not in Europe and not associated with pork. Although mesocercariae findings in wild boar have been described from around 1915 onwards, the parasite received more interest of meat hygienists only in the last two decades, maybe due to increasing numbers of wild boar carcasses utilized as food and more sensitive methods for *Trichinella* examination. In recent studies in Austria (2011-2014), the southeast of the Czech Republic (2012-2013) and west Hungary (2013), mesocercariae were recovered from 65/1,362; 15/221 and 5/316 wild boar carcasses, respectively. The studies demonstrated that wild boar meat with vital mesocercariae will be placed on the market, and that there was a pronounced regional clustering. Temporal and regional clustering has been reported in literature and can be explained by the life cycle of this parasite.

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