

XVIII EUROPEAN CONGRESS OF LEPIDOPTEROLOGY

Programme and Abstracts



29 July – 4 August 2013, Blagoevgrad, BULGARIA

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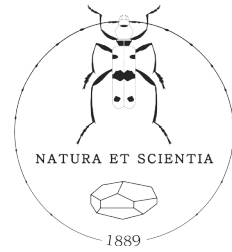


Sofia 2013

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Venue for presentations

All sessions are in the Balkanski Academic Center:

The plenary sessions and key note talks are always in the Andrey Delchev Auditorium, as are the parallel sessions A.

Parallel sessions B are Hall “B”, not far from the auditorium.

The poster session and exhibitions are also in the Balkanski Academic Center.

The Theatre and the Canteen are in “America for Bulgaria Student Center” (New Campus), opposite Balkanski Academic Center.

Programme

Monday, 29 July

17.00 Welcome reception

19.30 Dinner. New Corpus, Canteen

Tuesday, 30 July

New Corpus, Theatre. Opening Ceremony

7.30 Breakfast. New Corpus, Canteen

9.00 Welcome

9:15 **Gerhard Tarmann:** Opening Address by the President of the SEL

9:30 **Peter Beron:** Opening Address on behalf of the National Museum of Natural History, Sofia

9:45 **Stefan Kirilov:** Opening Address on behalf of the Directorate of the Rila National Park. Presenting the Rila National Park

10:00 **Elena Topuzova:** Opening Address on behalf of the Directorate of the Pirin National Park. Presenting the Pirin National Park

10:15 **Stoyan Beshkov:** Treasures of the Congress center and its surroundings – species and habitats

New Corpus, Canteen

11.30 Cocktail

Auditorium. Invited plenary lecture

14:00 **Niels Peder Kristensen:** Early lepidopteran evolution in the light of the newly discovered 'Kangaroo Island Moth'

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Auditorium. Plenary session: Systematics, Phylogeny

chair: Erik van Nieukerken

14:40 Wolfram Mey: First record of the family Micropterigidae from Bitterfeld amber (Insecta, Lepidoptera, Micropterigidae).

15:00 Maria Heikkilä*, Marko Mutanen, Pasi Sihvonen, Niklas Wahlberg & Lauri Kaila: Phylogeny of ditrysian Lepidoptera – progress report of the morphological study.

15:20 Francesca Vegliante: Copulatory mechanism of *Anania hortulata* (Pyraloidea: Crambidae).

15:40 Coffee Break

**Auditorium. Parallel afternoon session A:
Symposium Molecular Phylogeny**

Convenor: Niklas Wahlberg

Hall B. Parallel afternoon session B

16:20 Niklas Wahlberg: Diversification over millions of years in Lepidoptera: the effect of climate changes and plant radiations.

16:40 Camiel Dooreweerd* & Erik van Nieukerken: Diet conservatism and distant host shifts allowed for global radiation in *Ectoedemia* sensu stricto (Nepticulidae).

17:00 Erik van Nieukerken, Camiel Dooreweerd & Ruben Vijverberg: Heliozelidae phylogeny and hostplant relationships.

17:20 Jadranka Rota: Using an eight-gene phylogeny of metalmark moths (Choreutidae) to explore the evolution of host plant usage.

17:40 Irena Kleckova, Martin Cesanek & Zdenek Faltyněk Fric: Phylogeny of butterflies of the genus *Oeneis* and the evolution of boreomontane Holarctic fauna.

18:00 Erki Ōunap & Jaan Viidalepp: Phylogeny of Larentiinae (Lepidoptera: Geometridae), inferred from nuclear and mitochondrial genes.

16.20-18.20 Hossein Rajaei: Workshop “Scientific Digital Drawing”.
Participants 12, please register at reception.

19.00 Dinner

* apply for student's competition

Wednesday, 31 July

7.30 Breakfast. New Corpus, Canteen

Auditorium

Invited plenary lecture

9.00 **Paul Brakefield**: Evolution on the Butterfly Wing: from Molecules to Diversity

Auditorium, Parallel morning session A: Symposium Ecology and Evolution of Butterflies in Mediterranean and Alpine habitats (continued on Friday)
Convenor: Andrea Grill, co-chair Thomas Schmitt

Balkanski Academic Center, Hall B. Parallel morning session B: Taxonomy and speciation in Noctuoidea (continued on Friday)
Convenors: Alberto Zilli & László Ronkay

9.40 **Angelina Gallauner***: Tracing the origins of *Maniola* butterflies: phylogeny, phylogeography, and revision of the genus taxonomy based on genetic markers.

9.40 **Zoltán Varga**: Structural constraints of secondary asymmetry in male external genitalia of Noctuidae (Noctuinae, Hadenini).

10.00 **Andrea Grill**: Hot summers, long life: egg laying strategies of *Maniola* butterflies are affected by geographic provenance rather than adult diet.

10.00 **Herbert Beck**: Rivalry or cooperation between imaginal- and larvalsystematists concerning the systematics of the Noctuoidea? (Lepidoptera, Noctuoidea).

10.20 **Alix Mas***: Effects of temperature stress on *Maniola* larvae.

10.20 **Łukasz Przybyłowicz & Sebastian Tarcz**: Towards the understanding of Pseudothyretes classification (Lepidoptera: Erebidae: Arctiinae).

10.40 Coffee break

11.10 **Elena Haeler***: Sleeping beauty – Dormancy induction in female meadow brown butterflies *Maniola nurag* and *Maniola jurtina*.

11.10 **Stoyan Beshkov**: An annotated systematic and synonymic check list of the Noctuidae of Bulgaria – 13 years later.

11.30 **Martin Wiemers, Alexander Harpke, Elisabeth Kühn, Martin Musche, Oliver Schweiger & Josef Settele**: Climate change indicators in butterflies – responses of butterfly assemblages to climatic fluctuations in Germany.

11.30 **Ahmad Katbeh**: Contribution to the Noctuidae (Lepidoptera) of Jordan.

11.50 **Daniela Polic***: Mobility of ringlet butterflies in high-elevation alpine grassland: Effects of habitat barriers, resources and age.

11.50 **Herbert Beck**: Biology and systematic position of *Evisa schawerdae* Reisser, 1930.

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12.10 **Marko Nieminen:** Long-term and large-scale metapopulation monitoring of the Glanville fritillary butterfly (*Melitaea cinxia*).

12.10 **Herbert Beck:** News of the Armadini by the knowledge of the larva of *Armada beliothidia* (Hampson, 1896).

12.30 Lunch

Auditorium. Symposium Barcoding Lepidoptera

Convenors: Marko Mutanen & Axel Hausmann

Invited plenary lecture

14.00 **Marko Mutanen:** Species-level para- and polyphyly in DNA barcode gene trees in European Lepidoptera

Auditorium. Parallel afternoon session A

Chair: Marko Mutanen & Axel Hausmann

**Hall B. Parallel afternoon session B:
Conservation and ecology**

Chair: Martin Wiemers & Rudi Verovnik

14.40 **Axel Hausmann & Marko Mutanen:** The Geometrid Moths of Europe: Performance of DNA Barcoding and BIN assignment.

14.40 **Nils Ryrholm:** How to maintain and enhance biodiversity in an industrialized landscape.

15.00 **Mari Kekkonen* & Paul Hebert:** DNA barcode-based species delineation enhances taxonomic workflow in endemic Australian hypertrophine moths (Gelechioidea).

15.00 **Christian Darcemont:** Biodiversity of Rhopalocera in Republic of Macedonia : issues, threats, Red list.

15.20 **Richard Mally*, Peter Huemer, Andreas Segerer, Marko Mutanen & Matthias Nuss:** Revising the European *Udea* species (Pyraloidea: Spilomelinae) - Barcode versus morphology.

15.20 **Zdravko Kolev:** The butterflies of Bulgaria: diversity, challenges and prospects.

15.40 Coffee break

16.20 **Konstantin A. Efetov, Anna V. Kirsanova, Zoya S. Lazareva, Ekaterina V. Parshkova, Gerhard Tarmann & Rodolphe Rougerie:** DNA barcoding as an efficient tool for the Zygaenidae study.

16.20 **Miloš Popović*:** The fascinating butterfly diversity of Serbian Stara Planina Mt. Threatened by ski tourism.

16.40 **Bong-Kyu Byun, Seong Eun Jeong, Seung Jin Roh, Sang-Hyun Koh & Bong-Woo Lee:** Development of Monitoring Techniques for Lepidopteran Forest Pests using DNA barcodes in Korea.

16.40 **Christian Darcemont:** Practical method to compute butterflies area of occupancy (AOO) extrapolation: Example with the Republic of Macedonia.

17.00 Svetlana Nedoshivina : Study on the Tortricidae (Lepidoptera) in Vietnam. Current state and perspectives of using DNA Barcoding.	17.00 Tom Nygaard Kristensen : Genus <i>Melanargia</i> (Rhopalocera) in Nature.
17.20 Vasilii Anikin, Alexandr G. Demin, Maria V. Knushevitskaya : Molecular systematics of Palaearctic casebearer moths (Lepidoptera, Coleophoridae) based on analysis of gene sequence of the first subunit cytochrome c-oxidase (COI).	17.20 Rudi Verovnik : Effects of different types of artificial lighting on moths (Lepidoptera) in Slovenia.
17.40 Peter Huemer, Gustav Elsner & Ole Karsholt : Revision of the <i>Eulamprotes wilkella</i> species-group based on morphology and DNA barcodes, (Lepidoptera, Gelechiidae).	17.40 Ana Nahirnić* : New data on rare Zygaenidae from the Balkan Peninsula.
18.00 Vlad Dinca, Sergio Montagud, Gerard Talavera, Juan Hernández-Roldán, Miguel Munguira, Enrique García-Barros, Paul D.N. Hebert & Roger Vila : DNA barcoding of Iberian butterflies enables a continental-scale assessment of potential cryptic diversity.	18.00 Paul Kirkland : The State of Britain's Moths.

19.00 Dinner

Thursday, 01 August

7.30 Breakfast. New Corpus, Canteen

Midweek Excursion to Rila Monastery and Kirilova Polyana.

Departure 9:00, lunch in the mountain. Cultural program and collecting.

19.30 Dinner at congress centre

Friday, 02 August

7.30 Breakfast. New Corpus, Canteen

Auditorium

Invited plenary lecture

9.00 **Thomas Schmitt**: The molecular biogeography of south-eastern Europe: case studies in butterflies

Auditorium. Plenary morning session: Symposium Biogeography and phylogeography of balkanic-carpathian and balkanic-alpine connections

Convenors: Zoltán Varga & László Rakósy

9.40 **Zoltán Varga:** Biogeography of Balkanic high mountain Lepidoptera.

10.00 **László Rakósy:** Endemic Lepidoptera of Carpathians and their Balkanic connections.

10.20 **Thomas Simonsen:** Phylogeography of *Hepialus humuli* (L.) in Europe: Alpine refugia, postglacial expansions, cryptic diversity and taxonomic implications.

10.40 Coffee break

11.10 **Gerhard Tarmann, Predrag Jakšić & Ana Nahirnić:** ODINS Project: The Zygaenidae of the Balkan Peninsula – aims, efforts, results, outlook.

Auditorium. Parallel session A:

Symposium Taxonomy, history and ecology of mining Lepidoptera

Convenor: Jurate De Prins, co-chair Richard Brown

Hall B. Parallel morning session B:

Symposium Ecology and Evolution of Butterflies in Mediterranean and Alpine habitats (continuation)

Convenor: Andrea Grill, co-chair Thomas Schmitt

11.30 **Richard Brown, Sangmi Lee & Jeffrey K. Barnes:** Asa Fitch — Pioneer American Entomologist and his contributions to descriptions of leaf-mining Lepidoptera.

11.30 **János Pál Tóth, Judit Bereczki & Zoltán Varga:** A review on recent results of *Melitaea phoebe* species group.

11.50 **Rumen Tomov:** The occurrence of alien leaf-mining moths (Lepidoptera) in Bulgaria.

11.50 **Piotr Nowicki, Vladimír Vrabec, Birgit Binzenhöfer, Johann Feil & Barbara Zakšek:** *Maculinea (Phengaris)* dispersal in inhospitable matrix: rare, risky, but long-distance.

12.10 **Sergey Sinev:** Diversity of Microlepidoptera in the Eastern Palaearctic: already known and still concealed.

12.10 **Martina Šašić:** Ecology and conservation of two large blue butterflies *Phengaris teleius* (Bergsträsser, 1779) and *Phengaris nausithous* (Bergsträsser, 1779) in Croatia.

12.30 Lunch

Symposium Taxonomy and speciation in Noctuoidea (continuation)

Convenors: Alberto Zilli & László Ronkay

14.00 **Natalia Kirichenko:** Lepidopteran leafminers on native and alien woody plants in Siberia

14.00 **Rudi Verovnik:** The Butterfly Atlas of Slovenia – a tool for butterfly conservation.

14.20 Levente Szócs : Data on the parasitoid complexes of leaf mining insects on oaks (preliminary results).	14.20 Zoltán Varga, Péter Gyulai, Gábor Ronkay & László Ronkay : Taxonomic and biogeographic review of the genus <i>Chersotis</i> Boisduval, 1840 (Noctuinae, Noctuini).
14.40 Jurate De Prins : A collection of mining Lepidoptera in the post genomic era.	14.40 Discussion

15.00 Coffee break

15.30 General Meeting of SEL in Andrey Delchev Auditorium

18.30 Congress photo in Scaptopara Campus

19.30 Congress Dinner in Vodenitzata Restaurant

Saturday, 3 August

7.30 Breakfast. New Corpus, Canteen

Auditorium

Invited plenary lecture

9.00 **Lyubomir Penev, Teodor Georgiev, Pavel Stoev, Jordan Biserkov, Laurence Livermore, Jeremy Miller, David Roberts & Vincent Smith**: Breaking the publishing bottleneck in biodiversity.

Auditorium. Parallel morning session A: Biodiversity Informatics and collections Chair: Jadranka Rota	Hall B. Parallel morning session B: Life histories, ecology Chair: Nils Ryrholm
9.40 Ian J. Kitching & Thomas Simonsen : Lepidoptera Species File: a community-editable taxonomic resource for a hyperdiverse group of charismatic insects.	9.40 Enrique García-Barros : Designing a body size index for the comparative study of adult Lepidoptera.
10.00 Martin Honey : Collections Management at the Natural History Museum – the last 40 years.	10.00 Dubi Benyamini : Long-term butterfly pupal diapause in Israel.
10.20 Alessandro Giusti : The Sphingidae collection at the Natural History Museum (NHM), London.	10.20 Maurice Jansen : The Lepidoptera species composition of salt and brackish marshes In the Netherlands.

10.40 Coffee break

18 XVIII European Congress of Lepidopterology – 29 July - 4 August 2013, Blagoevgrad, Bulgaria

<p>Session Microlepidoptera Chair: Matthias Nuss</p>	
<p>11.10 Leif Aarvik: Overlap between African and Palaearctic genera of Tortricidae: Cochyliina.</p>	<p>11.10 Iva Mihoci, Mladen Kučinić & Axel Hausmann: Diversity of geometrids (Lepidoptera, Geometridae) in mountains of Dinaric karst and ecological patterns of their vertical stratification.</p>
<p>11.30 Boyan Zlatkov: Structure and possible functioning of the vesica in Eucosmini and Grapholitini (Lepidoptera: Tortricidae).</p>	<p>11.30 Siiri-Lii Sandre, Ants Kaasik, Ute Eulitz & Toomas Tammaru: Colour polyphenism in the larvae of <i>Ematurga atomaria</i> (Geometridae): causes and consequences.</p>
<p>11.50 David Agassiz: A new Sesiid from Africa with an interesting life history (and a puzzling Gelechioid).</p>	<p>11.50 Tommaso Russo, Massimo Di Rao & Alberto Zilli: <i>Polyplocia ridens</i> and <i>P. neoridens</i> (Lepidoptera: Drepanidae), a possible model of geographic differentiation along the Italian peninsula.</p>
<p>12.10 Colin Plant: An inventory survey of the pyraloid moths of Bulgaria (Crambidae & Pyralidae): an informal review of progress.</p>	<p>12.10 Nikolay Shtinkov: Distribution of <i>Leptidea sinapis</i> and <i>L. juvernica</i> (Lepidoptera: Pieridae) in Bulgaria.</p>
<p>12.30 Lunch</p>	
<p>Auditorium. Invited plenary lecture</p>	
<p>14.00 Don Lafontaine: Holarctic Lepidoptera: The Beringian Connection</p>	
<p>Afternoon session A. Session Microlepidoptera and faunas Chair: Wolfram Mey</p>	
<p>14.40 Tomasz Rynarzewski: The significance of larval study of Coleophoridae relationships (Lepidoptera, Gelechioidea)</p>	
<p>15.00 Vassily V. Anikin, Sergey A. Sachkov & Vadim V. Zolotuhin: The results of moths and butterflies investigations of the Volga-Ural fauna (Russia)</p>	
<p>15.20 Paul Waring: Extreme mothing</p>	
<p>15.40 Coffee break</p>	
<p>16.00 Closing ceremony</p>	

Overlap between African and Palaeartic genera of Tortricidae: Cochyliina

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Key words: Africa, Tortricidae, Cochyliina

The Palaeartic region has ca. 350 Cochyliina species in 21 genera (Razowski 2009). From Africa south of Sahara 45 species in 9 genera have been described. Most of the African species have been found in the southern part of the continent. There exist taxonomic problems in *Phtheochroa* and *Cochylimorpha*. The three genera *Eupoecilia*, *Hemiacta* and *Afropoecilia* share traits in the genitalia. The two genera *Diceratura* and *Cochylidia* should probably be synonymised.

A new Sesiid from Africa with an interesting life history (and a puzzling Gelechioid)

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Key words: Sesiidae, myrmecophilia

A Sesiid moth was reared from a domatium (ant gall) of *Acacia drepanolobium* (whistling thorn) from Kenya. This is the first host plant record for an African Sesiid. However, examination of the domatium from which the moth emerged suggested that the larva had not been feeding on the plant, but was dependent on the ants *Crematogaster* sp.. Either the larva had been fed by the ants or else was predatory on them.

A Gelechioid species was taken in Kenya which it is hard to place in a family. The unusual male genitalia are shown and suggestions will be welcome.

The results of moths and butterflies investigations of the Volga-Ural fauna (Russia)

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Key words: Lepidoptera, Russia, Volga-Ural, Eduard Eversmann, faunistics

In the cycle of publications devoted to the revision of the Volga-Ural fauna of moths and butterflies (Anikin et al., 1993-2009), the modern composition for all families was given. This cycle is based on the fundamental monograph by E. Eversmann (1844). Some parts of the cycle were published in collaboration with leading experts on the groups (Dr S.Yu.Sinev, Dr A.L.Lvovsky, Dr A.V.Sviridov, Mrs. E.M.Antonova, Dr P.Ya.Ustjuzhanin and others). In total 3484 species from 82 families (following the system which was accepted by authors at that time) were listed, and 2209 species were added to Eversmann's list. 35 species were deleted from the list as earlier misidentified or really disappeared from the region, or accidentally introduced (for example, *Euchampsonia cristata* Butl.). Nine species were newly synonymized. More than 10 species were described as new. Among the collected moths two species are new both to Europe and Russia. For the Astrakhan Area 539 species are listed, for the Volgograd Area – 1111, Saratov Area – 2301, Samara Area – 1651, Ulyanovsk Area – 1946, Bashkiria – 905, Uralsk and Atyrau Areas (altogether) – 1211 species. During the last 20 years many species were added to the revised list. Thus, we suspect that the species composition of the region is now almost completely known. Future changes and additions can be expected after taxonomic revisions and changes in the status of some species.

Molecular systematics of Palaearctic casebearer moths (Lepidoptera, Coleophoridae) based on analysis of gene sequence of the first subunit cytochrome c-oxidase (COI)

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Key words: Molecular systematics, Coleophoridae, Palaearctic

The family of casebearer moths (Coleophoridae) belongs to the superfamily Gelchioidea (Lepidoptera). It includes about 1500 species, 1184 of which occur in the Palearctic region. The casebearer's place in the taxonomic system remains controversial and unclear due to complexity of the morphological analysis and impossibility of using classical cytogenetic methods. In particular, more than half of the species of the superfamily Coleophorinae are traditionally placed in the genus *Coleophora*, which has a polyphyletic origin according to our research. Molecular phylogenetic methods combined with existing morphological data can make a significant contribution in the development of the natural taxonomy of family Coleophoridae and updating of morphological keys for species definition. In the course of our work we have analyzed the structure of the gene encoding the 1st subunit of cytochrome C oxidase (COI) for 170 specimens belonging to 51 genera of the Coleophoridae. These include 108 specimens, of which the barcode was analysed in

the Canadian Center of DNA barcoding and the barcodes for 62 specimens were taken from GenBank. data were analysed using the maximum likelihood method and the Bayes method. *Chironomus plumosus* (Diptera, Chironomidae) was chosen as distantly related outgroup, and as a related group – a few species of the family Batrachedridae (Lepidoptera). The resulting phylogenetic schemes of the COI-gene confirmed the necessity and validity of dividing *Coleophora* into a few smaller genera, which were singled out earlier according to morphological features. Phylograms indicate the presence of different clades (according to the COI-gene data) of *Coleophora* representatives ranked by authors to genera *Casignetella*, *Perigra*, *Ecebalia*, *Carpochena*, *Goniodoma*, *Damophila*, *Suireia*, etc. A number of evolutionary branches include sequences of separate genera (*Multicoloria*, *Klimeshija*, *Perigra*, etc.) as well as *Coleophora* species which phylogenetic position has not been reviewed yet, so it raises the question about changing their taxonomic status. Furthermore, the existence and monophyly of tribes Casignetellini and Apripturini, the monophyly of the genus *Ardania*, *Eupista*, *Augasma* and *Haploptilia* have been confirmed. Thus, the phylogeny of Coleophoridae, based on COI gene analysis is consistent with previous taxonomic concepts.

Rivalry or cooperation between imaginal- and larvalsystematists concerning the systematics of the Noctuoidea? (Lepidoptera, Noctuoidea)

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Key words: larval systematics, Noctuoidea

All efforts by the imaginal-systematists (Minet 1986, Speidel & al. 1996, Kitching & Rawlins 1998) to prove monophyly of the Noctuidae *sensu* Hampson were in vain. Then the molecular genetists (Mitchell et al. 2006) investigated the problem. On the basis of the investigations by Mitchell and collaborators a LAQ-clade which included the Lymantriidae, the Arctiidae, the quadrifine Noctuidae and also the Nolidae was recognized. On this basis Fibiger & Lafontaine (2006) decided to combine the Lymantriidae, the Arctiidae and the quadrifine Noctuidae with the newly erected family Erebidae. Still unsatisfied with this result, a Finland-based team of scientists (Zahiri et al. 2011) continued the molecular genetical investigations and produced a series of papers, the last of which about the Nolidae *sensu* Kitching 1998 (Zahiri et al. 2012). All these investigations were undertaken without considering the larval-systematical results by Beck (1999, 2000 and especially 2009). Despite the fact that M. Fibiger was aware of these investigations and results since 2005 (SEL-lecture in Rome), he (Fibiger, 2010) did not quote the work by Beck (2009) in vol.

12 of Noctuidae Europaea, listing in place that by Zahiri et al. (2010). The Finnish molecular-genetists around Zahiri (2010, 2011) quoted the work but did not take it in consideration either; the same occurred with the investigation about the Nolidae *sensu lato* (Zahiri et al. 2012).

It shall be addressed here the issue of the great importance of larval investigations for taxonomical decisions on the family-level by the character 'bristle', i.e. by the chaetotaxy, after respective chaetograms. Accordingly, by the clear definition of the Nolidae *sensu stricto*, *sensu* Hampson, *sensu* Beck 2009, it turns out as impossible accepting the present molecular genetical results (Zahiri et al. 2012) regarding the Nolidae *sensu lato*, *sensu* Kitching 1998.

Biology and systematic position of *Evisa schawerdae* Reisser, 1930

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Key words: *Evisa schawerdae*

According to Ronkay & al. 2001: 155 the systematic position of this taxon is not resolved. In spite of the differences as compared with the Lithophanina, Ronkay placed this taxon there. Now by the knowledge of the larva by ex ovo-rearing (Beck 2008/9) it is clear that *Evisa* belongs to the Agrocholina. Evidence for this decision is given by comparison of the genitalia and the larval pattern of *Evisa schawerdae* with those of taxa of the Agrocholina.

News of the Armadini by the knowledge of the larva of *Armada heliothidia* (Hampson, 1896)

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Key words: Noctuidae, Armadini

The systematic position of the Armadini is still unresolved (Goater 2003 puts the Armadini to the Catocalinae, Fibiger & Lafontaine 2005 to the Acontiinae). The revision of the Armadini by Wiltshire 1979 is no true revision. A characterization which includes all taxa he included in the tribe is missing. The characterization of the Armadini and their combination with the Acontiinae by the synapomorphy 'scaphium at the basis with two setosed hills' (Fibiger & Lafontaine) is not specific

enough as to define the character as an autapomorphy. The larval character ‘reduced’ prolegs on A3 (the overall character for the Acontiinae by Hampson) is also completely insufficient, because not at all suitable for characterization. Now the larva of *Armada heliothidia* (Hampson, 1896) is available, all prolegs are completely developed. The pattern of the larva is very close to that of larvae of *Cucullia* Schrank, but the larval morphology gives evidence to combine this species with the Cuculliinae Omiini Recorophorina Beck; whether the status of the Recorophina within the Omiini may be hold is debatable, because Beck includes in it the so different genera as *Recoropha*, *Janthinea* and now ‘*Armada*’ (with *heliothidia*). Whether the combination of *heliothidia* with *Armada* by Wiltshire is correct may be doubted. What we need is a clear imaginal characterization of the Armadini and all its genera.

Long-term Butterfly Pupal Diapause in Israel

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Key words: Diapause, Israel

In the late 1950's while breeding *Euchloe belemia* larva found on a "Crucifer" on Mt Carmel, Haifa, North Israel, the author discovered that the adult hatched after three years. This phenomenon unknown to him and not found in available literature was the incentive to start a life-time experiment of breeding the annual single-brooded Israeli species. The summary of this on-going effort are 792 bred larvae of three families: Papilionidae, Pieridae & Lycaenidae. The author did not find until now long-term pupal diapause in Nymphalids, Satyrids and Hesperids. The longest diapause was found in the desert-flying White, *Euchloe falloui*: its pupa hatched successfully after fifteen years. The presentation deals with fourteen Israeli butterflies where this phenomenon was found. The author analyzes the results to find two major behavioral characteristics: programmed risk-sharing planning of annual hatchings and opportunistic hatching taking advantage of the sporadic annual rains.

Wolbachia infestation in the two phenological forms of Large Blue (*Maculinea arion*) (Lepidoptera: Lycaenidae)

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Key words: *Maculinea arion* – spring and summer type – Carpathian Basin – *Wolbachia*

Socially parasitic and globally threatened *Maculinea arion* has been in the focus of intense conservation research. In the Carpathian Basin *M. arion* exists in two phenological forms ('spring and summer arion' according to their flight periods) which occur in certain habitats. Our previous studies reported on significant differentiation between these forms both in wing and genital traits. At the same time, they did not show any genetic differentiation on two mitochondrial loci and in allozymes. Additionally, we screened altogether 108 *M. arion* individuals from six geographic regions and all specimens proved to be infected by the intracellular bacteria from the genus *Wolbachia* (Rickettsiaceae). Since *Wolbachia* may play a great role in speciation of their hosts and the forming of their phylogenetic and phylogeographic patterns, we examined whether the differences between the two forms of *M. arion* are attributable to *Wolbachia*.

Distributional maps of the NATURA 2000 butterfly and moths species in Bulgaria

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Key words: butterflies and moths, Natura 2000, Habitat Directive, maps

Natura 2000 species are the species that are placed on Annex II of the Directive 92/43/EEC, Treaty of Accession 2003. In Bulgaria at present they are: *Catoptia thrips* (Hübner, 1818), *Eriogaster catax* (Linnaeus, 1758), *Lycaena dispar* ([Haworth], 1802), *Phengaris (Maculinea) nausithous* (Bergsträsser, 1779), *Polyommatus eroides* (Frivaldszky, 1835), *Nymphalis vaualbum* ([Denis & Schiffermüller], 1775), *Euphydryas maturna* (Linnaeus, 1758), *Euphydryas aurinia* (Rottemburg, 1775), *Desertobia (Erannis) ankeraria* (Staudinger, 1861), *Lignoptera fumidaria* (Hübner, [1825]), *Euplagia quadripunctaria* (Poda, 1761) and *Dioszeghyana schmidtii* (Diószeghy 1935). The distribution of these species in Bulgaria is presented on maps. From these *Catoptia thrips* (Hübner, 1818) is on the way to extinction, because all known localities are almost completely destroyed. The last time it was found in Bulgaria was 18 years ago. *Coenonympha oedippus* (Fabricius, 1787) and *Colias myrmidone* (Esper, [1781]) were reported from the country at the beginning of last century, but now they are extinct in Bulgaria. *Gortyna borelii lunata* (Freyer, 1838) was wrongly reported from Bulgaria as a result of mislabeling. *Leptidea morsei* (Fenton, 1881) needs to be confirmed for the country. *Lycaena belle* ([Denis & Schiffermüller], 1775) was surely proved for the country by foreign researchers from Netherland, but is not published yet. *Lycaena helle* and *Pseudophilotes bavius* are new addition to Natura 2000 and Bulgarian fauna, not published yet.

An Annotated Systematic and Synonymic Check List of the Noctuidae of Bulgaria – 13 years later

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Key words: Bulgaria, Noctuidae, Erebidae, Nolidae, Erebidae, faunistic

An Annotated Systematic and Synonymic Check List of the Noctuidae of Bulgaria (Insecta: Lepidoptera: Noctuidae) was published by me at the end of 2000 in *Neue Entomologische Nachrichten* 49, Markt-leuthen. 694 species were reported on 300 pages according to concept of Noctuidae followed at that time (as including also Nolidae, Erebidae and Euteliidae). For most of the species critical notes and illustrations of the adults and their genitalia were presented as formal evidence of the identifications. 13 years later, following recent research by the author and other contributors, 19 species new to the country have to be added. Most of relevant records are already published: *Nola ronkayorum* Beshkov, 2006; *Nola barouni* Wiltshire, 1951 (Beshkov, 2010); *Ophiuche lividalis* (Hubner, 1790) (Beshkov & Langourov, 2004; Plant & Beshkov, 2009); *Hypenodes humidalis* Doubleday, 1850 (Plant, Beshkov, Pickles & Zlatkov, 2012); *Eublemma pudorina* (Staudinger, 1889) (Noct. Europ. 12); *Pandesma robusta* (Walker, [1858]) (Beshkov, 2010); *Emmelia candefacta* (Hübner, 1831) (Beshkov, 2010); *Valerietta breblayi* Beshkov, 2006; *Bryophila felina* (Eversmann, 1852) (Noct. Europ. 12); *Apamea 'sicula'* (Turati, 1909) (Zilli, Ronkay & Fibiger, 2005); *Gryposia wagneri* Kobes & Fibiger, 2003 (Beshkov & Langourov, 2004); *Hadena persimilis* Hacker, 1996 (Nowacki & Beshkov, 2004); *Euxoa montivaga* Fibiger, 1997 (Beshkov, 1910); *Euxoa pareruta* Fibiger, Gylai, Zilli, Yewla & L. Ronkay, 2010; *Xestia trifida* (Fischer von Waldheim, 1820) (Beshkov & Radev, 2010).

Xanthodes albago (Fabricius, 1794), *Megalodes eximia* (Freyer, [1844]) (one specimen from Bulgaria in NHM Wien, M. Fibiger, pers. comm.), *Acosmetia caliginosa* (Hübner, [1813]) and *Spodoptera littoralis* (Boisduval, 1833) (J.P. Kaitila, pers. comm.) are reported for the first time from Bulgaria.

Hypenodes orientalis Staudinger, 1901, *Gortyna borelii lunata* Freyer, 1939, *Apamea michieli* (Varga, 1976), *Egira bulgarica* Beshkov, 2000, *Chersotis andereggii* (Boisduval, 1832) and *Chersotis alpestris* (Boisduval, 1837) are considered to be have been wrongly reported for Bulgaria due to mislabeling or misidentification.

Several species were confirmed for the country, e.g. *Hypenodes anatolica* Schwingenschuss, 1938, *Bebouneikia freyeri* (Frivaldsky, 1835), *Epimecia ustula* (Freyer, [1835]), *Caradrina gibba* (Donzel, 1837), *Photodes morrisii* (Morris, 1837), *Coranarta cordigera* (Thunberg, 1788) and others. Many species known only from a single locality in Bulgaria were found in other localities from different parts of the country: *Macrochilo cribrumalis* (Hubner, 1793), *Ophiusa thiraca* (Cramer, [1777]), *Eutelia adoratrix* (Staudinger, 1892), *Diabryisia nadeja* (Oberthür, 1880), *Autographa bractea* ([Denis & Schiffermüller], 1775), *Cucullia pustulata pustulata* Eversmann, 1842, *Cucullia balsa-*

mitae Boisduval, 1840, *Calophasia barthae* Wagner, 1929, *Cleonymia opposita* (Lederer, 1870), *Athetis lepigone* (Möschler, 1860), *Ceryna cervago* Eversmann, 1844, *Dryobota labecula* (Esper, [1788]), *Polymixis trisignata* (Menetries, 1848), *Egira anatolica* (Hering, 1933), *Cerastis leucographa* ([Denis & Schiffermüller], 1775). Other species known as rare in Bulgaria were found in many localities: *Chelis maculosa* ([Denis & Schiffermüller], 1775), *Polygogon tentacularia* (Linnaeus, 1758), *Schrankia taenialis* (Hubner, [1809]), *Amphipyra micans* (Lederer, 1857), *Nyctobrya amasina* (Draudt, 1931), *Amphipoea oculatea* (Linnaeus, 1761), *Oligia versicolor* (Borkhausen, 1792), *Dioszeghyana schmidtii* (Dioszeghy, 1935), *Hadena drenowskii* (Rebel, 1930), *Euxoa conspicua* (Hubner, [1827]), *Agrotis catalaunensis* (Milliere, 1837), *Noctua janthe* (Borkhausen, 1792) and many others.

Treasures of the Congress center and its surroundings – species and habitats

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Key words: habitats, endemic species, SW Bulgaria

The aim of this presentation is to present the surroundings of Blagoevgrad with their different habitats, and to show the treasures among butterflies and moths there. The Congress center, Blagoevgrad is situated in the submediterranean area and at the same time on the slopes of the highest mountain in the Balkans. The surrounding landscapes are very divers, varying from semimediterranean and arid landscapes to evergreen, deciduous and coniferous forests and subalpine meadows. Well preserved natural habitats can be found almost everywhere, the area is mostly mountainous and there is no intensive agriculture or industry. Within one hour of car drive, one can reach subalpine meadows with Balkan endemic or subendemic species such as *Colias caucasica balcanica*, *Erebia rhodopensis*, *Erebia orientalis*, *Boloria graeca balcanica*, *Syngrapha rilaecacuminum*, *Epipsilia cervantes vargai*. Many relict and high altitude species occur in the highest parts of the Rila (2925m) and Pirin (2914m) mountains: *Erebia gorge pirinica*, *Erebia cassioides*, *Erebia pronoe*, *Erebia pandrose*, *Euphydryas Cynthia*, *Boloria pales*, *Glacies coracina*, *Arctia flavia*, *Agrotis fatidica*, etc. Most of these species can be observed around glacial lakes, widely present in Rila and Pirin. In these and other mountains across Blagoevgrad there are also dry limestone habitats with another species composition: *Agriades dardanus*, *Polyommatus nephobiptamenes*, *Charissa certhiatus*, *Hadena drenowskii drenowskii*, *Chersotis anatolica*.

At low altitudes there are different kinds of habitats present with many endemic species, and species with a limited distribution in Europe, some of which are locally abundant. Such species are *Triodia adriaticus*, *Bembecia pavicevici*, *Lemonia strigata*, *Lemonia balcanica*, *Rethera komarovi drilon*, *Zerynthia cerisy ferdinandi*, *Antocharis grune-*

ri, *Euchole penia*, *Polyommatus aroaniensis*, *Pseudochazara orestes*, *Pseudochazara amalthea*, *Archibaris puella mediterranea*, *Kresnaia beschkovi*, *Nyctiodes dalmatina*, *Cryphia seladona*, *Teinoptera lunaki*, *Valerietta niphopasta?*, *Metaegle pallida*, *Janthinea frivaldskii*, *Agrochola thurneri*, *Hadena vulcanica urumovi*, etc. Although the macrolepidopteran fauna is relatively well explored, the fauna of Microlepidoptera is poorly investigated and needs further investigation.

Evolution on the Butterfly Wing: from Molecules to Diversity

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Key words: Mycalesina, Phylogenetics, Parallel Radiations, Evolution, Ecology, Sex Pheromones, Androconia

To what extent do the mechanisms that generate phenotypic variation influence the tempo and direction of evolution, and thus become reflected in patterns of occupancy of trait space and in species' radiations? We are working with several key sets of traits on the wings of butterflies of the subtribe, Mycalesina, to explore such issues. A molecular phylogenetic reconstruction of over two-thirds of the more than 300 species has resolved many of the relationships among and within the major groups (work with Niklas Wahlberg). These include parallel radiations in mainland Africa, on Madagascar and in Asia. We now compare the evolvability of different key traits both experimentally within the model species, *Bicyclus anynana*, and now using a more comparative approach within the radiations and the whole subtribe. Research on wing eyespots and on developmental phenotypic plasticity, crucial for species living in seasonal habitats, has been extended to studies of larval host plants and patterns of diversity in the wing androconia and male sex pheromones involved in mate choice and the evolution of reproductive isolation (work with Christer Löfstedt). Among challenges for the future will be to disentangle both pattern and process involving evolutionary divergence for these key traits, and the ways in which they interact.

Asa Fitch – Pioneer American Entomologist and his contributions to descriptions of leaf-mining Lepidoptera

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Key words: Fitch leaf-mining Lepidoptera America Descriptions

Asa Fitch (1809-1879) was the first salaried, professional entomologist in the United States. He became known for reports on the noxious, beneficial, and other insects of New York, and these reports set the stage for the emergence of American Entomology. He described 451 species of insects and other arthropods, although several of these proved to be junior synonyms. His descriptions of 51 species of Lepidoptera included such well known species as *Atteva aurea*, *Cydia caryana*, *Paraclemensia acerifoliella*, as well as several gelechiids and gracillarids, the latter including species of *Phyllonorycter* and a junior synonym of *Macrosaccus robiniella* based on a reversal of precedence of priority. Fitch described *Sinoe robiniella* (Gelechiidae) based on a flat, deeply constricted larva (similar to *M. robiniella*), a tentiform mine on underside of leaves (similar to *Phyllonorycter*), and an adult that clearly was not a gracillariid. None of the mines or reared specimens are known to exist. This presentation will provide a biographical sketch of Asa Fitch, his contributions to mining Lepidoptera, and a resolution of the identity of a gelechiid species with larvae and mines that represent two genera of gracillarids.

Development of Monitoring Techniques for Lepidopteran Forest Pests using DNA barcodes in Korea

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Key words: Forest insect pests, monitoring, identification, Lepidoptera, DNA barcode

The importance of a correct identification has been increased to solve the problem of various related fields, including forest pest monitoring, insect inventory and survey. Rapid diagnose has emerged as a core issue important to forest protection. However, most insect pests were found in the field in their larval stage, which is very difficult or impossible to identify by external morphological characters. As we know, DNA barcoding is a taxonomic method using the mitochondrial COI gene in the insect's DNA to identify it to species level. Recently we began to study DNA barcoding of forest insect pests to serve the correct identification of the forest insect pests in Korea during 2012-2015, under the financial support of the Korea government (Korea Forest Service). The purpose of this study is to build a library

of the DNA barcode information to obtain an accurate identification using DNA barcode data. We will extend the study taxa annually for the main groups, including the Geometridae, Noctuidae, Tortricidae and Pyralidae. In Korea, more than 3,500 species are known as forest insect pests (Korea Forestry Research Institute, 1997). Among them, a total of 940 species of Lepidoptera are known to date. This makes the Lepidoptera one of the important insect groups. In this study, we sampled the moths in four research areas, carried out a morphological identification, and obtained the DNA barcode. The morphological study with adult material is very important to get a correct DNA barcode. Therefore, we collected adult samples intensively from various localities in Korea, which will be identified by external and genitalic structures. After identification of the specimen, a tissue sample was collected from the hind leg for extracting mitochondrial DNA. The DNA barcode of about 300 species was obtained in the first year of this study. It will be continued to extend the taxa with more samples. The voucher specimens will be preserved in the national collections, such as Korea National Arboretum. We hope this research will provide a solution for the difficulties of the identification of forest insect pests.

DNA barcoding of the family Geometridae (Lepidoptera) in Korea

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Key words: Forest pests, monitoring, identification, Lepidoptera, DNA barcode, Geometridae

This study was performed to provide accurate identification of geometridae, using the DNA barcode. In total, 1,997 adult specimens of 293 species were collected from 12 forest areas in Korea. In this study, we conducted the correct identification using external morphology and genitalic characters. In addition, we observed and compared the voucher specimens, preserved in the major entomological collections in Korea, including Hannam university Natural History Museum (50 species), Korea Forest Research Institute (51 species) and the National Academy of Agricultural Science (35 species) for correct identification. For extracting DNA sequences of the mitochondrial gene COI, the hind legs were detached and sampled with tweezers, providing about 25 mg of tissue sample. We amplified and sequenced the standard DNA barcode fragment of 648 basepairs. As a result, we have complete DNA barcodes for all 190 species. These results will be presented in Forest Pests Information Data Sheets for Geometridae, containing DNA Barcode information, external morphology, ecological characteristics and phenology.

A Synonymic checklist of Genus *Epinotia* (Lepidoptera, Tortricidae) in the Korean peninsula

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Key words: *Epinotia*, Tortricidae, Lepidoptera, Korea

The genus *Epinotia* is one of the largest genera of the tribe Eucosmini, belonging to the subfamily Olethreutinae of family Tortricidae, with more than 1,600 described species worldwide (Brown, 2005). In Korea, in total 17 species were listed by Byun et al. (2009). Later Byun (2011) added a species *Epinotia maculana* (Fabricius, 1775) from North Korea. In the present study, we review and list the genus *Epinotia* for the Korean peninsula.

A total of 18 species of the genus are recorded from the Korean peninsula, including information on North Korea, which is based on material of the Hungarian Natural History Museum, Budapest, Hungary. Other available information, including the distribution ranges and host plants is provided.

Genus *Epinotia* Hübner, [1825]

1. *Epinotia bicolor* (Walsingham, 1900)
2. *Epinotia contrariana* (Christoph, 1881)
3. *Epinotia cruciana* (Linnaeus, 1761)
4. *Epinotia exquisitana* (Christoph, 1881)
5. *Epinotia majorana* (Caradja, 1916)
6. *Epinotia maculana* (Fabricius, 1775)
7. *Epinotia parki* Bae, 1997
8. *Epinotia pentagonana* (Kennel, 1901)
9. *Epinotia piceae* (Issiki, 1961)
10. *Epinotia pinicola* Kuznetsov, 1969
11. *Epinotia ramella* (Linnaeus, 1758)
12. *Epinotia rasdolnyana* (Christoph, 1882)
13. *Epinotia rubiginosana koraiensis* Falkovitsh, 1965
14. *Epinotia rubricana* Kuznetsov, 1968
15. *Epinotia solandriana* (Linnaeus, 1758)
16. *Epinotia thapsiana* (Zeller, 1847)
17. *Epinotia ulmi* Kuznetsov, 1966
18. *Epinotia ulmicola* Kuznetsov, 1966

Genetic diversity of the stem borer *Sesamia nonagrioides* (Noctuidae) populations in south-western Iran, using RAPD-PCR

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Key words: Sugarcane borer, Mediterranean corn borer, gene flow, RAPD

The stem borer *Sesamia nonagrioides* (Lefèbvre) is an important pest of sugarcane in Khuzestan province, south-west Iran. It also damages maize and rice in south-western Iran. The understanding of the intraspecific level of gene flow among populations of an insect pest can be a fundamental step to any pest management practice. Thus, four populations of *S. nonagrioides* from sugarcane, maize and rice fields of Khuzestan and Fars provinces in south-western Iran as well as a population from maize fields of north-west Spain were evaluated, using RAPD. Eight 10-bp oligonucleotides primers produced a total of 64 markers. Nei's genetic distances obtained for paired comparisons of *S. nonagrioides* populations ranged from 0.069 (Firuzabad versus Amir Kabir sugarcane Co.) to 0.169 (Nurabad versus Amir Kabir sugarcane Co.). On the average, the studied Spanish population showed a genetic distance value of 0.129 in paired comparisons with other populations. The genetic distance values were used as input data for two-dimensional principal coordinate analysis (PCA), in order to study the variation among *S. nonagrioides* populations. In general, there were significant genetic differences among the studied populations and the AMOVA has led to a Φ_{PT} estimate equal to 0.393, indicating that 39% of the genetic variability is found among groups and 61% within groups ($p \leq 0.001$). These results suggest the occurrence of a low level of gene flow among pairwise *S. nonagrioides* populations from sugarcane, maize and rice fields in south-western Iran, compared to Firuzabad versus Amir Kabir populations. Such levels of differentiation among populations indicate only moderate dispersal capacity of *S. nonagrioides*, even when no remarkable geographical barriers existed. For an effective management of this pest, there is an urgent need for a better understanding of the gene flow of sympatric *S. nonagrioides* populations associated to different host plants along the distribution range of this species.

Biodiversity of Rhopalocera in Republic of Macedonia: issues, threats, Red list

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Key words: Rhopalocera, Republic of Macedonia, threats, Red list

Few years ago, the team has setup a first Red List of butterflies for the Republic of Macedonia, and as this area of Balkans is suffering of lack of sufficient amount of data, has proposed a protection by law, as a short term answer, for a subset of this list. The highest priority is to ensure that their biotopes will not be threatened by lack of information. The next step is monitoring and active management actions dedicated to each species, this last point being uppermost for endemic species.

This short communication draws up our view of the status of all potential anthropogenic threats, throughout the several regions of the country.

The first part is an overview of natural hotspots and National parks of the country, their global patrimonial interest and their interest for butterflies, and also, less well-known areas, more potentially subject to threats linked to human activities, but very important for the survival of some species.

The second part is an overview of potential threats divided into industrial pollution, status of water, of dumping ground, agriculture and pastoral practices changes, quality of air and direct threats in National parks.

The conclusion is a help to prioritize actions among the selected species.

Practical method to compute butterflies area of occupancy (AOO) extrapolation: Example with the Republic of Macedonia

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Key words: Butterfly, AOO

The amount and distribution of data of butterflies recorded differ significantly according to the area. For example, the Republic of Macedonia is globally under-

sampled, and apart from some well studied “hot spots”, some large areas are data deficient.

For each species, with a low number of recorded localities, the known AOO (Area of Occupancy) of the species is supposed to be smaller than the real one. This paper aims at extrapolating the AOO based on a good knowledge of the environmental data and of the ecology and ethology of the butterfly.

The first step is to collect environmental data, and the proposed model is based on data with an open and easy access, such as altitude, type of soil, humidity and coverage. The conversion technique into an Excel table is described. The table is a matrix covering the map of the studied area and is composed of cells of 1' per 1'.

According to the ecology of the species, a matrix of probability P_{xy} is computed and indicates the degree of suitability of each cell. Then, according to its ethology (dispersal factor), the known locations and the P_{xy} of the cells of these locations, some additional cells are computed as “Extrapolated AOO” with standard mathematical model.

The result is a more accurate representation of the possible AOO and a better estimation of the EOO (Extend of Occurrence) and a help to choose the best appropriate geographical point to visit in next studies on field, to confirm or invalidate the extrapolated data.

A collection of mining Lepidoptera in the post genomic era

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Key words: African, collection, mining Lepidoptera, post genomic

I am happy to present an incomparable collection of smaller Afrotropical moths deposited at the Royal Museum for Central Africa. It has a mission to enhance public understanding and appreciation of the natural world of Africa, insect, plant and the human place in it, sparking curiosity and a spirit of discovery. Most species of mining moths occupy a primitive position in phylogenetic trees, so understanding their evolutionary relationships is the key to understanding the evolution of Lepidoptera. Due largely to technological advances in molecular sequencing and phylogenetic computational analysis we can also clarify insect plant relationship. In this post genomic era, Lepidoptera taxonomy will be furthered by integrative methods aimed at hypothesis corroboration from molecular, morphological, and paleontological evidence. So, the achieved current consensus of relationships in mining Lepidoptera provides a foundation for further comparative studies and offers a framework to evaluate incoming genomic evidence. Notable recent phylogenetic successes include the resolution of Gracillarioidea and Yponomeutoidea and

suprageneric taxa within those superfamilies. Based on the collection of Afrotropical Lepidoptera we are pursuing our goals through 3 research foci: (1) developing a general information system on Afrotropical taxa and quality control of collection specimens in-house; (2) pursuing signals of evolution to identify the morpho-, functional and ecological traits and the underlying mechanisms; (3) examining these traits to understand how they rapidly evolve, and studying their diversity to guide long term research strategies, which ensure the status of the museum collection as a supranational scientific heritage.

DNA barcoding of Iberian butterflies enables a continental-scale assessment of potential cryptic diversity

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Key words: cryptic species, DNA barcodes, Europe, identification, taxonomy

While the number of DNA barcoding studies has dramatically increased during the last years, large scale comprehensive surveys referring to the European butterflies are still lacking. Based on intensive sampling from various regions of Spain and Portugal, we have gathered ca. 3450 DNA barcodes for all Iberian butterfly species, with an average of ca. 15 specimens per species. Subsequently, we combined the Iberian dataset with the other published Barcode of Life Data Systems (BOLD) projects dealing with the European butterfly fauna (covering especially well Romania and southern Germany). This resulted in a dataset of 5782 sequences of carefully identified specimens corresponding to more than 60% of all European butterfly species (with an average of ca. 19 specimens per species). This large dataset, which includes a good representation of both Mediterranean and temperate areas, provides novel insights not only into the effectiveness of DNA barcoding to identify European butterflies, but also into the levels of potential butterfly cryptic diversity at a continental scale. The cases highlighted provide guidelines for future research and have numerous implications for taxonomical, ecological, biogeographical and conservation studies of butterflies. Finally, we will also introduce the next step in our assessment of butterfly genetic diversity: the DNA barcoding of West Mediterranean butterflies.

Diet conservatism and distant host shifts allowed for global radiation in *Ectoedemia sensu stricto* (Nepticulidae)

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Key words: Phylogeny, leaf-mining, host choice, biogeography

Ectoedemia s. str. follows trends with regard to host choice that are seen in many intimate insect-plant relationships, including a high degree of monophagy, a preference for ecologically dominant plant families and the tendency that related insect species feed on related hosts. The main host families for *Ectoedemia s. str.* are Fagaceae, Rosaceae, Betulaceae and Salicaceae. We used three independent genetic markers totalling 1945bp to infer the phylogeny of 73 spp. of *Ectoedemia s. str.* Our results provide the basis for a new proposal of monophyletic species groups. Host family choice and biogeography are mapped onto the phylogeny. This showed that even though host family is a conservative character that is often retained within species groups, there is no pattern of co-speciation or parallel cladogenesis, and shifts to distantly related hosts have occurred. We also found that most species are restricted to a single biogeographic region, but that species groups are commonly represented throughout the Northern Hemisphere. When host family and biogeography are looked at simultaneously, results show that the combination of these factors plays part in the evolution of the subgenus but also that for a complete understanding more factors will need to be evaluated.

DNA barcoding as an efficient tool for the Zygaenidae study

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Key words: DNA Barcoding, Zygaenidae

The taxonomy of the Zygaenidae is well established for a large part of the family and has been improved step by step over the last 60 years based on many characters: larval morphology (the chaetotaxy of the larvae, microstructures of the integument), head morphology (including biometry), special characters in the structure of the antennae, wings, legs, abdomen (e.g. coremata, lateral 'glands'), special habits of the larvae (e.g. leaf mining, boring or free feeding), cocoon construction, special calling and mating habits, pheromones, mimicry, the examination of the karyotypes, protein electrophoresis results, biochemical analyses combined with the toxicity of the Zygaenidae and the study of antigen properties of haemolymph proteins (monoclonal immunosystematics). However, there are still unresolved problems.

The present study aims to advance resolution of the taxonomy of the Zygaenidae by constructing a DNA barcode library for all species from the Palaearctic, South East Asian, African, American, and Australian regions (BOLD project "DNA barcoding of Zygaenidae moths"). At present 252 species are in the project. This is approximately 25% of the global fauna of the Zygaenidae.

Our DNA data correspond remarkably with established taxonomic opinions. They demonstrate diagnostic sequence differences in the COI gene for almost all of the species that have been studied and show that the genetic distances in most cases fully support established grouping in the family system. Only some results are contradictory: some cases involve barcode sharing by different species while others involve deep intraspecific sequence divergences in species that are well recognized by morphological and biological characters.

The study confirmed the effectiveness of DNA barcoding as a tool for the determination of Zygaenidae species. It has also shown that when coupled with morphological, biological, ecological, and biochemical observations, DNA barcoding data can be also very useful for aiding taxonomic and biogeographical decisions.

Designing a body size index for the comparative study of adult Lepidoptera

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Key words: Body size, weight, morphometry, wing, moth, butterfly

The Lepidoptera represent one of the hyper-diverse insect taxa and are a relevant subject for evolutionary studies including those on body size evolution. As in other groups of animals a preliminary problem related to the comparative analysis of body size is how the trait 'body size' can be reliably estimated across species from subtaxa which may be featured by remarkably different body architectures. A balance between what would be desirable and what is possible may reasonably point

towards dry body mass as an adequate proxy for adult body size. Even so this may be difficult to gather from a wide and taxonomically varied species sample. Adult wing size has often been used as a measure of body size within taxonomic groups (e.g. families) but it is generally agreed that this might not perform convincingly when several unrelated families or superfamilies are to be compared. In this study I intend to derive an estimate of dry body weight from multiple regression on a small number of linear measurements, and to estimate its reliability. The results fit expectations in that although linear measurements of the wings (e.g. fore wing length, wing span) are well correlated to body weight, thorax and abdomen measurements are by far more precise. A combination of few measures from the thorax, abdomen and wings seem to provide a reasonable approach and might be applied to a wide range of non-related species.

The Sphingidae collection at the Natural History Museum (NHM), London

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Key words: Sphingidae, Collection, Natural History Museum (London), Jean-Marie Cadiou, Rothschild, Curation

The NHM collection of Sphingidae presently holds 113000 pinned specimens and a further 176000 papered ones, making it the most important collection of this moth family in the world.

Before August 2008 the Natural History Museum's collection of Sphingidae contained ca. 60000 pinned specimens, the vast majority of which were dated pre-1930. Then, thanks to the generous sponsorship of the Rothschild family, the de Rothschild family, the John Spedan Lewis foundation, Ernest Kleinwort Charitable Trust and members of the public, the NHM was able to acquire one of the largest private collections of Sphingidae, the Jean-Marie Cadiou collection.

The Cadiou collection, which contains 53000 pinned specimens and 176000 unsorted and still in the original envelopes, doubled the size of the NHM original holdings and has provided modern material that was lacking in our collection.

This talk will give a brief overview of both the original NHM and the recently purchased Cadiou sphingid collections, and explain how the current curation of this important collection into modern unit trays and refurbished Rothschild drawers is taking place.

Hot summers, long life: egg laying strategies of *Maniola* butterflies are affected by geographic provenance rather than adult diet

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Key words: butterfly ecology, oviposition, longevity, *Maniola*, summer dormancy, nectar amino acids, Nymphalidae

Maniola butterflies undergo summer dormancy in dry and hot habitats and deposit their eggs only in early autumn when conditions become more favourable for their offspring. Female individuals of this genus are therefore relatively long-lived. For long-lived butterflies adult diet is of particular importance. We tested if added amino acids in nectar substitute fed to the butterflies affected timing of oviposition, fecundity and longevity. A hundred *Maniola* females were sampled from Mediterranean and Central European populations and made to oviposit under controlled laboratory conditions. Forty individuals were offered sucrose solution with additional amino acids while the remainder were fed with plain sucrose solution. We found that egg-laying strategies and longevity depended on geographic provenance rather than diet. Supplementary amino acids in adult diet did neither prolong lifetime nor increase total egg production. *Maniola* females from Sardinia started to lay eggs at least 20 days later relative to Central European *M. jurtina* and lived three times as long. Mediterranean individuals had on average twice the length of reproductive period and lifespan relative to Central European ones, and individuals of Pannonian origin lived longer than Alpine butterflies. Average total egg numbers were 200-350 eggs per female and did not differ significantly between populations. The fact that oviposition strategy could not be altered through diet may indicate that for univoltine butterflies, like *Maniola*, diet-quality at the adult stage is less important than endogenous factors, or factors the butterflies are exposed to in an earlier developmental stage than the imago. Oviposition strategy closely matched the climatic conditions that prevail in the geographic regions where these butterflies fly.

Sleeping beauty – Dormancy induction in female meadow brown butterflies *Maniola nurag* and *Maniola jurtina*

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Key words: Nymphalidae, Sardinia, Austria, day length, food resources, oviposition, longevity

In Sardinia, females of the two butterfly species *Maniola nurag* and *Maniola jurtina* perform a summer dormancy, meaning that they don't oviposit before autumn. Caterpillars feed on grass which is scarce during summer-drought. While *M. nurag* is endemic on the island, *M. jurtina* is widespread over Europe and populations of climatically cooler regions usually don't perform an aestivation. Which factors induce dormancy in these butterflies has until now been limited to educated guesses. In this study we test two of them: (a) day length and (b) the availability of food resources for the offspring (fresh grass). For the experiment, 150 females were collected from Sardinia (*M. nurag* + *M. jurtina*) and Austria (*M. jurtina*) and were kept under three different controlled conditions: long day with fresh grass, long day without fresh grass and short day. Day length had a pronounced effect on lifespan and timing of oviposition of Sardinian females. One female actually survived for eight months (mean long day: $\sim 3\frac{1}{2}$ months). Fresh grass had no effect and *M. jurtina* from Austria didn't show a reaction to the different treatments. They behaved like short day-females from Sardinia. For univoltine butterflies, like *Maniola*, timing of oviposition is crucial. We conclude, that summer dormancy in Mediterranean *Maniola* butterflies is induced by day length, while it has no effect on egg laying behaviour of Central European individuals.

The Geometrid Moths of Europe: Performance of DNA Barcoding and BIN assignment

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Key words: Geometridae, Europe, DNA Barcoding, BINs

In the past seven years the Bavarian State Collection of Munich (ZSM) contributed more than 110,000 DNA barcodes to the global iBOL campaign. Together with several partners, e.g. the Finnish Barcoding Project, we have gathered barcodes for 88% of the European geometrid moth species. These data are used to compare traditional taxonomic species delimitation with DNA barcoding and to test the performance of the "Barcode Index Numbers (BINs)" in delineating species. We conclude that DNA barcoding is a very promising method for biodiversity assessments and that the BIN system reflects well the species boundaries as they result from traditional methods. The performance of the BIN-system is good at European level and usually excellent (close to 100% match with traditional species) at country level. The results of this study encourage using DNA Barcoding and BIN assignment for biodiversity investigations all over the world.

Phylogeny of ditrysian Lepidoptera – progress report of the morphological study

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Key words: Ditrysian Lepidoptera, morphology, phylogeny

What does the history of the lineages leading to the lepidopteran superfamilies we recognize today look like? How are the ditrysian superfamilies related to each other? These are questions that several molecular studies have addressed in recent years. These studies have brought new information, including some surprises, and have also confirmed some prior hypotheses about the evolutionary relationships of Lepidoptera. There are, however, branches in the evolutionary tree of Lepidoptera that are only weakly supported, and several groups that have not yet found a stable position. Especially, the backbone phylogeny of the Apoditrysia has not been convincingly resolved. To complement molecular studies a large scale morphological research project has been underway. It is based on thousands of larval, pupal and adult male and female specimens representing most subfamilies of ditrysian Lepidoptera. The aim of the project is to find morphological characters that would contribute in resolving the problematic parts of the ditrysian phylogeny, evaluate relationships suggested by molecular studies and anchor taxa for which DNA data is unable to find a fixed position. In this presentation I will talk about the morphological examination of the material obtained from museums and collectors from all around the world, about what has been learned so far, and what are the potential outcomes and future applications of this project: improving our knowledge of the ditrysian phylogeny, learning about the morphological innovations of different lineages, and placing fossils in their phylogenetic context.

Collections Management at the Natural History Museum – the last 40 years

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Key words: Lepidoptera, Collections management, Natural History Museum

In March 2014 I retire after 40 years as a Lepidoptera curator. My talk will give a brief historic perspective and highlight the varied and significant changes that have occurred during that period, covering aspects such as the members of staff, the collections and their care, and the buildings. I started my career in the British Museum (Natural History), Department of Entomology, Lepidoptera Section and will finish it in the Natural History Museum, Department of Life Sciences, Terrestrial Invertebrates Division. These changes are not just in the name but also reflect changes in the departmental structure and the way that we work. Recent priorities for Lepidoptera will be discussed and I will conclude with some comments about my own ‘research’ – work that I hope to continue in retirement, in particular the moth fauna of the Balearic Islands and some recent discoveries made there.

Poster

Do agri-environmental measures efficiently protect *Maculinea* butterflies in Őrség, western Hungary?

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Key words: *Maculinea* species, mowing time, un-mown strip, *Sanguisorba officinalis*, Őrség National Park

In spite of the tremendous amount of money spent on them, the efficiency of agri-environmental schemes in the protection of target species is still in doubt. Here we tested whether specific measures of a Hungarian programme targeting invertebrates and birds of hay meadows positively affect indicator species such as *Maculinea* butterflies. Eight pairs of hay meadows were selected in the Őrség National Park in 2009. Each site pair consisted of a meadow managed under the scheme and another which fell outside of the scheme. According to the scheme meadows were mown either before 1st of June or after the 15th of July and 10-15% of their area was left un-mown; whereas, outside of the scheme there was no such management done. Abundance of the *Maculinea* species and other butterflies was estimated by counting individuals along three transects in each meadow during the flight period of *Maculinea* butterflies. Our results show that abundance of *Maculinea* species was higher in meadows where mowing was done before June 1st than in meadows where mowing was done in July. However, we did not find any correlation between mowing time and abundance of other butterfly species. Abundance of both *Maculinea* and other butterfly species was higher in un-mown stripes than in mown areas when the meadow was mown in July; whereas, there was no such difference seen when the meadow was mown in May. It can be concluded that the practice of early mowing is favourable for *Maculinea* butterflies since food plants have enough time to flower

by the flight period. In contrast late mowing is unfavourable for butterflies as there are no available plant and nectar sources during the flight period. In this case unmown stripes are important because they provide both larval food plant and nectar sources.

The effect of herb-layer on nocturnal macrolepidoptera (Lepidoptera: Macroheterocera) communities

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Key words: Diversity, comparison, macromoth, vegetation, Sessile Oak, Sopron Mountain

Vegetation beneath the canopy might be an important factor for the moth community structure in forested ecosystems, which is determined by forest management practices. Here we compared nocturnal macrolepidoptera communities and the herb layer in young and old Sessile Oak (*Quercus petraea*) forest stands, in the Sopron Mountains (Western Hungary). The investigation of Lepidoptera species was carried out 15 times from the end of March to the end of October, 2011. Portable light traps were used; a total of 257 species and 5503 individuals were identified. Geometridae were the most abundant moths, followed by Noctuidae and Notodontidae. To investigate vascular plant species in the herb layer, circle shape plots with 20 m radius around the moth traps were used. In each plot we estimated the abundance of plant species in 20 sub-plots with 1 m radius, in early May and late July, 2011.

The abundance of moth species was higher in the old forest stand, which might be the result of the also higher biomass. However; the abundance of vascular plants was lower in the old forest. Diversity indices (Shannon-, Simpson formula, Pielou's equatibility formula) of the herb layer and the macromoths community significantly differed in the study sites. The average number of plant species found in each sample was also dissimilar but we found no difference in the average number of moth species in any sample in the studied forests. For further analyses moths, which develop on plants in the herb-layer, were selected but difference between the young and old forest was not significant. Our results suggest that the herb layer is not the only key factor for macrolepidoptera communities in the investigated forest stands.

Revision of the *Eulamprotes wilkella* species-group based on morphology and DNA barcodes, (Lepidoptera, Gelechiidae)

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Key words: *Eulamprotes wilkella*, DNA barcodes, Gelechiidae

The *Eulamprotes wilkella* species-group is revised based on morphological characters and on DNA barcodes of the mtCOI (Cytochrome c Oxidase 1) gene. Adult morphology combined with sequence information for nine species supports the existence of 12 species, seven of which are described as new to science. Species of the *E. wilkella* group are, beside of the silvery and whitish markings in the forewing, characterized by a huge phallus of about the same length as the remaining male genitalia (when seen in lateral position), and the females have a more or less pronounced tendency to brachyptery. Whereas the male genitalia are very similar the genitalia of the females have better diagnostic characters, but (the brachypterous) females of half of the species are still unknown. There are some good diagnostic characters in the colour and markings of the adult moths. The larvae, which have been described from only one of the 12 species, are supposed to prefer mosses as feeding substrate. The distribution of the *Eulamprotes wilkella* group seems to be restricted to the Palearctic region, with most species occurring in Europe. DNA barcodes of *E. libertinella* (Zeller) point towards further speciation, but we have not (yet) been able to detect morphological differences between specimens from populations with different barcodes, and we refrain from describing further new species based alone on differences in the DNA barcodes. For our ongoing studies we herewith ask everybody to look for and collect brachypterous females of Gelechiidae, both during the next days of field work and in general.

The lepidoptera species composition of salt and brackish marshes in the Netherlands

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Key words: salt, marshes, ecology, ecosystem, halophytes

The Lepidoptera fauna from 26 nature reserves in the brackish and salty tidal and non-tidal zone was investigated in the Netherlands and Belgium in the period 1980-2006. The aim of the study was to make an inventory of the Lepidoptera species which were able to survive the harsh environmental conditions. More than 600 species were observed and from this group 98 species could be allocated as native

to the ecosystem based on observations of immatures. Larvae or pupae of a small part of this group could not be traced because of their rare occurrence or hidden lifestyle. Rearing confirmed many of the formerly recorded host plants, and new additional host plants were found, new phenological and ecological data were collected, resulting in a gradual increase in the number of halophytic species during the period of investigation. Species from which immature data were collected in one site were recognised as native to other nature reserves as well when a specimen of any stage was observed. Overall numbers are shown in the J-curve and the species composition of different types of nature reserves are compared and explained by the following environmental parameters: maximum, minimum and average salinity, area, inundation frequency and the number of halophytic host plant species. The results will be illustrated by means of multivariate techniques, including Redundancy Analysis and Twinspan, showing the same species composition in areas with a comparable environment and a much higher number of native species than expected. Examples are given of species of different categories in their relationship with the ecosystem.

Contribution to the Noctuidae (Lepidoptera) of Jordan

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Key words: Noctuidae, Jordan

The Noctuidae of Jordan were collected (among other moth families) from the different parts of Jordan since 2008 through a project sponsored by the Deanship of Scientific Research, the University of Jordan. Fixed UV light traps were placed in localities representing the main ecological zones of Jordan. The duration of the traps ranged from several weeks to more than 2 years for some locations. The traps were placed in Dibeen Nature Reserve (North Jordan), Al Shoumari Nature Reserve (Eastern Desert), Dana Nature Reserve (South Jordan) which are run by the Royal Society for the Conservation of Nature. Traps were also placed in the University of Jordan Farms (2 in the Central Jordan Valley and one near Amman in the high lands). Some traps were placed in or near private farms or gardens. Specimens of Noctuidae collected previously from Jordan and deposited in the University of Jordan Insect Museum (UJIM) were examined. As a result of this research, a large collection for the members of this family was established in the UJIM, which is the largest collection in the country so far. A total of 86 species in 54 genera were recorded from the different parts of Jordan. The following species were new records for Jordan: *Autophila ligaminosa* (Eversmann, 1851), *Clytie infrequens* (Swinhoe, 1884), *Catocala olgaorlovae* Kravchenko, *et al.*, 2007, *Catocala conjuncta* (Esper, 1787), *Catocala*

separata (Freyer, 1848), *Aedia leucomelas* (Linnaeus, 1758), *Apamea platinea* (Herrich-Schäffer, 1852), *Xanthia (Spudaea) castanea* Osthelder 1933, *Agrochola osthelderi* Bour-sin, 1951, *Xylena exsoleta* (Linnaeus, 1758), *Polymixis serpentina* (Treitschke, 1825) and *Dichagyris leucomelas* Brandt, 1941. The most species-rich genus was *Eublemma* which contained 15 species. *Agrotis* had 9 species, *Catocala* 8 species, *Cleonymia* and *Caradrina* 4 species. However, most of the genera included from 1–3 species. The data contributed to our knowledge of the spatial and temporal distribution of the Jordanian Noctuidae. A list was prepared for species known to occur in Jordan from literature in addition to the results of this research. Available biological, ecological, distributional or zoogeographical data and future research were discussed.

DNA barcode-based species delineation enhances taxonomic workflow in endemic Australian hypertrophine moths (Gelechioidea)

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Key words: DNA barcoding, species delimitation, Gelechioidea

Many lepidopteran groups remain poorly studied, which is especially true for micro-moths. Things are even worse in the Southern Hemisphere where fauna can be nearly completely unknown. For instance in Australia, the estimated number of all lepidopteran species is 22 000 of which about a half is still lacking scientific description. Obviously, when working with such groups, fine-scale species delimitation based on extensive morphometric or multi-locus data is unfeasible and coarser methods are needed. The thoroughly studied standardized DNA barcode region provides suitable level of variation to form species-like clusters (operational taxonomic units OTUs) and, thus, offers an ideal solution for the initial phase of the taxonomic workflow followed by other studies with additional data such as phylogeny reconstruction and revisionary work. The aim of this study is to define putative species (OTUs) for the subfamily Hypertrophinae using three novel methods for species delimitation (General Mixed Yule-coalescent GMYC, Automatic Barcode Gap Discovery ABGD and Barcode Index Number System BIN). We examine the concordance of the resulting OTUs, evaluate them in regard to their monophyly, diagnostic characters and geographic ranges, and finally provide the distribution pattern of the Hypertrophinae in Australia. The subfamily Hypertrophinae is a mainly endemic Australian group with 51 described species. Based on the results of this study, the species count will rise well above one hundred.

A lowland, Mediterranean *Nebula Bruand*, 1846 species: *N. ibericata* (Treitschke, 1871): contribution to an understanding of its biology and larval morphology (Lepidoptera, Geometridae, Larentiinae)

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Key words: Geometridae, Larentiinae, larva, chaetotaxy, morphology, biology, Central Iberia

N. ibericata is a lowland, Atlanto-Mediterranean species which shows the following two adaptations to hydro-deficit in the Mediterranean Basin, according to data from the sub-desertic central Iberian interior (590-600m): the imago flies from October to early May and the larva spends the summer months as a pre-pupa in a substantial cocoon. Morphological data are also provided on the poorly-known larva.

Lepidopteran leafminers on native and alien woody plants in Siberia

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Key words: Leaf miners, native and alien woody plants, Siberia

Leafmining moths represent an important group of herbivores with numbers of important pests and invaders that threat forests, parks and gardens in many countries around the world. In Siberia, this insect group is relatively poorly studied. Yet, not much is known about how indigenous leaf miners colonize alien woody plants introduced to this part of Russia.

We surveyed alien and congeneric native woody plants to test whether alien plants are less attacked by native Lepidopteran leaf mining insects compared to native plants, following the enemy release hypothesis, which suggests that invasive organisms are more successful in the area of introduction because they are released from the natural enemies that control them in the area of origin. The study was carried out in 2008-2012 in five Siberian arboreta in Novosibirsk, Krasnoyarsk, Tomsk on about 80 woody plant species from 16 families and 25 genera, originating from various geographical regions, including Europe, North America, East Asia, etc. Alien plants were significantly less attacked by native Lepidopteran leafminers than indigenous congeneric plants, supporting the tested hypothesis. The level of attacks and

species richness was about twice lower on alien trees. Alien plants originating from distant regions (Europe, North America) were less colonized by Lepidopteran leaf miners than native plants (Wilcoxon matched pairs test: $Z = 2.7$, $N = 20$, $p = 0.008$), whereas no significant difference in leaf miners attack was found for plant species of East Asian origin and North Asian (native plant) origin ($Z = 1.5$, $N = 30$, $p = 0.15$).

We also performed observations on other native and alien woody plants (particularly, alien plant species and genera having no relatives in Siberia) in city parks, gardens and suburban forests (Krasnoyarsk krai, Novosibirsk oblast, Tomsk oblast, Altai Krai, Republic of Altai). All together, more than 140 plant species from 46 genera were examined for leaf miners diversity. Our field data and an extensive literature survey provided an important dataset for the constitution of a website on leafmining insects colonizing woody plants in Siberia. The website (<http://leafminerssiberia.ru>) will be available for public access soon, upon completion of revision by specialists. This is the first electronic atlas on leafminers in Russia. So far, it contains a list of 180 leaf mining insect species colonizing native and alien woody plants from 35 plant genera. 68% of these species belong to 13 families of Lepidoptera. Every leafminer is provided with diagnostic characters for mines, a description of the morphology of larvae and pupae, information on the phenology, host plants, geographic ranges, and high numbers of original photographs that may help to identify samples down to species or morpho-species level.

In the course of our field studies in Siberia, several thousand leaves with mines of different insect species (often with larvae or pupae inside) were collected and placed in an annotated herbarium. A large number of leafmining insect species were sampled as immature stages (larvae and pupae) directly from mines on various woody plants and preserved in 95% alcohol. Thus, this collection has a value of host plant data (missing from field collections of adults) and can potentially be used for further molecular studies.

The study was supported by the EU FP7 Project PRATIQUE (№ 212459), a grant of President of the Russian Federation (MK-7049.2010.4) and Russian Foundation for Basic Research (Grant No. 12-04-31250).

The State of Britain's Moths

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Key words: Lepidoptera, macro moths, monitoring, decline, Rothamsted, Britain, conservation, habitat loss

The new State of Britain's Larger Moths 2013 report shows clearly that moths are in decline. The total number of larger moths recorded in the national network of Rothamsted trap samples decreased by 28% over the 40 years from 1968 to 2007.

Declines are worse in southern Britain, with a 40% decrease in total abundance, while there was no overall change in northern Britain (where declines have been offset by increases). The Rothamsted light-trap network is one of the longest-running and most wide-ranging insect population research projects ever conducted. Analyses of this data set, carried out by Rothamsted Research and Butterfly Conservation, together with information from the National Moth Recording Scheme and other sources, have been gathered together to produce the new report.

Forty-year national population trends were generated for 337 species of widespread and common moths. Two-thirds (227 species) show decreasing population trends over the 40 year study and over one-third (37%) of the species decreased by more than 50%.

Although the majority of trends are negative, 53 species (16% of the total) more than doubled their population levels (i.e. increased by at least 100%). Many of these species have also undergone dramatic range expansions, particularly northwards. Moth species that occur in both southern and northern Britain fared significantly worse in the south.

The widespread decline of Britain's moths is a clear signal of potentially catastrophic biodiversity loss caused by human impacts on the environment. Moths comprise a substantial part of Britain's biodiversity and play important roles in food chains and as pollinators. Their decline will have knock-on effects on the birds, bats and mammals, which depend on them for food, and shows widespread degradation of our environment caused by habitat loss (e.g. to intensive agriculture, changing woodland management and urbanisation). Chemical and light pollution of the environment may also be having significant negative effects on moth populations, while climate change is causing both positive and negative impacts.

Taxonomic problems in the Eurasiatic *Craniophora* species (Noctuidae, Acronictinae)

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Key words: *Craniophora pontica*, *C. harmandi*, *C. fasciata*, *C. hemileuca*, *Cranionyxeta*, taxonomic problems, genitalalia

The subfamily Acronictinae consists of more than 400 species and is distributed in all biogeographical regions. The bulk of species is known from Southeast Asia (China, Philippines, Taiwan, etc.) and the temperate areas of the Pacific coast (Russian Far East, Korea, Japan). There are two main phyletic branches within the subfamily,

according to the external and genital characters. The first group comprises *Acronicta*, *Moma*, *Simyra*, etc. with rather diverse external features but with similarly built clasping apparatus and similar structure of the vesica. The other group contains the *Craniophora* (sensu lato) species. The members of this group are externally often very similar, the clasping apparatus is less sclerotized than in *Acronicta* and the everted vesica is more complex. The *Craniophora* branch has three main species-groups (the *pontica*-, *harmandi*-, and *fasciata*-groups). The species of these groups show nearly the same or very similar wing patterns but the genitalia are well differentiated in both sexes. The additional two groups show an intermediate position between *Acronicta* and *Craniophora*. One of them is *Cranionycta*, the other is *Craniophora* (s.l.) *hemileuca* Berio.

Lepidoptera Species File: a community-editable taxonomic resource for a hyperdiverse group of charismatic insects.

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Key words: Online database, e-taxonomy, community tool, global checklist

For decades the ‘Card Index’ created and maintained (until 1982) by the Natural History Museum, London has been one of the most valuable go-to global resources for Lepidoptera names and synonymies. In 2003 the Card Index was digitised and made available on the web as ‘LepIndex’ accessible through NHM’s website. Despite the lack of consequent updates for two decades, LepIndex was widely considered the most complete online database of Lepidoptera names and as such was fed into other online global resources such as Species2000, CoL and EoL. Over the decade since LepIndex was created the resource’s limitations and errors have become abundantly clear. In 2011 we therefore started the lengthy process of cleaning up and updating LepIndex with the ultimate aim of moving the resources to a more user-friendly and accessible (editable) platform. We are in a position to migrate the updated and up-to-date database to Species Files with the aim (hope) of engaging the international Lepidopterists community in the continuous maintenance of an unique taxonomic resource.

Phylogeny of butterflies of the genus *Oeneis* and the evolution of boreomontane Holarctic fauna

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Key words: Lepidoptera, Nymphalidae, Satyrinae, phylogeography, climate

Butterflies of the genus *Oeneis* Hübner, [1819] (Lepidoptera: Nymphalidae) are distributed mainly in cold boreal and montane habitats of Northern Hemisphere. Their diversity centre is in the mountains of Central Asia, only five species are known from Europe and about ten from North America. We studied the phylogeny of this genus, using 19 of the ca 30 known species representing all recognised species groups. The phylogeny is based on one mitochondrial and three nuclear genes. We have found that the genus is paraphyletic with North American *Neominois* Scudder, 1875. This genus is placed between subgenera *Protoeneis* Gorbunov, 2001 and *Oeneis* s.str. Otherwise the phylogeny follows traditionally recognised species groups with the exception of *O. aktashi*, which groups with the “*polixenes* group”. The origin and diversification followed the Miocene rise of the Central Asian mountain ranges and the next diversification happened after colonisation of arctic areas as well as several invasions to North America. The species originally inhabited cold dry grasslands. During the past, several changes of habitat as well as several invasions to warmer areas were recovered. High species richness in the Asian mountains was probably caused by long term stable climatic conditions.

The study was supported by GAČR (P505/10/2248, P505/10/1630) and GAJU (135/2010/P, 144/2010/P, 106/2010/P).

The butterflies of Bulgaria: diversity, challenges and prospects

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Key words: Butterflies, Bulgaria, habitats, diversity, conservation, ecology, taxonomy, determination aids

This talk is intended as an easily approachable yet informative introduction to the diversity of habitats and associated butterfly fauna in Bulgaria. This country is boasting with the richest fauna from all European countries that lack a true Mediterranean zone. I first focus on the main habitat types to be found in Bulgaria, rising from the sea level to the highest mountains at nearly 3000 m. I then review some

ecologically and taxonomically challenging cases which have greatly expanded our knowledge of Bulgarian butterflies in recent years. The taxonomical conundrums include one of the very few confirmed species new to science to be described from Europe in the last decade, *Polyommatus orphicus* Kolev, 2005. Finally, an overview is given to the efforts of the author to raise basic butterfly research on a new and more coordinated level in Bulgaria, with the use of Internet and the author's website "The Butterflies of Bulgaria". As the next, crucial step in popularizing and facilitating productive interest in butterflies (and ultimately other Lepidoptera), the upcoming guide "The Butterflies of Bulgaria" by the author and Nikolay Shtinkov is introduced.

Tracing the origins of *Maniola* butterflies: phylogeny, phylogeography, and revision of the genus taxonomy based on genetic markers

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Key words: COI; Cyt-b; wingless; Elongation factor 1 α ; Lepidoptera; Satyrinae; speciation; endemism; post-glacial re-colonization; island biogeography; evolutionarily significant unit.

The Palaearctic genus *Maniola* (Nymphalidae) includes seven species. *Maniola jurtina* is a widespread European butterfly. *Maniola chia* is endemic on the Greek island Chios. *Maniola cypricola* is endemic on Cyprus and *M. nurag* on Sardinia. *M. telmessia* inhabits southern and western Turkey and occurs eastwards as far as the Bosphorus. *M. halicarnassus* lives on the Bodrum peninsula as well as on the Aegean island of Nissiros. The distribution area of *M. megalis* is in southern Turkey and extends eastwards to Iran. Despite the omnipresence of the *Maniola* taxon in Europe, these butterflies have been studied little in phylogenetic contexts. Therefore, we reconstructed the phylogeny of this genus using two regions of the mitochondrial DNA, cytochrome oxidase subunit I (COI, barcoding region) and cytochrome b (Cytb), as well as sequences of nuclear DNA (wingless and elongation factor 1- α). This resulted in an alignment of 2430 base pairs for 58 individuals of *Maniola* and some outgroup species, which were partly obtained from the NCBI GenBank. Phylogenetic trees were computed with Maximum Likelihood as well as Maximum Parsimony analysis of the combined data set. So far, the haplotypes seem to split into two main groups, representing roughly an eastern and western branch of *Maniola*. Intraspecific genetic variation is overall higher than interspecific genetic variation. Topology of phylogenetic trees does thus not cluster according to the seven morphologically described species.

Genus *Melanargia* (Rhopalocera) in Nature

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Key words: Lepidoptera, Nymphalidae, Satyrinae, *Melanargia*

A short survey of the genus *Melanargia* Meigen, 1828 (Marbled Whites) is presented.

All the European species incl. subspecies and forms are shown in pictures (photographed by the author) of live specimens in nature.

Uppersides and undersides of both sexes as well as biotopes/habitats for most species and maps of distribution are shown.

Early lepidopteran evolution in the light of the newly discovered "Kangaroo Island Moth"

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Key words: Phylogeny, homoneurous moths, 'Kangaroo Island moth', homoplasy

It has long been known that the 'Hennigian comb' pattern of the base of the lepidopteran family tree entails more complexities (parallelisms/character reversals) than appeared to be the case when it was first recognized in the mid-20th century. This has been due both to availability of more information about long-known taxa and to the discovery of previously unknown taxa which have proved to be additional 'teeth' in the comb. Still, a morphology-based phylogeny which can be formalized as Micropterigidae + (Agathiphagidae + (Heterobathmiidae + (Eriocraniidae + (Acanthopteroctetidae + (Lophocoronidae + (Neopseustidae + (Expoporina + Heteroneura)))))) has for some time been considered reasonably well substantiated, and recent molecular evidence for alternative arrangements has so far not had sufficient support to be considered compelling.

An unexpected challenge to the systematization of the basalmost Lepidoptera comes from a new homoneurous moth taxon discovered in 2009 on Kangaroo Island off continental South Australia, and with ample material only available since October 2012. It is conifer-associated, the larva being an apodous twig miner in *Callitris*, and the adults have the mouthparts so reduced that it is not immediately obvious whether the tiny galeae represent an original condition or are a reduced proboscis. An account will be given of the moth's principal structural traits, which give highly conflicting evidence on its phylogenetic position; according to *preliminary* molecular analyses this should be in the pre-glossatan grade. No placement of the

new moth taxon can be proposed which will not necessitate disturbing assumptions of homoplasy in characters so far considered truly informative.

Oral presentation

Holarctic Lepidoptera: The Beringian Connection

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Key words: Holarctic Lepidoptera

Thirty-six species of butterflies and 223 species of moths are currently believed to have naturally occurring Holarctic distributions. Introduced species and cosmopolitan species, the latter also probably aided by man or ships, are only briefly mentioned. In spite of observations by Alfred Wallace in 1876 on a trans-Beringian faunal connection, compelling geological evidence by George Dawson (namesake for Dawson, Yukon) in 1894 for a dry-land connection 1600 km wide connecting Asia and North America with extensive ice-free areas in Alaska and Yukon, and the floral evidence from Eric Hultén, beginning in 1937 – the importance of possible Amphi-Atlantic connections continued into the 1950's (e.g., Krogerus, 1954). Other topics included are taxonomic difficulties, typical larval host plants selection, geographical distribution patterns, and the effects of late Pleistocene glaciations on northern biomes, especially in the Beringian area, are reviewed. The recent role of Barcoding as a taxonomic tool in comparing the Nearctic and Palearctic faunas and in determining if a species is naturally Holarctic or introduced are also discussed. The greatest barrier to studies on Holarctic distributions is the lack of moth collecting and access to fresh material from Russian Beringia.

Poster

Supporting and encouraging butterfly monitoring in Romania

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Key words: Butterfly conservation, cultural landscapes, Eastern Europe, long-term trends, monitoring, volunteers, training, raising awareness

Numerous species of butterfly that are rare or endangered within the European Union can still be found in good numbers in southeastern Europe, including Romania. These species are often associated with landscapes and biotopes that have

been used and modified by humans for many centuries. Accelerating changes in land use, leading either to intensification or abandonment, could be threatening the small scale mosaic of different habitat patches upon which these species may depend. To understand the effects of these changes, and to be able to derive meaningful land management recommendations, data on the state of the populations are urgently required. However, the capacity of most research projects to provide adequate long-term data on butterfly population trends is limited. Involving volunteers in the monitoring of butterflies is one way of building a long-term database. Furthermore, it offers the opportunity to encourage citizens to observe the environmental changes in their surroundings and how these affect natural processes. In several European countries, butterfly monitoring schemes are already established. To support the development of such a scheme in Romania, we initiated a programme of activities designed to promote butterfly monitoring. We contacted all researchers and NGOs that we found to be active in lepidopterology in Romania and developed several communication platforms (website, facebook, online interest groups). We arranged a workshop in Transylvania to bring interested people together in 2012. Together with these network members we formulated a plan on how to proceed to establish monitoring in Romania. During several transect training days arranged at different locations, we were able to train and recruit several volunteer transect walkers. Further funding will enable more people to have access to relevant literature and materials, and also support their attendance at future training events. We intend that this will lead to a self-sustaining monitoring scheme that will begin to reveal how butterflies in Romania are doing, eventually assisting in their conservation. The database will also contribute to trans-national schemes such as the EU Grassland Butterfly Indicator. The progress we have made to date has revealed the critical need for leadership, co-ordination and collaboration. We anticipate that by the end of 2013 we will have at least 15 transects operating and we will have a network of enthusiasts who will sustain and continue to build a butterfly monitoring scheme in this ecologically rich country.

Revising the European *Udea* species (Pyraloidea: Spilomelinae) – Barcode versus morphology

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Key words: Pyraloidea; Crambidae; DNA barcoding; morphology; Europe;

The genus *Udea* is currently represented by 35 valid species in Europe. Among them are several species which are insufficiently recognizable by traditional, morphology-

based taxonomy. We revise the European *Udea* species using the traditional character complexes of wing pattern and genitalia as well as the DNA barcode in order to test the morphology-based taxonomy. Altogether, 239 COI barcode sequences for 31 of these species are compiled and analyzed. Specimens of 22 (71%) of these species are correctly grouping within their own, significantly distinct cluster of individual species. For the other nine species, conflicts are observed between barcode and morphology data. These conflicts comprise (1) misidentification due to similar morphology, (2) failing of the DNA barcode in distinguishing morphologically distinct species, and (3) the finding of more than one expected barcode cluster per morpho-species. These results clearly suggest that neither morphology nor the DNA barcode alone provide sufficient information for the recognition of species boundaries. In contrast, the combination of the two character sets allows to critically test traditional and familiar taxonomies, stimulating the re-investigation of our fauna by entering an interdisciplinary approach for taxonomy.

Effects of temperature stress on *Maniola* larvae

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Key words: *Maniola*, temperature stress, development, ecology

Maniola nurag, a Sardinian endemic, and *Maniola jurtina*, its pan-European congener, are two similar looking species of butterflies. Yet, they clearly differ in their phenology and habitat requirements. In spite of these differences, one may come across hybrid individuals, albeit the ratio of hybrid population over non-hybrid populations stays very low. Obstacles to the expansion of the hybrid population can be the short amount of time and/or space shared by the two species to reproduce with each other. As temperature changes can induce modifications in life history traits, it can admittedly change the phenology or environmental requirements of one or both species, giving them more opportunities to mate with each other. This leads to the following question: could a change in winter temperature experienced by the larvae lead to a shift in the phenology of both species so that they are more likely to meet and mate?

To consider this question, I am studying the effects of temperature stress on the development and ecology [life history traits and reproduction] of these two *Maniola* species. Different short term temperature treatments will be experienced by caterpillars of both species (larvae from each species and from different mothers will undergo a six weeks period of either cold conditions or warm conditions) in order to assess whether it is possible to provoke variation in the development.

First record of the family Micropterigidae from Bitterfeld amber (Insecta, Lepidoptera, Micropterigidae)

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Key words: taxonomy, systematics, Micropterix, fossil species and genera, Bitterfeld amber

Species of the family Micropterigidae represent the most ancestral evolutionary line of extant Lepidoptera. The fossil record is comparatively rich, encompassing compression fossils from Dobbertin and Grimmen in Northern Germany (Jurassic) and inclusions from Lebanese (Cretaceous), Burmese (Cretaceous) and Baltic amber (Eocene). Despite of intensive collecting and research on the Baltic amber entomofauna only a few inclusions containing Micropterigid moths are known up to now. They represent four species in the genera *Baltimartyria* and *Micropterix* (questionable). In contrast, the few years of extracting Bitterfeld (= Saxonian) amber from coal mines near Bitterfeld, Germany, have yielded a total of eight inclusions. The material is deposited in the Museum für Naturkunde Berlin. Five species were recognised representing five genera which are not recorded from Baltic amber so far. The specimens were documented in detail, and their diagnostic characters were outlined and compared with species from extant genera of Micropterigidae from the Northern and Southern Hemisphere. The results are discussed in terms of phylogeny and systematic placement of the new taxa including aspects of the historical biogeography of the family.

Diversity of geometrids (Lepidoptera, Geometridae) in mountains of Dinaric karst and ecological patterns of their vertical stratification

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Key words: Geometridae, Mountains, Diversity, Rapoport's rule

Diversity and ecological patterns of vertical stratification of one of the largest Palearctic moth families (Lepidoptera, Geometridae) were researched on two Dinaric karst mountains. Out of a total of 464 geometrid species in Croatia, 232 geome-

trid species were found in the study areas, 164 on Mt. Biokovo and 132 on Mt. Lička Plješivica. There are two peaks in the vertical stratification observed on both mountains. These are at the transition zones (ecotones) of mid altitudes towards both lower and higher elevations. All diversity indices are inversely correlated with altitude. Mt. Lička Plješivica and Mt. Biokovo are distinct in diversity with low levels of similarity. There is a significant separation of zones corresponding to low, mid and high altitudes in both areas. The impact of variables significantly changes with seasons but is almost unaffected with respect to elevation. A single, most important variable affecting altitudinal distribution on both mountains is dew temperature. Species inhabiting mid-altitudes showed a wide altitudinal range in contrast to the narrow ranges observed for representants of the low and high altitudes which is not in accordance with Rapoport's rule. Future activities should focus on addressing the question whether the fairly broad elevation ranges in the middle elevations on both mountains can be explained by the mid-domain effect.

Species-level para- and polyphyly in DNA barcode gene trees in European Lepidoptera

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Key words: DNA barcoding, Lepidoptera, paraphyly, polyphyly, introgression, incomplete lineage sorting, gene tree

Gene trees are representations of gene genealogies. Although gene genealogy may differ from that of a species, both are usually correlated and sets of gene trees are frequently used to infer relationships among taxa. Gene trees of the DNA barcode region (a fragment of the COI gene) are widely used nowadays in alpha-taxonomy since they bear valuable information regarding species relationships and because they powerfully discriminate species. This is complicated, however, by the fact that species do not always form monophyletic units in gene trees. In a recent literature survey, about 26% of arthropod species were documented to show species-level paraphyly or polyphyly in mitochondrial gene trees. Here, we report the frequency of non-monophyly in DNA barcode gene trees in a wide variety of European lepidopteran species and based on an extensive sampling (over 40K sequenced individuals). We observed many potential cases of historical introgression between species, as well as other cases of presumably young species where lineage sorting was incomplete. However, a significant proportion of these cases may represent artifacts caused by misidentifications or inaccurate taxonomy such as oversplitting or lumping.

New data on rare Zygaenidae from the Balkan Peninsula

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Key words: Zygaenidae, Balkan Peninsula

Recent field surveys during the project Zygaenidae of Balkan Peninsula resulted in some significant records. *Zygaena cynarae* (Esper, 1789) was collected in western Serbia on Zlatac Mt. which is the second record for this species in Serbia. *Zygaena minos* (Denis & Schiffermüller 1775) has been discovered as new for Montenegro, Albania and Macedonia. *Z. transalpina* (Esper, 1780) is newly recorded for Montenegro. One hybrid specimen *Z. transalpina* / *Z. angelicae* Ochseneheimer, 1808 was also found. The subspecific status of *Z. minos* and *Z. cynarae* is discussed.

Study on the Tortricidae (Lepidoptera) in Vietnam. Current state and perspectives of using DNA Barcoding

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Key words: Tortricidae, Vietnam, South-Eastern Asia, DNA Barcoding

Tortricidae are relatively small moths, often known as leafrollers, with globally more than 9000 species. South Eastern Asia is known as a center of tortricid diversity, but our knowledge of Vietnamese and South Asian Tortricidae as a whole is rather poor. Study on the tortricid fauna of Vietnam began at the early 20th century with the short faunistic notes mostly devoted to the common pest species.

As the result of many expeditions carried out at the end of the 20th and the beginning of the 21st century the amount of fresh material from Vietnam rapidly increased. Different publications based on this material included a lot of newly described species. Some of them were described on a single specimen. This situation creates serious problems in the identification of Oriental species.

Molecular research on Vietnamese Tortricidae has now a great importance in the study of this fauna. Many problems that are caused by limited material can be solved using DNA Barcoding, such as matching the unknown sex or by studying the distribution of genetically heterogeneous populations. The current research is based on material from the Russian and the Dutch Naturalis expeditions carried out in 2006 – 2012.

658bp of the Cytochrome C Oxidase I (COI) barcoding marker were sequenced for 925 specimens belonging to 165 species of vietnamese Tortricidae. All data were integrated in one DNA barcoding project to resolve taxonomic problems by comparison with all available material. As a result about 80% of collected females were matched with males and 27 possible new species were confirmed by DNA barcoding.

Oral presentation

Long-term and large-scale metapopulation monitoring of the Glanville fritillary butterfly (*Melitaea cinxia*)

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Key words: habitat fragmentation, long-term population monitoring, management of ecological data, *Melitaea cinxia*, spatial synchrony of population dynamics

Long-term observational studies conducted at large spatial scales contribute to better understanding of landscape effects on population and evolutionary dynamics, including conditions affecting long-term viability of species. However, large-scale studies are expensive and logistically challenging to continue for a long time. I describe the landscape structure, methods and data management in the metapopulation monitoring of *Melitaea cinxia* that has been conducted in a network of 4,000 habitat patches within a study area of 50 by 70 km in the Åland Islands in SW Finland since 1991. Furthermore, I describe the long-term metapopulation dynamics of *M. cinxia* based on the monitoring. No long-term change in the overall metapopulation size has occurred, but the level of spatial synchrony and the amplitude of fluctuations in year-to-year metapopulation dynamics have increased, possibly due to increasing frequency of exceptional weather events. The added value of large-scale and long-term population studies will be discussed.

Oral presentation

Heliozelidae phylogeny and hostplant relationships

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Key words: Phylogeny, molecular analysis, DNA barcoding, leafminers, grapevine, pest species

A new phylogeny of Heliozelidae is presented, based on four genes (COI, COII, 28S, Histon3) and ca 52 taxa. We recognise three main clades: *Heliozela*, a core *Antispila* s. str.

and a large clade of species with reduced venation, comprising the small genera *Holocacista*, *Antispilina* and *Coptodisca* and a number of misplaced *Antispila* species. *Holocacista* and *Antispilina*, previously monotypic, are enlarged. *Holocacista* is mainly African-Asian, with some representatives in Europe and South America, and feeds mainly on Vitaceae and Rubiaceae, but also some other families. *Antispilina* is restricted to Polygonaceae in Europe and East Asia. The North American “*Antispila*” *ampelopsifoliella* group, feeding on Vitaceae and Hydrangeaceae, is paraphyletic with regard to the also American *Coptodisca*, or in some analyses polyphyletic. *Coptodisca* species feed on a wide range of trees. Core *Antispila* feed mainly on Cornaceae and Vitaceae and *Heliozela* on trees in the Fagales and Myrtaceae. Recent problems of invading North American species in Italy, and a native South African species shifting to grapevine, underline the importance of a thorough knowledge of a family where Vitaceae as hostplant are a recurrent theme.

***Maculinea (Phengaris)* dispersal in inhospitable matrix: rare, risky, but long-distance**

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Key words: dispersal mortality, emigration, mark-recapture, movement distance, Virtual Migration model

In the classic metapopulation theory suitable habitats occupied by local populations and the unsuitable matrix separating them form 'black-and-white' landscape mosaic, in which dispersal predominantly depends on spatial configuration of habitat patches. In reality, however, matrix composition may affect dispersal as well. Using intensive mark-recapture we investigated inter-patch movements in *Maculinea (Phengaris) nausithous* and *M. teleius* occurring sympatrically in six metapopulations. Among the investigated metapopulations three (Dečín, Gorice, Steigerwald) had the matrix dominated by forests, thus an inhospitable environment for grassland butterflies, and in the remaining three (Přelouč, Kraków, Teisendorf) the matrix was mostly composed of open land, including meadows, fallow lands and fields. Based on intensive mark-recapture surveys conducted, dispersal parameters for each metapopulation were derived with the Virtual Migration model. Both species showed significantly lower propensity to emigrate from their natal habitat patches, and they suffered substantially higher dispersal mortality in forest matrix metapopulations (ca. 30–60 % vs.

0–10 % in open land matrix). In contrast, average movement distances were roughly an order of magnitude longer in forest matrix as compared with open land one (ca. 500–1600 m vs. 100–200 m). Our results indicate that forest matrix induces strong selection against dispersal, which leads to reduced emigration rate, but at the same time it promotes, typically infrequent, long-distance movements. The recorded patterns are likely to stem from the fact that *Maculinea* butterflies avoid crossing high contrast edges between their meadow habitat and forest, but once they have entered the latter they tend to fly continuously in one direction. Both behavioural mechanisms were confirmed by direct butterfly observations in an independent study.

Oral presentation

Phylogeny of Larentiinae (Lepidoptera: Geometridae), inferred from nuclear and mitochondrial genes

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Key words: Geometridae, Larentiinae, phylogeny

The geometrid subfamily Larentiinae has so far been relatively little studied from the phylogenetic point of view. Several recent studies have confirmed that this subfamily is monophyletic but the phylogenetic relationships between its subgroups (tribes and genera) are largely obscure. Hereby we present the hitherto most complete phylogeny of Larentiinae, comprising representatives from all currently valid tribes and several taxa of uncertain tribal placement. The analysis is based on sequence data from one mitochondrial and eight nuclear genes, the total length of the data matrix was more than 6900 bp. Most of the morphologically defined larentiine tribes were resolved as monophyletic in both ML and Bayesian phylogenetic analysis. Majority of phylogenetic lineages were also resolved identically by these two approaches though incongruencies regarding to the placement of some tribes close to the root of Larentiinae were also discovered. The results will be discussed as well as future perspectives for research on the phylogeny of Larentiinae.

Poster

NHM: iCollections British and Irish Lepidoptera Project

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Key words: Lepidoptera, digitisation, British

Butterflies are the iconic emblem of summer and the countryside. Records of their occurrence are seen as useful indicators of the state of the environment. Within museum collections there is a considerable volume of useful data reflecting the distributions over time of the UK and Ireland's butterfly and moth populations. iCollections' British and Irish Lepidoptera Project aims to fully digitise and make available specimen data in the NHM's collections of butterflies, macromoths and micromoths. This is a pilot project examining methods of mass digitisation of our collections and is part of the Digital NHM programme.

Breaking the publishing bottleneck in biodiversity

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Key words: Cybertaxonomy, publishing, dissemination, markup, data publishing

“Publishing bottleneck” is comparable to the “taxonomic impediment” in biodiversity research, but is caused by: (1) increasing amount of unpublished data due to the intensification of methods for scientific exploration, such as for example next-generation genome sequencing or deep sea bottom sampling; (2) continuing the practice of publishing in non-machine-readable formats, such as paper and PDF; (3) low uptake and inconsistent policies for data publishing; (4) pressure of funders and administrators to publish in “high-impact” journals; and (5) increasing difficulties with peer-review, due to rising volume of publications and increasing time-pressure on reviewers.

The *Biodiversity Data Journal* (BDJ) (www.pensoft.net/journals/bdj) and associated *Pensoft Writing Tool* (PWT) (www.pwt.pensoft.net) are launched as the first work flow ever to support the full life cycle of a manuscript, from writing through submission, community peer-review, publication and dissemination within a single, fully XML-based, online collaborative platform.

BDJ publishes papers in all branches of biodiversity science, for instance taxonomic, floristic/faunistic, morphological, genomic, phylogenetic, ecological or environmental data, with no lower or upper limit to manuscript size. The main types of manuscripts are: (1) single taxon treatments (e.g., new taxa, new taxon names, new synonyms, re-descriptions, etc.); (2) data papers describing biodiversity-related databases; (3) sampling reports and local observations; (4) local/regional and/or

habitat-based checklists/inventories; (5) ecological and biological observations of species and communities; (7) identification keys, from conventional dichotomous to multi-access interactive keys; and (8) descriptions of biodiversity-related software tools.

Text and data submitted to *Biodiversity Data Journal* will be formally peer-reviewed and evaluated for technical soundness and the correct presentation of appropriate and sufficient metadata. The scientific quality and importance of the paper and data will be judged by the scientific community through a novel *community-based pre-publication* peer-review and possibilities to comment after publication (*post-publication peer-review*). Authors may also opt for an entirely public peer-review process. Reviewers may opt to be anonymous or to disclose their names.

To keep the costs affordable to all, all manuscripts submitted to BDJ must be structured, either written in the Pensoft Writing Tool (PWT), or submitted from integrated external platforms, such as Scratchpads or GBIF's Integrated Publishing Toolkit (IPT). The PWT provides a set of pre-defined, but flexible, article templates as well as search and import function from external databases, electronic registries, occurrence data in Darwin Core format, reference bibliographies, etc. All preparation methods include track change and comments tools, revision history and version control, online collaboration between authors and external contributors (e.g., mentors, potential reviewers, linguistic editors, colleagues, etc.), pre-submission validation of the manuscripts. Submission to the journal is simply at the click of a button.

BDJ is being launched within the EU-funded project ViBRANT (www.vbrant.eu).

An inventory survey of the pyraloid moths of Bulgaria (Crambidae & Pyralidae): an informal review of progress

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Key words: Bulgaria, Balkans, Pyraloidea, Crambidae, Pyralidae, faunistics, biodiversity, climate change

Bulgaria occupies a position in the extreme south-east of Europe and may therefore provide a gateway for Lepidoptera species colonising Europe from Asia, perhaps under the influence of climate change. However, whilst the “macro” moth species are relatively well known, there is no existing complete list of the Pyraloidea (Crambidae & Pyralidae) of Bulgaria. Early attempts were made to compile lists, notably by Hans Rebel in 1903 and by Julius Ganev during the 1980s, but the more recent (1996) European checklist by Karsholt & Razowski is very incomplete, contains a

few errors and, of course, lacks supporting data. This short and informal paper reviews the practical aspects of the recording process and presents some preliminary results and observations. At July 2013, the Pyraloidea fauna of Bulgaria stands at 382 taxa, comprising 379 species and three endemic subspecies; these are divided as 229 Crambidae and 153 Pyralidae. 144 species have not been seen in Bulgaria for 13 years. A further 46 were last recorded between 1980 and 1999 but may still present. For five taxa (1 Crambinae; 4 Phycitinae), there are published reports, but these lack detailed information about locality and year of capture. It is most strongly urged that participants in ECL18 will record Pyraloidea during the course of the conference and provide the data to the author by the end of 2013.

Mobility of ringlet butterflies in high-elevation alpine grassland: Effects of habitat barriers, resources and age

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Key words: dispersal, habitat fragmentation, *Erebia*, mobility, alpine butterflies, age, mark-release-recapture, metapopulation

Dispersal is a crucial feature for the preservation of butterfly metapopulations, which can be affected by habitat fragmentation. Each individual that leaves the habitat and enters the matrix takes a risk. Therefore, even winged organisms, like butterflies, are often extremely sedentary and spend their whole lifetime in a relatively small area. For such species, large roads may constitute a real obstacle for movement. I conducted a mark-release-recapture study on six alpine *Erebia* species in the Hohe Tauern National Park in order to investigate if the Großglockner Hochalpenstraße – a large and highly frequented road in an alpine environment – acts as a barrier to movement for these relatively sedentary butterflies. By studying six species which differ in body-size and ecological requirements I aimed at analysing which of the following variables predict movement probability: (a) species membership, (b) ecological specialization, (c) resource availability, (d) age or (e) patch isolation. I also estimated the population sizes of the six analysed *Erebia* species.

I captured a total of 429 individuals, of which 113 were recaptured. My data indicates that neither body-size nor ecological specialization significantly influenced mobility patterns in these *Erebia* butterflies. The road, however, seemed to be a barrier for dispersal. I found that butterflies that had to cross the road to get to another suitable habitat patch were less likely to leave the patch than butterflies that did not have to cross the road. Butterflies that were on a patch with a high nectar level were less likely to leave the patch. In addition age influenced mobility, with mid-aged butterflies being most likely to change between patches.

The fascinating butterfly diversity of Serbian Stara Planina Mt. threatened by ski tourism

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Key words: Habitats directive, red list, legislature, fauna, endangered, *Boloria eunomia*

Using literature data and computer databases from the recent butterfly surveys, a total of 158 butterfly species from the Serbian side of the Stara Planina Mt have been analysed. Apart from being the mountain with the largest number of butterfly species in Serbia, it is also hosting the greatest number of threatened and protected species. A total of 104 of those species are regarded as threatened (99 in Serbia and 17 in Europe). Thirty-two of the species recorded are strictly protected in Serbia. In addition four species are listed in Annex II, and eight in Annex IV of the Habitats directive. In comparison only Šar Planina Mts. were proven to have similar butterfly diversity.

Although the mountain was proclaimed Nature Park, Emerald site and a potential Natura 2000 site, the Serbian government has developed a large scale plan for ski tourism centre. Most of the construction has already started although it was illegal before the plan got the status „of national importance“ in 2013. This has already caused local extinction of one of the three known populations of *Boloria eunomia*, while the remaining two are severely declining. Additional threats for some other threatened butterflies (eg. *Nymphalis vanalburni*, *Lycaena helle*, *Erebia orientalis*) in the area are also discussed.

Towards the understanding of *Pseudothyretes* classification (Lepidoptera: Erebiidae: Arctiinae).

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Key words: Syntomini, taxonomy, sexual dimorphism, Africa

Due to the morphological similarity of the *Pseudothyretes* species as well as the very strong sexual dimorphism, the taxonomy of this genus is very poorly studied. Until now the only good character which allowed to distinguish the taxa was the structure of male genitalia. However, the greatest problem is the association of females with the proper males. Despite the relative abundance of the specimens in the museum collections it was impossible to make these associations. Moreover, the problem is the more important and intriguing because two of the taxa have been described only on the basis of females. Although there is a strong suspicion that they are

conspecific with one of the “male” based species there is no evidence for this. Another problem is that without proper association of males and females it was not possible to identify the numerous females housed in entomological collections or freshly collected during entomological expeditions. We decided to involve the DNA barcoding method based on comparison of a fragment of the *COI* gene to identify particular *Pseudothyretes* species despite the sexual differences between males and females. As a result the females of four species are described and the differences between them are highlighted. The thorough examination of males in the course of the preparation of the Thyretini catalogue (Przybyłowicz 2009) lead also to the detection of a previously unknown species of *Pseudothyretes* which is described in the present study. Examination of additional, fresh material of *P. kamitugensis* confirmed earlier suggestions (Przybyłowicz 2011) that this species should be divided into two separate taxa.

Poster

Male genital allometry in two noctuid species (Lepidoptera: Noctuidae)

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Key words: allometry, sexual selection, male genitalia, Noctuidae, Lepidoptera

One-size-fits-all and related hypotheses predict that static allometry slopes for male genitalia will be consistently lower than 1.0 and lower than the slopes for most other body parts (somatic traits). We examined the allometry of male genital and non-genital morphological traits of two pest species of noctuid moths, *Spodoptera exigua* (Hübner, [1808]) and *Helicoverpa armigera* (Hübner, [1808]). The relationship between body size and genital traits was in general strongly negative-allometric. The relationship between the body size indicator and somatic traits was approximately isometric in most cases, except in four traits in *S. exigua*, in which the slopes showed slight negative allometry and the hind tibia in *H. armigera* in which the slope had positive allometry. The Coefficients of Variation for all structures were low, not exceeding 8%. Genital traits showed significantly lower CV than somatic traits. Our observations of strongly negative allometry for genitalic traits are consistent with stabilizing selection on genital size and we suggest that the male performance in interactions with females is the source of selection on male genital allometry.

Faunistic study on Noctuidae, Hadeninae and Plusiinae (Noctuidae, Lepidoptera) of north-eastern Iran

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Key words: Noctuidae, new species, new record, fauna, Iran

A faunistic study on the subfamilies Noctuidae, Hadeninae and Plusiinae (Noctuidae, Lepidoptera) was conducted in Khorasan-e-Razavi province located at north-eastern Iran. Samplings were carried out during 2010-2012 by using different types of light and bait traps. Totally, 70 species and subspecies belonging to 27 genera were recorded including a new species in the genus *Anagrorisma*. Five species and two subspecies were also new to Iranian fauna. Taxonomy of the species and their distribution pattern are discussed.

Review of the genus *Eugnorisma* Boursin, 1946 (Lepidoptera: Noctuidae, Noctuidae) in Iran with additions and corrections

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Key words: Lepidoptera, Noctuidae, Noctuidae, *Eugnorisma*, fauna, new record, Iran

A checklist of nine species and four subspecies of the genus *Eugnorisma* Boursin, 1946 in Iran, with remarks, is presented based on the literature and our research results. Furthermore one species and 4four subspecies are discussed, as formerly erroneously published taxons from Iran, because of misidentification or mislabeling. New data on the distribution of some species of this genus in Iran are also given including four new records for the Iranian noctuid fauna from Khorasan-e-Razavi province in Northeastern Iran and from the Zagros range, provinces of Kordestan, Fars and Kohgilouyeh and Boyerahmad in Western Iran.

Biodiversity and zoogeographical patterns of the subfamily Larentiinae (Geometridae) in Iran

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Key words: Biodiversity, Biogeography, Iran, Larentiinae

The subfamily Larentiinae in Iran was reviewed based on a comprehensive data set (over 3500 specimens). A large set of morphological characters was considered, complemented with DNA barcode analyses. Type specimens have been checked wherever possible. In addition, Iranian Larentiinae have been compared with those of adjacent regions in order to identify species endemic in Iran. Based on actual distribution data of each species and considering the climatic conditions at the places of their origin, potential distribution areas were calculated. Niche models for species from neighboring areas suggest the potential occurrence of these elements in the Iranian fauna. Observation frequency and species richness (actual and potential) were calculated based on a complete set of sampling data (including locality, geographic coordinates, altitude and time). The results presented with maps for Iran and the Middle East. Potential gaps concerning sampling and faunistic research in Iran are discussed.

Workshop “Scientific Digital Drawing”

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Key words: Scientific Digital Drawing

Digitization of scientific illustrations with Adobe packages is going to be a standard method for many taxonomists (Coleman 2003, 2006). Producing accurate drawings with higher quality, ready to publish, but easily modifiable drawings in a short time are the most important advantages of digital drawing. The resulting vector graphics can be directly processed by most online journals and can be used for printing in journals and digital copies (pdf 's for proofs and eps files for publication). By using vector paths, the files are much smaller and have a much higher quality and resolution than bitmap versions. In this workshop I will introduce the basic drawing methods of digital illustration with a special focus on Lepidoptera. Also I will show some short cuts and important tricks in digital drawing. Then I will show how we can increase the speed of the illustration of complex details, such as setae, in Adobe Illustrator. This workshop has been set up and offered in last December in Museum Alexander Koenig in Bonn, Germany.

Time needed: 2 hours

Attendance limitation: 12 people

Using geometrid moths for tracing the Quaternary refugia in Iran

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Key words: Ecological niche modeling, *Gnopharmia*, Iran, Phylogeography, *Prunus*, Refugia

Past climatic changes had essential consequences on the composition of current biodiversity. Such effects (especially those of the Quaternary glaciations) on contractions and expansions of populations of different organisms could be investigated by new phylogeographical methods (e.g. population genetic analysis and spatial distribution models). In the present study, two sympatric moth species from the Middle East (*Gnopharmia colchidaria* s.l. and *G. kasrunensis*) and their host-plants (*Prunus scoparia* and *P. fençliana*) were used to test the effects of the Quaternary climate changes on the largely neglected biodiversity of Iran. We complementarily analysed the population structure of both moth species (187 specimens, based on COI) in congruence with batched species distribution models (SDMs) for all four taxa and for the era of the Last Glacial Maximum (21 ky BP), 6 ky BP and today. Coincidence of SDMs and the distribution of haplotype lineages indicated a shared refugium for the southwestern Zagros Mountains and potential species-specific refugial areas in the southern Caucasus and the Kopet-Dagh Mountains. Both moth species experienced past population expansion.

Endemic Lepidoptera of Carpathians and their Balkanic connections

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Key words: Carpatho-endemic, palaeoendemic, neoendemic, South Balkanic, Step-pic, Alpine, Arctic-Alpine, Balkanic-oreal

Endemic species have mostly evolved by geographical restriction of range. It means that their former geographic relations were disconnected. However, these can be unraveled by taxonomic and phylogenetic surveys. It was already pointed out (Rákósy 1998) that the endemic taxa of Romania consist of Carpatho-endemic elements in a considerable proportion. They can be subdivided into (i) palaeoendemic taxa, i.e. isolated populations of relict-like, often flightless species (as *Agonopteryx banatica* Georgescu, *A. dumitrescui* Georgescu, *Dablica wagneri* Gozmány, *D. rakosyi*

Weidlich, *Infurcitinea roumanica* Căpușe, *Postsolenobia banatica* Hering, *Zygaena nevadensis georghenica* Reiss*) with spot-like or highly scattered distribution, or (ii) neo-endemic ones which represent isolated, genetically differentiated populations of more widely distributed species. To the latter group they belong: (a) subspecifically differentiated isolates of Continental steppic species (as *Filatina transsilvanella* Kovács & Kovács, *Pseudophilotes bavus hungaricus* Diószeghy, *Conisania poelli ostrogovichii* Draudt, *Oncocnemis michaelorum* ssp. indescr. *), (b) Carpathian subspecies of Boreo-Montane species (as *Boloria titania transsylvanica* Tiltcher, *Standfussiana lucernea kovacsi* Rákósy, *Spaelotis clandestine gyilkosi* Kovács, Kovács & Rákósy), (c) northern isolates of Eastern Mediterranean or South Balkanic species (e.g. *Peridea korbi herculanea* Popescu-Gorj*, *Chersotis laeta macini* Rákósy, Stangelmaier & Wieser*, *Ch. fimbriola niculescui* Rákósy*), (d) Carpathian subspecies of Alpine and Arctic-Alpine species (e.g. *Psodos coracina diószeghyi* Schmidt*, *P. canaliculata schwingenschussi* Wehrli, *P. noricana carpathica* Schwingenschuss, *Erebia manto trajanus* Hormuzaki, *E. epiphron transsylvanica* Rebel, *E. sudetica rodnensis* Rebel, *E. pharte belensis* Goltz, *E. pronoe regalis* Hormuzaki, *E. cassioides neleus* Freyer*) and (e) Balkanic orlean species (as *Coenonympha rhodopensis schmidtii* Diószeghy*, *Erebia melas carpathicola* Popescu-Gorj & Alexinschi*, *E. melas runcensis* König*). The species marked with * clearly show Balkanic biogeographic connections.

Geographical range of *Cydalima perspectalis* (Walker, 1859) [Lepidoptera: Pyraloidea: Crambidae: Spilomelinae] and its recent expansion in France

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Key words: *Cydalima perspectalis*, Pyraloidea, Crambidae, Spilomelinae, invasive species, geographic distribution, diagnosis

Geographical range of *Cydalima perspectalis* (Walker, 1859) [Lepidoptera: Pyraloidea: Crambidae: Spilomelinae] and its recent expansion in France

The Plant Health Laboratory (Laboratoire de la Santé des Végétaux) located in Montpellier is a national reference in the field of plant health. The group is specialized in entomology and invasive plant study. In France, the bio-monitoring of invasive species is implemented by the NPPO following monitoring guidelines that aim at i) early detecting organisms harmful to plants and ii) set up management measures so as to eradicate or control the populations. In that context, monitoring is the backbone of the European plant passport's process, a system that has been set

up throughout the European Union with the aim to guarantee the plant health. The present work provides an update of the Box Tree Moth *Cydalima perspectalis* (Walker, 1859) geographic distribution in France, its potential distribution worldwide based on species distribution modelling and relevant elements of identification.

Distribution: Native of Asia, the Box Tree Pyralid has been recorded for the first time in France in 2008. The first European record of this moth occurred in 2007 in the state of Baden- Wuttemberg (Germany) while the species was probably introduced in 2005. In 2008 and especially 2009, several outbreaks were recorded in Europe (2008; France mainland, Netherlands, 2009; Austria, United Kingdom). The species geographic distribution widened from 2009 on and the moth was recorded in Italy, Czech Republic, Hungary, Turkey and Slovenia in 2011. In France mainland, the species was recorded in Bas-Rhin, Haut-Rhin, 2008; Essonne 2009; Paris 2010; Allier, Charente, 2011; Alpes Maritimes, Bouches-du-Rhône, Hérault, Yvelines, Tarn, Tarn et Garonne, Vendée, Hauts-de-Seine, Val-d'Oise 2012. These data suggest that the Box Tree Moth has a large potential geographic range in Western Europe.

Potential distribution: Based on the biological data available from literature (Maruyama, 1987) we elaborated an ecological model that led to maps of the Box Tree Moth potential distribution worldwide.

Taxonomy: The box tree *Diaphania perspectalis* (EPPO Alert List) was placed in various genera including *Palpita*, *Diaphania*, *Glyphodes* and *Neoglyphodes*. In a recent taxonomic review, Mally & Nuss (2010) proposed that it be transferred to the genus *Cydalima* hence named *Cydalima perspectalis*.

Taxonomic Review of the family Psychidae (Lepidoptera) in Korea

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Key words: new record, new species, Psychidae, Tineoidea, Lepidoptera, Korea

This study was conducted to review the family Psychidae from Korea. In this study, a total of 10 species belonging to 7 genera was recognized in Korea. Three species are reported for the first time from Korea. All the known species were redescribed with illustrations genitalic structures. A key to the subfamilies was provided.

Family Psychidae

Taleporia tripchopterella Saigusa, 1961

Taleporia nigropterella Saigusa, 1961

Kozhantsbikovia vernalis Saigusa, 1961

Kozhantsbikovia koreana Saiusa, 2012

Eumeta variegatus (Snellen, 1879)

Eumeta minuscula Butler, 1881
Mabasena aurea Butler, 1881
Acanthopsyche nigraplaga Wileman, 1911
Bruandia nipponica Hori, 1926
Proutia rotunda Suomalainen, 1990

Oral presentation

Using an eight-gene phylogeny of metalmark moths (Choreutidae) to explore the evolution of host plant usage

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Key words: herbivory, microlepidoptera, molecular phylogeny, plant defences

Metalmark moths (Choreutidae), so named because of the iridescent markings on their wings, are a small family with about 410 currently described species. Although they are cosmopolitan in their distribution, most of their species richness is in the tropics, and a large percentage of choreutid species remains undiscovered. For example, a survey of herbivorous insects in Papua New Guinea found that only about 15% of choreutids discovered there in the past 15 years have been previously described. Using eight genes from representatives of most choreutid genera, as well as more than 150 DNA barcodes from additional species, we built a molecular phylogeny that allows us to explore the evolution of host plant usage in this family. The picture that is beginning to emerge from this study is suggesting that the lineages that have switched to feeding on plants with latex are more species rich than their sister lineages. One possible explanation for this is that overcoming the problems of feeding on plants with latex, which is presumed to be an efficient herbivore defense, enables lineages to expand into new ecological niches, possibly facilitating their speciation.

Oral presentation

Polyploca ridens and *P. neoridens* (Lepidoptera: Drepanidae), a possible model of geographic differentiation along the Italian peninsula

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Key words: *Polyploca*, Drepanidae, Italy, peninsulas, morphoclines, speciation, geometric morphometrics

Several cases of species pairs in which one member geographically substitutes the other along the Italian Peninsula have been described over the time and new ones are continuously being discovered, either in the Lepidoptera or other animal groups. Following a review of a number of such cases, we studied after geometric morphometrics one of the most controversial examples of such pairs, that represented by *Polyphloca ridens* (Fabricius, 1787) and *P. neoridens* Parenzan, 1976 (Lepidoptera: Drepanidae, Thyatirinae). The latter, restricted to Central-Southern Italy, was diagnosed with respect to its widespread European and NW African ally after outstanding differences in the genitalia, but the authors' views on the distinction of the two taxa have been contrasting. We thus surveyed over 100 European populations of *ridens/neoridens*, although we laid particular emphasis in sampling from the Italian Peninsula in order to test the hypothesis that its geometric features had played a role in 'proximo-distal' speciation. Following preparation of male and female genitalia, geometric morphometrics was performed on a total of 202 aedeagi (3 homologous and 34 sliding semi-landmarks), 203 left valvae (3 homologous and 16 sliding semi-landmarks) and 102 sterigmata (2 homologous and 10 sliding semi-landmarks on the left hemi-profile), all features providing most evident differences between the two 'taxa'. Relative Warp Analysis on the configurations of the specimens into the principal warps space revealed that in all cases no definite subsets of individuals could be identified, these forming single 'clouds' which however stretch out in the space in agreement with geographic gradients. We thus conclude that the concept of *P. neorides* as a species on its own is unsubstantiated and that in the study case geographic variation is better described in terms of morphoclines, an outcome which we also discuss in relation to other putative examples of geographic differentiation along the Italian Peninsula.

The significance of larval study of Coleophoridae relationships (Lepidoptera, Gelechioidea)

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Key words: Coleophoridae

Initial studies on Coleophoridae larvae indicate that their features may play a significant role in establishing a phylogeny of Coleophoridae. We assume that heavily sclerotized dorsal shields, not divided into smaller parts and their absence on metathorax form a synapomorphy. Thus, based on this assumption, the most primitive Coleophoridae would be the group feeding on *Vaccinium* and *C. cornutella* followed by closely related species *C. binderella* and *C. orbitella*. Simultaneously, this and other species with similar wing pattern, do not have sclerotized dorsal shields on the larval metathorax. This feature occurs in species which can be distinguished by mottled

color streaks. However, some groups of species with a simple phalotheca in male, show in the larvae the presence of dorsal shields on the metathorax. The structure of larva indicates that the development of the family began with species with uniform dark grey-brown forewings and larvae without sclerites on metathorax and small sclerites on mesothorax. A more advanced feature would include the presence of several consolidated sclerites on mesothorax and well-developed sclerites on mesothorax. The larval study may provide additional informations to the systems established on other characters (DNA, imago morphology). An example can be found in the pistol-case group of species. According to the larval characters *C.pyrrhulipennella* does not belong to this group but to the *vibicigerella*-group with typical sheath-cases, while DNA markers indicate the affinity to the pistol-case group. However, some characters may be homoplasies. Especially in species with atypical biology, e.g. the absence of sclerites on the metathorax in species which hide the thorax in plant tissue, eg. *C.gnaphali*, while in closely related species the shields on the metathorax are present. According to my hypothesis the dorsal shields on the thorax are part of the “body cover defence” mechanism and overthrow the view of the primitivity of the double phaloteca (J.F. Landry). During radiation of Coleophoridae, the species acquired more and more sclerites on the thorax. Especially on meso- and metathorax, while the prothorax is rather stable. The sclerotization of larvae is well developed in places where the body of larvae is endangered of parasitoids attacks. This area includes not only the thorax but also the anal part because the larva must drop the faeces out of the terminal part of the case. Therefore, the species with the thoracic hidden in the host plant develop a sclerotization of anal segments.

How to maintain and enhance biodiversity in an industrialized landscape

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Key words: conservation biology, land use, alternative land use, nature conservation

In Sweden, as well as in most parts of western Europe, the constantly intensified human land use is causing an ever increasing habitat deterioration. Due to this, there has been a dramatic decline in butterfly and moth species over the past 50-60 years in the most industrialized and densely populated parts of Europe. This has also led to the national extinction of a number of species. To mitigate this effect, both official organizations and NGO:s have tried to adapt the land use to more environment friendly management with varying outcome. One more recent option is to find alternative habitats such as infrastructure areas and construct and maintain them in such a way that biodiversity is enhanced and that these sites work as refuge

for endangered species. We have been trying to plan and develop roadsides, power lines and adjacent areas etc in an ecological way, in order to enhance the biological potential of such sites both locally and on a landscape scale. The total area of such sites is large enough to, to some extent, compensate for land loss in the surrounding industrialized landscape. Also for military training fields, motor tracks etc we have developed action plans and maintenance techniques in order to increase biodiversity and facilitate for endangered species. There are two levels of actions: general and basic information and guidelines how to produce and maintain the sites, and more detailed plans tailored for the local fauna and flora.

Poster

Utilisation of organic and intensively managed vineyards by butterflies in Western Hungary

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Key words: butterfly communities, diversity, seasonality, habitat use, stepping stone, agricultural landscape

Vineyards cover approximately 3,530,000 hectares, 0.8% of the European landscape, the majority of them occur in Southern and Central Europe. A large proportion of vineyards are owned or managed by larger companies, many of which do not consider, that introduction of organic technologies in vine-growing could not only influence their market positions, but would support the protection of biodiversity. In our study, we tested how butterflies utilise intensively managed and organic vineyards, compared to natural or semi-natural grasslands, which formerly covered the vineyard areas in Central Europe.

For the study four wine regions were selected in Western Hungary: Sopron, Kőszeg, Zala (Nagyrada) and Pannonhalma. These areas differ by their geology as well as by meso-climatic conditions, but the applied management is generally very similar in the intensively managed vineyards and unique standard management (characterised by application of organic pest and disease control, absence of artificial fertilizers and creation of a flower rich, extensively cut grass-strip in the spacing) was applied in the organic experimental plots, designed by the program: In each wine region sampling plots of intensively managed and organic vineyards were

selected, with three transects in each plot to survey butterflies. They were complemented by three transects in the control plots (natural or semi-natural grasslands), 54 transects in total. Each transect was sampled nine times between April and August for two consecutive years (2011-2012). To understand how butterflies utilize the vineyards compared to grassland habitats and to measure whether butterfly communities benefit from organic management against intensively managed vineyards, three measures of species α diversity (Shannon-Weaver's index, Simpson index, Pielou's evenness index) were calculated, complemented by species abundance distributions, compared with corresponding theoretical distributions. In addition to the observed species richness nonparametric richness estimators were also evaluated. Community structure comparison between sites and seasons was estimated using cluster analysis based on Morisita-Horn similarity coefficient. Canonical correspondence analysis (CCA) was used to examine seasonal trends of species.

During the study a total of 2557 specimens representing 5 families, 38 genera and 57 species of butterfly were identified. Small White (*Pieris rapae*), Green-veined White (*P. napi*), Common Blue (*Polyommatus icarus*) and Meadow Brown (*Maniola jurtina*) were among the dominant species in all samples, while the rare Scarce Large Blue (*Maculinea teleius*) and Dusky Large Blue (*M. nausithous*) were recorded only from the control area at Kőszeg. Large Copper (*Lycaena dispar rutilus*), a species of Community Interest (Natura 2000) was recorded from many control plots, but also in organic vineyard plots on a few occasions. As expected, the highest cumulative species richness, diversity and abundance values were found in the control grasslands. With regards to the vineyard sites, the intensively managed sites are characterized by less diverse and abundant butterfly communities compared with the organically managed sites.

Very similar abundance distribution patterns (geometric series) were observed for the intensively managed and organic vineyards, while MacArthur's broken-stick model was found to explain adequately the observed distribution in the control sites. Similarity measures applied to seasonal butterfly data indicated clear separation of the spring butterfly communities from those detected in the summer/late summer period, which can generally be explained by butterfly seasonality, but also by the specific utilisation of vineyards by various butterfly species or species groups in different seasons. For example during the summer, small lycaenids and *Colias* species were attracted by the flowering legumes in the organic vineyards, while large Nymphalids appeared on ripe grapes in numbers in the late summer samples.

The results of the study indicate that organic management in vineyards are in favour of butterflies, positioning organic vineyard areas as transition between natural or semi-natural grassland habitats and intensively managed agricultural (desert) land. The extensively cut flower-rich strips between the vine-rows provide imagos with nectar, while the pesticide-free area could serve as a permanent breeding site for a number of species. Organic vineyards could well merit the term "stepping stone", lying within a hostile matrix of intensively managed agricultural landscape.

We hope that our results would encourage land-owners to change their technology to butterfly-friendly organic management.

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Colour polyphenism in the larvae of *Ematurga atomaria* (Geometridae): causes and consequences

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Key words: polyphenism, polymorphism, colouration, host plant, phenotypic plasticity

Larvae of the polyphagous geometrid moth *Ematurga atomaria* show remarkable variation in colouration and patterning. On the basis of a series of laboratory experiments, we showed that the variability - though genetically based in part - involves a substantial environmental component. We transformed the multidimensional variation in colour and pattern into two dimensions interpretable as patterning and darkness. Plastic changes in the darkness of the larvae were elicited by direct cues: the larvae were darker when reared on dark host-plants. In contrast, host-specific degree of patterning (stronger pattern on *Calluna* than on *Vaccinium*) was also induced when the larvae were reared in absolute darkness. This implies that an indirect cue must be used: the case is more complex than just visually mediated background matching. Indeed, we showed that surface roughness is a likely candidate to serve as the proximate cue for determination of some pattern elements, a case not reported for insect larvae earlier. Larvae of *E. atomaria* originating from geographic populations using different host-plants showed analogous plastic responses which indicates that the link between the indirect cue and visual appearance of the host is not specific to plant species. Quantitative genetic analysis showed that, in conflict with some recent suggestions, larval colouration shows neither environmental nor genetic correlations with indices of individual performance.

Ecology and conservation of two large blue butterflies *Phengaris teleius* (Bergsträsser, 1779) and *Phengaris nausithous* (Bergsträsser, 1779) in Croatia

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Key words: Phengaris, ecology, conservation

Butterflies of genus *Phengaris* are parasites within nests of red *Myrmica* ants. Due to their specific life-cycle and habitat loss, they are highly endangered throughout Europe. The aim of this study was to define the distribution and key factors affecting the abundance of two highly endangered large blue butterflies, *Phengaris teleius* and *Phengaris nausithous* in Croatia. They often occur in sympatry and have similar habitat requirements. In Croatia *P. teleius* is more widespread and abundant than *M. nausithous*. For understanding their ecology more data is needed on population biology and microhabitat preferences of both species. Adult butterfly and caterpillar numbers, food-plant, ant community and different abiotic factors including soil chemistry were studied within the protected landscape Bedekovićeve grabe near Čakovec, northern Croatia. The overall results showed that the density of *P. teleius* is associated with plant density, but not with height or bud size. Contrary these results, density of *P. nausithous* is limited with the presence of the host ant *M. rubra* and suitable microhabitat conditions that omit their survival. It has been concluded that populations of both species are stable within the site, but low mobility and bad management could reduce the effective population size. Habitat management should focus on the maintenance of different microhabitats that hold both species and resources, demanding some flexibility in mowing regimes.

Butterflies of Croatia: status, threats and conservation

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Key words: butterflies, Croatia, fauna, Natura 2000, conservation

The checklist of butterflies of Croatia is a result of documenting butterfly diversity and attempts to create a national database. In total there are 196 species recorded. The history of studying butterflies in Croatia begun in the 19th century and since that time the level of knowledge has risen considerably. Still, the information on distribution and especially the trend of the species is poor. Problems of categorizing a poorly documented fauna will be discussed. Some examples of recent changes in range and species diversity will be linked to the causes of change: habitat decline,

loss and fragmentation. Recently we assessed the status of the butterfly fauna of Croatia and created the Red Book of threatened butterflies of Croatia. About 25% of Croatia's butterfly fauna is of conservation concern, including species of national and European concern. All threatened species are legally protected. The main causes for the declines are thought to be changes in rural land use, especially land abandonment and agricultural intensification. Recently research efforts have been made for proposing Natura 2000 sites.

The molecular biogeography of south-eastern Europe: case studies in butterflies

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Key words: molecular biogeography

South-eastern Europe is one of the geographically most diverse regions of Europe. This high geographic diversity and its central position as link between the Mediterranean, central Europe and the eastern steppe regions is fostering its rich biogeographic structures including many different faunal and ecological elements. Since long, this fascinating area is studied by lepidopterologists, but modern genetic analyses now allow a more in depth understanding of its biogeographic structures. In this talk, I present examples for all major biogeographic groups present in south-eastern Europe: Mediterranean, continental and mountain species.

Mediterranean species had an important glacial refuge in the coastal regions of the Balkan Peninsula. However, this refuge area most probably was not continuous in many of the cases. Thus, *Melanargia galathea* most probably had three glacial core areas at the Balkan Peninsula, all of which became expansive to the North during the postglacial warming. The number of core areas in the blue *Polyommatus coridon* might even have been larger, but major genetic groups can be located at the western and the eastern flank of the Balkans, with mostly the western flank becoming expansive during the Postglacial.

Continental species formerly have been thought to postglacially originate from eastern Asia. In contrast to this old assumption, genetic data on *Erebia medusa* revealed multiple Würm glacial refugia in southeastern Europe, at the foot-hills of the mountains of Bulgaria and the Southern Carpathians and also in the Carpathian Basin, all of them mostly retreating to higher altitudes of the nearby mountains along the postglacial warming.

Mountain butterfly species show several different patterns in south-eastern Europe. Some species like *Coenonympha rhodopensis* and *Erebia ottomana* might have been widely distributed during the cool glacial conditions resulting in considerable

gene flow all over the region and only rather weak postglacial differentiation in the respective isolated mountain ranges. In other cases, the arid central Balkan depression and the Danube valley might have prevented exchange of individuals so that different lineage could evolve like in *Erebia melas*. If such isolation was maintained for several glacial-interglacial cycles, endemic species evolved like the eastern Balkan endemic *Erebia orientalis*, closely related to two different lineages of *Erebia epiphron* endemic to the western Balkans and the Carpathians. In further cases, like in *Erebia cassioides*, populations are isolated in the Balkan Mountains and Carpathians for a longer period of time so that relatively local mountain specific lineages have evolved.

Oral presentation

Distribution of *Leptidea sinapis* and *L. juvernica* (Lepidoptera: Pieridae) in Bulgaria

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Key words: Wood White, *Leptidea sinapis*, *Leptidea juvernica*, Bulgaria

The distribution of *Leptidea sinapis* (Linnaeus, 1758) and *L. juvernica* Williams, 1946 (until recently reported as *L. reali* Reissinger, 1989) in Bulgaria has not been systematically investigated so far. Only a few isolated finds with certain identification have been reported for both species. In this talk, we present new material from 12 different localities identified based on genitalia morphometrics. The distribution of the species is discussed including the available literature data. Some identification issues and the habitat preferences of the two species are also discussed.

Oral presentation

Phylogeography of *Hepialus humuli* (L.) in Europe: Alpine refugia, postglacial expansions, cryptic diversity and taxonomic implications

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Key words: alpine diversity, glacial refugia, post glacial expansion, mtDNA, nuclear DNA, phylogeography

We explore the phylogeography of the common ghost moth, *Hepialus humuli* (L.) in Europe based on COI mtDNA and RpS5 ncDNA with special focus on populations in the Alps and surrounding regions, as well as northern Europe. RpS5 fails to recover any phylogeographic signal, but COI reveals a remarkable pattern with central European populations grouping in four well-separated groups. In the Alps the groups show a clear north-south and east-west pattern, probably representing four glacial refugia. Following the last glacial maximum, the north-western group spread into Western Europe as far as Normandy. The north-eastern group spread into eastern and northern Europe, including Scandinavia, and possibly into the Balkans as well. The British Isles as well as the North Atlantic islands groups, the Faroese and Shetlands were colonised during this expansion. Despite the deep divergence in mtDNA between the populations in Italy and southern Austria, and the remaining populations, there are no consistent morphological differences, and we conclude that there is no evidence that the southern populations should be considered a separate species. Finally we assess the taxonomic status of the North Atlantic subspecies *H. humuli thulensis* Newman.

Diversity of Microlepidoptera in the Eastern Palaearctic: already known and still concealed

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Key words: Microlepidoptera, Eastern Palaearctic, diversity

Our knowledge of the Microlepidoptera diversity on the vast territory of the Eastern Palaearctic on the whole, and particularly in Russia, remains very uneven and incomplete. Synthesis of all available data in the framework of the Catalogue of the Lepidoptera of Russia (2008) has revealed here the presence of 57 families, comprised of 1016 genera and 5056 species. The publication of the Catalogue has served as a positive stimulus for the intensive development of taxonomic and faunistic research in the Eurasian region. Over a period of the last five years the known diversity of Microlepidoptera in Russia has increased considerably, and was enriched with one additional family (Pterolonchidae), several genera, tens of species new to the fauna of the country and hundreds of species new to certain regional faunas. The new distributional data also provide noteworthy corrections of the geographic ranges for many species, particularly for their northern and eastern limits.

At the present time only the regional faunas of the northwestern and parts of central European Russia, as well as those of the Volga region, Southern Urals, Northwestern Caucasus, Transbaikalia and the southern part of the Russian Far East seem to be comparatively well studied. The maximum taxonomic diversity of

Microlepidoptera occurs in the southern part of the Far-Eastern region where the fauna is significantly enriched with Oriental zoogeographic components. The rather high level of lepidopteran taxonomic diversity in the Northwestern Caucasus is explained by the penetration of Mediterranean faunal components, whereas in the Lower Volga region and in the Southern Urals it is associated with turanic faunal components. The following regions require additional faunistic studies: Central-Chernozem, European Southern taiga, European Northeastern, East Caucasia, Central Ural, Central and Lower Ob' River, Northern Yenisei, Middle Sea-of-Okhotsk and several others. Further investigations in these and neighbouring regions of China as well as fundamental taxonomic revisions of some large and still insufficiently studied microlepidopteran groups (Pyraloidea, Gelechiidae, Coleophoridae, etc.) will increase the total number of species in the Eastern Palearctic to 6500 and probably even more.

ODINS Project: The Zygaenidae of the Balkan Peninsula – aims, efforts, results, outlook

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Key words: Zygaenidae, Balkan Peninsula, Greek Islands, taxonomy, biogeography, distribution

Within the framework of ODINS (Österreichische Digitalisierungsinitiative naturkundlicher Sammlungen/Austrian initiative for the digitisation of natural history collections) and its subdivision 'Südostwind' (this term means 'fresh wind from the south-east') the project entitled *The Zygaenidae of the Balkan Peninsula* was started in 2011. The idea behind these initiatives is to revise, summarize and database all historical and new biological data, especially those from existing material in museums and collections from the Balkans, and to compile new field data. Due to very limited budget resources *The Zygaenidae of the Balkan Peninsula* has been started as a first pilot project based on the knowledge that substantial material is available not only in collections in Austria and Germany but also in the most important museums in the Balkans (Ljubljana, Zagreb, Sarajevo, Belgrade, Skopje, Sofia) and in private collections. This project is a joint initiative between Zygaenidae specialists and other professional entomologists from the Balkan countries. Basic revisional work has been done in the meantime and this continues. Moreover, extended fieldwork based on current results has been undertaken. The results provide a lot of new distributional patterns and give us a much better overview of the Zygaenidae from the

Balkan Peninsula and the Greek Islands. The region is shown to be an important transition zone with overlapping distributional patterns, hybridisation and a mixture of populations of obviously different origin. Of course, a lot of new questions have arisen from this work. An overview of the project is provided and preliminary results are presented and discussed. The final goal of the project is a shared database for all participants and institutions together with the publication of a book on the Zygaenidae of the Balkan Peninsula.

The occurrence of alien leaf-mining moths (Lepidoptera) in Bulgaria

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Key words: leaf miner, moths, alien, occurrence, Bulgaria

A total of 469 leaf-mining lepidopteran species are recorded from Bulgaria. Eight of them are of alien origin. These alien leaf miners, except *Phthorimaea operculella*, were detected during the last two decades.

The potato tuber moth *P. operculella* was found already in 1950 in a restricted area of southern Bulgaria. Since then it has been detected in several localities in South Bulgaria but in low abundance. Heavy infestation by this moth has been observed during the last 7 years in the Southern part of Bulgaria. The species extends its areal to the North and has been detected in North-East Bulgaria as well. The tomato leaf miner *Tuta absoluta* was first reported in Bulgaria in 2009. An infestation on tomatoes in greenhouses was observed mainly in southern Bulgaria. At present all tomato growing areas in Southern Bulgaria are heavily infested.

Caloptilia roscipennella was reported in Bulgaria in 1996. At present it is spread throughout Bulgaria but it is very rare. *Cameraria ohridella* was reported as new to the Bulgarian fauna in 1993 despite the fact that it was first detected in 1989. At present all horse-chestnut trees in Bulgaria are infested by this moth. A four-year cycle of the total premature defoliation of trees in Bulgarian natural stand of *Aesculus hippocastanum* – natural reserve “Dervisha” has been observed. An infestation by *C. ohridella* on single *Acer pseudoplatanus* trees was also recorded. *Parectopa robiniella* was first observed in Northern Bulgaria in 1988. *Macrosaccus robiniella* was first observed in Sofia in 2001. At present both species feeding on *Robinia* are distributed mainly in Northern Bulgaria. Populations of both species reached outbreak densities very soon after their arrival and largely collapsed a few years later. *Phyllonorycter issikii* was first found in northeastern Bulgaria and region of Sofia in the summer of 2006. The species extends its area very slowly to the vicinity of Sofia only. *Argyresthia thuiella* was first found in Sofia in 2008. At present the species is very rare.

Heavy infestation by *C. obridella* negatively affects seed and fruit weight of *A. hippocastanum* what may severely impair the growth and survival of horse chestnut seedlings. This fact confirms the negative impact of the moth on the biodiversity. The tuber moth *P. operculella* and the tomato leaf miner *T. absoluta* became serious crop pests.

Oral presentation

A review on recent results of *Melitaea phoebe* species group

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Key words: distribution, ecology, life cycle, foodplant, nomenclature

In the last few years, several cryptic species have been discovered under the name *Melitaea phoebe* due to the improvement of scientific methods: *Melitaea punica* (distributed in North Africa), *Melitaea ornata* (distributed from Italy to the Eastern border of Kazakhstan under Mediterranean and sub-Mediterranean climate conditions) or *Melitaea zagrosi* (the known distribution is located in the Zagros Mts.). At the same time, some of the described species proved to be only characteristic subspecies of *Melitaea phoebe*, for example *Melitaea sibina* (distributed in high mountains of Central Asia). Our presentation summarises the published articles about *Melitaea phoebe* species group and synthesise the available information on its taxonomy, distribution and biology.

Poster

Trends in phenological variables and population size in six micro-moth species

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Key words: climate change, phenology, micromoth

The study of climate change and its effects on phenology and population dynamics of various organisms has become an important issue in biology in the past few decades. Under changing climatic conditions species need to adapt to new environment and/or need to shift range of occurrence to improve survival rates. Cli-

mate change could affect phenology and voltinism of Lepidoptera species as it was shown in several previous investigations.

Six micro-moth species (*Anarsia lineatella*, *Cydia pomonella*, *Grapholita funebrana*, *G. molesta*, *Lobesia botrana*, *Phyllonorycter blancardella*) were monitored from 1993 to 2012 using sex pheromone based traps in North-Eastern Hungary. The temperature was measured 3 times a day and the precipitation was also recorded on a daily basis.

From the daily capture data we calculated the First Emergence Date (FED), the Last Emergence Date (LED), the annual cumulative number of individuals and the number of generations.

The trends of the phenological variables were described and the relationships with the climate variables are discussed.

Data on the parasitoid complexes of leaf mining insects on oaks (preliminary results)

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Key words: leaf miners, parasitoids, Oak, *Phyllonorycter*, Hungary

Leaf miners are good models to study multi-trophic interactions, including the regulating potential of their parasitoids. Only a few works have been published concerning the parasitoids of the Central European and Hungarian leaf miners. The great majority of the earlier rearing activities were made from agricultural pests and some invasive leaf miners. This research project intends to fill gaps in the knowledge of the parasitoid fauna of leaf miners living on oaks in Hungary, including new host records, etc. Here we report the results of the first two years of our rearing activity. In 2011 and 2012 we studied the parasitoid complexes of 9 leaf mining species, most of them Lepidoptera, developing on 4 different species of oaks (*Quercus petraea*, *Q. cerris*, *Q. pubescens* and *Q. robur*). In 2011, samples were collected in 6, and in 2012 in 12 different localities across Hungary. Altogether we have collected 1,830 leaf mines, including *Phyllonorycter* spp., *Tischeria* spp. and *Acrocercops* sp. The mines were cut out from the leaves and after a short time of drying they were put in air ventilated plastic tubes for individual rearing. The tubes were regularly checked, and the emerged parasitoids were kept in ethanol. From these rearing activities 28 different parasitoid species have emerged. The great majority of the reared parasitoid species (21) belongs to the Eulophidae family. We have also reared 3 braconid, 3 ichneumonid and one encyrtid species. After comparing our rearing results with those in the scientific literature, we have concluded that our results include novel and unpublished host-parasitoid associations. No host record has been listed so far for *Sympiesis angustipennis* in the Universal Chalcidoidea Database

(Natural History Museum, London, UK). The species was described by J. Erdős from Hungary, who reared it from a leaf miner on *Stipa* sp. We reared this species from *Phyllonorycter heegeriella*. Many of the parasitoids reared from leaf mining Lepidoptera have also been recorded for other orders of leaf miners (beetles and sawflies).

Taxonomic and biogeographic review of the genus *Chersotis* Boisduval, 1840 (Noctuidae, Noctuidi)

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Key words: species groups, synapomorphies, lock-and-key mechanisms, endemic species, species diversity centres, gradients, allopatric speciation

The genera *Standfussiana* Boursin, 1946, *Rhyacia* Hübner, [1821], *Epipsilia* Hübner, [1821] and *Chersotis* were grouped into the fourth group of Noctuidi (Lafontaine 1998). They preserved several ancestral characters as the presence of clavus and the +/- reduced corona, the bisaccate bursa copulatrix often with variable number of signa, etc. Some species groups of *Chersotis* share the synapomorphic configuration of a specialised clavus, covered by spinulose structures, with some *Rhyacia* and *Epipsilia* species. The heavy sclerotisation and the well-developed lateral pockets of the ductus bursae have been evolved under the constraints of strongly sclerotized cornuti, corresponding to the specific "lock-and-key" structures in the female and male genitalia. Mostly based on the genital characters of both sexes, we outlined and characterised 19 species groups:

- The *rectangula*-group (1) and *ocellina*-group (3) were already regarded by Mikola & al. (1987) as closely related. The *sordescens*-group (2) should be considered as the true sister-group of the *rectangula*-group (1). Thus, the (1+2) can be evaluated as sister-group of (3).
- The species-groups (4-8) consist of the next monophyletic unit characterised by the short digitiform or globular clavus and the single cornutus in the recurved or helicoidal vesica (with obtuse medial cornutus and spinulose superficial structures in the *Ch. vicina* group).
- Strongly supported monophyly was observed for the species-groups (9-10) based on some synapomorphies: digitiform costal process of valva; short, basally thick, apically pointed harpe; recurved vesica with two cornuti.
- In the "*elegans*"-group a recent speciation due to marginal splitting was hypothesised (*Ch. elegans* vs. *Ch. kacem* and *Ch. eberti*). *Ch. anatolica*, largely sympatric with *Ch. elegans*, may be the result of an earlier wave of speciation, while *Ch. larixia* is the mostly separated species within this group (insular subsp's).

- Within the "*fimbriola*-group" the sister-group relations are only slightly changed by the description of *Ch. nekrasovi*, which proved to be the sister species of *Ch. gratissima*. *Ch. cryptocuprea* evolved by marginal splitting from *Ch. cuprea*.
- The species group with yellow hind wings and diurnal activity (= *Cyrebia* Guenée, 1852) is connected by some synapomorphies with the *fimbriola*-group (clavus, falcate harpe, broad ductus bursae, etc.). Generic separation of this species group would make *Chersotis* paraphyletic.

Most *Chersotis* species are exclusively Palearctic. The majority of species inhabits xeric habitats in the Mediterranean and West- and Central Asiatic mountains. In Europe, species number shows a decreasing gradient to the Southwest. Oppositely, the Balkans, especially its southern areas are populated by a considerable number, partly locally occurring species. The continental Euro-Siberian area is only populated by a limited number of widely distributed, mostly steppic species. The Anatolian peninsula shows an eastwards increasing species gradient (mostly East of the Anatolian diagonal), by the appearance of some Iranian-Transcaspian species. The Zagros system and the Transcaspian mountain chains of Kopet Dagh and Koh-i-Binaloud show a surprisingly high number of rather localised or even endemic species. The Hissaro-Darwaz system, the Hindukush and western Tien-Shan also present close biogeographic connections by the occurrence of several stenochore species. A smaller number of species is confined to the western Himalayas and to the boundary area between the Palearctic and Indo-Malaysian region, respectively. A single Transberingian species (*Ch. juncta*) is recorded from NE Siberia and boreal North America. *Chersotis* is rich in pairs or triplets of closely related species which might have originated quite recently by allopatric speciation. Most of them show purely allopatric ranges of distribution, or with insignificant overlap.

Biogeography of Balkanic high mountain Lepidoptera

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Key words: Faunal types, central Balkanic split, Alpine connections, Carpathian connections, vegetation zonation, oro-Mediterranean

The balkanic high mountains are populated by several types of mountain species. They belong to five main biogeographical groups: (i) **boreo-montane** ("Siberian") species represented by isolated, partly differentiated populations mostly in the coniferous forests zones; (ii) **arctic-alpine** (in majority Eurasiatic!) species represented by isolated, most often taxonomically differentiated populations in alpine zones of highest Balkanic mountains; (iii) **alpine** (nearly exclusively European!) species represented by isolated, mostly taxonomically differentiated populations in subal-

pine-alpine zones of Balkanic mountains; (iv) **Balkanico-oreal** species often with isolated populations (subspecies) in the Southern or Southwestern Alps and Massif Central, in special cases also in the Appenines or in Southern and Eastern Carpathians; (v) **oro-Mediterranean-xeromontane** species occurring in the southern Balkanic mountains, being either endemic or represented by endemic subspecies.

The most typical biogeographical patterns are as follows: (i) close connections of the western Balcanic (Dinaric) populations of alpine and arctic-alpine species with southeastern Alpine ones; (ii) close connections of the eastern Balcanic (Thracian) populations of alpine and arctic-alpine species with southern Carpathian ones; (iii) the “Central Balcanic split” in taxonomic subdivision of several alpine and arctic-alpine species; (iv) the southern limit of distribution of boreo-montane, arctic-alpine and alpine species agrees with the “Adamovic-line”, i.e. the southern limit of alpine type of vertical zonation of vegetation; (v) the northern limit of oro-Mediterranean xeromontane species also well agrees with this important line, since these species are connected with the oro-Mediterranean type of vegetation (partly by food plant specialisations, see: endemic Polyommata or by rupicolous habitats, as some Noctuidae).

Structural constraints of secondary asymmetry in male external genitalia of Noctuidae (Noctuidae, Hadenini)

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Key words: Symmetric “bauplan”, dissymmetry, harpe-ampulla complex, saccular process, stimulation, prolonged copulation

The basic architecture of the external genitalia of Noctuidae (“genital capsula”) is bilaterally symmetric. Secondary asymmetry is well-known in different subfamilies and tribes. I will try to interpret the functions and processes which may be responsible for the secondary asymmetry (i.e. dissymmetry). I consider the genital structures as *correlated elements of a complex structure* (“bauplan”) in which some changes in details can be explained by selection due to optimization of the reproductive success. Major pathways of changes are, however, delimited by some structural constraints which parallelly appear in different phyletic lines of Noctuidae (subf. Noctuidae s.l.). One of these constraints is the subsistence of symmetry in structures with their own musculature. Oppositely, some rigid parts without their own musculature can more rapidly and divergently evolve in connection with the different allocation of functions. Such asymmetric structures may have some selective advantages due to the more effective stimulation, on one side, and fixation of genital parts during copulation, on the other. Asymmetric structures can effectively enhance the varia-

tions of the spatial geometry (- and also in species diversity! -) but without change of the “bauplan” which can be parallelly preserved in different taxonomical groups, e.g. in subtribes *Poliina* and *Anartina* (*Hadenini*). It means that the originally symmetric “bauplan” with its homologies can be considered as a phyletic “heritage” while the functional dissymmetrisation driven by selective optimization is the “habitus” in which numerous homoplasies can occur.

Copulatory mechanism of *Anania hortulata* (Pyraloidea: Crambidae)

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Key words: Ditrysia, genitalia, functional morphology, copulation

All species of the genus *Anania* Hübner, 1823 share two synapomorphies in the genitalia. In males, the phallus bears a long, often bilobed spine, which arises at approximately mid-length of the phallic tube, and which exceeds posteriorly its apex. In females, the ostium bursae is borne on a finger-like protuberance, which in turn is sunk in a deep invagination (*sinus vaginalis*), opening ventrally between the 7th and 8th abdominal segments (Leraut 2005, *Nouvelle Revue d'Entomologie* (N. S.), 22 (2): 123-139, and our observations).

According to our preliminary observations, the phallus inclusive of the spine appears too large for penetrating the ostium bursae of conspecific females. Moreover, the spine usually terminates in a saw-like edge.

The choice of *A. hortulata* (Linnaeus, 1758) for our functional study of the genitalic autapomorphies of the genus *Anania* was suggested by the presence of a large population of this species in the vicinity of our institute. *A. hortulata* shows, however, the maximum of complexity in the male and female genitalia within its genus. In addition to the abovementioned synapomorphies of all *Anania* species, males of *A. hortulata* also have a spine (*pollex*) on the ventral border of the valva and a large, unpaired, hook-shaped spine on the *juxta*. The *sinus vaginalis* of *A. hortulata* comprises, laterally to the median pocket hosting the finger-like protuberance, an additional pair of largely sclerotized pockets. Moreover, females of *A. hortulata* have a movable, spinulose, sclerotized plate (*lamella antevaginalis*), which at rest partially covers the floor of the *sinus vaginalis*.

Copulating pairs were immobilized by letting them fall into very cold 70% ethanol (approximately -20°C). Most of them were then transferred into Bouin's fluid, where the abdomens were cut off near to their bases in order to facilitate the penetration of the fixative. Some males and females were fixed at rest in the same way; others were fixed by injection of Bouin's fluid, or preserved dry or in 70% ethanol

after natural death. After external examination, some of the specimens were dissected (with or without previous treatment with 10% KOH) or cut into histological sections.

According to our observations, the phallic spine remains outside of the finger-like protuberance during copulation, embracing the protuberance and apparently acting as a guide for the apex of the phallic tube, which penetrates the ostium bursae. The male strongly grasps the female with its valvae, so that, at the level of the pollices, the width of the female body can be reduced down to approximately 1/4 of its width at rest. The sinus vaginalis is protracted, which requires the evagination of its slightly sclerotized lateral walls. The lamella antevaginalis is rotated by approximately 165° towards the male; this produces a transverse fold at the connection between the movable plate and 7th abdominal sternite. The hook-like spine of the juxta becomes engaged in this fold, thus grasping the female ventrally. Additionally, the male grasps the female dorsally with the uncus on the membrane between the 7th and 8th abdominal segments.

The causes which lead to the evolution of the peculiar genitalic autapomorphies of *Anania*, and of the additional specializations found in *A. hortulata*, are not clear from the present study. A comparative study of copulatory mechanisms in other species of *Anania* and in representatives of closely related genera, in the frame of a phylogenetic analysis, would be needed in order to formulate any founded hypothesis on the evolution of these traits.

The Butterfly Atlas of Slovenia – a tool for butterfly conservation

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Key words: Rhopalocera, distribution, conservation, species richness

The Slovenian butterfly atlas project started in 2001 and was initiated by the Society for research and conservation of Lepidoptera in Slovenia in cooperation with the Centre for Cartography of Fauna and Flora. Data collation covered literature records, butterfly collections, and unpublished observations. In the last decade active surveys of undersurveyed regions were organized to achieve a wider coverage. Until the end of 2011 a total of 212.936 records were collated, mostly from field observations (75%). Literature data covered 446 bibliographic units and 33.571 records. The major collection of the Slovenian Natural History Museum and several private collections added 15.864 records. As spatially broad sampling was a priority due to limited number of active observers, the coverage is far from uniform with several regions under- or over-studied. The main 'grey' areas are the predominantly

woodland areas in southern and eastern Slovenia. However, only 3% of all UTM 5x5 km squares were not surveyed, mostly marginal squares with less than 20% of the area in Slovenia. Out of 179 species confirmed to be part of the Slovenian fauna 173 were recorded during recent surveys. The species that are considered extinct or potentially extinct in Slovenia are: *Pyrgus onopordi*, *Colias myrmidone*, *Nymphalis vaualbum*, *Nymphalis xanthomelas*, *Hyponphele lycan* and *Chazara briseis*. The Primorska region, Kraški rob and Vipava valley in particular, are the hot spots of butterfly diversity in Slovenia and should be considered prime targets for butterfly conservation. Additionally the predominantly low intensity agricultural regions like Haloze and Goričko proved to be important centers of butterfly diversity and core distribution areas of many threatened species. Our Atlas provides a good overview of the recent distribution of the butterflies in Slovenia and should be considered as a powerful tool for nature conservation.

Effects of different types of artificial lighting on moths (Lepidoptera) in Slovenia

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Key words: light pollution; moth diversity; UV light; public lighting; biodiversity loss

In recent decades light pollution has been recognized as an important factor in ongoing biodiversity loss. Moths are among the most numerous and diverse group of insects attracted by lights. Although habitat loss in general is a more serious problem compared to the light pollution, light pollution has contributed to evident, but not yet quantified declines in moth densities and diversity in Slovenia. In order to test the effects of light pollution on moth behavior, we conducted a three year field survey as a part of LIFE+ project Life at Night (LIFE09 NAT/SI/000378), including four church triplets from different regions of Slovenia where reflectors were modified to remove light seepage and UV light emission. During the project each of the churches in a triplet was lighted by unmodified reflectors, modified reflector with filter removing UV light (blue), and modified reflector with filter removing blue and UV light (yellow) alternated in consecutive years. Light intensity on the sampling surfaces of the church was measured using MAVO-SPOT, GOSSEN light meter. At each church a sampling plot approximately 30 m² was selected where both the number of adults and number of species was counted six times each season. The results show up to tenfold increase in both number of species and specimens at churches illuminated by original reflectors emitting UV light. There is also significant positive correlation between number of specimens ($P < 0.0001$)

and number of species ($P < 0.0001$) with increasing light intensity. Regardless of the geographic position the original reflectors with UV light attract significantly higher number of specimens and species ($P = 0.0002$). Based on our observations it is evident that the removal of UV light can minimize the effects of light pollution caused by public lighting. This goal could be achieved with minimum financial input by simple modifications of current lighting using UV light filters.

Life cycles of Lepidoptera in Las Marismillas (Doñana National Park, Southern Spain): First results

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Key words: Life cycles, Lepidoptera, Las Marismillas, Doñana, Southern Spain

Since 2010 a survey on the diversity of Lepidoptera and plant formations is carried out in Las Marismillas, Doñana National Park (Huelva, Southern Spain). Searching in the vegetation (herbs, bushes and trees) caterpillars of 25 species were found; rearing these larvae and those obtained *ex ovo* from eggs laid by seven adults of different species, we got the life cycles of the following 32 taxa (species and sub-species):

- Anacampsis scintillella* (Fischer von Röslerstamm, [1841])
- Nothris congressariella* (Bruard, 1858) = (*N. declaratella* (Staudinger, 1859))
- Scythris inertella* (Zeller, 1855)
- Lobesia littoralis* (Humphreys & Westwood, 1845)
- Lobesia artemisiana* (Zeller, 1847)
- Lobesia bicinctana* (Duponchel, 1844)
- Lobesia botrana* (Denis & Schiffermüller, 1775)
- Acrolita subsequana* (Herrich-Schäffer, 1851)
- Agdistis neglecta* Arenberger, 1976
- Zerynthia rumina isabelae* Sabariego & Huertas, 1975
- Plebejus argus hypochionus* Rambur, 1858
- Itame vincularia* (Hübner, [1813])
- Rhoptria asperaria pityata* (Rambur, 1829)
- Menophra abruptaria* (Thunberg, 1792)
- Petrophora convergata* (Villers, 1789)
- Cyclophora porata* (Linnaeus, 1758)
- Glossotrophia rufomixtaria* (Graslin, 1863)
- Gymnoscelis ruffasciata* (Haworth, 1809)
- Saturnia pavonia josephinae* (Schawerda, [1924])

Hyles euphorbiae (Linnaeus, 1758)
Coscinia cribaria chrysocephala (Hübner, 1804)
Phragmatobia fuliginosa (Linnaeus, 1758)
Tyria jacobaeae (Linne, 1758)
Cerocala scapulosa (Hübner, [1788])
Eutelia adulatrix (Hübner, [1813])
Nola subclamydula Staudinger, 1871
Eublemma candidana (Fabricius, 1794)
Eublemma ostrina (Hübner, [1808])
Mesapamea secalis (Linné, 1758)
Mythimna loreyi (Duponchel, 1827)
Agrotis segetum (Denis & Schiffermüller, 1775)
Agrotis spinifera (Hübner, [1808])

Poster

Larvae of Sterrhinae (Lepidoptera, Geometridae): new morphological and biological data from Central Spain

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Key words: Geometridae, Sterrhinae, larvae, chaetotaxy, morphology, biology, Central Spain.

Data are provided, in many cases original, on the larvae of the following geometrid taxa: *Scopula rufomixtaria* (Graslin, 1863), *S. asellaria dentatolineata* Wehrli, 1926, *Rhodometra sacraria* (Linnaeus, 1767) and *Casilda consecraria* (Staudinger, 1871). Larvae were either collected from known habitats or bred out *ex ovo*.

Poster

Mutual exclusion between cryptic species generates most butterfly beta-diversity

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Key words: ecological niche modeling, genetic lineages, island biogeography, Lepidoptera, species interactions

The cryptic fraction of biodiversity is composed by morphologically similar species that are or have been overlooked by scientists. Most research is now directed towards documenting such cases, and estimating what will be the impact of this hidden fraction on the monumental task of describing Earth's biodiversity. We address for the first time the question whether the cryptic fraction of biodiversity displays particular properties beyond the fact that it is composed of morphologically similar species. By using the butterfly fauna of the Western Mediterranean we demonstrate that the cryptic fraction of diversity is overwhelmingly composed by groups of species that are not sympatric. Using two model cryptic species pairs we show that neither dispersal capacity, nor climatic factors seem to explain the observed chequered pattern of distributions, and that the existence of species interactions resulting in mutual exclusion is the most likely hypothesis. Finally, we demonstrate that mutual exclusion between cryptic species on islands accounts for most beta-diversity turnover. Thus, we show that the inclusion of cryptic diversity, frequently excluded in large-scale surveys and studies because of intrinsic identification difficulties, is of capital importance.

Diversification over millions of years in Lepidoptera: the effect of climate changes and plant radiations

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Key words: Timing of divergence, molecular systematics, plant-insect interactions, phylogenies

Understanding how the diversity of life responds to radical climate change has become an urgent task. Using the megadiverse order Lepidoptera as my model group, I will discuss how biotic and abiotic phenomena have interacted to influence the diversification rates of a group of organisms over millions of years. We have estimated a timeframe for the evolution of Lepidoptera and find that the crown group originated about 215 million years ago in the late Triassic. There appear to be three points in time where diversification rates have changed, first in the late Cretaceous coincidentally with the diversification of angiosperm plants, second after the great Cretaceous-Paleogene extinction event, and third in the Oligocene when the Earth cooled down and dried up. I will discuss the implications of these results to ongoing elevated extinction rates and climate change scenarios.

Extreme mothing

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Key words: moths

An account of a selection of extremes, superlatives and high-lights from over a half century of mothing, with the aim of entertaining as well as informing. Examples will include the largest numbers of moths trapped, the largest species encountered, mothing in extreme habitats such as in deserts, results from the oldest forests, ecological work on the rarest species, rediscoveries of species thought extinct in the British Isles, extreme conservation measures for endangered species, recoveries of marked individuals against the odds, and much more, drawing on experiences from Europe and around the world.

Climate change indicators in butterflies – responses of butterfly assemblages to climatic fluctuations in Germany

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Key words: butterflies, climate change indicators, CTI, Germany

The Community Temperature Index (CTI), i.e., the average thermal conditions of the ranges of species in a community or assemblage, was introduced to measure the impact of climate change on species assemblages. We applied this index to a long-term dataset of butterflies from the German Free State of Saxony covering 35 years, and compared it with data of the German butterfly monitoring scheme TMD from this and other German states.

The results indicate that butterfly assemblages respond to oscillations in annual mean temperature within the next generation.

The results also confirm that climate warming has affected butterfly assemblages during the last 2-3 decades by changing their composition towards species adapted to higher ambient temperatures. However, adaptation of butterfly assemblages to climate warming in Saxony is apparently insufficient to keep pace with the rate of climate warming during the past 35 years. Whereas hygrophilous species assemblages seem to have responded strongly, hardly any shift in composition is apparent in xerothermophilous species guilds.

We introduce our new project LepiDiv which, inter alia, intends to create the basis for applying this index also to butterfly assemblages in the Mediterranean region.

Structure and possible functioning of the vesica in Eucosmini and Grapholitini (Lepidoptera: Tortricidae)

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Key words: dichlorvos, everted vesica, cornuti, spermatophore

Eucosmini and Grapholitini are highly specialised and closely related tribes of sub-family Olethreutinae of family Tortricidae. Our previous studies showed considerable similarity in the general shape of the everted vesica and structure of cornuti of these tribes. In this study the possible functioning of vesica during copulation is discussed based on everted vesicae of intact specimens treated with dichlorvos. This compound causes eversion of the vesica and forming of spermatophore. The comparison between chemically and mechanically everted vesicae showed that they consist of two functionally different parts: eversible and non-eversible. Clear distinction in the position and function of deciduous and non-deciduous cornuti was observed. The mechanism of detaching of deciduous cornuti from the vesica was revealed. Some peculiarities of the lock-and-key mechanisms in both tribes are commented.

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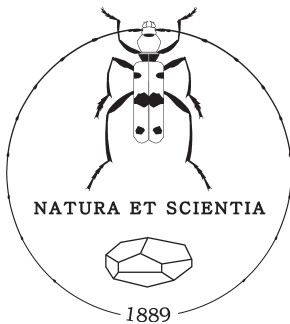
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