8th International Symposium on Syrphidae

4th – 8th June 2015

Monschau, Germany

Programme and Abstracts

Edited by Heather Humphrey-Patton & Ximo Mengual

The Organizing Committee

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Microdon (Microdon) tristis Loew, 1864
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Contents

Welcome

Dear Fellow Dipterists and Friends,

We welcome you to the 8th International Symposium on Syrphidae (ISS8) in Monschau. We are very pleased to see the amount of talks and posters at this meeting focusing on many aspects of Syrphidae, from systematics to their use in pest management.

The "International Symposium on Syrphidae" (ISS) is a regular meeting for researchers to present, share, and discuss their work on flower flies or hoverflies, commonly named "Schwebfliegen" in German. The aim of these symposia is to promote the study of flower flies, to engage new researchers, and to encourage the collaboration between scientists from different fields. Over the years, syrphidologists have developed a network around the world to work together in order to better understand these interesting flies from many points of view. The ISS is the principal activity of this global network and is a crucial resource used to keep in contact with collaborators, to gain first-hand insight into new research results on Syrphidae, and to argue about the future of this discipline.

On this occasion, the ISS8 takes place in the heart of Europe, in the historic town of Monschau (Germany). We wanted a symposium that stimulates new research collaborations and the delight of sharing experiences on Syrphidae. We hope we have succeeded and this meeting brings new discussions, such as global efforts for a family phylogeny, exploratory field work, bidiversity assesments, and fundaments for a society.

We thank our main funding agency, the Deutsche Forschungsgemeinschaft (DFG), for the support to make this meeting possible, the Samuel W. Williston Diptera Research Fund for the travel support funds for students attending the symposium, and the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK) for the infrastructure and logistics.

We are pleased to have you in Monschau, and before starting, we would like to remember our friend, colleague and mentor, Pavel Láska († 26.09.2014). Pavel was an extremely competent scientist and a warm human being. It was not possible to compile all his articles due to his expertise in many fields beyond Syrphidae, but we like to share a moment of memory and salute to Pavel by sharing all his works on Syrphidae in pdf. We thank Tore R. Nielsen and Libor Mazánek for their help.

Björn Rulik & Ximo Mengual
The Organizing Committee

General remarks

Location
Monschau preserves the magic of the old German cities with many half-timbered houses and narrow streets, which have remained nearly unchanged for 300 years. Located in the middle of the Eifel region of western Germany, in the narrow valley of the Rur River, the city of Monschau offers nature and culture and it is a popular destination for tourists.

While staying at the Carat Hotel, all daily meals and coffee breaks are included except dinners. During dinner time, we invite all delegates to try the German cuisine in the city of Monschau or stay in the hotel, where a buffet and/or a menu are also available.

The stay at Carat Hotel also includes free use of swimming pool and sauna. Please contact the Carat personnel directly for more details.

The rooms can be paid directly at the Carat Hotel reception during the registration on Thursday June 4th. Cash and credit card are accepted.

Meals
Dietary requirements as participants have stated on the registration form have been considered. A special dish will be served, ask kitchen personnel who have the list of persons.

The Symposium Banquet is not included and should be booked separately.

Social events
On Thursday June 4th at Carat Hotel, there will be a Welcome Dinner for all the participants at 7:30 pm. Please keep in mind that if you are not staying with us at the Carat Hotel, the price for the Welcome Dinner is 19,90 euros.

The Symposium Banquet will be held at Carat Hotel on Saturday June 6th. This time the Banquet is a special menu buffet that must be booked separately. The cost of the Banquet is 25 euros and drinks are not included.

Connectivity
Internet access will be provided for all delegates. During the symposium, two laptops for common use will be available.

Transport and arrival
Transport from Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), in Bonn (Germany), to Monschau and vice versa will be organized. A bus will leave from Bonn at 2 pm on June 4th and will come back to Bonn on 8th June around 7 pm.

Excursion 8th June

After we leave Monschau around 9 am, we will do a field excursion to several Nature Reserves (NSG) in the vicinity. In the morning, we plan to visit the NSG 'Perlenbach-Fuhrtsbachtal-Talsystem' and the NSG 'Oberes Rurtal mit den Felsbildungen der Ehrensteinley'. After lunch (lunch package provided by Carat Hotel), we plan to visit the NSG 'Hoscheider Venn mit Quellgebieten des Dreilaeger und Schleebaches'. Around 5 pm we will drive back to Bonn.

Participants must bring their entire luggage with them. Please arrange your own accommodation if staying additional night(s) in Bonn.

The Organizing Committee has requested collecting permits to the German authorities and insect collecting is permitted. There is no additional cost for the field excursion.

Travel support funds

Small travel support funds are granted to students. These travel support grants are possible due to the funding from the S.W. Williston Diptera Research Fund.

Abstracts

Abstracts are arranged in alphabetical order by first author, and names of presenting authors are marked with an asterisk. Most abstracts were edited to a certain extent, but the content remains the sole responsability of the authors.

Disclaimer: This work is not issued for the purpose of public and permanent scientific record, or for purposes of taxonomic nomenclature, and as such is not published within the meaning of the various codes. Thus, any nomenclatural act contained herein (e.g. new combinations, new names), does not enter biological nomenclature or pre-empt publication in another work.

S.W. Williston Diptera Research Fund

Forschungs museum KOENIG

DFG Deutsche Forschungsgemeinschaft

Programme

Thursday 4 June

15:00 – 17:00	Arrival to the Carat Hotel, Monschau
17:00 – 19:00	Registration at front desk
19:30 – 21:30	Welcome Dinner

Friday 5 June

09:00 – 10:00	Registration at front desk
10:00 – 10:20	Welcome

Session 1. Faunistics and biogeography. Chairs: A. Ssymank & X. Mengual

Plenary talk

10:20 – 10:50	**A. Barkalov & V. Mutin** Hoverflies (Diptera, Syrphidae) of Chukotka: fauna and distribution
10:50 – 11:20	Break
11:20 – 11:40	**S. Sahib, B. Wakkie & B. Belqat** Hoverflies (Diptera, Syrphidae) of Morocco: a taxonomic and ecological study
11:40 – 12:00	**K. Huo** What a huge number of hoverflies in China!
12:00 – 12:20	**J.H. Skevington, A.D. Young, W. van Steenis, M. van Zuijen & F.C. Thompson** Revising a continental fauna: Australian Syrphidae
12:20 – 14:00	Lunch

14:00 – 14:20 **T. Zeegers**
Hoverflies (Syrphidae) of the former military base Soesterberg (The Netherlands): how runways became nature

Session 2. Integrated pest management, biology, ecology and conservation. Chairs: S. Rojo & A. Ricarte

Plenary talk

14:30 – 15:00 **A. Ricarte & M.A. Marcos-García**
Biodiversity and conservation of saproxylic Syrphidae (Diptera): the Spanish experience

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15:00 – 15:30 Break

15:30 – 15:50 **F. Jauker & B. Jauker**
Hoverflies in landscape ecological research

15:50 – 16:10 **Z. Janovský, P. Gruberová, N. Uhlíková, K. Kmecová, A. Pavlíková & E Horčičková**
Patterns of hoverfly occurrence in agricultural landscapes: the interplay between phenology, resource availability, and habitat type

16:10 – 16:30 **L. Saez-Forcada, A. Campoy, C. Pérez-Bañón & S. Rojo**
Age-state, two-sex life table of the drone fly *Eristalis tenax*

16:30 – 16:50 **A. Pavlíková & Z. Janovský**
How time, weather and inflorescence ontogeny influence hoverfly pollination activity: observations of inflorescence of *Succisa pratensis*

16:50 – 18:00 **Poster session 1**

Saturday 6 June

09:30 Opening

09:40 – 10:00 **C. Taylor, T. Reader & F. Gilbert**
Hoverflies are imperfect mimics of wasp colouration

10:00 – 10:20	**F. van de Meutter** Oviposition behaviour in *Chamaesyrphus lusitanicus* Mik, 1898
10:20 – 10:40	**M.N. Morales, S. Rojo, C. Pérez-Bañón, A.P.N. da Silva, L. Langsdorff Oliveira & C.E. Souza Bezerra** Predatory flower flies as agents for biological control in Brazil
10:40 – 11:00	**A. Lucas, D. Forman & N. de Vere** Syrphidae as pollinators in Welsh grasslands
11:00 – 11:30	Break

Session 3. Phylogenetics and DNA barcoding. Chairs: G. Ståhls & J.H. Skevington

Plenary talk

11:30 – 12:00	**J.H. Skevington, X. Mengual, G. Ståhls, S. Kelso, A.D. Young, K. Jordaens, M. Reemer, M. Hauser, J. van Steenis, G. Miranda, W. van Steenis & M. De Meyer** Syrphidae phylogenetics: An update on our efforts to create a comprehensive hypothesis of world flower fly relationships
12:00 – 12:20	**G. Ståhls, X. Mengual, M. Reemer, M.N. Morales & J.H. Skevington** The same old gene fragments but considerably improved taxon sampling: impact on Syrphidae phylogeny
12:20 – 14:00	Lunch
14:00 – 14:20	**B. Rulik** German Barcode of Life Project: first syrphid results
14:20 – 14:40	**K. Jordaens, G. Goergen, A. Vokaer, M. Virgilio, T. Backeljau & M. De Meyer** DNA barcoding contributes to the taxonomy of Afrotropical hoverflies
14:40 – 15:00	**N. Veličković, M. Djan, D.O. Vidaković, G. Stahls, L. Šašić, S. Radenković, J. Ačanski & A. Vujić** Genetic species concept within genus *Merodon* (Diptera, Syrphidae)
15:00 – 15:30	Break

15:30 – 15:50	**X. Mengual, G. Ståhls & S. Rojo** New insights into the *Scaeva – Eupeodes* evolutionary lineage
15:50 – 16:10	**A.D. Young, S.A. Marshall & J.H. Skevington** The uses of molecules and morphology in taxonomy: A revision of the Nearctic species of *Platycheirus* (Diptera, Syrphidae)

Round table

16:10 – 17:00	**S. Kelso, J.H. Skevington, G. Ståhls, X. Mengual, K. Jordaens & M. Reemer** Syrphidae molecular systematics – round table discussion
17:00 – 18:00	**Poster session 2**
19:30 – 21:30	Symposium Banquet at the Carat Hotel

Sunday 7 June

08:50 Opening

Session 4. Systematics and taxonomy. Chairs: M.N. Morales & M. Reemer

Plenary talk

09:00 – 09:30	**G.V. Popov** Syrphidae from Cretaceous — refuted?
09:30 – 09:50	**M. Reemer** The Microdontinae: what's going on?
09:50 – 10:10	**M.N. Morales, A. Ssymank & G. Ståhls** Overview of the Afrotropical *Simoides* Loew
10:10 – 10:30	**J.T. Smit** The genus *Eumerus* Meigen, 1822 of the Arabian Peninsula
10:30 – 11:00	Break
11:00 – 11:20	**K. Moran** A review of the North American Criorhinina (Diptera, Syrphidae)

11:20 – 11:40	**W. van Steenis & M. van Zuijen** The Australian genus *Hemilampra*
11:40 – 12:00	**J. Ačanski, S. Radenković & A. Vujić** Delimitation difficulties in species splits: a geometric morphometric shape analysis of wing and male terminalia in *Merodon avidus* complex
12:00 – 12:20	**A. Vujić, Z. Nedeljković, R. Hayat & O. Demirözer** The genus *Chrysotoxum* Meigen, 1803 in Turkey
12:20 – 14:00	Lunch
14:00 – 14:20	**L.E. Mielczarek & A. Tofilski** Identification of species of *Xanthogramma* using wing venation
14:20 – 14:40	**M. Miličić, J. Ačanski, L. Šašić, S. Radenković & A. Vujić** Ecological divergence of species in *Merodon cinereus* complex
14:40 – 15:00	**A. Tofilski & L.E. Mielczarek** Smaller syrphid flies are more asymmetrical
15:00 – 15:30	Break
15:30 – 16:00	**G.F.G. Miranda** In search of more characters in the female abdomen and genitalia of Syrphidae
16:00 – 16:20	**F.C. Thompson** Half a century of flower fly research. Where have we come from, where are we, and where should we be going?
16:20 – 16:30	Open discussion, closing remarks

Special talk

17:00 – 17:30	**A. Ssymank** Syrphidae of the Eifel National Park (Northrhine-Westphalia)

Monday 8 June

09:00 – 17:00	**Excursion** NSG 'Perlenbach-Fuhrtsbachtal-Talsystem' NSG 'Oberes Rurtal mit den Felsbildungen der Ehrensteinley' NSG 'Hoscheider Venn mit Quellgebieten des Dreilaeger und Schleebaches'
around 19:00	Arrival to Bonn

List of poster presentations

P.-M. Bauer, S. Pfister, J. Schirmel & M. Entling
The effect of semi-natural habitats and landscape complexity on hoverflies (Diptera, Syrphidae) in an agricultural landscape

A. Campoy, C. Pérez-Bañón, T.R. Nielsen & S. Rojo
First data about preimaginal morphology of *Eristalis fratercula* (Diptera, Syrphidae)

D. Chrysler & G.F.G. Miranda
Lepidomyia Loew, 1864 of the Brazilian Amazon

J. Hadrava & K. Daňková
Hoverflies in pollination networks

K. Jordaens, G. Goergen, A. Kirk-Spriggs, A. Vokaer, T. Backeljau & M. De Meyer
DNA barcoding identifies an introduced hover fly species (Diptera, Syrphidae, Syrphinae) in the Afrotropics

A. Lucas, D. Forman & N. de Vere
Hoverflies as pollinators in Welsh grasslands

Z. Markov, A. Ricarte, Z. Nedeljković & A. Vujić
Syrphids of Northern Serbia: evidence from a regional survey of pollinator insects

X. Mengual, C. Pérez-Bañón, E. Arcaya & S. Rojo
Notes about preimaginal morphology and phylogeny of Neotropical species of genus *Syrphus* Fabricius (Diptera, Syrphidae)

A.L. Müller & J. Dauber
Can climate and biodiversity targets be harmonised by a diversification of the energy crop production?

V. Mutin, W. van Steenis, S. Bot, C. Palmer, J. van Steenis, J.H. Skevington, X. Mengual, G. Merkel-Wallner, M. van Zuijen, T. Zeegers & A. Ssymank
Syrphid fauna of Tumnin River basin (the Eastern macroslope of the Northern Sikhote-Alin)

G. Nève
Parhelophilus crococoronatus Reemer, 2000 in France

C. Pérez-Bañón, A. Aracil, M.N. Morales, G. Ståhls & S. Rojo

Phylogenetic position and notes on the ultrastructure of the puparium of the genus *Austalis* (Diptera, Syrphidae)

J. Preradović, S. Radenković, C. Pérez-Bañón, D. Obreht, M. Đan, L. Šašić & A. Vujić

Pupal stages in genus *Merodon* Meigen, 1803 (Diptera, Syphidae)

T. Romig

Syrphidae of the Italian Alps: New data on the syrphid fauna of South Tyrol

A. Ssymank & D. Doczkal

Red Data Book of Syrphidae (Diptera) in Germany – methods and results of the current 2012 version and outlook for 2020

J. van Steenis

Syrphidae in trees: website and project about artificial breeding sites for saproxilic Syrphidae

A. Vujić, S. Radenković, & A. Grković

Taxonomic status of *Eumerus* Meigen, 1822 (Diptera, Syrphidae) species in the South-East Europe

Abstracts

Delimitation difficulties in species splits: a geometric morphometric shape analysis of wing and male terminalia in *Merodon avidus* complex

Jelena Ačanski[1]*, Snežana Radenković[1] & Ante Vujić[1]

1 University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology, Trg Dositeja Obra dovica 2, 21000 Novi Sad, Serbia

The *Merodon avidus* complex was the subject of many studies in the last decade. Lack of clarity in species determination was present due to great variability of morphological characters. As a consequence, *Merodon avidus* (Rossi, 1790), was described six times under different names (Hurkmans 1993). Later, morphological traits and alozime variability showed that *M. avidus* is a genetically and geographically structured taxon (Milankov et al. 2001). Mitochondrial DNA COI marker failed to delimit taxa defined by alozime loci. Additionally, wing shape showed great similarity between allopatric metapopulations of investigated taxa (Milankov et al. 2009).

A new study conducted on re-determined specimens and new material collected from different parts of Central and Southern Europe, Morocco, and Turkey confirmed that *M. avidus* is a species complex. DNA barcoding sequences clearly separated *M. ibericus* nom. nov. Vujić, while *M. avidus* and *M. moenium* (Wiedemann, 1822) are separated with species-specific alleles found at the AAT locus (Popović et al. in press). Morphological characters are very stable in populations of *M. moenium*, contrary to populations of *M. avidus*. Spring generation of *M. avidus* differs from the late summer/autumn generation of *M. avidus* and can be easily confused with *M. moenium*. Further, these species are not separable by male genitalia features. This study represents results of using the geometric morphometry (shape of wing and surstyle of male genitalia) in species delimitation within the *M. avidus* complex.

This study was financially supported by the Ministry of Science, Republic of Serbia, Grant No. ON173002 and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

References

Hurkmans W. 1993. A monograph of *Merodon* (Diptera: Syrphidae). Part 1. Tijdschrift voor Entomologie, 136: 147–234.

Milankov V, Vujić A, Ludoski J. 2001. Genetic divergence among cryptic taxa of *Merodon avidus* (Rossi, 1790) (Diptera: Syrphidae). An International Journal of Dipterological Research, 12 (1): 15–24.

Milankov V, Ludoški J, Ståhls G, Stamenković J, Vujić A. 2009, High molecular and phenotypic diversity in the *Merodon avidus* complex (Diptera, Syrphidae): cryptic speciation in a diverse insect taxon. Zoological Journal of the Linnean Society, 155: 819–833.

Popović D, Ačanski J, Djan M, Obreht D, Vujić A, Radenković S. Sibling species delimitation and nomenclature in the *Merodon avidus* complex (Diptera: Syrphidae). European Journal of Entomology, in press.

Hoverflies (Diptera, Syrphidae) of Chukotka: fauna and distribution

Anatolii Barkalov[1] & Valerii Mutin[2]*

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During field seasons of years 2013 and 2014, authors studied syrphids in the lower reaches of the Anadyr River. A total of 98 species belonging to 31 genera were found. Two species were described as new to science (Barkalov and Mutin 2014), another four species were recorded for the first time in Russia, and 43 species are new for the Chuukese fauna. Collected hoverflies represent the fauna of the hypo-arctic tundra in Northeast Asia where bushes combine with vast areas of tussock tundra. Shrubs (*Betula* spp.) and small trees (*Duschekia fruticosa*, *Salix* spp., *Sorbus sibirica*) together with elfin wood (*Pinus pumila*) occupy only the river valley. Hoverflies with xylophagous larvae constitute about 6%, the Syrphinae account for 65.3%, and species of Pipizinae represent 3.1%.

In the tundra, syrphids feed on flowers of *Rubus chamaemorus* and disappear after June because vegetation is formed mainly by a sedge (*Carex lugens*) and cotton grass (*Eriophorum vaginatum*). We collected numerous syrphids among shrubs inside of the high floodplain and adjacent river terrace. The valley sides of the Anadyr River are occupied by late-lying snowfields. As a result, hoverflies were able to visit blooming dwarf willows and *Rhododendron aureum* from mid-June to late July. The majority of syrphid species were caught on blooming *Spiraea beauverdiana* and *Sorbus sibirica*.

During a brief stay in the town of Anadyr, we successfully collected hoverflies in meadows along Kazachka River. Many flies were caught on blossoming *Saussurea nuda*, *Arctanthemum arcticum*, and *Potentilla egedii*, but species of the *Platycheirus clypeatus* group, together with *Melanostoma* spp., visit flowering grasses here as they do elsewhere.

This study was funded by the Russian Foundation for Basic Research, grant number 13-04-00202-a and partly by the Federal Fundamental Scientific Research Programme for 2013-2020 No.VI.51.1.9.

References

Barkalov AV, Mutin VA. 2014. Two new species of Syrphidae (Diptera) from Chukotka (Northern Russian Far East). Zootaxa, 3846 (2): 285–292.

The effect of semi-natural habitats and landscape complexity on hoverflies (Diptera, Syrphidae) in an agricultural landscape

Philipp-Martin Bauer[1]*, Sonja Pfister[1], Jens Schirmel[1] & Martin Entling[1]

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In agricultural landscapes, semi-natural habitats act as important landscape features for many organisms. While semi-natural habitats provide essential resources like shelter and food, they can significantly increase the local abundance and biodiversity of arthropods including beneficial arthropods. However, research is needed to analyse which types and characteristics of semi-natural habitats are most favourable for beneficial arthropods and if there are interactive effects with the landscape complexity. In this study we focussed on hoverflies as an important beneficial organism group in agriculture. We investigated hoverfly abundance and diversity in four common types of semi-natural habitats along a landscape gradient. Over a year we collected 6,400 hoverflies in 69 semi-natural habitats in south-west Germany. Mean hoverfly abundance was highest in woody structures which was mainly driven by aphidophagous hoverflies (79% of all our individuals). In contrast, we found the highest diversity in herbaceous structures for both aphidophagous and non-aphidophagous hoverflies. The abundance of non-aphidophagous hoverflies were additionally positively related with the landscape complexity while the abundance of aphidophaous hoverflies were more related to local factors. Our results suggest that non-aphidophagous hoverflies benefit from complex landscapes which may be explained by a higher food availability for larvae that usually feed outside crop fields. In contrast, aphidophagous syrphids may be better able to handle landscapes of low complexity due to the fact that their larvae can use food resources from inside crop fields, but they still show a very high dependence on local factors. This knowledge can be used for future efforts of managing beneficial arthropods in agricultural landscapes of low level complexity.

First data about preimaginal morphology of *Eristalis fratercula* (Diptera, Syrphidae)

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2 Sandvedhagen 8, NO-4318 Sandnes, Norway

The larvae of the drone flies (*Eristalis* spp.) are commonly known as rat-tailed maggots due to the presence of a very long anal segment and a telescopic breathing tube. Occuring similarly with other saprophagous eristalines, the preimaginal stages are associated with decaying organic material in liquid or semi-liquid media.

Eritalis fratercula is a boreal species (northern Norway, northern Sweden, Finland, northern Russia, Greenland, Alaska, and Canada) associated with seasonally-flooded grassland with standing water in tundras and beside rivers in taigas. Preimaginal stages were not described, but eggs and larvae had been obtained in captivity from a gravid female collected at Skogmo, northern Norway (Nielsen and Svendsen 2014). Female was fed with drops of diluted honey applied on a *Ranunculus* flower. A plastic dish with a solution of soil, water, and cow manure was provided as rearing media. After some days, a number of larvae of different stages were killed in hot water and preserved in 70% alcohol. Scanning electron microscopy has been used for describing the egg and larvae of this species for the first time. Moreover, the preimaginal morphology of *E. fratercula* will be compared with all known descriptions of the genus *Eristalis*. Notes about the life cycle of this species are also presented.

References

Nielsen TR, Svendsen S. 2014. Hoverflies (Diptera, Syrphidae) in North Norway. Norwegian Journal of Entomology, 61: 119–134.

Lepidomyia Loew, 1864 of the Brazilian Amazon

Daiane Chrysler[1] & Gil Felipe Gonçalves Miranda[1]*

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Lepidomyia Loew, 1864 (Eristalinae, Brachyopini) ranges from the Southern United States to Argentina. Larvae are saprophagous and live in tree hollows with decomposing organic matter or in exudating tree sap. This genus is similar to *Myolepta* Newman, 1838, but species of *Lepidomyia* have an elongated basoflagellomere and both male and female have a facial tubercle. The latest revision and key are from Hull (1946), when it was still considered as *Lepidostola* Mik, 1886. The last described species was *L. micheneri* (Fluke, 1953). While studying material from the Brazilian Amazon, some specimens observed did not match any of the described species, so they had their genitalia dissected, photographed, and were then diagnosed. Among the characters that distinguish this morphospecies from other described species are the scale pattern on the mesonotum and abdomen, the rounded apex of the scutellum, and the only slightly protuberant vertex.

References

Hull FM. 1946. The genus *Lepidostola* Mik. American Museum Novitates, 1326: 1–15.

Hoverflies in pollination networks

Jiří Hadrava[1]* & Klára Daňková[1]

1 Department of Zoology, Faculty of Science, Charles University in Prague, Czech Republic

Pollination networks bring us a new approach to plant-pollinator communities' research. In previous studies, they were used especially for theoretical issues (e.g. mechanism of maintenance of highly diversified communities). However, only a few works were focused on particular taxa of pollinators in these data.

Many pollination network data have already been published by ecologists from many regions across the whole world. In our study, we additionally observed pollination networks on 49 localities in Central and Eastern Europe.

In these networks, hoverflies were widely distributed (in total, more than 10% of recorded pollinators were hoverflies). There were also large numbers of recorded individuals in some hoverflies species (for example *Eristalis tenax*, *Sphaerophoria scripta*, and *Episyrphus balteatus*), and therefore these data are available for study on autecology of these species as well.

We examined species-level network characteristics of hoverflies compared to other taxa. Linkage between these characteristics and biogeographic or phylogenetic information is discussed.

What a huge number of hoverflies in China!

Keke Huo[1]*

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The history of research on hoverfly taxonomy in China is reviewed. A checklist of the hoverflies (Diptera, Syrphidae) from China has been compiled based on the references of Chinese hoverflies, specimens from Chinese research institutes and those collected by researchers from various regions of China from 2000–2014. A total of 947 species, 119 genera, 15 tribes, and 3 subfamilies are listed: 379 species, 47 genera, and 4 tribes of the subfamily Syrphinae; 535 species, 65 genera, and 9 tribes of Eristalinae; and 33 species, 7 genera, and 2 tribes of Microdontinae.

Patterns of hoverfly occurrence in agricultural landscapes: the interplay between phenology, resource availability, and habitat type

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Hoverflies in agricultural landscapes are one of the main pollinator groups, and many species, unlike solitary bees, can thrive even under intensive farming. Despite their importance, the determinants of hoverfly occurrence in agricultural landscapes are largely unknown. In our present study, we focus on the interaction of floral resource availability with hoverfly (and plant) phenology and site type (semi-natural meadow/road verge) in determining hoverfly densities and species composition.

We conducted our research during two field seasons, three times (spanning from mid July to mid August) per season, by means of a trap-netting study at plots with an assessed amount of floral resources. This study resulted in more than 8,000 collected hoverfly specimens, which were further determined.

The analysis revealed that the phenology of both plants and hoverflies is the key determinant of both hoverfly densities and species composition. Amount of floral resources had only a marginal effect on hoverfly densities; however, this changed when also accounting for species composition of the flowering plants. Hoverfly species composition was influenced both by general gradient in flowering species composition as well as by some of the dominant flowering plant species, especially *Centaurea jacea*. Floral species composition explained altogether approximately half of the variation in hoverfly species composition when compared to amount explained by phenology. The effect of site type was negligible when correcting for differences in flowering plant species composition. The importance of densities of flowering *C. jacea* individuals for hoverflies (despite the fact that they are only infrequently visited) lies in their attraction of hymenopterans competing with hoverflies over resources, which then decreases plot attractiveness to hoverflies, even though plant species preferred by them co-occur with *C. jacea*. Finally, based on the results of our study, we also discuss methods of estimating hoverfly densities irrespective of local plot floral attractiveness.

Hoverflies in landscape ecological research

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Landscape ecology explores the relationship between ecological processes at large spatial scales. From an applied viewpoint, a major focus lies on how anthropogenic practices affect distribution patterns of organisms that potentially provide ecosystem services. Especially in cultivated landscapes, scientific as well as public interest in the resulting impact on ecosystem functions has significantly increased over the past decades.

Hoverflies are excellent study organisms in landscape ecological studies for several reasons. 1) They provide a broad array of ecosystem functions and services in the focus of scientific and practical interest such as pollination, pest control, and matter decomposition. 2) Differing larval habitat requirements allow for the assignment of specific functional groups with differing sensitivity to specific land-use change. 3) The active faunistic community contributes to a high level of ecological knowledge within this taxon.

We will present our own studies and recent literature to illustrate current research on hoverflies in agricultural landscapes. We will emphasise the following:

- The differential larval development of hoverflies allows for reasonable predictions of community level responses to land-use change at large spatial scales. The available ecological knowledge is a solid prerequisite for including hoverfly distribution patterns in landscape models.

- Hoverfly species richness and overall density contrast in their responses to land-use change. This illustrates the potential conflict between conserving biodiversity vs. conserving ecosystem services.

- Hover flies' responses to land-use change are significantly different from wild bees, the most prominent flower-visiting indicator in agroecosystems. This calls for a more differentiated approach in analysing the effectiveness of agri-environmental schemes in preserving pollinators in cultural landscapes.

DNA barcoding identifies an introduced hoverfly species (Diptera, Syrphidae, Syrphinae) in the Afrotropics

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Recently (2013–2014), several hoverfly specimens from two localities in Benin and Cameroon (West and Central Africa) were caught from a species that we could not identify using existing identification keys for Afrotropical Syrphidae. Sequencing of the standard COI barcode region and a subsequent BLAST-IDS in BOLD revealed a 100 % sequence similarity with *Toxomerus floralis* from Suriname (South America). Species identification was subsequently confirmed by morphology and sequencing of part of the nuclear 18S rDNA gene. The species is widely spread in Benin, Nigeria, and Cameroon, and eggs, larvae, and adults are abundant at several localities. Yet, the full extent of its geographic distribution within tropical Africa remains to be determined. This is only the second known established introduction of a non-African hoverfly species in the Afrotropics. Interestingly, the larvae of the species are pollinivorous, which is a rare feeding mode within the subfamily Syrphinae. Moreover, it is the only Syrphinae species of which the larvae feed on pollen from two plant species from different families (Cyperaceae and Rubiaceae). This example illustrates how DNA barcoding may allow a fast and accurate identification of introduced species.

DNA barcoding contributes to the taxonomy of Afrotropical hoverflies (Insecta, Diptera, Syrphidae)

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The identification of Afrotropical hoverflies is very difficult because of limited recent taxonomic revisions and the lack of comprehensive identification keys. In order to assist in their identification, and to improve the taxonomy of this group, we constructed a reference dataset of 480 COI barcodes for 83 of the more common nominal species from Ghana, Togo, Benin, and Nigeria (West Africa) and evaluated its identification accuracy with three methods (K2P distance-based, neighbor joining, and using SpeciesIdentifier). Results of the three methods were highly congruent and showed a high identification success. Nine species pairs showed a low (< 3%) mean interspecific K2P distance with several cases of paraphyly and misidentifications. A high (> 3%) mean intraspecific K2P distance was observed in eight species with several cases of para/polyphyly which may indicate the occurrence of cryptic species. Optimal K2P thresholds to differentiate intra- from interspecific K2P divergence were highly different among the three subfamilies (Eristalinae: 3.5%, Syrphinae: 5.8%, Microdontinae: 0.7–2%). In addition to providing an alternative identification tool, our study indicates that DNA barcoding improves the taxonomy of Afrotropical hover flies by selecting (groups of) taxa that deserve further taxonomic study and by attributing the unknown sex to species for which only one of the sexes is known. We will also illustrate how expanding the reference database with species and DNA barcodes from other Afrotropical regions may contribute further to the taxonomy of this group.

Syrphidae molecular systematics – round table discussion

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A group of us who work on molecular systematics problems will participate in a round table discussion to share our experiences and thoughts on current topics relevant to Syrphidae research.

The panel will discuss the pros and cons of different molecular approaches and platforms being utilized in molecular systematics including COI barcoding, Sanger sequencing, and anchored enrichment sequencing.

Speakers will lead a discussion with the audience that should help inform and open lines of discussion about issues related to our collaborative phylogenetic and taxonomy projects. Topics to be covered include DNA preservation and project workflow, pros and cons of different DNA types (mitochondrial vs. nuclear DNA, coding vs. non-coding DNA), taxon sampling vs. gene sampling, project-specific gene loci selection, Sanger vs. anchored enrichment sequencing, as well as obtaining and using COI barcodes for taxonomy.

Hoverflies as pollinators in Welsh grasslands

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Species-rich grasslands form a significant part of the wildlife resource of west Wales, and their conservation is a key priority. The most important conservation grasslands are dry species-rich grasslands, with typical species such as *Centaurea nigra* and *Lotus corniculatus*, and marshy grasslands, where the key indicator plant species are *Molinia caerulea* and *Cirsium dissectum*. Hoverflies are known to be important pollinators in a range of habitats, but their role in pollen transport, and the degree to which they demonstrate floral constancy, is unclear.

This study has combined field studies with DNA metabarcoding to study the impact of agricultural intensification on hoverfly communities in grasslands, and the role that hoverflies play in providing pollination services in grassland habitats.

Results from fieldwork on grassland field sites suggest that, whilst grassland plant community is an important driver of hoverfly assemblages, grazing management is also important. Metabarcoding has been used to investigate the pollen loads carried by *Eristalis* species, to determine if pollen loads differ between sites, and years. A more limited study has also been made of the pollen loads of five other hoverfly species: *Arctophila superbiens*, *Rhingia campestris*, *Volucella bombylans*, *Cheilosia illustrata* and *Sericomyia silentis*.

The results are providing insights into the habitat and flower choice of individual insects, and the potential role they play in pollination in grassland habitats.

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This presentation will discuss the results of a study of Syrphid communities found in these two conservation grasslands and two more botanically impoverished grasslands that are the result of agricultural intensification, and will explore how grassland management, as well as plant community, is the key driver in determining Syrphid assemblages.

Subsequent work has involved washing pollen from *Eristalis* hoverflies captured at four marshy grassland sites and using DNA metabarcoding to identify the species of pollen they carry. Preliminary results will be described, which are giving insights into the flower choice of individual insects and the potential role they play in pollination in grassland habitats.

Syrphids of Northern Serbia: evidence from a regional survey of pollinator insects

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The role of pollinator insects is crucial for the sustainability of wild ecosystems, as well as for guaranteeing production levels in many crops. Within Diptera, syrphids are exceptional pollinators for their dependence on flowers and length of time they spend visiting them. The study of insects as pollinators is a trending topic in science and the authorities of Vojvodina province, Serbia are promoting the generation of basic knowledge on this region's pollinators. Vojvodina, with 252 syrphid species recorded is basically a grassland-dominated flat area with two mountains, Fruška Gora and Vršačke planine, covered in woods.

Apoidea hymenopterans (Hymenoptera) and syrphids were surveyed in nine sites of Vojvodina from March–October 2014. The site habitats were deciduous forests, steppes, salt marshes, and sands. In the sampling results, syrphids were represented by 84 species. A new *Eumerus* species of the *bactrianus* group was discovered in the Pannonian steppe. However, most syrphid species were collected in forest sites. Floral resources of annual umbelifers (Apiaceae) occurring either in isolated patches within croplands or in track sides resulted to be important for the population maintenance of syrphid species of conservation interest such as *Chrysotoxum lineare* or the new *Eumerus*.

This study was funded by the project OI173002 of the Serbian Ministry of Education, Science, and Technological Development.

Notes about preimaginal morphology and phylogeny of Neotropical species of genus *Syrphus* Fabricius (Diptera, Syrphidae)

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Syrphus is a mainly north temperate genus with about 70 species described worldwide and 17 species occurring in the Neotropical Region. Although some species are common, very scarce data exist on larval morphology and a thorough molecular study of the genus has not been done.

In this contribution we present the first data about larval morphology of Neotropical species using scanning electron microscopy and we compare it with the one of Palaearctic species and published descriptions. First preliminary molecular phylogeny of genus *Syrphus* is also presented, including species from Palaearctic, Nearctic, and Neotropical Regions.

This study was partly funded by the German Barcode of Life (GBOL project), funded by Bundesministerium für Bildung und Forschung, and the Venezuelan Consejo de Desarrollo Científico, Humanístico y Tecnológico (CDCHT-UCLA; project 003-DAG-2007).

New insights into the *Scaeva* – *Eupeodes* evolutionary lineage (Diptera, Syrphidae)

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Scaeva, *Eupeodes*, and related genera share a common ancestor and constitute a relatively large radiation of Syrphini. Previous phylogenetic analysis using morphological data (larval and preimaginal data) and also molecular characters show that genera *Eupeodes*, *Scaeva*, *Ischiodon*, and *Simosyrphus* are very closely related. Preliminary molecular studies also include New World species of genus *Pseudodoros* into this clade, and accordingly, larval and/or adult morphology of other genera of predatory syrphids might also be related.

This contribution presents a molecular phylogenetic analysis of main species-groups of genera *Scaeva* and *Eupeodes*, including all known species of genus *Pseudodoros*, and representatives of other related genera such as *Betasyrphus* and *Notosyrphus*. Systematics results of *Eupeodes*, *Pseudodoros*, *Ischiodon*, and *Symosyrphus* are discussed.

This study was partly funded by the German Barcode of Life (GBOL project), funded by Bundesministerium für Bildung und Forschung.

Identification of species of *Xanthogramma* using wing venation

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To date, about 20 species of *Xanthogramma* are known from the Palaearctic Region, and six valid European species of *Xanthogramma* are recognized. The species are grouped into two subgenera: *Olbiosyrphus* and *Xanthogramma*. The subgenus *Olbiosyrphus* is represented in Europe by only one species (*X. laetum*). The other Europaean species belong to *Xanthogramma* s. str.: *X. citrofasciatum*, *X. marginale*, *X. dives*, *X. pedissequum*, and X. *stackelbergi*. The last three species can be difficult to discriminate because of large intraspecific variation. One earlier molecular study suggested that *X. pedissequum*, *X. dives*, and *X. stackelbergi* belong to one taxon (Ricarte et al. 2014).

We have investigated all the European species of *Xanthogramma* and three Eastern Palaearctic species (*X. sichotanum*, *X. coreanum*, *X.* sp.). The wing venation of 125 males and 47 females of *Xanthogramma* were measured. The measurements were used for identification of the species. Percentages of correctly identified individuals were relatively high, and for problematic *pedissequum* group, were as follows: *X. dives* (95.24% males, 78.57% females), *X. pedissequum* (95.12% males, 100% females), *X. stackelbergi* (83.33% males, 100% females). These results confirmed distinctness of the analyzed species. Moreover, the measurements confirmed earlier suggestions that *X. citrofasciatum* should be split into two species. The wing measurements do not confirm the distinctness of subgenus *Olbiosyrphus*.

This study was funded by the grant DS-3500/KSiP/15 of the Ministry of Science and Higher Education.

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Ecological divergence of species in *Merodon cinereus* complex (Diptera, Syrphidae)

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Merodon cinereus complex belongs to *aureus* group (sensu stricto) according to Radenković et al. (2011) which comprises a small species with a short, rounded abdomen, a distinct spike on the hind trochanter in males, and the characteristic structure of male genitalia: narrow, elongated, sickle-shaped hypandrium without the lateral sclerite of aedeagus.

Studies of Milankov et al. (2008) and Francuski et al. (2011) on *Merodon cinereus* (Fabricius, 1794) indicated the presence of several closely related taxa in this complex. Genetic and morphometric analyses of the material collected from the Alps and Balkan Peninsula (Serbia, Croatia, Montenegro, and FRY Macedonia) so far established three evolutionary independent lineages in the *cinereus* complex (Vujić et al. in prep.). Each of these species is endemic and connected with a particular mountain range that has specific climatic conditions.

This study defines environmental envelopes of investigated species using principal component analysis (PCA). Further, it allows the comparison of environmental preferences to indicate the degree of niche differences and to point out which climatic conditions on inhabited mountains can be correlated with speciation. Outcomes of the PCA analysis are used as an additional tool for distinguishing morphologically similar taxa.

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In search of more characters in the female abdomen and genitalia of Syrphidae

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Traditional generic identification keys separate the three currently recognized subfamilies of Syrphidae in their initial dichotomy based on the pilosity of the postpronotum and the number of visible abdominal segments on the male. Borisova (1980, 1982, 1984) made several observations about the morphology of the female genitalia, highlighting some distinct characters in a few groups of syrphids. Hippa (1986) discussed structures with possible taxonomic value but explicitly named only a few characters that were shared by some supra-specific taxa. Miranda et al. (2014) associated modifications on the female pre- and post-abdomen with specific genera. To supplement that initial dichotomy, the author's current study aims to expand the knowledge on Neotropical female Syrphidae and to offer characters of the female pre- and post-abdomen for diagnosis of supra-specific taxa, which might also be used in studies involving Syrphidae in other biogeographical regions.

This study was funded by the grant PCI/INPA/MCTI (#313083/2013-4).

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Overview of the Afrotropical *Simoides* Loew

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Simoides Loew is a small Afrotropical genus comprising six recognized species: *S. crassipes* (Fabricius) – type species –, *S. expletus* (Loew), *S. flavipila* Hull, *S. notatus* (Bigot), *S. villipes* (Loew), and *S. descendens* Becker. The genus belongs to the tribe Eristalini (Eristalinae), and its sister group is *Phytomia* Guérin-Méneville. Most of the species are known from the type material only. Consequently, there are few records of *Simoides* species in the current literature, except for *S. crassipes*, which seems to be widespread, and more local records for *S. villipes*. There is no identification key available for the species of *Simoides*. Furthermore, the abdominal pattern is quite similar among its species, even similar to some Afrotropical *Eristalinus*, which resulted in frequent misidentifications.

It is worth pointing out that several Afrotropical Eristalini species among different genera have similar abdominal color pattern. Thus, there is a need to look for consistent diagnostic characters for good identification keys.

Given the current scenario, and after sampling species of *Simoides* in South Africa, we have decided to carry out systematic studies on this genus. To our surprise, we found out that some type species do not belong to this genus. Therefore, we have decided to divide our work in two parts: 1) a review of the genus, including an appropriate identification key and description of new species; 2) phylogenetic analysis based on morphological and molecular data. A discussion of our preliminary results is presented.

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Predatory flower flies as agents for biological control in Brazil

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This three-year project aims to investigate which species of Syrphidae can play an important role to the biological control of pests in Brazil, especially aphids. During the first year (2014–2015), Syrphidae larvae are being collected in four different crops in Minas Gerais state, Brazil: 1) Cut roses, cultivated in greenhouse; 2) Organic cabbage (*Brassica oleraceae* var. *acephala*); 3) Citrus trees (*Citrus* spp.); 4) Guava trees (*Psidium guajava*). After a year of sampling, Age-Stage, Two-Sex Life tables will be studied for the most abundant species of Syrphidae sampled in each crop. To investigate the prey-predator interactions, the functional response will be also evaluated.

As preliminary results, 45 samples were carried out. A total of 452 immature Syrphidae belonging to four genera (*Allograpta*, *Ocyptamus*, *Pseudodoros*, *Toxomerus*) were collected from which 48.33% did not complete their development. From the 51.67% viable pupae, 71.62% adults of Syrphidae and 28.38% parasitoid wasps emerged. The most abundant species of Syrphidae was *Allograpta exotica* (Wiedemann), followed by *Ocyptamus gastrostactus* (Wiedemann); the parasitoids were mainly *Diplazon laetatorius* (Fabricius) (Hymenoptera, Ichneumonidae).

In Brazil, few studies have been conducted on the activity of predatory species of Syrphidae. Moreover, some of these studies showed the importance of several Syrphidae species on biological pest control based only on the survey of adults regardless of the presence of immature stages in the crops. This is the most comprehensive study on Syrphidae predators developed in Brazil to date.

This study is supported by CAPES (Brazil) proc. PVE 88881.030378/2013-01.

A review of the North American Criorhinina (Diptera, Syrphidae)

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The North American species concepts of the Syrphidae subtribe Criorhinina are reviewed. Members of this subtribe are easily recognizable, with their robust size and convincing wasp or bumble-bee mimicry. The North American region contains 26 recognized species in three genera: *Criorhina* Meigen, 1822, *Sphecomyia* Latreille, 1829, and *Merapioidus* Bigot, 1879. Of these genera, the North American *Criorhina* have never been reviewed, *Sphecomyia* was reviewed in 1965, and *Merapioidus* is monotypic. This revision is based on external morphological characters of the adult flies and includes studies of the male terminalia. Five new synonyms are proposed. *Criorhina bubulcus* (Walker, 1849) is senior to *Criorhina quadriboscis* Lovett, 1919. *Criorhina kincaidi* Coquillett, 1901 is senior to *Criorhina grandis* Lovett, 1921 and *Criorhina latipilosa* Curran, 1925. *Criorhina nigriventris* Walton, 1911 is senior to *Criorhina mystaceae* Curran, 1925. *Criorhina metallica* (Bigot, 1882) is senior to *Criorhina lupina* (Williston, 1882).

The 21 concepts found to represent valid species are re-described. Eleven new species are recognized and described totaling six new Nearctic *Sphecomyia*, one new Nearctic *Criorhina*, and four new Neotropical *Criorhina*. A dichotomous key for their identification is developed, and illustrations and photographs are provided to support descriptions and facilitate future identification. The biogeography of the subtribe in North America is discussed. While generic concepts are not examined, morphological and molecular evidence is presented indicating that *Sphecomyia* are derived *Criorhina*. Additionally, evidence is presented indicating that the Central and Mesoamerican species of *Criorhina* are not closely related to other *Criorhina* but instead to the mostly Oriental *Matsumyia* Shiraki, 1949.

Can climate and biodiversity targets be harmonised by a diversification of the energy crop production?

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After the Renewable Energy Act was passed in Germany, maize became of vital importance as feedstock for the increasing biogas production. In some regions, the maize acreage doubled within 10 years (2003–2012). Thereby, energy maize displaced other food and fodder crops, such as wheat, and led to the conversion of grassland and fallows into arable land. Thus, energy maize production is criticised for decimating valuable food and larval habitats for pollinators. One promising new crop to counteract the negative effects of this habitat loss is *Silphium perfoliatum* L. (Asteraceae) because it provides both an adequate biogas yield and floral resources for pollinators.

To evaluate the attractiveness of *Silphium perfoliatum* for syrphids, we examined 16 established commercial fields in Lower Saxony in Northern Germany. During the late flowering period of *Silphium perfoliatum* between July and September in 2012, we set coloured pan traps in the fields as well as in reference habitats. The study sites showed a gradient in landscape composition and land-use diversity. Our results indicate that mostly saprophagous hoverflies can benefit from a cultivation of *Silphium perfoliatum*, but only when semi-natural habitats are present in the surroundings (3,000 m radius).

This study was funded with support from the Federal Ministry of Food and Agriculture (BMEL) by the central coordinating institution for research, development, and demonstration projects in the field of renewable resources (FNR, project number: 22004411).

Syrphid fauna of Tumnin River basin (the eastern macroslope of the Northern Sikhote-Alin)

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The basin of the Tumnin River (Khabarovskiy Krai, Russia) occupies the eastern macroslope of the Northern Sikhote-Alin. There is a pronounced ecotone between the coniferous boreal forests of Siberia and the mixed subboreal forests of East Asia. The syrphid fauna of this territory contains local endemics of the Eastern Palaearctic. Entomologists have rarely visited the basin of Tumnin River, although V.K. Arsenyev collected various insects in the vicinity of the Emperor's Harbor (city of Sovetskaya Gavan) as far back as 1908. His collection has not been examined and is now mostly lost. Information on 109 species and 38 genera of syrphids from the environs of Tumnin Village has been published previously (Mutin 2011).

In June 2013, a group of participants of the 7th International Symposium on Syrphidae had a trip, organized by the first and fifth author, to the Far East and surveyed an area of the Tumnin Spa and its surroundings as well as the coast of the Tatar Strait near the estuary of the Tumnin River. Members of the group collected a large amount of syrphid material, including specimens of more 70 species and 16 genera unknown previously in the area. *Blera yudini* and *B. nitens* were very interesting finds made on the top of a mountain near the Tumnin Spa and *B. violovitshi* along the Tumnin River. *Sericomyia dux* was a surprise as other known specimens were collected in the Southern Primorje. With further collections made during July 2012 and May 2014, more than 200 species and 59 genera have now been found in the basin of the Tumnin River. These records also provide a good indication of the overall syrphid fauna of the Northern Sikhote-Alin.

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Parhelophilus crococoronatus Reemer, 2000 in France

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Parhelophilus crococoronatus was described by Menno Reemer (2000) based on specimens from Portugal. In the original description, one specimen from France was mentioned: Carpentras, VI.1953. A population of the species was located in Fos-Sur-Mer, in the Mediterranean France in 2014. This species was not captured in Malaise traps set at the site, but only by direct net capture. Searches in the Museum National d'Histoire Naturelle (Paris) and in the Marseille Museum failed to locate further specimens. Only specimens of the sister species *P. frutetorum* were found. The flight period of *P. crococoronatus* seems to be short in South France (at the beginning of May). These factors might explain why the species had been overlooked for so long.

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How time, weather, and inflorescence ontogeny influence hoverfly pollination activity: observation of inflorescences of *Succisa pratensis*

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Inflorescences composed of many florets flower for several days during which they pass through different flowering phases. Inflorescences of *Succisa pratensis* Moench first produce male anthers for several days and then shift to a short female phase with stigmas present. We recorded whole lifespans of five inflorescences of *S. pratensis* to find out if flowering phase affects plant's attractiveness for pollinators, what the structures of insect visitors are, and how weather conditions influence pollinator activity.

Hoverflies represented 92% of 5075 recorded insect visitors. Particularly dominant species were as follows: *Eristalis tenax* (32%), *E. interruptus* (15%), *Helophilus hybridus* (8%), *H. trivittatus* (7%), *Sericomyia silentis* (5%), and *H. pendulus* (3%). Inflorescences in female phases were generally more visited than male ones. Hoverfly activity followed one of several diurnal activity patterns. Interestingly, confamilial species did not share similar activity patterns. Pollinators stayed on individual plants usually less than 30 seconds. Such short visits can be beneficial to the plant by increasing outcrossing rate and reducing the risk of self-fertilization.

Phylogenetic position and notes on the ultrastructure of the puparium of the genus *Austalis* (Diptera, Syrphidae)

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The genus *Austalis* was described from the Australian biotic region in 2003 (Thompson 2003). The typically bright metallic adults of genus *Austalis* are readily distinguished from all other eristaline syrphids by the pilosity of the pleuron, having the unique combination of pilose posteroventral anepimeron along with pilose katepimeron. But little is known of the life histories and morphology of the preimaginal stages of the *Austalis* species. Scanning electron microscopy has been used for describing morphology of the puparia of this genus based on specimens reared in semi-natural conditions in small pools with natural vegetation in Southeast Australia.

Phylogenetic position of genus *Austalis* is presented based on combined analysis of molecular and adult morphological characters. The preimaginal morphology will be compared with close-related genera of Eristalinae.

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Syrphidae from the Cretaceous — refuted?

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Syrphid's origin in the Cretaceous has become a common reference in the literature on fossil insects. This opinion is based on a note by Kovalev (1979). All further reports about Cretaceous Syrphidae are based only on that report. I had an opportunity to study this unique specimen deposited in the Palaeontological Institute of Russian Academy of Science, Moscow (№ 3631/13). This is a Santonian (Late Cretaceous) retinite amber with an inclusion: a single dipteran adult labeled as "Syrphidae". It was found in the "Ugolyak" locality (Taimyr Peninsula, Russia) in 1976. The inclusion is fragmented (only head, thorax with legs, partial abdomen, wings without blades) and in poor condition. Study of the specimen led to the conclusion that it does not belong to Syrphoidea and is possibly a representative of Platypezoidea.

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Pupal stages in genus *Merodon* Meigen, 1803 (Diptera, Syphidae)

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The immature stages of species from phytophagous genus *Merodon* Meigen, 1803, as well as their host plants, are mostly unknown although it is one of the largest genera of hoverflies in Europe with more than 170 species (Vujić et al. in prep.). All known immature stages of genus *Merodon* feed on the tissues of living plants such as bulbs and rhizomes of families Asparagaceae [*Ornithogalum* L., *Muscari* (L.) Miller, *Drimia* Jacq. (syn. *Urginea* Steinh.), *Hyacinthella* (Steven) Losinskaja, *Anthericum* L., *Prospero* Salisbury (syn. *Scilla* L.)]; Iridaceae [*Gladiolus* L., Iris L., *Crocus* L.]; and Amaryllidaceae [*Narcissus* L.] (Heiss 1938, Stuckenberg 1956, Ricarte et al. 2008, Speight 2014). Until now, the pupal stages of the following three *Merodon* species were described: *M. equestris* (Fabricius, 1794), *M. luteihumerus* Marcos-García, Vujic & Mengual, 2007 and *M. bombiformis* (Hull, 1944). During field investigations in Eastern Serbia (National Park Djerdap Gorge), one puparium was found in the ground, near the bulb of *Ornithogalum* sp. The DNA barcode data confirmed that this pupa belongs to the species *M. aureus*. Analysis of an old museum material from The Bavarian State Collection of Zoology (Zoologische Staatssammlung München, Germany) revealed puparium of one more species, *M. rufus* Meigen, 1838.

Here, presented for the first time, are the descriptions of puparia of these two *Merodon* species, including main diagnostic characters of the pupal spiracle (length, shape, and arrangement of tubercles) and posterior breathing tube (length, shape, color, and number of spiracular openings and their arrangement) by use of scanning electron microscopy. In addition, puparium morphology of *M. aureus* and *M. rufus* are compared with all known puparium descriptions of genus *Merodon*.

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The Microdontinae: what's going on?

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In 2013, the year of the previous International Symposium on Syrphidae, a new classification was proposed for the genera and species of the Microdontinae, supported by the results of phylogenetic analyses. The aim of this new classification was to provide a framework for further studies on the phylogeny, taxonomy, and biology of this group.

Two years later, a number of papers on the taxonomy and biology of the Microdontinae have been published and several projects are in progress. This presentation will summarize the published findings and give a view into what's going on

Biodiversity and conservation of saproxylic Syrphidae (Diptera): the Spanish experience

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Saproxylic syrphids are those dependent on dead wood or decaying material associated with the woody parts of trees. Larvae of these species contribute to decomposition and nutrient recycling processes in forests. Saproxylic syrphids can act as indicators of woodland quality because their breeding sites are usually associated with over mature trees and moist, fallen wood. These syrphids are included in the Red Lists of many European countries (e.g. *Caliprobola speciosa* in Spain) or are targets of individual conservation (e.g. *Hammerschmidtia ferruginea* in the UK). Even in some countries, such as Serbia, certain species are protected under legislation. However, saproxylic syrphids are still poorly understood in terms of their distribution, population dynamics, ecological interactions, breeding sites, and even taxonomy.

Studies carried out in the Mediterranean forests of Spain during the last decade have increased our knowledge on the saproxylic syrphids in Europe. Early stages and breeding sites have been discovered, as well as new syrphid/tree associations for many species. The relationships between species interactions and environmental characteristics were assessed in the wider community of saproxylic insects from rot holes of trees. Network analyses were conducted to better understand the structure, dynamic, and stability of the saproxylic community. Our results also revealed facilitation processes among saproxylic species in rot holes. Mediterranean forests that have been traditionally managed throughout history (e.g. ‘dehesa’) have been shown to have an important diversity of saproxylic syrphids. All these and other results of 10-years work in Spanish saproxylic syrphids have proven useful for species and habitat conservation.

Studies presented in this talk were funded by the projects CGL2012-31669 of the Spanish Ministry of Economy and Competitiveness and PROMETEO /2013/034 of the Generalitat Valenciana.

Syrphidae of the Italian Alps: New data on the syrphid fauna of South Tyrol

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South Tyrol is the northernmost province of Italy situated entirely in the Alpine region. Until recently, the syrphid fauna of this region was poorly documented: the latest published checklist, together with a recent amendment, includes only some 180 species (Hellrigl 1986, 2012). Here, data are presented from three surveys (1994 to 2013) using different collecting methods (Malaise traps and hand netting) in two distinct areas (National Park Stilfser Joch and Val Gardena in the Dolomite Mountains). The total material of 3,917 specimens yielded 184 species, 89 of them newly recorded for South Tyrol, and four not mentioned before for Italy (*Brachyopa vittata*, *Pipiza luteitarsis*, *Platycheirus discimanus*, *Xanthogramma stackelbergi*). Here, the three data sets are compared, methodical bias is discussed, and a revised checklist for South Tyrol is presented, now covering 277 species. In addition, details of collecting dates and environments are provided for selected uncommon species.

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German Barcode of Life project: first syrphid results

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The GBOL (German Barcode of Life) project is a national DNA barcoding campaign to capture the genetic diversity of animals, fungi, and plants in Germany. GBOL has been granted a funding of approximately 5 million Euros by the German Federal Ministry of Education and Research (BMBF) for an initial period of 3.5 years. The GBOL project is a step towards collecting, processing, data sharing, and deposition of samples in conventional and molecular collections in order to facilitate the compilation of an open access DNA barcode library of biodiversity.

GBOL is a national consortium of natural history museums and other research institutions which will provide their professional taxonomic expertise and existing infrastructure (collections/biobanks, databases, bioinformatics platforms, and laboratories) to comprehensively collect, catalog, describe, and sequence the eukaryotic species in Germany. Professional taxonomists in GBOL depend on the enthusiastic and active support of qualified amateur taxonomists to establish a comprehensive library of biodiversity.

More than 1,000 specimens of flower flies representing nearly half of German syrphid diversity (48%) were acquired and attempted to be genetically analyzed. So far, over 800 barcode compliant sequences corresponding to 214 flower fly species were successfully generated. Though far away from a comprehensive genetic library covering all German diversity of Syrphidae, a first overview of preliminary results from our national DNA barcoding campaign is given.

Age-state, two-sex life table of the drone fly *Eristalis tenax* (Diptera, Syrphidae)

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Eristalis species play an important ecological role, mainly due to their contribution in the pollination process. In fact, *E. tenax* has been reared in captivity in order to be used as a pollinator under controlled conditions, such as in isolation cages or in greenhouses, to improve seed setting for diverse crops. Nevertheless, to develop an effective mass rearing system, a comprehensive description of the species' development, survival, and fecundity, as well as basic data on population growth parameters, is necessary. All this information can be provided by the life table methodology.

The main purpose of this research is to know the biological and demographic information about the development of *E. tenax*. The life table has been constructed using developmental data from 240 larvae reared under controlled conditions (40 ± 10% RH, 25 ± 5ºC, and a 12L:12D photoperiod). The larval longevity and mortality was recorded until their pupation. The pupae were isolated in petri dishes until adult emergence. The imagines were isolated in big plastic containers for recording their longevity and fecundity.

All these data were analysed with the software, "Age-stage, two-sex life table analysis", in order to take both sexes and the variable developmental rate among individuals and between sexes into consideration (Chi 1988, 2014). Population dynamics of *E. tenax* and *Eristalinus aeneus* reared under the same controlled conditions were compared.

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Hoverflies (Diptera, Syrphidae) of Morocco: a taxonomic and ecological study

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A preliminary inventory of the hoverflies of northeastern Morocco is presented based on a study of 426 specimens collected from 52 sampling sites. A total of 24 genera are recorded for the Moroccan fauna: *Ceriana*, *Cheilosia*, *Chrysotoxum*, *Dasysyrphus*, *Epistrophe*, *Episyrphus*, *Eristalinus*, *Eristalis*, *Eumerus*, *Eupeodes*, *Melanostoma*, *Meliscaeva*, *Merodon*, *Myathropa*, *Neoascia*, *Platycheirus*, *Scaeva*, *Sphaerophoria*, *Syrphus*, *Syritta*, *Paragus*, *Orthonevra*, *Xanthogramma* and *Xylota*.

Sampling was carried out systematically using an entomological net for flower-visiting insects and a Malaise trap for passive collection during 2012–2014. The faunal list is rich and diverse, reflecting an important diversity of habitats.

Syrphidae phylogenetics: An update on our efforts to create a comprehensive hypothesis of world flower fly relationships

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Flower flies are increasingly being used as models and study organisms in ecological research. The demand for predictive phylogenies at both generic and species levels have thus increased substantially. Thirty scientists from 13 countries have initiated or are planning to participate in a collaborative effort to assemble these phylogenies. Six genes form the backbone of the effort: all of COI, 28S D2–3, 18S, two regions of CAD, AATS, and Period (for a total of ~ 6kB of data). We are also using anchored phylogenetic techniques on a subsample to build a robust phylogenetic hypothesis for higher-level relationships. At this point we have over 600 species from more than 150 genera included in the six-gene project and 30 species of 29 genera sampled using a 500-probe dataset (>225,000 kB of data). Additionally, we are building a large DNA barcode dataset (5' COI) obtained from pinned museum specimens for use in supplementing phylogenetic hypotheses and for help with taxonomy and association of life stages and sexes (over 13,500 specimens of more than 1,600 species sampled). Preliminary phylogenetic results, an overview of the project, and proposed next steps will be presented and discussed.

Revising a continental fauna: Australian Syrphidae

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In recent years, Syrphidae have gained increasing recognition as beneficial insects, both in wild and agricultural settings. Adults are frequent flower visitors and pollinators, while many larvae are important natural control agents of aphids, scales, and their relatives. However, some larvae are plant feeders and may be significant pests. Syrphids also attract considerable attention from ecologists for studies of mimicry, evolution of feeding specialization, etc., and from naturalists, because they are often large, conspicuous, and brightly coloured. Because of all of these reasons, Syrphidae is likely one of the best-known major families of Diptera in most faunal regions. However, in the Australian region there are still several genera that have yet to be formally described and others in dire need of revision. In addition, published species keys are poor to non-existent. The main goals of this project will be to review and revise the taxonomy of the 54 genera of syrphids present in Australia (lead by Dr. Thompson) and to phylogenetically place some of the uniquely Australian lineages of Syrphidae within a global context. The phylogenetic portion of the project will be closely associated with the world Syrphidae phylogeny lead by Dr. Skevington. Additionally, several large genera that may not be treated completely in Dr. Thompson's revision will merit separate publications (*Psilota*, *Hemilampra*, *Triglyphus*). *Psilota* is a relatively speciose genus in Australia, with sixteen described species and many more undescribed based on preliminary morphological assessment by van Steenis. Many of the species within *Psilota* are extremely character-poor from a morphological point of view (even male genitalia display subtle specific differences at best), and extensive COI sequencing will be necessary in the initial stages of the project. Revision of the Australian *Psilota* will be a major part of Young's PhD thesis in progress.

The genus *Eumerus* Meigen, 1822 of the Arabian Peninsula

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The genus *Eumerus* Meigen, 1822, as part of the project 'The hoverflies of the Arabian Peninsula', is reviewed. Eleven species are recognised among the examined material, three of which are undescribed, and *E. efflatouni* Curran, 1938 is tentatively placed as a synonym of *E. vestitus* Bezzi, 1912.

Identifying *Eumerus*-specimens can be challenging, especially when dealing with species predominantly associated with the African fauna. Lyneborg started a revision of the African species but unfortunately passed away before he was able to finish it (Pape 2007). However, he did leave a comprehensive manuscript key with numerous new species and several new synonymies; the latter are dealt with in Lyneborg et al. (2015). All taxa examined from the Arabian Peninsula have been checked with his manuscript key and none of the three species of *Eumerus* described here belong to any of the undescribed species treated in his manuscript. Apart from Africa, the Oriental and Palearctic fauna also need to be considered for the species of the Arabian Peninsula. Specimens as well as (photos of) types of a vast number of species from both the Palearctic and Oriental region have been examined.

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Syrphidae (Diptera) of the Eifel National Park (Northrhine-Westphalia)

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The Eifel National Park, just a few kilometers northeast of Monschau, is a young National Park founded in 2004 with ca. 10,800 ha in the siliceous Eifel mountain range between 180 and 635 m a.s.l. Part former military training ground with open grasslands and broom (*Sarothamnus*) scrub and part acidic beech forest mountain range, its steep slopes to a river and reservoir of the Rur with dry oak forests make it an attractive and diverse landscape in the subatlantic climate. Hoverflies (Syrphidae) have been investigated mainly by direct observations and as by-catch of a Malaise-trapping project (2009–2012) designed for Hymenoptera. Some smaller investigations of Syrphidae were also made in earlier times in the region. With 183 species currently known, the hoverfly fauna is quite rich. However, the expected dead wood fauna of saproxylic flies is still underrepresented as the majority of forest included in the national park is still quite young.

More systematic studies of hoverflies in the future, especially in the small river valleys and streams, will probably come up with some additional species, considering that the trapping project was favouring drier habitats for Hymenoptera within a short period; field visits in 2012 could not fully compensate for this shortcoming.

Permits and access to the National Park were kindly granted by the Eifel N.P. authorities.The Malaise-trapping project was conducted by Jürgen Esser.

Red Data Book of Syrphidae (Diptera) in Germany – methods and results of the current 2012 version and outlook for 2020

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The German Red Data Books of animals and plants are coordinated by the Federal Agency for Nature Conservation (BfN, Bonn) and currently updated. Part of this eight-volume compendium was the Red Data Book of Syrphidae published in volume I of the invertebrates in 2012 (Ssymank et al. 2012). Major changes to previous Red Lists included full checklists and completely new methods for assessing the status. An overview of the applied assessment methods and criteria, the results, and the major threats identified will be given. Of the 463 hoverfly species, 1.1 % is (presumed) extinct and 30.7% threatened. In December 2014, a workshop on a review of methods and future planning for the next update in 2020 for the whole German Red Data Book took place in the BfN. During this workshop, a memorandum of authors and the results of the workshop addressed major difficulties and future necessities to continue future Red Data Book updates.

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The same old gene fragments but considerably improved taxon sampling: impact on Syrphidae phylogeny

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Syrphidae comprises > 6,000 species worldwide, and it is currently divided into four subfamilies: Microdontine, Eristalinae, Pipizinae, and Syrphinae (Mengual et al. 2015). We carried out molecular phylogenetic analyses using parsimony and Bayesian inference on a dataset of mtDNA COI and nuclear 28S rDNA gene regions comprising 369 syrphid taxa representing all currently recognized tribes. Additionally, for a smaller taxon set of 204 taxa, we conducted the analyses also including a fragment of the 18S rDNA gene in combination with the COI and 28S. The outgroup taxa comprised multiple taxa of Pipunculidae, Platypezidae, and Phoridae, and the trees were rooted on Phoridae. The results are presented and discussed focusing on the monophyly of the subfamilies and tribes of Syrphidae.

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Hoverflies are imperfect mimics of wasp colouration

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Many Batesian mimics are considered to be inaccurate copies of their models, including a number of hoverfly species which are judged poor mimics of bees and wasps. This inaccuracy is surprising since more similar mimics are expected to deceive predators more frequently and therefore have greater survival. One suggested explanation is that the colour patterns may be perceived differently by birds, the probable agents of selection, than by humans. In particular, if patterns contain an ultra-violet (UV) component, this would be visible to birds but overlooked by humans. So far, indirect comparisons have been made using human and bird responses to mimetic stimuli, but direct colour measurements are lacking. Hoverfly and wasp patterns vary over small (< 1 mm) spatial scales, which make accurate spectral readings difficult to obtain. First, we demonstrate that accurate spectra can be recorded from patches as small as 0.5 mm diameter provided the probe is targeted at the centre of the patch. Secondly, spectral readings from a wide range of hoverfly and wasp patterns show very low reflectance in the UV range and do not display any human-invisible colour boundaries. Finally, we model how the recorded spectra would be perceived by both birds and humans. While humans are slightly better than birds at detecting colour differences between wasps and hoverflies, bird vision is capable of discriminating the two taxa in almost all cases. We therefore conclude that hoverflies are imperfect mimics even in the "eye of the beholder".

Half a century of flower fly research: Where have we come from, where are we, and where should we be going?

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Half a century of flower fly research: Where have we come from, where are we, and where should we be going?

Smaller syrphid flies are more asymmetrical

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Wings of insects appear to be symmetrical; however, the symmetry is not perfect. The asymmetry is often used as a measure of developmental instability. It is expected that individuals developing in unfavorable environments are more asymmetrical. Because the unfavorable conditions should also lead to smaller body size, it can be expected that smaller individuals are more asymmetrical.

We have measured wings in nine species of *Eristalis* and *Dasysyrphus*: *E. obscura*, *E. pertinax*, *E. arbustorum*, *E. picea*, *E. rupium*, *E. similis*, *E. tenax*, *D. neovenustus*, and *D. venustus*. The sample size in each of the species was at least 40 individuals. In all species there was a negative correlation between wing size and wing asymmetry. However, the negative correlation was only statistically significant in *E. tenax* and *D. neovenustus*. The two species in which the correlation was significant had sample size larger than 70.

Negative correlation between wing size and wing asymmetry seems to be present in many species of Syrphidae; however, the relationships is weak, and sample size needs to be relatively high in order to be confirmed statistically.

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Oviposition behaviour in *Chamaesyrphus lusitanicus* Mik, 1898

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Chamaesyrphus lusitanicus is a rare member of the Belgian Syrphidae fauna that occurred mainly in heathland areas. After the destruction of a large part of the former heathland areal, it was believed to be extinct by Verlinden (1991). Since 2009, it was rediscovered at several heathland relicts in the northeastern part of Belgium. It was noted that *C. lusitanicus* populations always occurred very locally, which prompted further investigations towards its specific niche within the heathland habitat. All occurrence sites were characterized by the presence of open sand and the presence of nearby coniferous woodland. At one of the populations with a particularly high density of *C. lusitanicus*, in late afternoon many tens of female *C. lusitanicus* were found to oviposit. Oviposition was concentrated on the northwestern slope of a partly excavated land dune with sparse vegetation of young *Pinus* and mainly mosses. Oviposition occurred by repeatedly inserting the tip of the abdomen in loose sand at the edge of sparse patches of mosses, often *Tortula ruralis*. Further observations indicated that otherwise exposed slopes were not used for oviposition, unless in the dense shade of pine trees. It is assumed that *C. lusitanicus* prefers moist (northern, shaded) parts of open sand dunes within heathland for oviposition. This is where most of the mosses are to be found, which may act as food for this species. This understanding helps to explain the observed distribution of *C. lusitanicus* in Belgium. Current nature development in heathlands where topsoil is removed near forest or on northern faced slopes may create habitat for *C. lusitanicus* and help to further revitalize current populations.

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Syrphidae in trees: website and project about artificial breeding sites for saproxilic Syrphidae

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Inspired by Maibach and Goeldlin (1992) and Rotheray (1993), I started in 1997 with experiments on creating artificial breeding sites. I tried PET bottles filled with sawdust and plastic ice buckets filled with mashed carrot-potato-onion mixture. The PET bottles were hung in different trees, and the buckets were placed on the ground or in the peat. The sawdust only attracted *Myathropa florea*, and the mashed potato buckets did attract *Helophilus pendulus* and *Myathropa florea*.

Research in Scotland (Rotheray and Rotheray 2010, Rotheray 2013), England (Rotheray 2004), and Austria (Schmid and Moertelmaier 2007) showed that the composition of the sawdust mixture is crucial for the survival of the species. Direct sunlight, bacterial growth, and poor humidity and insulation, which is the case when only PET bottles are used, makes this artificial tree hole less suitable for the more critical species. To find out what specific requirements the larvae of the different species have, I made nesting boxes from different types of wood and filled them with different water-sawdust mixtures to attract females to lay eggs.

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The Australian genus *Hemilampra*

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Hemilampra is a genus of Brachyopina endemic to Australia. The genus was erected in 1850 by Macquart for the single species *Hemilampra australis* Macquart 1850. Since then, three other species of this genus have been described: *Chrysogaster rectinervis* De Meijere, 1908, *Chrysogaster rufonasus* Curran, 1926, and H*emilampra dichoptica* Thompson, 2003.

The authors collected 30 specimens in a four week collecting trip to Australia in 2006. Identifications were made using the unpublished Conspectus of Australian Syrphidae by Chris Thompson. He treats 14 species and we collected several additional ones. Based on this discovery, we started a revision of the genus. At the moment, this revision is part of a continental revision of Australian Syrphidae lead by Chris Thompson, Andrew Young, and Jeff Skevington.

We have now studied almost 500 specimens of *Hemilampra* and believe that *Hemilampra* should be split into two or three genera, based on morphological characters only. We distinguish at least 25 species across these groups. Most of the species are collected in Queensland, New South Wales, and Tasmania. From Victoria, the Australian Capital Territory, South Australia, and Western Australia, we have few specimens and species. This could be due to collection bias.

Since four species are represented by only one specimen and 10 other species have fewer than 10 specimens, the study of more material will eventually result in more species and a better knowledge of their distribution.

Genetic species concept within genus *Merodon* (Diptera, Syrphidae)

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The genus *Merodon* represents one of the most species-rich genera of hoverflies, which are primarily distributed in the Palaearctic Region with less species occurring in the Afrotropical Region. The aim of this study was delimitation of the species of the *Merodon planifacies* (AF), *M. luteomaculatus* (PA), and *M. atratus* (PA) complexes using mitochondrial cytochrome c oxidase subunit I (COI) and geometric morphometric analyses of wings and male surstyli. Molecular phylogenetic studies of COI in 47 specimens of the *M. planifacies* complex, 71 specimens of the *M. luteomaculatus* complex, and 38 specimens of the *M. atratus* complex revealed the existence of genetically distinct species within genus *Merodon*. Within *M. planifacies* complex, two populations sampled in different valleys of the Drakensberg Mountains in the Republic of South Africa share identical morphological characters, but the phylogenetic analyses for the COI gene revealed the presence of two well-supported clades, considered as new (genetic) species. In *M. luteomaculatus* complex, we discovered five genetically distinct species: one in the Balkan mainland, two on smaller Greek islands (Naxos, Andros), and two on Peloponnesus: one present on Erymanthos mountain and one in the lowland area of this island. Based on phylogenetic analyses of *M. atratus* complex, three genetic species were described from different mountain ranges in Central and South-East Europe. Within these complexes, geometric morphometric analyses of wing and surstylus shape also confirmed (supported) the species delimitations.

The genus *Chrysotoxum* Meigen, 1803 (Diptera, Syrphidae) in Turkey

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The wasp-mimicking syrphids of the genus *Chrysotoxum* Meigen (Syrphinae, Syrphini) are represented in the Palaearctic Region by 71 species, 11 of which are recorded in Turkey (Saribiyik 2014). In order to increase our basic knowledge on *Chrysotoxum* in this poorly surveyed country, specimens deposited at the EMIT (Entomological Museum of Isparta, Turkey) were revised.

Three taxa were found to be new to science, *C.* aff. *octomaculatum*, *C.* aff. *gracile* and *C.* aff. *vernale*, and three other, *C. gracile* Becker, *C. montanum* Nedeljković & Vujić and *C. orthostylum* Vujić were new to Turkey. The taxa new to science shared a short basoflagellomere (shorter than scape and pedicel together). *Chrysotoxum* aff. *octomaculatum* can be separated from *C. octomaculatum* by the wing pigmentation and proportion of abdominal lateral margin coloured in yellow. *Chrysotoxum* aff. *gracile* differs clearly from the similar *C. gracile* by the colour of katepisternum and femur base; in females the shape and distance between the frontal pollinose maculae are also valid characters to separate these two species. *Chrysotoxum* aff. *vernale* can be distinguished from *C. vernale* by the relative abundance of black hairs on the scutum and the scutellum colour; in females the colour of the metafemur is also diagnostic. A key to the 17 Turkish species of *Chrysotoxum* is proposed.

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Taxonomic status of *Eumerus* Meigen, 1822 (Diptera, Syrphidae) species in South-East Europe

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Genus *Eumerus* Meigen, 1822 is the third largest hoverfly genus in Europe, predominately with southern distribution. Taxonomic status of most of species needs to be revised. Based on our own research, studies of large European collections and revision of available type material, a preliminary checklist of species of genus *Eumerus* Meigen on the Balkan Peninsula and East Mediterranean islands is presented.

Presence of 29 species with known names is confirmed in South-East Europe: *Eumerus alpinus* Rondani, 1857 (*olivaceus* Loew, 1848 of authors); *E. amoenus* Loew, 1848; *E. argyropus* Loew, 1848; *E. armatus* Ricarte et Rotheray, 2012; *E. armenorum* Stackelberg, 1960 (*tauricus* Stackelberg, 1952 of authors); *E. basalis* Loew, 1848; *E. claripennis* Coe, 1957; *E. clavatus* Becker, 1921; *E. consimilis* Šimić et Vujić, 1996; *E. flavitarsis* Zetterstedt, 1843; *E. funeralis* Meigen, 1822; *E. grandis* Meigen, 1822; *E. hungaricus* Szilady, 1940 (*elaverensis* Seguy, 1961 of authors); *E. lucidus* Loew, 1848; *E. minotaurus* Claussen & Lucas, 1988; *E. niehuisi* Doczkal, 1996; *E. niveitibia* Becker, 1921; *E. ornatus* Meigen, 1822; *E. ovatus* Loew, 1848; *E. pulchellus* Loew, 1848; *E. pusillus* Loew, 1848; *E. richteri* Stackelberg, 1960; *E. sinuatus* Loew, 1855; *E. sogdianus* Stackelberg, 1952; *E. strigatus* (Fallen, 1817); *E. sulcitibius* Rondani, 1868; *E. tarsalis* Loew, 1848; *E. tricolor* (Fabricius, 1798); *E. truncatus* Rondani, 1868. Additionally, we found six undescribed species: one species from Montenegro, two from continental Greece, and three species from the Aegean islands.

The uses of molecules and morphology in taxonomy: A revision of the Nearctic species of *Platycheirus* (Diptera, Syrphidae)

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The 76 Nearctic species of *Platycheirus* Lepeletier and Serville are revised, including five species new to North America: *Platycheirus alpigenus* Barkalov and Nielsen, P*latycheirus brunnifrons* Nielsen, *Platycheirus clausseni* Nielsen, *Platycheirus speighti* Doczkal, Stuke and Goeldlin, and *Platycheirus splendidus* Rotheray. This revision was undertaken using a combination of mitochondrial DNA sequence data and traditional morphological methods. The females of most of the 76 species were considered to be previously indistinguishable in the Nearctic Region, although most species that also occur in the Palearctic have been included in regional keys. Nearctic females were addressed as rapidly and efficiently as possible using mitochondrial DNA sequences to match females to morphologically identifiable males and by consulting existing Palearctic keys. After associating both sexes, females were re-examined for morphological characters for use in a new photographic key to Nearctic *Platycheirus*. Additionally, the utility of molecular data for the identification of *Platycheirus* is discussed, and remaining problem areas as well as potential future projects within the genus are overviewed.

Hoverflies (Syrphidae) of the former military base Soesterberg (The Netherlands): How runways became nature

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In 2009, the military abandoned the airbase Soesterberg in the middle of the Netherlands. The base is located on a sandy deposit due to the Saale glacier. It is extremely dry and can be considered one of the few steppe-like areas in the Netherlands. The grasslands along the runway are oligotrophic. This is a result of decades of mowing by the military, a strategy to prevent large flocks of birds from using these grasslands (and hence cause danger to the airplanes).

From the time the military left, I have sampled and studied the insect fauna of the former military base, mainly by Malaise traps. The xerophilic oligotrophic grasslands proved, in particular, to host a very interesting fauna. This type of habitat has disappeared very rapidly over the last decades from the Netherlands and is currently virtually restricted to the coastal dune area. Especcially noteworthy in Syrphidae are populations of the *Xanthogramma* species *citrofasciatum* and *stackelbergi*. The forests on the base host an interesting fauna but are not of national importance.

It is concluded that the steppe-like grasslands on the base Soesterberg represent an unique habitat of national importance. Though it currently has the status of a preserved area, the area is still threated by recreation and ambitions of building houses.

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