9th International Symposium on Syrphidae

28th August - 1st September 2017

Curitiba, PR, Brazil

Program and Abstracts

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Cover page art

Dr Mírian N. Morales

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Welcome

Dear Fellow Dipterists and Friends,

We are very pleased to welcome you to the 9th International Symposium on Syrphidae (ISS9), from 28th August to 1st September 2017, in Curitiba, Brazil.

The ISS, which takes place every two years, were mainly held in Europe: 1) Stuttgart - Germany (2001); 2) Alicante - Spain (2003); 3) Leiden - The Netherlands (2005); 4) Helsinki (Siikaranta) - Finland (2007); 5) Novi Sad (Fruška Gora) - Serbia (2009); 6) Glasgow - Scotland (2011); 7) Novosibirsk - Russia (2013); 8) Monschau - Germany (2015). The present symposium is taking place for the first time in the Americas, more specifically in the Neotropical Region.

The Symposia on Syrphidae aim to stimulate and establish new worldwide research networks, to discuss the most recent insights and advances in the area and, above all, to encourage collaboration among scientists from different fields of research in this group of flies.

We are very pleased to see the number of talks (34) and posters (29) at this meeting focusing on many aspects of Syrphidae, including Phylogenetics, Systematics, Taxonomy, Faunistics, Biogeography, Biodiversity Assessment and Conservation, Biology, Ecology and Integrated Pest Management.

We thank our main funding agency, the Coordination for the Improvement of Higher Education Personnel – CAPES, Ministry of Education, Brazil, for the support to make this meeting possible; the Graduation Programs in Entomology of Federal University of Lavras (UFLA) and of Federal University of Paraná (UFPR), the Brazilian Society of Zoology and the Taxonline – *Rede Paranaense de Coleções Biológicas* for support staff and logistics. We also thank our International Scientific Committee for support, evaluating and reviewing the abstracts.

We are sure it is going to be a very successful meeting and will be an excellent opportunity to establish new research collaborations and share experiences on Syrphidae.

We hope you all enjoy the Symposium and your time in Curitiba.

Mírian N. Morales & Luciane Marinoni

Organizing Committee

General remarks

Location

Curitiba is located in the South Region of Brazil and most of its inhabitants are of northern European descent. It is an important cultural, political, and economic centre in Latin America. Although Curitiba holds a population of 2 million inhabitants, it is managed to preserve its mid size town atmosphere. It was founded by the Portuguese over 300 years ago and settled by immigrants (such as Italians, Polish, Ukrainians, Germans, and Japanese). The name "Curitiba" comes from the Tupi words *kurí tyba* (= many pine seeds), due to the large number of pinecones of Paraná pines (*Araucaria angustifolia*) occurring in the region by the time of its foundation.

Venue

The ISS9 will be held in the Hotel la Dolce Vita located in a preserved region of rich nature, close to the "*Serra do Mar*".

Social Events

All social events will be held at La Dolce Vita Hotel.

On Monday August 28th, there will be a Welcome Dinner for all the participants at 19:30.

A special dinner will be offered on Wednesday August 30th for all the participants at 19:30.

Program

General remarks

Oral presentations will be 15 minutes long plus 4 minutes for discussion. A digital file in Microsoft PowerPoint, saved as .ppt or .pptx (compatible with PowerPoint 2013), or a .pdf file, as well Prezi.exe must be uploaded to the computer in the morning (during the Opening) or just after lunch (before the beginning of the session). Files must be named with the presenter's first and last name and the day of the week (Tuesday, Wednesday or Thursday).

Posters must be mounted by the presenters on the corresponding poster boards during the Opening or just after lunch (before the beginning of the session) on Tuesday 29th August. Poster boards and mounting materials will be available in the meeting room.

(*) Names of presenting authors are marked with an asterisk

Monday 28th August

09:00 – 12:00	Arrival to the La Dolce Vita Hotel
12:00 – 13:30	Lunch
14:00 – 18:00	Arrival / Registration at front desk
19:30 – 21:30	Welcome Dinner

Tuesday 29th August

08:45 – 09:15	Opening
09:15 – 09:30	Welcome

Session 1. **Phylogenetics and DNA Barcoding**

Chairs: X. Mengual, J. Skevington & G. Ståhls

Plenary talk

09:30 – 10:00 K. Moran*, J.H. Skevington, X. Mengual, G. Ståhls, S. Kelso, A.D. Young, K. Jordaens, M. Reemer, S. Bot, J. van Steenis, A. Ssymank, M. van Zuijen, M. Hauser, G.F.G. Miranda, W. van Steenis, V. Mutin, M. De Meyer, M. de Groot, M. Locke & C. Palmer
A multi-gene hypothesis of world flower fly (Diptera, Syrphidae) relationships.

10:00 – 10:20 S. Kelso* & J.H. Skevington
Mining large Anchored Hybridization Enrichment datasets to identify novel nuclear markers with high phylogenetic informativeness.

10:20 – 10:50	Coffee Break

10:50 – 11:10 **T.O. Burt*, T. Pauli, A.D. Young, K. Moran, J.H. Skevington, S. Kelso, A. Donath, C. Mayer, M. Petersen, K. Jordaens, G. Ståhls, S. Liu, X. Zhou, R.S. Peters, O. Niehuis, B. Misof & X. Mengual**
Big data challenges: resolving the phylogenetic relationships of the subfamily Syrphinae (Diptera, Syrphidae) with anchored-hybrid enrichment.

Plenary talk

11:10 – 11:40 **K. Jordaens*, T.O. Burt, M. De Meyer, Y. De Smet, G. Goergen, S. Kelso, X. Mengual, M.N. Morales, K. Moran, S. Radenković, M. Reemer, J.H. Skevington, J. Smit, A. Ssymank, G. Ståhls, J. van Steenis, N. Veličković, A. Vujić, A. Whittington & A.D. Young**
DNA barcoding of Afrotropical hoverflies (Diptera, Syrphidae): state-of-the-art, challenges and future perspectives.

11:40 – 12:00 **N. Veličković*, S. Radenković, K. Jordaens, A. Vujić, G. Ståhls, A. Grković & M. Đan**
Genetic characterization of the *Eumerus triangularis* Hervé-Bazin species group (Diptera, Syrphidae) from the Republic of South Africa.

12:00 – 13:30 Lunch

14:00 – 14:20 **G. Ståhls*, L. Šašić Zorić & M. Đan**
First records for the bacterial endosymbiont *Wolbachia* in phytophagous hoverflies (Diptera, Syrphidae: *Merodon*).

14:20 – 14:40 **J.H. Skevington*, K. Moran, A.D. Young, M. Locke, S. Kelso, K. Jordaens, G. Ståhls, M. Reemer, S. Bot, M. Hauser, J. van Steenis, W. van Steenis, G.F.G. Miranda & X. Mengual**
Using the DNA barcode database for practical purposes – case study with the Nearctic field guide.

14:40 – 15:00 **T. Pauli, T.O. Burt*, K. Bayless, K. Meusemann, B. Wiegmann, A. Donath, L. Podsiadlowski, C. Mayer, A. Kozlov, A. Vasilikopoulos, D. Yeates, S. Liu, X. Zhou, B. Misof, R.S. Peters & X. Mengual**
The end of Syrphoidea: flower flies (Diptera, Syrphidae) and big-headed flies (Diptera, Pipunculidae) are not sister-groups.

Session 2. Systematics and Taxonomy

Chairs: J. Ačanski, M.N. Morales & S. Rojo

Plenary talk

15:00 – 15:30 **M. Reemer***
Neotropical Microdontinae (Diptera, Syrphidae): a summary.

15:30 – 16:00 Coffee break

16:00 – 16:20 **S. Radenković*, A. Vujić, G. Ståhls, M. Đan, N. Veličković, C. Pérez-Bañón, S. Rojo, A. Ssymank & X. Mengual**
Afrotropical species of *Merodon* Meigen (Diptera, Syrphidae).

16:20 – 16:40 **J. Ačanski*, A. Vujić, S. Radenković & L. Šašić Zorić**
A preliminary classification of species from *Merodon aureus* Fabricius group (Diptera, Syrphidae) based on geometric morphometric analysis of male genitalia.

16:40 – 18:00 **Poster session 1**

19:30 – 21:30	Dinner

Wednesday 30th August

08:50 – 09:20 Opening

(*Continuing*)

Session 2. Systematics and Taxonomy

Chairs: J. Ačanski, M.N. Morales & S. Rojo

09:20 – 09:40 **A. Aracil*, A. Campoy, C. Pérez-Bañón & S. Rojo**
Deepening in the morphological characters of the larvae of *Eristalis tenax* (Linnaeus) and *Eristalinus aeneus* (Scopoli) (Diptera, Syrphidae) and their feeding habits.

09:40 – 10:00 **Z. Nedeljković*, L. Šašić Zorić, M. Đan & A. Vujić**
Three new species of the genus *Chrysotoxum* Meigen (Diptera, Syrphidae) from the East Mediterranean.

10:00 – 10:20 **A.D. Young*, J.H. Skevington, W. van Steenis & F.C. Thompson**
A taxonomic revision of the *Psilota* Meigen (Diptera, Syrphidae) of Australia.

10:20 – 10:50	Coffee break

Session 3. Faunistics, Biogeography, Biodiversity Assessment and Conservation.

Chairs: L. Marinoni, S. Radenković, M. Reemer & A. Vujić

Plenary talk

10:50 – 11:20 **A.L. Montoya Giraldo*, D. Grisales & M. Wolff**
Biogeography and divergence age of *Argentinomyia* Lynch Arribálzaga (Diptera, Syrphidae).

11:20 – 11:40 **J. Kempka, G. Bitencourt & A.C. Pereira***
Preliminary mapping of the occurrence of Syrphidae (Diptera) in the State of Paraná, Brazil.

11:40 – 12:00 **A. Vujić*, J. Ačanski, M. Miličić, L. Likov, L. Šašić Zorić & S. Radenković**
Distribution of species from the *Merodon aureus* Fabricius group (Diptera, Syrphidae).

12:00 – 13:30	Lunch

Plenary talk

14:00 – 14:30 **A. Ssymank***
Dramatic losses of insects in the last decades: A case-study on Syrphidae (Diptera) in the Wahnbachtal (Germany) and possible implications for nature conservation and agriculture.

14:30 – 14:50 **M. Đan*, N. Veličković, S. Radenković, J. Ačanski, S. Rojo, C. Pérez-Bañón, G. Ståhls & A. Vujić**
First report on high species diversity in *Merodon planifacies* Bezzi species complex (Diptera, Syrphidae).

14:50 – 15:10 **L.-J. van der Ent***
On the contribution of www.waarnemingen.nl to the Dutch Syrphidae (Diptera) fauna.

15:10 – 15:30 **S. Bot* & F. van de Meutter**
Towards a field guide of Syrphidae (Diptera) of Belgium and the Netherlands with the emphasis on photographing specimens using focus stacking.

15:30 – 16:00 Coffee break

16:00 – 16:20 **M. Locke*, J.H. Skevington, A.D. Young, K. Moran, B. Crins & S. Marshall**
Databasing contributes to a new field guide to flower flies (Diptera, Syrphidae).

16:20 – 16:40 **G.F.G. Miranda*, A.L. Ferreira & R.O. dos Santos**
The Syrphidae (Diptera) collection at "Instituto Nacional de Pesquisas da Amazônia".

16:40 – 17:00 **A. Ssymank* & D. Doczkal**
Syrphidae (Diptera) from the Biodiversity Hotspot Grenzach-Wyhlen (Germany).

17:00 – 18:00 **Poster session 2**

19:30 – 21:30 Special Dinner

Thursday 31st August

08:50 – 09:30 Opening

Session 4. Biology and Ecology, and Integrated Pest Management.

Chairs: M. Locke, G.F.G. Miranda, A. Ssymank & N. Veličković.

Plenary talk

09:30 – 10:00 **S. Rojo*, C. Pérez-Bañón, X. Mengual, C. Rojas & M. Vargas**
Drone-flies and their rat-tailed larvae (Diptera, Syrphidae), are they entomological sheep in wolf's clothing?

10:00 – 10:20 **F.B. de Oliveira & M.N. Morales***
Waste stabilization ponds as larval breeding sites of saprophagous Syrphidae (Diptera).

10:20 – 10:50 Coffee break

10:50 – 11:10 **A. Campoy*, M. Lutsyk, C. Pérez-Bañón & S. Rojo**
Improvement of the larval rearing media for *Eristalinus aeneus* (Scopoli) (Diptera, Syrphidae) using by-products from beer industry.

11:10 – 11:30 **A. Fleischmann, F. Rivadavia, P.M. Gonella, C. Pérez-Bañón, X. Mengual* & S. Rojo**
Kleptoparasitism in flower flies (Diptera, Syrphidae): a new larval lifestyle.

11:30 – 11:50	R. Földesi* & C. Bálint Pollen analysis from gut content of *Episyrphus balteatus* (De Geer) (Diptera, Syrphidae) in a German agroecosystem.
12:00 – 13:30	Lunch

Plenary talk

14:00 – 14:30	A. Vlašánková, E. Padyšáková, M. Bartoš, X. Mengual*, P. Janečková & Š. Janeček Spurred flowers and short-proboscid pollinators: challenging Darwin.
14:30 – 14:50	J. Klečka* On the role of Syrphidae (Diptera) in plant-flower visitor networks.
14:50 – 15:10	J. Hadrava* & J. Klečka Where do hoverflies (Diptera, Syrphidae) pollinate?
15:10 – 15:30	M.N. Morales*, L.D. Audino, A.A.M. Ragi & S. Rojo Local drivers affecting the predaceous flower flies (Diptera, Syrphidae) community in organic agricultural areas in Brazil.
15:30 – 16:00	Coffee break
16:00 – 16:20	A.L. Montoya Giraldo*, M.N. Morales & M. Wolff Feeding habits database as a tool for conservation of the Neotropical Syrphidae (Diptera): an invitation to collaborate.
16:20 – 16:40	Open discussion, closing remarks
19:30 – 21:30	Dinner

Friday 1st September

09:00 – 15:00	Excursion - After we leave the La Dolce Vita Hotel Excursion to Morretes/PR we will do an excursion to Morretes/PR by bus through the Graciosa Road (crossing through the Atlantic forest) or BR-277, depending on the weather conditions. Arriving in Morretes you will have time to visit the town, have lunch and continue to Antonina, a colonial town facing the bay.
Around 17:00	Arrival to Curitiba.

List of poster presentations

Titles are arranged in alphabetical order by first author last name

1. J. Ačanski*, S. Radenković & A. Vujić
   Evaluating the impact of geographical distribution and climate on wing and male genitalia shape differences among cryptic and sibling species of *Merodon* Meigen (Diptera, Syrphidae).

2. A. Aracil*, C. Pérez-Bañón, G. Ståhls, S. Radenković, A. Vujić & S. Rojo
   Preimaginal morphology of *Merodon planifacies* Bezzi complex (Diptera, Syrphidae) collected from bulb plants in South Africa.

3. E. Arcaya, X. Mengual, M.N. Morales*, C. Pérez-Bañón & S. Rojo
   Species of *Palpada* Macquart (Diptera, Syrphidae) in the Entomological Museum 'Jose Manuel Osorio' (MJMO), Venezuela.

4. T.O. Burt* & X. Mengual
   Origin and diversification of hoverflies: a revision of the Afrotropical *Allobaccha* Curran (Diptera, Syrphidae).

5. A. Campoy*, C. Pérez-Bañón, S. Radenković, G. Ståhls, A. Vujić & S. Rojo
   Preimaginal morphology of three species of genus *Eumerus* Meigen (Diptera, Syrphidae) from South Africa.

6. A. Chroni, M. Đan*, D.O. Vidaković, A. Vujić, T. Petanidou, L. Šašić Zorić, N. Veličković, N.K. Tubić, G. Tataris & S. Radenković
   A DNA barcode library of the Mediterranean species of *Eumerus* Meigen (Diptera, Syrphidae).

7. A. Grković, M. Janković, J. Ačanski*, A. Vujić & S. Radenković
   Diversity and distribution of the genus *Eumerus* Meigen (Diptera, Syrphidae, Merodontini) on the Balkan Peninsula.

8. M. Janković, M. Miličić, S. Radenković & A. Vujić*
   Additional hoverfly species (Diptera, Syrphidae) will be suggested for protection in Serbia!

9. K. Jordaens*, R. Copeland, G. Goergen, M. Hamer, S. Janssens, A.H. Kirk-Spriggs, J. Midgley, B. Muller & L. Njoroge
   The Pollinator Information Network for Two-Winged Insects (PINDIP).

10. K. Jordaens*, G. Goergen, A. Ssymank & M. de Meyer
    A preliminary checklist of the Syrphidae (Diptera) of Ghana, Togo, Benin and Nigeria.

11. K. Jordaens*, G. Goergen, S. Kelso, J.H. Skevington & M. de Meyer
    The Afrotropical hoverfly genus *Mesembrius* Rondani (Diptera, Syrphidae) as an example of how DNA barcoding can improve the identification of sexually dimorphic insects.

12. K. Jordaens*, J. van Steenis, G. Goergen & M. de Meyer
    An improved taxonomy for the Afrotropical hoverfly genus *Syritta* Lepeletier & Serville (Diptera, Syrphidae).

13. G.P. López García* & X. Mengual
    First records of *Nausigaster flukei* Curran (Diptera, Syrphidae) from Argentina.

14. A.M.F. Maciel*, A.P. Nascimento da Silva, C.E.S. Bezerra, M.N. Morales & B. Souza
    Predation of *Myzus persicae* (Sulzer) (Hemiptera, Aphididae) by *Allograpta exotica* (Wiedemann) (Diptera, Syrphidae) under laboratory conditions.

15. D. Milić*, M. Janković, A. Grković, S. Radenković, M. Miličić, J. Ačanski & A. Vujić
    Environmental niches of species from genera *Eumerus* Meigen and *Platycheirus* Lepeletier & Serville (Diptera, Syrphidae) designated as important for conservation in Serbia.

16. D. Milić*, S. Radenković, L. Šašić Zorić, M. Đan, J. Ačanski & A. Vujić
    Impact of climate change on distribution of cryptic species in *Merodon atratus* (Oldenberg) complex (Diptera, Syrphidae).

17. M. Miličić, A. Vujić*, T. Jurca & P. Cardoso
    Trait-based extinction risk in Southeast European hoverflies (Diptera, Syrphidae).

18. A.L. Montoya Giraldo*
    The flower flies (Diptera, Syrphidae) of Puerto Rico with notes on the West Indies fauna and its potential origin.

19. A.P. Nascimento da Silva*, A.M.F. Maciel, M.N. Morales, B. Souza & S. Rojo
    Captivity rearing establishment for the aphid predator *Allograpta exotica* (Wiedemann) (Diptera, Syrphidae).

20. A.C. Pereira*, C.C.F. da Costa & L. Marinoni
    Diversity of Syrphidae (Diptera) in three distinct environments of southern highland fields in Palmas, Paraná, Brazil.

21. C. Pérez-Bañón, M.I. Lillo, D. Aznar, X. Mengual, S. Radenković, A. Vujić & S. Rojo*
    Preimaginal morphology of the South African *Graptomyza signata* (Walker) (Diptera, Syrphidae): first larval description and updated description of the pupae.

22. J. Preradović, J. Ačanski*, S. Radenković, A. Grković, A. Vujić, C. Pérez-Bañón, S. Rojo & G. Ståhls
    A novel method in hoverfly taxonomy? Quantifying variability among *Merodon planifacies* Bezzi (Diptera, Syrphidae) populations by using geometric morphometric analysis of posterior respiratory processes of the immature stages.

23. T. Putalová*, J. Hadrava, K. Daňková, E. Matoušková & M. Tkoč
    Collection of Syrphidae (Diptera) in National Museum, Prague, Czech Republic (NMPC).

24. S. Radenković*, A. Vujić, N. Veličković, G. Ståhls, M. Đan, C. Pérez-Bañón, S. Rojo, K. Jordaens & X. Mengual
    Notes on the genus *Eumerus* Meigen (Diptera, Syrphidae) from the Republic of South Africa.

25. L. Sáez, C. Pérez-Bañón, R. Driessen & S. Rojo*
    Use of flies (Diptera, Calliphoridae and Syrphidae) as commercial pollinators in celery crops (*Apium graveolens* var. *rapaceum* and *Apium graveolens* var. *dulce*) under greenhouse conditions.

26. T. Tot, Z. Nedeljković*, S. Radenković & A. Vujić
    New *Paragus* Latreille (Diptera, Syrphidae) species from South Africa.

27. B.A. Veríssimo*, A.M. Auad, G.B. da Silva & B.S. Rodrigues
    Olfactory responses of the predatory *Salpingogaster nigra* Schiner (Diptera, Syrphidae).

28. B.A. Veríssimo*, A.M. Auad, G.B. da Silva & B.S. Rodrigues
    Reproductive capacity, embryonic period and viability of the eggs of *Salpingogaster nigra* Schiner (Diptera, Syrphidae).

29. S. Veselić, S. Radenković, G. Ståhls & A. Vujić*
    Evolutionary relationships within the species-rich genus *Merodon* Meigen (Diptera, Syrphidae, Eristalinae).

Abstracts

Abstracts are arranged in alphabetical order by first author last name, and names of presenting authors are marked with an asterisk.

Most abstracts were edited to a certain extent, but the content remains the sole responsibility of the authors.

Oral presentation

A preliminary classification of species from *Merodon aureus* Fabricius group (Diptera, Syrphidae) based on geometric morphometric analysis of male genitalia

Jelena Ačanski*[1], Ante Vujić[2], Snežana Radenković[2] & Ljiljana Šašić Zorić[1]

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According to recent results, the *Merodon aureus* species group consists of morphologically similar species (small sized with rounded abdomen, metatrochanter with spike in males) classified into five subgroups (Šašić *et al*. 2016). Interspecific morphological differences within groups are very subtle, and each subgroup has at least one complex of cryptic species. An additional aggravating circumstance is extremely similar structure of the male genitalia (posterior surstylus lobe with parallel margins and rounded apex; narrow, elongated, sickle-shaped hypandrium without lateral sclerites of the aedeagus) in different members of the group, which lead to difficult or even impossible species identification (especially within species complexes).

The structure of male genitalia is the most important taxonomical character and represents a good character for systematic and taxonomic studies of hoverflies (Glumac 1959, 1960; Hippa & Ståhls 2005). The fact that morphology of male genital structures is considered as one of the fastest evolving traits in animal groups with internal fertilization, indicates that even morphologically very similar or cryptic species from *M. aureus* group have different male genitalia. For this purpose we employed geometric morphometric analysis to detect possible subtle morphological variation of posterior surstyle lobe of male genitalia.

Results revealed a subtle but significant shape differences in posterior surstyle lobe of male genitalia among all investigated species. Moreover, preliminary classification of 19 species from *M. aureus* group based on geometric morphometric results is given, with comparison of morphology based classification.

This study was financially supported by the Ministry of Science, Republic of Serbia, Grant No. OI173002 and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

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Glumac, S. 1959. Investigation of hypopygium structure of some hover-flies species (Syrphidae, Diptera) from the British Museum Natural History Collection. *Letopis naučnih radova poljoprivrednog fakulteta u Novom Sadu*, 3, 1-14.

Glumac, S. 1960. Phylogenetical system of the syrphid-flies (Syrphidae, Diptera) based upon the male genitalia structure and the type of the larvae with characteristics of the family and tribes. *Glasnik Prirodnjačkog Muzeja u Beogradu*, 16, 69-103.

Hippa, H; Ståhls, G. 2005. Morphological characters of adult Syrphidae: descriptions and phylogenetic utility. *Acta Zoologica Fennica*, 215, 1-72.

Šašić, L; Ačanski, J; Vujić, A; Ståhls, G; Radenković, S; Milić, D; Vidaković DO; Đan, M. 2016. Molecular and morphological inference of three cryptic species within the *Merodon aureus* species group (Diptera: Syrphidae). *PLoS ONE*, 11(8), p. e0160001.

Poster presentation

Evaluating the impact of geographical distribution and climate on wing and male genitalia shape differences among cryptic and sibling species of *Merodon* Meigen (Diptera, Syrphidae)

Jelena Ačanski*[1], Snežana Radenković[2] & Ante Vujić[2]

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Two morphological traits that have great importance in hoverfly taxonomy are analyzed in the present study: wing, and posterior surstyle lobe of male genitalia. Both traits are considered as highly heritable and represent the stable and reliable characters.

Impact of geographical distribution and climate on morphological variation of analyzed traits among cryptic and sibling *Merodon* Meigen, 1803 species were tested using Mantel test. The Mantel test was performed using three types of distance matrices: (1) morphologic (wing and surstyle shapes), (2) geographic and (3) environmental (climatic) distances.

Wing and surstyle shape differences were represented as squared Mahalanobis distances produced using geometric morphometrics. Geographic distances were calculated as the minimum distance between two species, while the environmental distances were taken as Euclidean distances of the factor scores calculated based on 19 bioclim variables generated for each locality from WorldClim dataset (2.5 arc-minutes resolution).

This study was financially supported by the Ministry of Science, Republic of Serbia, Grant No. OI173002 and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

Poster presentation

Preimaginal morphology of *Merodon planifacies* Bezzi complex, collected from bulb plants in South Africa

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The genus *Merodon* Meigen, 1803 is the largest European hoverfly genus; it is mainly distributed around the Palaearctic and Afrotropical biogeographical regions, being considered one of the most widespread genera in the Mediterranean area. It has a considerable amount of species with restricted distributional ranges in mountains and islands. Larvae of *Merodon* are phytophagous, feeding on buried storage structures of plants. This genus is known to be associated with bulbous plants. In some cases, the adults pollinate flowers of bulb plants while they are looking for pollen and nectar, and the larvae feed on the bulbs of those plants. Unfortunately, larval morphology and habits of most species remain unknown.

The *Merodon planifacies* Bezzi, 1915 species complex belongs to the Afrotropical lineage of the *desuturinus* species-group. New studies have revealed cryptic species within *M. planifacies*, isolated in different geographic habitats. The aim of this paper is to present first data about preimaginal morphology of *M. planifacies*, described using both optical microscopy and scanning electron microscopy from larvae collected in the North-West area of South Africa. Some larvae were sequenced to assign name of the species and the rest were artificially reared in the bulb in which they were found until they pupated.

This study was funded by the project of the European Union: Horizon 2020, Marie Skłodowska-Curie action, Research and Innovation Staff Exchange (RISE) Programme: FlyHigh - Insect -plant relationships: insights into biodiversity and new applications.

Oral presentation

Deepening in the morphological characters of the larvae of *Eristalis tenax* (Linnaeus) and *Eristalinus aeneus* (Scopoli) (Diptera, Syrphidae) and their feeding habits

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Eristaline hoverflies play an important role in two different ecosystem services due to a) the ability that their larvae have as bio-decomposers in semi-liquid media; and b) the pollination performed by the adults when feeding. For this reason, artificial massive rearing processes on these hoverflies are being developed for their production and commercialization. To optimize these processes a deep knowledge of the larval biology is necessary.

We have performed a morphological study of the cephalopharyngeal apparatus and the feeding processes of the larvae of two species: *Eristalis tenax* (Linnaeus, 1758) and *Eristalinus aeneus* (Scopoli, 1763). An innovative part of this study is the use of the scanning electron microscopy (SEM) and confocal microscopy for the description of the structures present in the cephalopharyngeal apparatus and the lips surrounding the oral cavity in the three larval instars (L1, L2 y L3). Pictures of these structures were taken and then measured and analyzed using the computer program ImageJ. The larval morphology of both species was compared.

In addition, we carried out an analysis of the size range of particles that the larvae are able to feed on, in order to study the feeding mechanisms of them. Fifteen larvae of each instar and species were fed in nutritive water with particles of selected size dissolved; particles were pollen grains and fungal spores. Then, larvae were dissected to check the presence of the particles in the gut in order to determine the ability of the larvae to ingest them.

This study was funded by the project of the European Union: Horizon 2020, Marie Skłodowska-Curie action, Research and Innovation Staff Exchange (RISE) Programme: FlyHigh - Insect -plant relationships: insights into biodiversity and new applications.

Poster presentation

Species of *Palpada* Macquart (Diptera, Syrphidae) in the Entomological Museum 'Jose Manuel Osorio' (MJMO), Venezuela

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The flower fly genus *Palpada* Macquart, 1834 (Diptera, Syrphidae) occurs only in the New World, from the southern U.S.A., south to Chile and Argentina. *Palpada* comprises ca. 85 known species and it is the most species-rich genus of the tribe Eristalini (Diptera: Syrphidae: Eristalinae) in the Neotropical Region. Adults are of relatively big size and are among the most abundant and conspicuous floral visitors within Syrphidae in the Neotropics. Their larvae are saprophagous of the "rat-tailed" type, and they feed on microbes and organic matter present in liquid or semi-aquatic habitats.

The aim of this contribution is to present the specimen records of the genus *Palpada* in the Entomological Museum 'José Manuel Osorio' (Universidad Centroccidental Lisandro Alvarado, Venezuela). Adults were captured using entomological hand net and Malaise traps. The results revealed a total of 218 specimens, which were sampled in several states of Venezuela: Barinas (Los Llanos Region); Bolívar (Southern Region); Lara, Falcon, Yaracuy (Western Central Region), Merida and Trujillo (Andean Region). We hope that these data contribute to a better understanding of the geographical distribution of the species of this flower fly genus, both in Venezuela and in the Neotropical Region.

This study was funded by the Consejo de Desarrollo Científico, Humanístico y Tecnológico (CDCHT-UCLA), project 006-AG-2013.

Oral presentation

Towards a field guide of Syrphidae (Diptera) of Belgium and the Netherlands with the emphasis on photographing specimens using focus stacking

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In Belgium and the Netherlands the number of nature enthusiasts is growing. Although birds remain the most popular group, insects attract more attention recently. For several insect groups nowadays good colorful field guides exists, for instance for Lepidoptera, Odonata and Orthoptera. Such a guide is missing for Syrphidae however. The lack of such a guide might hamper amateur naturalists to start looking into Syrphidae. To get a wider audience interested in Syrphidae, Frank van de Meutter and Sander Bot have prepared a field guide that is currently in progress. The book covers 382 different species, including all species known for the region, but also species that might turn up in the future. The text include characters for identification, and descriptions of habitat and ecology. Besides text, diagrams about flight period, distribution maps and plates with color photographs are given. The photographs are made from pinned specimens, using focus stacking. In this presentation, the progress of the book project is reported and the method used for photography is explained. This method can be a possible solution for museums for mass digitization of type specimens or for researchers when high quality images are needed for presentations or publications.

Oral presentation

Big data challenges: resolving the phylogenetic relationships of the subfamily Syrphinae (Diptera, Syrphidae) with anchored-hybrid enrichment

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A transcriptomic library comprising 19 taxa from the 1KITE project was used to design baits specific to the family Syrphidae in an attempt to resolve the phylogenetic relationships of the subfamilies, tribes and genera. Orthographic prediction produced 1,400+ orthologous genes, with 2100+ features or 2,899,920 base pairs, aligned with an *Eristalis tenax* (Linnaeus, 1758) (Diptera, Syrphidae) reference genome. Probes from the 6-gene Syrphidae project (http://www.canacoll.org/Diptera/Staff/Skevington/Syrphidae/Syrphidae_World_Phylogeny.htm) were added to the bait design excluding COI. Fifty percent of the genes targeted are part of the BUSCO (Benchmarking sets of Universal Single-Copy Orthologs) gene set. Targeted sequences were captured for 196 taxa from all subfamilies with emphasis on Syrphinae. Dual-

indexed, captured library was enriched for Illumina high-throughput sequencing. A big data pipeline is in development to associate indices with taxa, assemble contigs, and align sequences.

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Poster presentation

Origin and diversification of hoverflies: a revision of the Afrotropical *Allobaccha* Curran (Diptera, Syrphidae, Syrphinae)

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Allobaccha Curran, 1928 is a syrphid genus (Diptera, Syrphidae, Syrphinae) comprising 84 recognized species, which occurs in the Afrotropical, Indomalayan, and Australasian Regions. The group is characterized by their elongate and petiolate abdomen, katatergum pilose on dorsal portion only, and an incomplete postmetacoxal bridge. Within the BIG4 Project (http://big4-project.eu/), Afrotropical species concepts are reviewed based on morphological characters such as wing venation and wing coloration pattern, facial profile, male genitalia, coloration, shape and pattern of the body, or placement, color and length of pile. Moreover, these morphological diagnoses are compared to COI barcode data. Wing patterns and vein curvature have shown to be very useful in diagnosing species, combined with abdominal color patterns and shape. The facial tubercle in profile reveals a wide range of variation in shape, coloration, and pilosity. Male genitalia show moderate variation, thus their use in species diagnosis should be tentative. The abdominal shape and pattern have proven very useful in species diagnosis. These characters have been used in the Afrotropical fauna and should be useful in revising the Indomalayan fauna as well.

This study was funded by the European Union's Horizon 2020 Research and Innovation Program under the Marie Sklodowska-Curie grant agreement No. 642241.

Oral presentation

Improvement of the larval rearing media for *Eristalinus aeneus* (Scopoli) (Diptera, Syrphidae) using by-products from beer industry

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Most species belonging to the tribe Eristalini, subfamily Eristalinae, are generally accepted as good pollinators, and some of them are used to enhance the pollination in greenhouses and crops. These species are reared in artificial conditions in order to use them with commercial purposes. In this process, the larval rearing is probably the most complicated and demanding stage.

Currently, larvae of *Eristalinus aeneus* (Scopoli, 1763) are reared using fermented oats mixed with water. This medium provides a high variety of nutrients and microorganisms that are filtered by the larvae. It is known the importance as pollinator of eristalines but it is necessary the improvement in the quality and quantity of insects that can be reared in artificial conditions. For this reason, several substrates are being tested in order to find the most suitable and inexpensive larval rearing media. One option is to use by-products from beer industry, concretely bagasse barley. In contrast, this product is made with a different type of nutrients and microorganisms than the fermented oats media, which might be an advantage.

For all these reasons, in the present survey we compared the performance of *Eristalinus aeneus* in the two media, oats and by-products from beer industry, using life tables. Data were collected from 200 larvae reared under controlled conditions (70 ± 5 % RH, 22 ± 1 ºC and 12L:12D photoperiod) using both media. The larval longevity and mortality were recorded until pupation. The pupae were isolated in Petri dishes until adult emergence. The adults were isolated in plastic containers for recording their longevity and fecundity.

Data obtained were analyzed using the software "Age-stage, two-sex life table analysis" in order to consider both sexes and the variables 'developmental rate among individuals' and 'between sexes' (Chi, 1988; 2014).

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Poster presentation

Preimaginal morphology of three species of genus *Eumerus* Meigen (Diptera, Syrphidae) from South Africa

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Eumerus Meigen, 1822 (Diptera, Syrphidae) is one of the most speciose hoverfly genera, with more than 250 described species. Larvae of most species are unknown but the genus is traditionally considered as saprophagous, feeding on decaying parts of plants, although they could also be classified as mycophagous or even phytophagous.

Afrotropical species are badly studied and even adult identification is very difficult, because of limited taxonomic revisions and confusing nomenclature.

Preimaginal stages of three different species of *Eumerus* were collected in South Africa, in the Drakensberg region. Larvae and pupae were found inside decaying roots of *Aloe* sp. and bulb plants (Liliaceae). They were reared inside pieces of these plants until they pupated. The morphology of the larvae and pupae of these three species were described using optical and scanning electron microscopy (SEM). The species were sequenced to obtain barcodes.

This research was financed by the project of the European Union: Horizon 2020, Marie Skłodowska-Curie action, Research and Innovation Staff Exchange (RISE) Programme: FlyHigh - Insect -plant relationships: insights into biodiversity and new applications.

Poster presentation

A DNA barcode library of the Mediterranean species of *Eumerus* Meigen (Diptera, Syrphidae)

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The ingress of DNA barcodes in taxonomy has altered our way of perception; species identification and delimitation are facilitated, new species have been discovered and cryptic complexes have been revealed. In the present study, we surveyed the species occurrence of the genus *Eumerus* Meigen, 1822 (Diptera, Syrphidae) in the Mediterranean region by constructing a DNA barcode library.

According to our knowledge, the total number of *Eumerus* species occurring in the Mediterranean region amounts to 39 spp. (Chroni *et al.* unpubl.; Grković *et al.* unpubl.). Here, we studied 34 out of these 39 species, sampled from 10 countries and 75 localities. The 5'-end fragment of the mitochondrial cytochrome c oxidase subunit I gene (COI, DNA barcode, Folmer *et al.* 1994) was used to generate a 617 bp dataset of 345 sequences of *Eumerus* and four outgroup sequences: one sequence of *Platynochaetus setosus* (Fabricius, 1794) and *Megatrigon tabanoides* Doczkal, Radenković, Lyneborg et Pape, 2016, as well as two sequences of *Merodon erivanicus* Paramonov, 1925. We employed a Bayesian inference analysis under the GTR + G substitution model and partitioned the data by codon (2 partitions: positions 1st+2nd, and 3rd). All 34 species were delimitated by the DNA barcode with posterior probability values between 50.97 to 100%.

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Grković, A; Vujić, A; Chroni, A; van Steenis, J; Đan, M; Radenković, S. (unpubl.) Taxonomy and systematics of three species of the genus *Eumerus* Meigen, 1822 (Diptera: Syrphidae) new in southeastern Europe.

Oral presentation

First report on high species diversity in *Merodon planifacies* Bezzi species complex (Diptera, Syrphidae)

Mihajla Đan*[1], Nevena Veličković[1], Snežana Radenković[1], Jelena Ačanski[2], Santos Rojo[3], Celeste Pérez-Bañón[3], Gunilla Ståhls[4] & Ante Vujić[1]

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The highest diversity of bulbous plants, which are the known host plants for *Merodon* Meigen, 1803 species, is found in South Africa, but this does not reflect to the species diversity distribution in the *Merodon* genus, since there is low number of described species in the Afrotropical Region. On the contrary, in the Mediterranean region, the congruence between bulbous plant diversity and *Merodon* species-richness is notable. In this study DNA barcoding revealed the existence of cryptic species within the taxon previously known as *M. planifacies* Bezzi, 1915. During the field research in Republic of South Africa, specimens belonging to *M. planifacies* taxon were collected across eight localities. DNA barcodes were generated for 65 specimens of *M. planifacies* species complex. Maximum parsimony tree topology indicated that *M. planifacies* species complex consists of seven species, and the lowest number of mutational steps between species specific haplotypes was four. It was also noted that genetically diverged species inhabit geographically close areas, and isolation by distance test revealed no significant correlation between genetic and geographic distances. We believe that the diversity of bulbous plants in the study area could have influenced the species diversity of the *Merodon planifacies* species complex. This result contributes to hypothesize that *Merodon* harbors in the Afrotropical Region much higher species diversity than presently known. It is expected that further molecular and morphometric analyses will provide detailed structure of the *M. planifacies* species complex.

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Oral presentation

Kleptoparasitism in flower flies (Diptera, Syrphidae): a new larval lifestyle

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A new interaction between insects and carnivorous plants is reported from Brazil. Larvae of the predatory flower fly *Toxomerus basalis* (Walker, 1836) (Diptera, Syrphidae, Syrphinae) have been found scavenging on the sticky leaves of several carnivorous sundew species (*Drosera*, Droseraceae) in Minas Gerais and São Paulo states, SE Brazil. This syrphid apparently spends its whole larval stage feeding on prey trapped by *Drosera* leaves. The nature of this plant-animal relationship is discussed, as well as the *Drosera* species involved, and locations where *T. basalis* was observed. 180 years after the discovery of this flower fly species, its biology now has been revealed. This is (1) the first record of kleptoparasitism in the Syrphidae, (2) a new larval feeding mode for this family, and (3) the first report of a dipteran that shows a kleptoparasitic relationship with a carnivorous plant with adhesive flypaper traps. The first descriptions of the third instar larva and puparium of *T. basalis* based on Scanning Electron Microscope analysis are provided.

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Oral presentation

Pollen analysis from gut content of *Episyrphus balteatus* (De Geer) (Diptera, Syrphidae) in a German agroecosystem

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Hoverflies are considered useful insects as pollinators and biological control agents in agricultural fields, therefore their presence in agroecosystems may enhance the effectiveness of ecosystem services they provide. Imagoes feed on nectar and pollen of a wide spectrum of plant species, although their pollen consumption is influenced by different parameters. In order to know which plant species provide resource for hoverfly imagoes this study focused on pollen consumption of *Episyrphus balteatus* (De Geer, 1776) in a conventional crop field in Germany. Collecting was done by pan traps.

The results of the gut content analysis and pollen grains determination showed that *E. balteatus* fed mostly on flowers of yarrow species (*Achillea* spp. L.), hedge mustard (*Sisymbrium officinale* (L. Scop.), and greater plantain (*Plantago major* L.). In June and July mostly the wind pollinated plant species' pollen occurred in the gut content, while in August pollen of insect pollinated plant species were found in the digestive system of imagoes. Phacelia (*Phacelia tanacetifolia* Benth) might be attractive for *E. balteatus*, thus after harvesting of phacelia the imagoes were disappeared from pan traps. However, pollen of phacelia was found only in small amount in gut content. The plant-hoverfly visitation network showed that many plant species play a role in adults' diet, but flowering weeds may enhance their presence in agroecosystems.

Poster presentation

Diversity and distribution of the genus *Eumerus* Meigen (Diptera, Syrphidae, Merodontini) on the Balkan Peninsula

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The hoverfly genus *Eumerus* Meigen, 1822 (Diptera, Syrphidae) is one of the most species-rich hoverfly genera with 256 species registered worldwide (Pape & Thompson 2015). It is widely distributed in Palaearctic, Afrotropical, Oriental and Australian regions (Stackelberg 1961). In Europe, the highest species richness is recorded for the Mediterranean region (Ricarte *et al.* 2008).

The Balkan Peninsula, as one of the three Southern European glacial refugia, has remarkable species richness and represents a unique ecological and biogeographical phenomenon in Europe. The variety of geographical regions and ecosystems together with a complex geological history, have resulted in enormous species diversity of this area.

This study provides an overview of the distribution and diversity (species richness and altitudinal zonation) of the genus *Eumerus* on the Balkan Peninsula (including Greek islands). The main focus of the study was to identify areas with the highest diversity, but also sampling gaps on the Balkan Peninsula. Knowledge about diversity and distribution of the genus can contribute to conservation efforts, species protection and indirectly to preservation of vulnerable Mediterranean habitats, which represent evolutionary centers of exceptional significance.

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Oral presentation

Where do hoverflies (Diptera, Syrphidae) pollinate?

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Pollination is one of the most important mutualistic relationships in nature. It provides food sources for high number of insects and about 97% of world plant diversity is depending on this relation. In recent years, also economic importance of pollination is getting into the center of interest. During last decades, several studies showed that Diptera including Syrphidae are quite common pollinators. However, little is known how the importance of these groups for pollination varies across biotopes with different climatic and environmental characteristics.

We studied pollination networks on 74 localities spread over Central and Eastern Europe. Based on these data, we show how diversity and abundance of syrphids on flowers depend on geographical variables (e.g. latitude, altitude) and climatic variables (e.g. temperature, precipitation).

Poster presentation

Additional hoverfly species (Diptera, Syrphidae) will be suggested for protection in Serbia!

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Due to limited resources for conservation purposes, conservation efforts are often directed towards better explored/known, and more charismatic species (mostly mammals or birds), leaving other species, especially invertebrates, unprotected, or poorly protected. In order to point out the importance of hoverfly conservation, based on long- term monitoring data for Serbia, Vujić *et al*. (2016), identified key species and core areas significant for their survival in this region. The aim of this study was to designate species which need to be included in the list of protected and strictly protected species of hoverflies in Serbia, based on the new records from recent field work.

According to our results, 11 species will be suggested for future protection: *Chrysotoxum montanum* Nedeljković & Vujić, 2015, *Chrysotoxum orthostylum* Vujić, 2015, *Chrysotoxum tomentosum* Giglio- Tos, 1890, *Doros destillatorius* Mik 1885, *Eumerus banaticus* in litt., *Eumerus pannonicus* Ricarte, Vujić & Radenković, 2016, *Merodon calidus* in litt., *Merodon illyricus* in litt., *Merodon austerus* Vujić & Radenković, 2017, *Merodon moesiacus* in litt., *Merodon rasicus* Vujić & Radenković, 2015. Additionally, for the specified species with enough occurrence points, species distribution models were created using maxent function within *dismo* R software package in order to determine the suitable climatic habitats for these species. Results of this study can significantly contribute to planning future monitoring activities and creating conservation strategies for the preservation of important hoverfly species in Serbia.

This study was financially supported by the Ministry of Science, Republic of Serbia, Grant No. OI173002, and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

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Oral presentation

DNA barcoding of Afrotropical hoverflies (Diptera, Syrphidae): state-of-the-art, challenges and future perspectives

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The recognition and taxonomy of Afrotropical Syrphidae (Diptera) is still highly puzzling. In an attempt to assist in the identification of all life stages of Afrotropical Syrphidae, to stimulate ecological studies, and to boost taxonomic studies, Jordaens *et al*. (2015a, b) evaluated the added value of DNA barcoding to the above mentioned fields. Since then, a number of people and research groups have joined this effort. Here, we present the progress and current state of affairs regarding DNA barcoding activities of Afrotropical hover flies, highlight pitfalls encountered and taxa that deserve further attention, and present future perspectives and planned activities. We will illustrate how this increased joint DNA barcoding effort on Afrotropical

Syrphidae 1) has resulted in a significant taxonomic progress in several of the genera, 2) helps to improve newly developed/contemporary identification keys and 3) sets a baseline for local checklists.

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Poster presentation

The Pollinator Information Network for Two-Winged Insects (PINDIP)

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The "Pollinator Information Network for Two-Winged Insects" (PINDIP) addresses the role of Diptera (including Syrphidae) in plant-pollination in the Afrotropical Region and is funded by the JRS Biodiversity Foundation. It does so, by creating a network for Diptera taxonomists and plant-insect interaction ecologists. More specifically, the project has four major aims. 1) to construct a network for taxonomists and applied ecologists, involved in the field of plant-pollinator interactions in the Afrotropics; 2) to stimulate the sharing of Diptera specimens, by depositing identified reference material in African institutions where they can be accessed by others; 3) to create awareness of the role of, and appreciation of, Diptera in plant-pollinator networks, as the diversity of Afrotropical Diptera is very rich, but only ½ to ⅔ of species are currently described; 4) to increase expertise on dipteran taxonomy and ecology in several Afrotropical institutes, through the presentation of training courses in Diptera identification. Several important Afrotropical institutes currently do not have Diptera curators and technical staff and require guidance in terms of sorting and curating material. The planned training courses focus on tutoring collection curators, technicians and students, in order to build a sustainable network of trained taxonomists on Afrotropical Diptera within the Afrotropics.

Poster presentation

A preliminary checklist of the Syrphidae (Diptera) of Ghana, Togo, Benin and Nigeria

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The flower flies (Diptera, Syrphidae) fauna of West Africa has not been the subject of a dedicated study and remains poorly understood as a result. The little that is known is largely based on historical records supplemented by a few additions for some genera (e.g. *Syritta* Lepeletier & Serville, 1828). The last years two of us (GG and KJ) have undertaken several sampling campaigns in Ghana, Togo, Benin, and Nigeria, and AS has collected material in Togo. Besides, a sampling campaign with colleagues of the National Museum Bloemfontein was undertaken in 2016 in Togo and Benin. Here, we provide the results of these collecting efforts which will ultimately result in a first checklist of Ghana, Togo, Benin, and Nigeria. Besides, these collecting efforts have resulted in strong collaborations on the taxonomic revision of a number of genera among (some of) the authors and other researchers, e.g. *Asarkina* Macquart, 1834, *Allograpta* Osten Sacken, 1875, *Allobaccha* Curran, 1928 (ZFMK: Ximo Mengual, Trevor Burt), *Eristalinus* Rondani, 1845 (Smithsonian Institution Washington: F. Christian Thompson, RMCA: Yannick De Smet), *Eumerus* Meigen, 1822 (Naturalis: John Smit, University of Serbia: Nevena Veličković, Snežana Radenković, Ante Vujić), *Graptomyza* Wiedemann, 1820 (Bornemouth University: Andrew Whittington), *Mesembrius* Rondani, 1857 (CNC: Jeffrey H. Skevington, Scott Kelso), *Rhingia* Scopoli, 1763 (CNC: Jeffrey H. Skevington, Finnish Museum of Natural History: Gunilla Ståhls), *Syritta* (Jeroen Van Steenis), and genera within the subfamily Microdontinae (Naturalis: Menno Reemer). Finally, most of the species have been DNA-barcoded and will be included in a large-scale DNA barcoding study of the Afrotropical syrphid fauna.

Poster presentation

The Afrotropical hoverfly genus *Mesembrius* Rondani (Diptera, Syrphidae) as an example of how DNA barcoding can improve the identification of sexually dimorphic insects

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Sexual dimorphism is known from a large number of organisms, including Diptera. In most cases, males are morphologically distinct while females are morphologically more similar. A case in point is the hoverfly genus *Mesembrius* Rondani, 1857 (Diptera, Syrphidae). In the Afrotropical region, this genus currently comprises approximately 20 species. However, there is no identification key that allows the unambiguous identification of all taxa for this region. This is because original species descriptions are often vague, and especially the females are very difficult to identify. Here, we revised the taxonomy of the Afrotropical representatives of this genus. By examining male types and recently collected material, we first improved the identification key for males which are easily identified using the morphology of the front and hind legs. Subsequently, we used DNA barcoding to link females to known males. This resulted in a number of hitherto unrecognized morphological characters that can be used to identify the females. We are thus able to improve the current male and female identification keys for the Afrotropical species of this genus. The identification keys will be made available as an online tool, and supplemented with 2D+ focus stacking pictures of all species and of all taxonomically relevant characters.

Poster presentation

An improved taxonomy for the Afrotropical hoverfly genus *Syritta* Lepeletier & Serville (Diptera, Syrphidae)

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Approximately ten years ago the taxonomy of the hoverfly genus *Syritta* Lepeletier & Serville, 1828 was revised and since then one additional *Syritta* species was described, showing that the current number of *Syritta* morphospecies worldwide is 58 with 40 of these occurring in the Afrotropical region (Lyneborg & Barkemeyer, 2005). In an attempt to further improve the taxonomic knowledge of the Afrotropical representatives of this genus, we collected more than 1,000 *Syritta* specimens over a large part of their Afrotropical distribution area. All specimens were identified to morphospecies using identification keys and available type material. A selection of the identified male and female specimens (of the new collected material) was then used for DNA barcoding. Analysis of approximately 500 DNA barcodes revealed 40 well differentiated clusters of which 26 corresponded to known morphospecies, while 14 clusters correspond to unknown ones. Especially in the *S. bulbus* species-group, there is strong differentiation among the DNA barcodes although morphological differentiation appears to be limited. The taxonomy of the genus in the Afrotropical region will be revised resulting in an updated (online) identification key supplemented with stacked photographs of males and females and male genitalia drawings. We will also provide distribution maps for all the known Afrotropical *Syritta* species.

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Oral presentation

Mining large Anchored Hybridization Enrichment datasets to identify novel nuclear markers with high phylogenetic informativeness

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The recent application of Anchored Hybridization Enrichment (AHE) technology to Dipteran phylogenetic studies has generated a wealth of informative data that has been largely underutilized. We will discuss the need for the development of novel nuclear markers that can be successfully employed by the majority of molecular laboratories.

We will describe a method of mining published AHE datasets to identify candidate nuclear markers with high phylogenetic informativeness for both Sanger-based and targeted, high-throughput phylogenetic studies. A simple method for designing PCR primers for the novel markers is also presented.

Oral presentation

Preliminary mapping of the occurrence of Syrphidae (Diptera) in the State of Paraná, Brazil

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The present research used databases of educational and research institutions from State of Paraná, Brazil, to map the occurrence and distribution of Syrphidae (family and genera) registered in the state. Only two collections were found, from the State University of Ponta Grossa (UEPG) and the Federal University of Paraná (UFPR). The syphids registered in both collections total 6302 individuals. Next, the individuals were mapped using the DIVA-GIS® software and public shapefiles from the State of Paraná with the geographical limits, vegetation, climate and relief. Estimates of richness and predictive modelling of the most frequent genera were also made.

The results showed the presence of Syrphidae throughout the state, as expected, but indicated significant gaps in the Northwest and Southwest regions, while large numbers were pointed in the coastal regions and in the First and Second Plateaus of the state. Even the predictive modelling indicated many absences of the genus *Toxomerus* in the state, being a genus that presents very generalist aphidophagous species largely available in all environments. The Northwest counts on important centers of academic and research formation, being possible to emphasize the State University of Londrina (UEL), and the State University of Maringá (UEM), besides the *campus* Palotina of UFPR. However, those institutions do not have a Diptera collection database or do not provide this data online for consultation. In all analyzes, more occurrences were observed in the eastern region of the State. Since Syrphidae is a very diversified group, capable of occupying a wide range of niches, we believe that the methodology of obtaining data has been decisive for the results obtained. Thus, the study reinforces the importance of recording collected specimens on virtual, public platforms, allowing future studies to be made about biogeography, habits and distribution of Syrphidae species in Paraná and surrounding areas.

This study was funded by grant offered by Instituto Federal do Paraná, through the Students Affair Board (DAES).

Oral presentation

On the role of Syrphidae (Diptera) in plant-flower visitor networks

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Plants and insects visiting their flowers to feed on nectar and/or pollen form complex networks of interspecific interactions. Analyses of the structure of plant-flower visitor networks can yield insights into ecological and evolutionary mechanisms affecting insect and plant communities. Syrphidae, along with other Diptera, are an important component of plant-flower visitor networks in most parts of the world, but their role is less well known and less appreciated then, for example, the role of bees. I present data on the role of Syrphidae in plant-flower visitor networks at several dry grassland sites in the Czech Republic. Syrphidae are numerically one of the most abundant groups in these plant-flower visitor networks. Our observations show differences in plant visitation between species and variation in their level of selectivity for species of flowers. In conclusion, Syrphidae are an important and ecologically diverse part of plant-flower visitor networks in central European grasslands.

This study was funded by the Czech Science Foundation (project GP14-10035P).

Oral presentation

Databasing contributes to a new field guide to flower flies (Diptera, Syrphidae)

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The Canadian National Collection of Insects, Arachnids and Nematodes (CNC) has over 213,000 Syrphidae specimens databased. Of those specimens, 181,000 reside in our collection and the rest belong to other institutions. We currently have 88% of those records geocoded. Having all of these data at our fingertips now allows us to quickly access large amounts of information. We are able to create range maps, find flight times, habitat information, estimate abundance, plan collecting trips based on historic localities, create material examined lists and much more.

Using these data, we have written A Field Guide to the Syrphidae of Northeastern North America. This comprehensive guide covers 407 species found in or north of Virginia, Kentucky and Missouri, west to include Iowa, Minnesota, Ontario and eastern Nunavut east to the Atlantic Ocean, and including Greenland. Each species is illustrated, showing a habitus and key characters for identification. Range maps have been produced showing actual specimen locality records and a predicted Nearctic range for each species. Estimates of abundance, flight times and ecological information have been taken from the CNC database and much primary and secondary literature.

Our goal is to make the Syrphidae a more visible and studied group. The more eyes we have in the field, the more data we can gather about these enigmatic flies. The field guide is a resource for scientists and enthusiasts alike. Many syrphids are commonly found on flowers and are quite visible to photographers, gardeners, birders (who move to insect groups like butterflies and dragonflies) and other naturalists. If they can identify the species they see we will be able to gather more data about what these species do. The guide is currently in the editing stage and we hope to have it published within a year.

Poster presentation

First records of *Nausigaster flukei* Curran (Diptera, Syrphidae) from Argentina

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Nausigaster Williston, 1884 (Diptera, Syrphidae) is an endemic New World genus, which occurs from southern United States to Argentina and is absent from the Chilean subregion (Thompson *et al*. 2010). *Nausigaster* species are small flies with tuberculate face, body densely punctate and round abdomen. There are 15 described species, with nine taxa in the Neotropical Region (Thompson *et al*. 2010) and only one species cited and described from Argentina, *Nausigaster bonariensis* Lynch Arribálzaga, 1892.

Nausigaster flukei Curran, 1941 is a small to medium sized fly with abdominal tergum 2 produced basolaterally into a spur, and a particular wing pattern: extensive dark maculae connected along vein R4+5 and cell r1 infuscated subapically. It was originally described from Villarica, Paraguay (Curran 1941), and Carrera *et al*. (1947) reported it from Pôrto Cabral (São Paulo) and Iguassú (Laranjeiras do Sul, Paraná), in Brazil. It is here reported as new to Argentina from Mendoza, La Rioja and Jujuy provinces.

The new specimens of *Nausigaster flukei* from Argentina were identified using original descriptions and keys for the species of *Nausigaster* (Curran 1941; Thompson 2006), and morphologically compared with other species material from several collections. New material of *N. flukei* is deposited in the entomological collection of the Argentine Institute for Arid Zones Research (IADIZA), Mendoza (Argentina), in the Naturalis Biodiversity Center (RMNH), Leiden (The Netherlands), and in the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Bonn (Germany). New specimens collected in the Monte and Chaco Phytogeographical Provinces, broaden the distribution of this species.

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Poster presentation

Predation of *Myzus persicae* (Sulzer) (Hemiptera, Aphididae) by *Allograpta exotica* (Wiedemann) (Diptera, Syrphidae) under laboratory conditions

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Larvae of *Allograpta exotica* (Wiedemann, 1830) (Diptera, Syrphidae) are important natural enemies of a wide range of aphid species (Hemiptera, Aphididae). As a step towards the development of rearing protocols for maintenance of colonies of *A. exotica* under laboratory conditions, we are investigating which amount of aphids must be supplied to properly feed larvae of this species per day, achieving a high survival rate. A preliminary essay was designed with fifteen larvae of *A. exotica*, aged 0-12 h, individualized into 5 cm diameter Petri dishes containing nymphs of second and third instars of *Myzus persicae* (Sulzer, 1776) (Hemiptera, Aphididae), placed on a disc of sweet pepper leaf fixed on a layer of 2% agar solution. Each Petri dish was sealed with paper towel to promote internal aeration. After 24 hours the number of live aphids were counted and each larva was transferred into a new Petri dish containing a different number of aphids. The amount of supplied aphids was 25, 40, 50, 100, 150, 200, 250, and 300 from the first to the eighth day, respectively.

An average of 547.2 ± 42.78 aphids were consumed during its complete development (~7.44 days), and the larval survival rate was 60%. A second essay, following the same procedures of the first, is being designed to investigate if the previously amount of consumed aphids and the survival rate are increased when more than one larva of *A. exotica* is maintained in the same Petri dish. From five replications maintaining one, two and three larvae in the same Petri dish, preliminary results showed that grouping three larvae significantly increase the predation of *M. persicae* by *A. exotica*, achieving up to 1026 consumed aphids/larva during eight days.

These are preliminary attempts towards the establishment of an appropriate amount of *M. persicae* for feeding *A. exotica* under laboratory conditions.

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Poster presentation

Environmental niches of species from genera *Eumerus* Meigen and *Platycheirus* Lepeletier & Serville (Diptera, Syrphidae) designated as important for conservation in Serbia

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In Serbia according to the national legislation, 33 species of hoverflies (Diptera, Syrphidae) are declared as strictly protected and 44 species as protected. In addition, Vujić *et al*. (2016) defined Prime Hoverfly Areas (PHA) and suggested 168 species of hoverflies for protection and designated 91 endemic or endangered species, including 9 species of *Eumerus* Meigen, 1822 and 11 of *Platycheirus* Lepeletier & Serville, 1828. The aim of this study was to analyze the environmental niches of *Eumerus* and *Platycheirus* species recognized as important for conservation in Serbia. For species of genus *Eumerus* and *Platycheirus*, distributional pattern in relation to altitude, annual precipitation and annual mean temperature were established. In order to compare environmental niches of *Eumerus* and *Platycheirus* species, Principal components analysis (PCA) was carried out.

Results of the analyses showed that *Eumerus* species have a narrower altitudinal range, with some species found only in the lowland region. They inhabit more arid habitats, and prefer areas with higher annual mean temperatures. In contrast, it was established that most *Platycheirus* species can be found at higher altitudes with colder climate and that they prefer more humid conditions. Principal Component A analysis indicated partial overlap of the environmental niches of these two genera, but *Platycheirus* species seemed to be better adapted to harsher conditions.

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Poster presentation

Impact of climate change on distribution of cryptic species in *Merodon atratus* (Oldenberg) complex (Diptera, Syrphidae)

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Many studies focus on the distribution of cryptic species. Some of these complexes of morphologically almost identical species may comprise threatened taxa. In order to minimize future loss of biodiversity, it is important to know the potential impact of climate change on the distribution of cryptic species. Hoverflies can act as bioindicators and monitors of climate change and habitat quality. The genus *Merodon* Meigen (Merodontini) is the largest genus of European (including Turkey) hoverflies. It comprises about 120 species andhas many cryptic species with minimal morphological differences. *M. atratus* complex comprise four species: *M. atratus* (Oldenberg, 1919); *M. virgatus* Vujić & Radenković, 2016; *M. balkanicus* Šašić, Ačanski & Vujić, 2016 and *M.* aff. *atratus* (Turkey).

The aim of this study was to predict the current species distribution of the *Merodon atratus* complex; project their potential future ranges based on the future climate change scenarios, using Maximum entropy approach (MAXENT software, version 3.3.3); and evaluate the potential change in their range due to climate change. Species *M. atratus* occurs only in the Alps, while *M. balkanicus* and *M. virgatus* occupy the south-east part of European mountain. Range of newly discovered species, *M.* aff. *atratus* is restricted to the north-eastern part of Turkey.

Our results show that for all species 4.5 RCP future emission scenarios is milder than 8.5 RCP scenario. In year 2050 *M. atratus* and *M. balkanicus* (both scenarios) and in 2070 (4.5 scenario) the species would still be present in Southern Europe but only in the Alps. *M. virgatus* and *M.* aff. *atratus* may be less affected by climate change; by most future scenarios, these species will expand their range up to 100.78% and shift to the east and south. Information obtained in this research can help not only in future monitoring of species, but also in the conservation measures, especially for endemic and rare species.

This study was financially supported by the Ministry of Science, Republic of Serbia, Grant No. OI173002, and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

Poster presentation

Trait-based extinction risk in Southeast European hoverflies (Diptera, Syrphidae)

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Global warming has become an important issue in recent years because it represents a constantly growing threat to global biodiversity. It is anticipated that extinction risk due to climate change will increase for a large number of species in the future. Functional traits, such as habitat preferences or characteristics of the life cycle of the species, may affect the response of the individual species to climate change. Finding statistically significant relationship between individual traits and changes in the distribution of species indicates that these traits affect the ability of species to move their area of occupancy.

The aim of this study was to estimate the extinction risk for 44 hoverfly species in Southeast Europe (endemic to the area and native non-endemics) based on the predicted changes in the potential area of occupancy for two time periods (2041-2060 and 2061-2080), and to establish which functional traits are correlated with range changes. Functional trait data were obtained from Speight *et al.* (2015) and expert opinion. Species distribution models were used for estimating range changes, while the relationship between functional traits and estimated changes in range was tested using linear regression models and linear mixed effect models.

Results of both linear regression models and linear mixed effect models showed the existence of significant interdependence between defined functional traits of hoverflies and the estimated range changes for both analyzed time periods. In most cases, traits connected with changes in range size were larval microhabitat (concretely, root zone), period of flight during early summer and adult macrohabitat.

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Oral presentation

The Syrphidae (Diptera) collection at Instituto Nacional de Pesquisas da Amazônia

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The Instituto Nacional de Pesquisas da Amazônia (INPA) is a federal research institute of Brazil that focuses on research in the Brazilian Amazon and has a large number of researchers, technicians, and undergraduate and graduate students. Among its many areas of research there is a thriving Invertebrate collection with over 1 million pinned specimens and over 5 million specimens in ethanol, with an estimate of 40,000 specimens being deposited per year. In recent years, all the information of the zoological collections at INPA has been being slowly digitized into a MySQL database through the Specify infrastructure. The Syrphidae pinned collection has been fully integrated into the database and can be accessed online.

The collection holds 2,852 specimens, among 57 identified genera and 112 species, mostly from the Brazilian Amazon but with some representatives from other Brazilian regions and abroad. Although all specimens are identified at generic level, 2,083 specimens still lack a species identification. Distributional maps and other information on the specimens can be obtained through the collection's online portal. A joint effort with the IT department is generating a free online tool to create pictorial keys that directly access the information in the collection database.

The whole data digitization project, proposed and coordinated by Dr. Célio Magalhães (INPA), was funded by the grant # 504.273/2012-4 (MCTI/CNPq - Brazil - nº 45/2012).

Poster presentation

The flower flies (Diptera, Syrphidae) of Puerto Rico with notes on the West Indies fauna and its potential origin

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A total of 129 species of 27 genera were recorded by Thompson (1981) from the West Indies, including 61 endemic species to the region. In Puerto Rico, 12 genera and 49 species were recorded. In 2010, I studied the Puerto Rican Syrphidae material deposited in the UPR Mayagüez Insect Collection (INVCOL-UPRM), which allowed me to find additional species for the list. New distributional records and various nomenclatural changes proposed earlier, increased the number of species to 61 (19 genera). This new information, position Puerto Rico in the second place in biodiversity after Cuba, a country with 73 species and a high number of endemic species (16). Despite Puerto Rico being the fifth largest island with a vast territorial area (8897km^2), it has a diversity close to Cuba, Island with an area of 110922km^2. Puerto Rico exceeds the number of species of Jamaica (55 spp./11 endemic, 10991km^2), Hispaniola (38/11, 76190km^2) and the Bahamas (18/1, 11400km^2). The Island, share most species with Cuba (33 spp.), Jamaica (28), Hispaniola (21), Costa Rica (20), Colombia (20), Virgin Islands (18) Dominica (15), the Bahamas (15), Suriname (12), Guadalupe (11), Mexico (11), Florida (10), Monserrat (10) and St. Vincent (9).

The Puerto Rican Syrphidae fauna includes five distinct elements: 1) exclusive Puerto Rican endemics (13.5%), 2) Antillean endemics occurring on multiple islands (52.5%), 3) continental species that have colonized the Antilles (47.5%), 4) Central American fauna (25 species exclusively shared) and 5) South America components (22 species in common). These patterns could be the results of multiple process of dispersion/colonization from the continent, with subsequent island/island vicariance events related to geographical process as the splitting of GAARlandia, which give origin to the Island arcs of the West Indies and the subsequent connection among the fauna of the regions (Iturralde-Vinent 2006; García-Casco *et al*. 2008).

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Oral presentation

Biogeography and divergence age of *Argentinomyia* Lynch Arribálzaga (Diptera, Syrphidae)

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Argentinomyia Lynch Arribálzaga 1891 (Syrphinae, Bacchini) is a Neotropical-endemic genus, distributed from Northern Mexico to Northeastern Argentina, except absent in the Chilean subregion (Thompson 1981; Thompson 1999; Thompson *et al*. 2010). The genus is monophyletic and includes 32 species. Since the greatest diversity occurs in the Northwest (Central America + Northwest of South America) and Southeast continental areas, we investigated the divergence ages and spatial diversification of the genus, relating them with biogeographical and/or historical-geological events. In order to achieve this objective, a phylogenetic analysis was developed based on morphological and molecular data of mitochondrial cytochrome c oxidase subunit I (COI) and nuclear 28S rRNA genes available on GenBank (Mengual *et al*. 2008; Thompson & Skevington 2014).

To estimate the diversification ages, an ultrametric time-calibrated phylogenetic tree was constructed using the software BEAST. Calibration points include data of fossils in the out-group: *Eristalis pausisinuatus* Theobald, 1937, from the Oligocene (23-33.9 Mya), *Platycheirus infamatus* Heer, 1849 and *Syrphus geminatus* Heer, 1849, both from the Miocene (23-5.3 Mya) (Hull 1945; Thompson 1972; http://fossilworks.org)

A reconstruction of dispersion and vicariance events was conducted through the software S-DIVA and RASP 2.1 (Yu *et al*. 2010), using the biogeographical areas proposed by Antonelli *et al*. (2009). The analysis allowed recognizing areas of ancestral distribution from the trees generated in the Bayesian approach performed in BEAST.

The reconstruction of the biogeographical history indicates that the ancestral distribution was in Central America and north of the tropical Andes, with several expansions and vicariance events causing the diversification of recent Andean lineages. The divergence between the Central American and northern Andean clades is associated with a spatial disjunction along the Panama Isthmus, which supports evidence that an ancient event was mainly responsible for the diversification of major lineages of *Argentinomyia*.

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Feeding habits database as a tool for the conservation of Neotropical Syrphidae (Diptera): an invitation to collaborate

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Adult flower flies (Diptera, Syrphidae) are usually generalist pollinators, feeding on pollen and nectar. Larvae are diverse in lifestyles and adaptations, providing ecosystem functions and constituting a group with high value for assessing biodiversity. There are three main functional groups in Syrphidae larvae: phytophages, saprophages and zoophages. Larvae of Pipizinae and Syrphinae are predators, feeding on soft-bodied arthropods (some Neotropical Syrphini are subaquatic predators). Besides that, species of Syrphinae are leaf-miners, secondary stem-borers species and pollen-feeders (Syrphini and Toxomerini). Recently, a kleptoparasite species was recorded in several carnivorous sundew species. Larvae of Microdontinae, which its natural history is complex, mainly feed on immature ants. Most Eristalinae are saprophagous, feeding on dead and decaying organic matter (Milesiini and Volucellini), others are aquatic filter feeders (Eristalini, Brachyopini and Milesiini), some breed in exuding plant sap (Ceriodini) or animal dung (Rhingiini). About 257 Neotropical species (34 genera) inhabit semi-aquatic or aquatic environments.

In order to provide a database of larval habits, we compiled 703 records of host plants and associated prey of 47 Syrphidae genera. Records of 217 species were obtained from the available literature, label data and reared species. Most are in: *Copestylum* Macquart, 1846 (74 spp./133 records), *Ocyptamus* Macquart, 1834 (22/122), *Allograpta* Osten Sacken, 1875 (11/97), *Pseudodoros* Becker, 1903 (1/72), *Toxomerus* Macquart, 1855 (20/48), *Salpingogaster* Schiner, 1868 (2/44), *Quichuana* Knab, 1913 (6/26), *Eosalpingogaster* Hull, 1949 (7/25), *Meromacrus* Rondani, 1848 (7/15) and *Ornidia* Lepeletier & Serville, 1828 (3/14).

The task of documenting the larval habits and breeding sites as well is just beginning. We invite you to provide baseline information to know interactions, preferences and functions as a starting point to implement bioindication in the Neotropics.

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Oral presentation

Local drivers affecting the predaceous flower flies (Diptera, Syrphidae) community in organic agricultural areas in Brazil

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This work aimed to investigate the relative importance of local climatic variables, of spontaneous flowering plants and prey abundance in determining the abundance and composition of predaceous flower flies species (Diptera, Syrphidae) in organic agricultural areas from Brazil. For this, weekly collections of immature stages of Syrphidae were carried out, from February to November 2016, in four circular beds of *Brassica oleraceae* (var. *acephala*) L. Sampled areas were weekly characterized according to local climatic variables (temperature, humidity and precipitation), presence of spontaneous vegetation and flowering period, and aphid abundance. Two of the circular beds were maintained with spontaneous vegetation and two without maintenance of non-crop vegetation. To investigate the relative importance of these predictor variables we performed variance partitioning analysis.

From 42 samplings, 2761 immature specimens were collected, of which eight species were identified, distributed in four genera. *Allograpta exotica* (Wiedemann, 1830) was the most abundant species, standing out from the others in most of samplings. The main determinant of species distribution and abundance of Syrphidae was prey abundance, followed by local climatic variables. Local climatic variables presented a significant independent explanation for species composition. For the total abundance, on the other hand, the local climatic variables are only important when were combined with prey abundance. This shows that composition of predatory Syrphidae species in this system is highly determined by local climatic conditions; however, the abundance of immatures is solely related to prey abundance. The maintenance of spontaneous vegetation that could potentially attract adults of Syrphidae when blooming, do not increase the abundance of larvae, which are the control agents. Each sampled species present different responses to the investigated environmental variables. Therefore, it is important to know which species is the most effective predator, to manage local characteristics that increase the abundance of this species.

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Oral presentation

A multi-gene hypothesis of world flower fly (Diptera, Syrphidae) 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. A collaborative effort involving twenty scientists from 13 countries have joined to assemble a phylogeny of Syrphidae. Nine genes form the backbone of the phylogeny: all of

COI, 28S D2–3, CAD1, AATS, and Period along with three new loci (for a total of ~ 8kB of data). Taxa were chosen across Syrphidae with an effort made to include a member of every tribe and subtribe. Phylogenetic results including evidence which supports the elevation of additional subfamilies will be presented. Proposed next steps will be discussed.

Poster presentation

Captivity rearing establishment for the aphid predator *Allograpta exotica* (Wiedemann) (Diptera, Syrphidae)

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Larvae of predatory Syrphidae (Diptera) can play an important role as biocontrol agents of agricultural pests, though studies on its effective applicability are scarce, especially in the Neotropics. The aim of this work is to develop a rearing protocol for maintenance of colonies of *Allograpta exotica* (Wiedemann, 1830) under laboratory conditions. Five different assays were designed with 15 females and 15 males, in rearing cages of 40 X 40 cm. Abiotic conditions (photoperiod, temperature and relative humidity) are controlled at rearing chamber. Adult feeding resources are *Lobularia maritima* (L.) Desv. flowers, water, 10% honey solution, dehydrated or fresh pollen, and soybean flour. A Petri dish with a leaf of *Raphanus sativus* (L.) Domin (Brassicaceae) infested with *Myzus persicae* (Sulzer, 1776) (Hemiptera, Aphididae) is offered as oviposition substrate. Each assay includes the availability of all above-mentioned feeding resources, excepting (I) fresh pollen and soybean flour; (II) any pollen and soybean flour; (III) flowers, fresh pollen and soybean flour; (IV) flowers, dehydrated pollen and soybean flour; (V) flowers and fresh pollen.

All feeding resources are replaced every 48 hours, except for the soybean flour which is once a week. The oviposition substrate is replaced every 24 hours for egg counting. To date, assays I, II and III have been performed. The assay I continues in progress, running in the seventh generation. Assays II and III were phased out due to absence of oviposition in the first and low fertility rates of the eggs in the second. Based on preliminary results of assays I, II and III, dehydrated pollen and flowers nutritionally complement each other as feeding resources for captivity rearing maintenance of *A. exotica*.

However, we are expecting better results with assays IV and V since the protein values of the feeding resources supposed to be higher than in the previous assays.

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Oral presentation

Three new species of the genus *Chrysotoxum* Meigen (Diptera, Syrphidae) from the East Mediterranean

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The presence of 17 species of *Chrysotoxum* Meigen, 1803 (Ditpera, Syrphidae) has been confirmed in the East Mediterranean: *Chrysotoxum antennalis* Vujić, Nedeljković & Hayat, 2017; *C. bicinctum* (Linnaeus, 1758); *C. cautum* (Harris, 1776); *C. cisalpinum* Rondani, 1845; *C. clausseni* Vujić, Nedeljković & Hayat, 2017; *C. elegans* Loew, 1841; *C. fasciatum* (Muller, 1774); *C. fasciolatum* (De Geer, 1776); *C. festivum* (Linnaeus, 1758); *C. impressum* Becker, 1921; *C. intermedium* Meigen, 1822; *C. lessonae* (Giglio-Tos, 1890); *C. octomaculatum* Curtis, 1837; *C. parmense* Rondani, 1845; *C. persicum* Vujić, Nedeljković & Hayat, 2017; *C. vernale* Loew, 1841; and *C. verralli* Collin, 1940. In order to increase our knowledge of *Chrysotoxum* in this area we carried out new faunistic expeditions in Serbia, Montenegro, Italy, Greece and Turkey.

Three species were found to be new to science, *C.* aff. *octomaculatum* (Turkey), *C.* aff. *vernale* (Greece and Turkey) and *C.* aff. *intermedium* (Greece). *Chrysotoxum* aff. *octomaculatum* can be separated from *C. octomaculatum* by the presence of black pile in the posterior part of the mesonotum and the colour of the basal part of the femora. *Chrysotoxum* aff. *octomaculatum* is also similar to *C. verae* Violovitsh, 1973, from which it can be distinguished by the yellow lateral margins of terga 3 and 4 and the colour of the basal parts of the femora. *Chrysotoxum* aff. *vernale* clearly differs from the similar *C. vernale* by the color of the wing pigmentation and the katepisternum. *Chrysotoxum* aff. *intermedium* can be separated from the similar *C. intermedium* by the presence of additional narrow longitudinal vittae on the mesonotum, and the presence of an area of pollinosity on the posterior part of the mesonotum.

An ML analysis based on mtDNA COI gene and based on nuclear ITS2 sequences revealed a clear separation of *C.* aff. *octomaculatum* and *C.* aff. *vernale* from the other similar species.

This study was funded by the project OI173002 of the Ministry of Education, Science, and Technological Development of the Republic of Serbia and the H2020 project ANTARES.

Oral presentation

Waste stabilization ponds as larval breeding sites of saprophagous Syrphidae (Diptera)

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To reduce the degradation of aquatic environments, effluent treatment employing stabilization ponds (also called lagoons) has been widely used in Brazil. The clearance of organic matter occurs mainly by the action of microorganisms that develop under pre-established conditions. The aim of this study was to investigate the presence of immature stages of saprophagous Syrphidae in industrial effluent stabilization ponds at high organic loading rates, and contributing to the knowledge on the biology of these insects. The study area comprised two food industries located in the municipalities of Rolândia and Irati, both in Paraná state, Brazil. Immature specimens of Syrphidae were sampled in May (Rolândia) and October 2016 (Irati). Dissolved Oxygen (DO), Potential of Hydrogen (pH), and temperature (°C) of the stabilization ponds were measured at collection sites. Chemical oxygen demand (COD) were obtained in laboratory.

All sampled specimens were identified as belonging to the genus *Palpada* Macquart, 1834 and related to the "*vinetorum*" group. These larvae were developing in anaerobic conditions in both lagoons (DO: 0.00 mg/L), at pH 7.9 and 25°C in Rolândia, and at pH 8.1 and 27°C in Irati. Analysis of COD recovered reasonable values for such effluent, 1,030 mg/L from Rolândia and 1,100 mg/L from Irati, although both of them had a floatable layer of fat.

This is the first record of waste stabilization ponds as larval breeding sites for *Palpada* species. Further studies are being carried out in order to identify the species and its importance in such environment.

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Oral presentation

The end of Syrphoidea: flower flies (Diptera, Syrphidae) and big-headed flies (Diptera, Pipunculidae) are not sister-groups

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Syrphoidea is a suggested superfamily based on morphological characters, comprising families Syrphidae and Pipunculidae. Recent molecular phylogenies and new interpretation of some morphological characters questioned this clade. Using transcriptomic data from the 1KITE Project the phylogenetic relationships between the "lower Cyclorrhapha" and Schizophora were explored. 19 taxa were included representing the families Lauxaniidae, Lonchopteridae, Phoridae, Pipunculidae, Platypezidae, Platystomatidae, Sepsidae, Syrphidae, and Uliidae, with Dolichopodidae as outgroup.

A fully resolved tree with maximal support for all nodes was produced from 678,763 amino acid positions using Maximum Likelihood as optimality criterion. Eumuscomorpha was recovered monophyletic and resolved as the sister-group of Platypezoidea. Syrphoidea was not recovered and Pipunculidae was resolved as the sister-group of Schizophora. Within Syrphidae, Pipizinae and Syrphinae were resolved as sister-groups, with Eristalinae recovered as paraphyletic. Within the Syrphinae the tribe Bacchini was not supported as monophyletic. Our results prove that Syrphidae and Pipunculidae are not sister-groups and the superfamily Syrphoidea as currently defined is not supported by our molecular dataset.

The project received funding from China National GeneBank and BGI-Shenzhen, China; German Research Foundation (NI 1387/1-1; MI 649/6, MI 649/10, RE 345/1-2, BE1789/8-1, BE 1789/10-1, STA 860/4, Heisenberg grant WA 1496/8-1); Austria Science Fund FWF; NSF (DEB 0816865); Ministry of Education, Culture, Sports, Science and Technology of Japan Grant-in-Aid for Young Scientists (B 22770090); Japan Society for the Promotion of Science (P14071); Deutsches Elektronen-Synchrotron (I-20120065); Paul Scherrer Institute (20110069); Schlinger Endowment to CSIRO Ecosystem Sciences; Heidelberg Institute for Theoretical Studies; University of Memphis-FedEx Institute of Technology; and Rutgers University.

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Poster presentation

Diversity of Syrphidae (Diptera) in three distinct environments of southern highland fields in Palmas, Paraná, Brazil

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The aim of this survey is to compare the species richness, abundance and diversity of Syrphidae in southern highland field environment in Palmas, Paraná, Brazil. We placed Malaise traps in three distinct environments: forest fragment interior (area A), fragment border (area B) and open field (area C), whose weekly collections reached 320 samples. Sixty eight species of Syrphidae were identified from a total of 589 sampled syrphids (0.72% of total Diptera, 0.43% of total insects), being 49 specimens (8.32%) in area A, 371 (62.99%) in area B, and 169 (28.69%) in area C. The maximum and minimum temperature was the abiotic characteristic that most correlated with the abundance during the collection period ($r_{Tmax} = 0.62$, $p < 0.05$) ($r_{Tmin} = 0.54$, $p < 0.05$).

However, it would be important to analyze the microclimate, since we empirically observed temperature variation concerning the three environments, during the data collections, which can interfere in the abundance and richness of Syrphidae. Seven species were observed in all environments, but the most diverse, richest and most abundant environment was always the border (B). The results obtained by Bray-Curtis index and analysis of similarities (ANOSIM) indicate that the distance between the groups is greater than the distance within each group, characterizing the collection areas as diverse environments. Likewise, Sørensen similarity index highlighted, with its very low results, the difference in the composition of the Syrphidae fauna that exists among each of the environments. According to this analysis, the environments A and B are the most different from each other, while between B and C the difference is discretely smaller. In addition, all environments presented unique species, which suggests that comprehensive research should take into account the floristic formation when obtaining their data.

Poster presentation

Preimaginal morphology of the South African *Graptomyza signata* (Walker) (Diptera, Syrphidae): first larval description and updated description of the pupae

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Graptomyza Wiedemann, 1820 is the single genus of the tribe Volucellini (Diptera, Syrphidae) native to the Ethiopian region. However, the genus is only represented in this biogeographical region with less than 20 described species, most of them being forest inhabitants (Wittington, 1994a). Little is known about the preimaginal stages of *Graptomyza* and larval feeding habits, except that the larvae of a few species have a saprophagous habits, and that *G. signata* (Walker, 1860) has been reared on a diet of tomato and unspecified rooting fruits (Wittington,1994b).

In this poster, the first morphological description of the larvae and an updated description of the puparia of the genus *Graptomyza* are presented, using scanning electron microscopy and optical microscopy. The study was based on larval specimens collected in decomposed roots of "aloe-like" plant in a garden from North-West area of South Africa. Larvae were reared within the roots in which they were found until them pupate.

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Poster presentation

A novel method in hoverfly taxonomy? Quantifying variability among *Merodon planifacies* Bezzi (Diptera, Syrphidae) populations by using geometric morphometric analysis of posterior respiratory processes of the immature stages

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The phytophagous hoverfly genus *Merodon* Meigen, 1803 (Diptera, Syrphidae, Merodontini) is distributed over Palaearctic and Ethiopian Regions and comprises more than 160 species (Ståhls *et al*. 2009). Although this genus is relatively well-known, current knowledge is based mostly on studies of adult insects. The immature stages of only five *Merodon* species have been described to date and observational data on the host plants of larvae exist for only 15 species (Andrić *et al*. 2014). All known *Merodon* larvae develop in the underground bulbs and rhizomes of geophytes (i.e. Amaryllidaceae, Iridaceae and Hyacinthaceae) or the surrounding soil.

Integrative taxonomy approach has played an important role in hoverfly taxonomy. In the last decade, several taxonomic problems have been resolved with the use of morphological, genetic, geometric morphometric and environmental niche analyses. The majority of these studies have been focused on adults, neglecting the immature stages. However, there are also important morphological traits of immature stages that can be used for *Merodon* species identification, e.g. mouth and apical mandibular hooks, color of anterior (ARP) and posterior respiratory process (PRP), number of spiracular openings at the ARP apex, shape of spiracular openings at spiracular plate of PRP, among others (Andrić *et al*. 2014).

The main goal of this study was to quantify shape variability of the curvature of the spiracular openings on the PRP of immature individuals among *Merodon planifacies* Bezzi, 1915 populations collected in Republic of South Africa by using geometric morphometrics.

This study was funded by the project of the European Union: Horizon 2020, Marie Skłodowska-Curie action, Research and Innovation Staff Exchange (RISE) Programme: FlyHigh - Insect - plant relationships: insights into biodiversity and

new applications (project number 645636, 2015-2018), and Ministry of Science, Republic of Serbia, Grant No. OI173002 and the Provincial Secretariat for Science and Technological Development, Grant No. 114-451-1125/2014-03 and 114-451-1702/2014-03.

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Poster presentation

Collection of Syrphidae (Diptera) in National Museum, Prague, Czech Republic (NMPC)

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The collection of hover flies (Diptera, Syrphidae) housed in National Museum in Prague, Czech Republic (NMPC) has around 20,000 specimens and is currently being organized. The specimens were moved into 120 UNIT-type entomological boxes, from which 60 contain undetermined Syrphidae material. At this moment, re-curation of the collection is done by 50%. Besides specimens from the Czech and Slovak Republics, the collection also includes species from Central and East Asia, and South America. Therefore, experts on Syrphidae taxonomy are herewith invited to help us with identification of any taxa of this collection, especially species of Brachyopini, Pipizini, *Cheilosia* Meigen, 1822, *Merodon* Meigen, 1803 and *Platycheirus* Lepeletier & Serville, 1828. The preliminary list of syrphid taxa housed in the NMPC will be presented.

Oral presentation

Afrotropical species of *Merodon* Meigen (Diptera, Syrphidae)

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The phytophagous hoverfly genus *Merodon* Meigen, 1803 (Diptera, Syrphidae, Merodontini) is distributed over the Palaearctic and Afrotropical regions and comprises more than 160 species. The highest diversity of this genus is recorded in the Mediterranean region, which can be explained by the high variety of bulb plants, which are the larval hosts. The Afrotropical fauna is less diverse and includes only two species groups - *aureus* and *desuturinus*, both existing also in the Palaearctic. The *aureus* group includes the following presently known species: *Merodon apimimus* Hull, 1944, *M. bombiformis* Hull, 1944, *M. multifasciatus* Curran, 1939, and three undescribed taxa: *M. admiralus* Hurkmans sp. nov. (manuscript name), *M. appendiculatus* Hurkmans sp. nov. (manuscript name) and *M. zebra* Hurkmans sp. nov. (manuscript name). The Afrotropical lineage of the *desuturinus* group comprises four known taxa: *M. cuthbertsoni* Curran, 1939, *M. melanocerus* Bezzi, 1915, *M. planifacies* Bezzi, 1915 and *M. stevensoni* Curran, 1939. New studies have revealed cryptic species within the taxon *M. planifacies* and new species related to *M. melanocerus.* The aim of this paper is to present all hitherto known Afrotropical species of the genus *Merodon*, as well as newly discovered taxa, their diagnostic characters and distributional data.

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Poster presentation

Notes on the genus *Eumerus* Meigen (Diptera, Syrphidae) from the Republic of South Africa

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Eumerus Meigen, 1822 is widely distributed genus in the Palaearctic, Afrotropical, Oriental, and Australian Regions, with more than 250 described species. Early stages of this phytophagous genus develop in underground storage organs of plants, where they feed on semi-liquid and partially decaying plant tissues. Despite its wide geographical distribution and rich biodiversity, the genus lacks recent and comprehensive studies in systematics, biodiversity, ecology and biogeography. Especially the identification of Afrotropical species is very difficult because of limited taxonomic revisions. Leif Lyneborg (1932-2006), ex curator emeritus at the Department of Entomology, Natural History Museum of Denmark, made a monographic revision (in manuscript form) of the Afrotropical species of the genus *Eumerus* including more than 70 species new to science. Unfortunately he did not manage to finish this revision. During field investigations carried out in the Republic of South Africa from 2015 to 2017 within the "Fly High" project of the EU, Horizon 2020 RISE program, numerous specimens of the genus *Eumerus* were collected. Specimens were identified based on morphological analysis of material designated by Leif Lyneborg, as well as by using his key, with additional analysis of male genitalia characters and molecular data. The aim of this paper is to present a list of recorded species, with main diagnostic characters and distributional data.

This study was funded by the project of the European Union: Horizon 2020, Marie Skłodowska-Curie action, Research and Innovation Staff Exchange (RISE) Programme: FlyHigh - Insect -plant relationships: insights into biodiversity and new applications (project number 645636, 2015-2018); also funded by grant BE-TAF-6885 from the SYNTHESYS programme http://www.synthesys.info/) financed by the European Community Research; and partially by Ministry of Education, Science and Technological Development of the Republic of Serbia (OI173002 and III43002).

Neotropical Microdontinae (Diptera, Syrphidae): a summary

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More than 40% of the approximately 500 described species of Microdontinae (Diptera, Syrphidae) occur in the Neotropical region. The large morphological diversity of these species is reflected by the large number of genera, which is also higher in the Neotropics (27) than the rest of the world (16). Still, much remains to be discovered. New species show up in almost every batch of specimens I receive for identification. For some of these species, generic placement is problematic. Species taxonomy is also often problematic, due to the small number of specimens available per species. Little by little, new information has been published over the past years, and new research is in progress. This presentation will summarize present knowledge of taxonomy, phylogenetic relationships and biology of Neotropical Microdontinae.

Oral presentation

Drone-flies and their rat-tailed larvae (Diptera, Syrphidae), are they entomological sheep in wolf's clothing?

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There are few insects except the silk worm and the honey bee that have a historical record equal to that of this interesting creature. Its story begins in the dusk of prehistoric times" (Dolley, 1930). As Dolley also indicated, *Eristalis tenax* (Linnaeus, 1758), the most charismatic drone-fly is a saprophagous (as larvae), synanthropic, and cosmopolitan species being potentially the most abundant flower fly in the world. Nevertheless, contrary to most syrphid species, with medico-veterinary medical importance almost null, larvae and imagoes of this species have been associated with pathogens and may act as potential mechanical vectors of them. Moreover, there are many references of drone flies as accidental myiasis agents (pseudomyiasic) in humans and livestock around the world.

In humans, most cases are gastro-intestinal myiasis that were caused by the drinking of putrid water containing eggs or small larvae, or by ingestion of contaminated food. Although more than 200 species with rat-tailed maggots have been described and the preimaginal stages of most of them remain undescribed, frequently a single species is cited in virtually all reported cases of myiasis occasioned by flower flies around the world, i.e. *E. tenax*.

In the present study, the first intestinal human myiasis caused by a species of the New World genus *Palpada* Macquart, 1834 is reported from Costa Rica. In order to identify the species of this genus, DNA barcoding techniques as well as morphological inspection of a pre-adult were carried out. Furthermore, a critical world review of myiasis occasioned by syrphid species is given. The majority of the human reported myiasis caused by syrphids are gastrointestinal or enteric, being the other types much less reported: urogenital, nasal, and traumatic. Four other animal species have been also recorded as accidental hosts: cattle (cow), pigs, horses and dogs.

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Poster presentation

Use of flies (Diptera, Calliphoridae and Syrphidae) as commercial pollinators in celery crops (*Apium graveolens* var. *rapaceum* and *Apium graveolens* var. *dulce*) under greenhouse conditions

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In the agro-food industry, pollination carried out by insects is a fundamental service, in which they participate in the reproduction of 75% of the most relevant crops for humans. The decline of traditional pollinators and the need of generalist pollinators for hybrid plant lines point to the use of alternative pollinators. The aim of this study is to evaluate and explore the pollination potential of two dipteran species in two varieties of celery, as well as optimize their release conditions in the greenhouses.

The study was carried out in celery crops for seed production in a greenhouse in De Lier, Holland. We used a total of eight experimental isolation net cages, four of them for each variety of celery: celeriac (*Apium graveolens* var. *rapaceum*) and blanched celery (*Apium graveolens* var. *dulce*). The cages contained four different female lines and one male line in each one. The experiments with *Eristalinus aeneus* (Scopoli, 1763) were carried out on celeriac, and the experiments on blanched celery with *Protophormia terraenovae* (Robineau-Desvoidy, 1830). Two different fly densities were tested.

The pollinating activity of the flies was measured by monitoring floral visits. We did censuses of the individuals present in the flowers of a representative section of the line two times a day (09:00-11:00 and 14:00-16:00). The study was completed with the study of some aspects of the floral biology of the species, including floral phenology, the presence of pollen in the male flowers, the production of nectar in the female lines and the receptivity of the stigma. It was shown that *E. aeneus* presented a more active floral behaviour, showing a greater number of flower visits at lower densities than *P. terraenovae*. However, pupal emergence was more affected by the high temperatures reached at the commercial greenhouses for *E. aeneus* than for *P. terraenovae*.

Oral presentation

Using the DNA barcode database for practical purposes – case study with the Nearctic field guide

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We now have 22,479 syrphid COI barcodes representing well over 3,000 species. These data are a powerful tool for linking life stages, associating sexes, informing taxonomic decisions and creating phylogenetic hypotheses. While working on the Field Guide to Northeastern Nearctic Hover Flies, we regularly revised species concepts after consulting DNA data. As a result, we have found over 30 previously unrecognized syrphid species in our region. This includes 18 undescribed species, 10 old species names in need of resurrection as well as a few taxa previously thought to only occur in other regions. We will also propose synonyms for a number of species, including some found in both the Palaearctic and Nearctic.

We will illustrate the talk with a number of these examples and put forth a plea for more collaboration on this front. It would be fantastic to be able to freely share barcode data amongst our entire community, breaking down borders and facilitating taxonomists working on species delineation. Although not all of the data are public, we have shared our data with anyone interested in accessing them. Management of large datasets like these are a challenge and moving all data online is a challenge. We will discuss some of these pitfalls and open the floor to a discussion of possible solutions to enable more data sharing.

Oral presentation

Dramatic losses of insects in the last decades: A case-study on Syrphidae (Diptera) in the Wahnbachtal (Germany) and possible implications for nature conservation and agriculture

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First evidence of dramatic losses of biomass of insects was given by a study of the Entomological association Krefeld (EVKr) comparing biomass of insects of a Malaise trap study in 2013 in North Rhine-Westphalia with data from the same locality in 1989. While the "silent spring" was experienced by many entomologists in Germany with less and less insects, comparable data with identical methods and well documented localities are extremely rare. One big exception is very valuable Malaise trap material of the EVKr, which has been running many traps in the past 30 years, mostly in the central part of Germany in Northrhine-Westfalia. By chance I came across a Diploma thesis on Syrphidae of the Wahnbachtal, where 6 Malaise traps were placed in 1989; the material was rechecked subsequently and published in Hellenthal & Ssymank (2007) with 17,291 specimens from 140 species.

In the year 2014 again 6 identical Malaise traps were placed in the same localities and the Syrphidae identified. The results were an average loss of ca. 84 % in number of specimens (n= 2,737) and a reduction in the number of species of ca. 26 % (103 species). These dramatic losses are not only a simple loss of a fly group or of species protection in nature conservation, but on top have major implications on ecosystem services such as pollination or on food chains, especially on insect-feeding bird species. Changes in vegetation, climate or methodical problems can be largely excluded as explanations. The most probable explanation is modern agriculture with new pesticides including neonicotinoids as seed coatings, possibly in combination with additional fragmentation of habitats due to agricultural intensification. Currently a Federal Research Project (F+E) of the BfN by the EVKr investigates a broad set of different insect groups in a number of additional localities.

Oral presentation

Syrphidae (Diptera) from the Biodiversity Hotspot Grenzach-Wyhlen (Germany)

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As part of a larger "All Taxa Biodiversity Inventory" in the southwestern corner of Germany with field work conducted between 2008 and 2011, the first results of Syrphidae from 20 Malaise trap localities will be presented. The study area is only ca. 18.6 km², located at crossroads for insect migration. Including a few field observations 16,389 specimens produced 210 species of Syrphidae (+ 6 additional species in the vicinity), the highest number ever recorded in such a small area in Germany. The area is considered to be one of the 30 national biodiversity hotspots of Germany - representing 46% of the German Syrphidae fauna and ca. 55% of Baden-Württemberg. The systematic coverage of all major habitat types from dry to humid conditions allows comparison of habitat preferences.

Parasyrphus proximus Mutin, 1990 and *Merodon nigritarsis* Rondani, 1845 are new to Germany. The complete project consists of 44 localities with 57 trap years, which will in future produce additional rich results in terms of fluctuations, phenology and habitat preferences also for rarer species.

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Oral presentation

First records for the bacterial endosymbiont *Wolbachia* in phytophagous hoverflies (Diptera, Syrphidae: *Merodon*)

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The genus *Merodon* Meigen, 1903 (subfamily Eristalinae) comprises more than 160 species distributed over the Palaearctic and Palaeotropical regions. The genus is speciose in the Mediterranean region, as are also their bulbous host plants (e.g. Hyacinthaceae), in which the larvae develop. During recent years, a number of publications have revealed a high level of species diversity within the genus *Merodon* (e.g. Radenković *et al*. 2011; Vujić *et al*. 2012; Šašić *et al*. 2016). The *Merodon aureus* species group is especially interesting as it was shown to comprise a high genetic diversity and several complexes of cryptic species (Šašić *et al*. 2016).

Wolbachia is a genus of facultative endosymbiont bacteria common among arthropods, estimated to have infected two-thirds of all extant insect species (Hilgenboecker *et al*. 2007). A *Wolbachia* infection may affect the taxonomic utility of the maternally inherited mitochondrial genome by e.g. influencing the mtDNA substitution patterns, which may have implications for molecular taxonomic and systematic research. The aim of our research was to perform *Wolbachia* screening of specimens from different subgroups of *Merodon aureus* species group, to address a recent question of incongruent phylogenetic placements of some of these taxa based on mtDNA COI.

We screened 45 specimens for the presence of *Wolbachia* based on the PCR amplification of *Wolbachia* 16S rDNA. Additionally, we amplified and sequenced the *wsp* (*Wolbachia* surface protein) gene for 28 samples in order to classify the samples to a *Wolbachia* strain. All of the analyzed samples were positive for *Wolbachia* infection based on PCR amplification and sequencing of 16S. All tested samples belong to the supergroup A of *Wolbachia* according to the 16S sequences, and to at least five different strains based on analysis of *wsp* sequences. We also amplified nuclear 28S and ITS2 markers for most specimens. The implications of our findings are discussed for *Merodon aureus* group taxa.

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Poster presentation

New species of *Paragus* Latreille (Diptera, Syrphidae) from South Africa

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Paragus Latreille, 1804, with around 100 described species, is the only genus of the tribe Paragini. *Paragus* species are widely distributed across the world. The current knowledge of Afrotropical *Paragus* species is mainly based on Stuckenberg's revisions (1954 a, b), who divided this genus into two subgenera: *Paragus* Latreille, 1804 and *Pandasyopthalmus* Stuckenberg, 1954. Based on molecular and morphological characters Vujić *et al*. (2008) suggested a subdivision into four subgenera including the two previously established, establishing the subgenera *Afroparagus* Vujić & Radenković, 2008 and *Serratoparagus* Vujić & Radenković, 2008. Ssymank & Mengual (2014) modified the key to subgenera of *Paragus* from Vujić *et al*. (2008) and gave identification key for *Afroparagus* species. All known subgenera are represented in the Afrotropical Region with a total of 28 recorded species (Ssymank & Mengual, 2014).

The aim of this study was to introduce two newly discovered *Paragus* species from South Africa. Our results show that these species belong to subgenus *Pandasyopthalmus*. One species has characteristic paramere of male genitalia with wide base and narrow rounded apex. While the other can be distinguished by elongated abdomen and large cerci of male epandrium with hairs wavy at their tip.

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Oral presentation

On the contribution of www.waarnemingen.nl to the Dutch Syrphidae (Diptera) fauna

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In May 2005 the online platform https://waarneming.nl/ was introduced for recording bird observations of 70 different local birding clubs. Two years later it became also possible to record any kind of Dutch plant or animal species through this site. Nowadays up to seven million records are added each year by more than 16,000 different contributors. Using an app you can upload field data and make your findings immediately known to the rest of the digital world. Also many photos are uploaded to prove the correct determination or are used for asking for a proper determination.

At the beginning of 2017 waarneming.nl hold more than 150,000 records on hoverflies, including 85,000 photos. This is about 50% of all Diptera records which are registered by more than 1,500 different contributors. The aim of this presentation is to elucidate how well these observations reflect the Dutch hoverfly fauna. Which species seems to have a hard time in The Netherlands and which species seems to increase? But also what is the effect of having many new and often unexperienced contributors sending in photos of hoverfly species.

To answer these questions, the data on waarneming.nl on hoverflies was analyzed for the period 2005-2017 and compared with the distribution and abundance of hoverfly species as recorded in the Dutch Atlas on Hoverflies (Reemer *et al*. 2009) for the period 1990-2007.

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Oral presentation

Genetic characterization of the *Eumerus triangularis* Hervé-Bazin species group (Diptera, Syrphidae) from the Republic of South Africa

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A monographic revision of the Afrotropical species of the genus *Eumerus* Meigen, 1822 (Diptera, Syrphidae) was prepared by Leif Lyneborg (1932-2006), but never published. Ongoing studies of this genus in the Republic of South Africa within the "Fly High" project of the EU, Horizon 2020 RISE program resulted in collecting about 200 specimens. Preliminary morphological analysis of collected material indicated presence of 18 previously known species and 22 undescribed species. One group of species closely related to *Eumerus triangularis* Hervé-Bazin, 1913 was of special interest for further investigations. This group comprises species with particular silvery-reflecting antennae (dorsal part of inner side of pedicel). The main aim of this study was a genetic characterization of *Eumerus triangularis* group.

Analyzing sequences of cytochrome c oxidase I (COI) gene (known as “barcoding” region of mtDNA), we confirmed five species from this group: two previously known as *E. triangularis* and *E. rubidus* Hull, 1964, and three new species: *E. argenticornis* Lyneborg sp. n., *E. forchhammeri* Lyneborg sp. n. and *E. granulatus* Lyneborg sp. n.. Beside these five species, according Lyneborg, three additional species belong to this group: *E. funebris* Lyneborg sp. n., *E. tesselatus* Hull, 1964 and *E. villeneuvei* Hervé-Bazin, 1913. They are not included in this study due to lack of fresh material.

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Poster presentation

Olfactory responses of the predatory larvae of *Salpingogaster nigra* Schiner (Diptera, Syrphidae)

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Feeding on pastures, spittlebugs (Hemiptera, Cercopidae) are pests due to their great population and to the severity of damages caused. In the larval phase, *Salpingogaster nigra* Schiner, 1868 (Diptera, Syrphidae) feeds on spittlebug nymphs. There is a high association between the predator´s population fluctuation and its prey (spittlebugs) on the field. Current assay evaluates the olfactory responses of *S. nigra* for spittlebug nymphs through foam produced by the prey. Three bioassays were performed by olfactometer Y: i) nymphs *vs.* air; ii) foams produced by prey *vs.* air; iii) nymphs *vs.* foams. Each series comprised 50 females and each individual was tested once for all bioassays. Responses were measured with the first arm of Y with regard to the insect´s choice. Females of *S. nigra* had significant preference ($x^2 = 27.04$; GL=1; $p = 0.0001$) for odors produced by spittlebug nymphs, but there was no significant attraction ($x^2 = 0.64$; GL=1; $p=0.4237$) for odor released by the prey´s foam. Based on these results, we conclude that predatory larvae of *S. nigra* use the odors produced by spittlebug nymphs to locate its prey.

This study was funded by the Coordination for the Upgrading of Personnel in Higher Institutions (CAPES, Brazil).

Poster presentation

Reproductive capacity, embryonic period and viability of the eggs of *Salpingogaster nigra* Schiner (Diptera, Syrphidae)

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In its larval stage, the Neotropical species *Salpingogaster nigra* Schiner, 1868 (Diptera, Syrphidae) feeds on spittlebug nymphs (Hemiptera, Cercopidae). Present survey checks daily oviposition, duration of embryonic period and egg viability of *S. nigra*. Adults were collected on the experimental field of Embrapa Gado of Leite in Colonel Pacheco, Brazil. Thirty couples were individualized in acrylic cages (80 x 55x 55 cm) in the laboratory. Each cage contained the plant *Brachiaria decumbens* Stapf infested with spittlebug nymphs, which produced foam as a substrate for the predator´s egg laying. Eggs were collected daily, totaling 2,209 eggs. They were placed on 5cm-diameter Petri dishes, covered with filter paper and maintained in a climatic camera Phytotron at 28 ± 2ºC and 12L:12D photoperiod. Number of eggs per female, the duration of embryonic period and eggs viability were assessed, averaging 25.08±6.05 eggs/days/female, with embryonic development period of 2.73±0.11 days and viability rate at 64% ± 4.5%.

This study was funded by the Coordination for the Upgrading of Personnel in Higher Institutions (CAPES, Brazil).

Poster presentation

Evolutionary relationships within the species-rich genus *Merodon* Meigen (Diptera, Syrphidae, Eristalinae)

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The systematics and classification of the most species-rich hoverfly genus in Europe, *Merodon* Meigen, 1803 (Diptera, Syrphidae, Eristalinae) is still in need of revision. Several recent publications have dealt with taxa considered to constitute monophyletic groups (e.g. Mengual *et al*. 2006; Popović *et al*. 2015; Šašić *et al*. 2016). In this study we focus on resolving the intrageneric phylogenetic relationships of the genus *Merodon*, based on analysis of 251 morphological characters of adult males, as well as molecular characters (mitochondrial cytochrome c oxidase I and nuclear 28S rRNA, 18S rRNA genes) for 56 taxa and 6 outgroup taxa in combined analysis. The results indicated a clear monophyly of genus *Merodon* and existence of well supported monophyletic groups, putative subgenera: *avidus*, *aureus*, *desuturinus*, and *albifrons*. In addition, the systematic position and taxonomic ranking of species groups within the clades of this phytophagous genus was clarified.

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Oral presentation

Spurred flowers and short-proboscid pollinators: challenging Darwin

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Since the time of Darwin, biologists have considered the floral nectar spur to be an adaptation representing a high degree of plant specialization. Nevertheless, some researchers suggest that nature is more complex and that even morphologically specialized plants attract a wide spectrum of visitors. The flower visitors of *Impatiens burtonii* Hook. f. (Balsaminaceae) were surveyed in Cameroon, West Africa. In our study, the depth of the proboscis insertion into the spur, the distance of the nectar surface from the spur entrance, and the visitor´s effectiveness were measured.

Three insect species frequently contacted the stigmas of *I. burtonii* flowers and can therefore be considered potential pollinators. The hoverfly *Melanostoma* sp. (with the shortest proboscis), was most active early in the morning and fed on pollen and nectar near the spur entrance. The honeybee *Apis mellifera* Linnaeus, 1758 and the hoverfly *Rhingia mecyana* Speiser, 1910 were the most frequent visitors before and after noon, respectively. Although *R. mecyana* (the only visitor able to reach the end of the spur) was the most frequent, it did not deposit the largest number of pollen grains per visit. Nectar spurs may function as complex structures allowing pollination by both short- and long-proboscid visitors and separating their spatial and temporal niches. Spurred plants should be considered as more generalized and exposed to more diverse selection pressures than previously believed.

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Oral presentation

Distribution of species from the *Merodon aureus* Fabricius group (Diptera, Syrphidae)

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The *Merodon aureus* group consists of species sharing similar morphological characters with species *Merodon aureus* Fabricius, 1805 (Diptera, Syrphidae). The group comprises five subgroups defined based on morphological variations (Šašić *et al*. 2016). Presence of very subtle differences in morphological characters within the species of this group was formerly interpreted as great intraspecific variability. Veselić *et al* (2017) indicated that this morphological variability is due to presence of cryptic species complexes and provided evidence of 39 taxa within *M. aureus* group, including 13 undescribed cryptic species.

The aim of this study was to establish the distribution of all taxa identified within the *M. aureus* group. Results show that the genus has a broad range over the Mediterranean region, but all species of the *M. aureus* group exhibit patchy distributions, meaning that they represent regional or local endemics.

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Oral presentation

A taxonomic revision of the *Psilota* Meigen (Diptera, Syrphidae) of Australia

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Psilota Meigen, 1830 is a widespread but somewhat poorly known genus of Syphidae (Diptera), with 31 valid species worldwide. This genus is found throughout the Holarctic, Indo-Malayan, and Australasian regions, but is absent from the Neotropical and Afrotropical regions. Sixteen of the 31 described species are found in the Australasian region, with 14 of those native to Australia itself. In contrast to most *Psilota* found in the rest of the world, many Australian species are both colorful and easily collected. However, most Australian species remain undescribed.

Preliminary curation of the major Australian Diptera holdings (AM, UQIC, ANIC), combined with manuscript keys from both F.C. Thompson and W. van Steenis indicate that there are at least 37 (and likely many more) species of Australian *Psilota* that have yet to be described. Additionally, holotypes of several described species have been lost/destroyed, specimens that are not types have been labelled as if they are, and at least one unpublished name has entered the taxonomic literature, so name confusion abounds.

In order to make sense of the fauna, we will be producing a traditional taxonomic revision, complete with high-quality color photographs of external morphology and male genitalia of every species. Species concepts have been based largely on morphology, but COI data is being used to supplement this where possible.

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