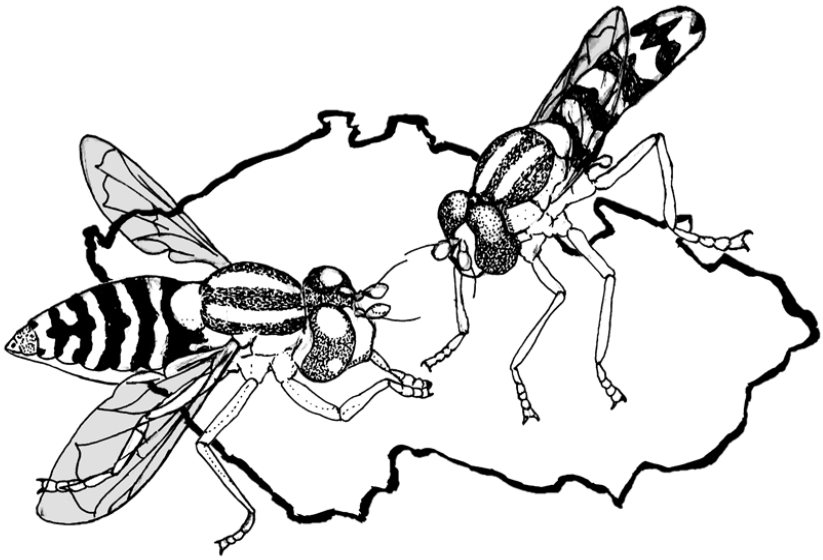
Book of Abstracts



12th International Symposium on Syrphidae
Průhonice, Czech Republic
2–7 September 2024

Edited by Tamara Tot & Jiří Hadrava

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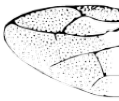

ČESKÁ SPOLEČNOST ENTOMOLOGICKÁ

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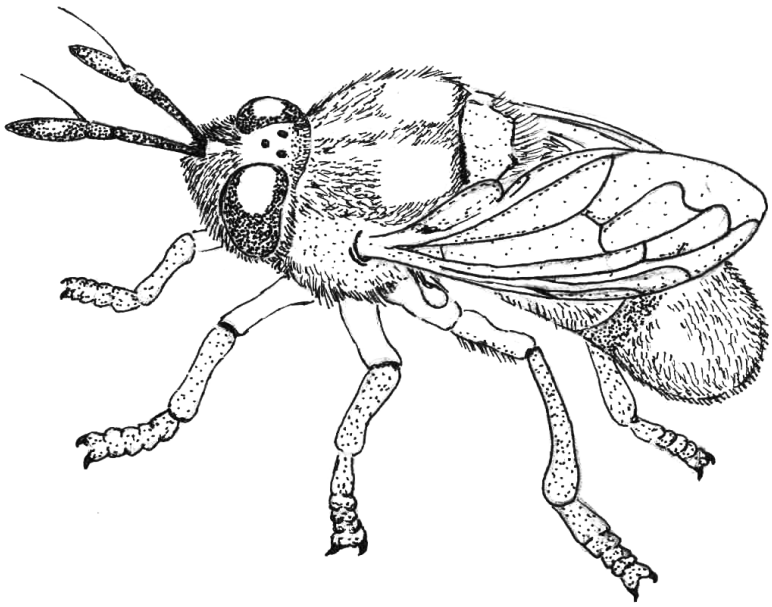
Introduction

The International Symposium on Syrphidae, organized every two years represents a significant milestone for our syrphidology community, bringing together researchers and enthusiasts from around the world to share recent advancements and foster international collaboration.

We are thrilled to host the 12th International Symposium on Syrphidae (ISS12) in Průhonice, Czech Republic. Participants will benefit from a rich programme, across six sessions, including taxonomy, systematics, phylogeny, genetics, phylogenetics, DNA barcoding, monitoring, biodiversity assessment and conservation, faunistics, biogeography, biology, ecology, functional and applied ecology, and management.

We are eagerly looking forward to keynote speeches, informative presentations during 3 plenary talks, 42 oral presentations, and 22 posters, each presenting outstanding results. Our heartfelt thanks go to all participants and contributors, who will make ISS12 a success. We are confident that this symposium will provide a place for valuable idea sharing and inspire further research in the field of syrphidology.

We look forward to enjoy ISS12 with all of you!



The book of abstracts was typeset in LaTeX. All the illustrations (including logo of the symposium) were drawn by Tadeáš Ryšan.

Programme

Programme of the Symposium

2nd September	Arrival
3rd September	Symposium
4th September	Symposium
5th September	Symposium, gala dinner
6th September	Excursion to Hrnčířské louky and Milovice
7th September	Departure, possible tour in Prague centre

Time schedule for 3rd–5th September

08:00-09:00	Arrival to Průhonice Castle
09:00-10:30	Presentations
10:30-11:15	Coffee break
11:15-12:30	Presentations
12:30-14:30	Lunch (in Hotel Floret)
14:30-16:00	Presentations
16:00-16:45	Coffee break
16:45-19:00	Additional programme (poster session, free discussions etc.)
19:00-21:00	Dinner (in Hotel Floret)

Monday, 2nd September 2024 – Arrival

16:00-19:00 **Registration** in Hotel Floret + accommodation

19:00-22:00 **Welcome dinner** (in Hotel Floret)

Tuesday, 3rd September 2024

08:00-09:00 **Registration** in the Průhonice castle + poster installation

09:00-09:30 **Welcome speech** + information about the Průhonice castle

09:30-10:00 **Plenary talk: Francis Gilbert**: *Are hoverflies good pollinators of flowers?*

SESSION 1: TAXONOMY, SYSTEMATICS, PHYLOGENY

Session Chairs: John Smit and Ante Vujić

10:00-10:15 **Roger Morris**: *Understanding beginners' identification issues.*

10:15-10:30 **Gunilla Ståhls**, Sander Bot, Axel Ssymank, Ana Grković, Marina Janković, Laura Likov, Libor Mazánek, Ximo Mengual, Marija Miličić, Gerard Pennards, Snežana Radenković, Tamara Tot, Ante Vujić: *Recent developments of the Taxo-Fly project – an EU funded Service Contract to generate Taxonomic Resources for European hoverflies.*

10:30-11:15 **Coffee break**

11:15-11:30 **Sander Bot**, Rune Bygebjerg, Gunilla Ståhls, Ante Vujić: *Updates in taxonomy of European Cheilosia Meigen (Diptera, Syrphidae).*

11:30-11:45 **Leendert-Jan van der Ent**, Gunilla Ståhls: *A new species of the subgenus Taeniochilosia from the Balkan Mountains.*

11:45-12:00 **Iván Ballester-Torres**, Zorica Nedeljković, Pablo Aguado-Aranda, María Ángeles Marcos-García, Antonio Ricarte: *Going through the checklist of the Ibero-Balearic species of Cheilosia Meigen (Diptera: Syrphidae): new records and species.*

12:00-12:15 **Tamara Tot**, Robert Żóralski, Frank Van De Meutter, Ximo Mengual, Sander Bot, Iva Gorše, Xavier Lair, Martin Speight, Rüstem Hayat, Santos Rojo, Celeste Pérez-Bañón, Ljiljana Šašić Zorić, Mihajla Đan, Snežana Radenković, Ante Vujić: *Revision of the taxonomical status of some Western Palaearctic chrysogasterine taxa (Diptera: Syrphidae).*

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12:30-14:30 **Lunch** (in Hotel Floret)

SESSION 2: GENETICS, PHYLOGENETICS, DNA BARCODING

Session Chairs: Gunilla Ståhls and Kurt Jordaens

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15:00-15:15 **Iva Gorše**, Ljiljana Šašić Zorić, Ante Vujić, Snežana Radenković, Mihajla Djan: *What to do when COI is not enough? Genome-wide data shed light on the taxonomy of the Merodon ruficornis group (Diptera: Syrphidae).*

15:15-15:30 **Alice Dabrowski**, Andrew D. Young: *Preliminary larval evidence suggesting a new cryptic Eupeodes Osten-Sacken (Diptera: Syrphidae) species in North America.*

15:30-15:45 **Mihajla Djan**, Iva Gorše, Ana Grković, Milica Ranković Perišić, Dubravka Milić, Nataša

Kočiš Tubić, Ante Vujić, Snežana Radenković: *Environmental DNA survey for characterization of pollinator's community.*

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Wednesday, 4th September 2024

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11:45-12:00 **David Bennett**, Tim Diekötter: *No significant effect of landscape factors on hoverfly richness at wildflower compensation areas in northern Germany, and comparative results of wildflower eDNA for bees and hoverflies.*

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16:00-16:45 **Coffee break**

16:45-18:00 **Průhonice park guided tour** + free programme (posters and microscopes are accessible)

19:00-21:00 **Dinner** (in Hotel Floret)

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09:00-09:30 **Plenary talk: Santos Rojo**: *An overview of the role of hoverflies in non-conventional economic and environmental issues*

SESSION 5: BIOLOGY, ECOLOGY

Session Chairs: Daniele Sommaggio and Menno Reemer

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09:45-10:00 **Blessing Chidinma Umeh**, Markus Sydenham, Gunnar Mikalsen Kvifte, Michael A. Patten: *Do mimic hoverfly spatially match their bumblebee models?*

10:00-10:15 **Grigory Popov**, Ruslan Mishustin, Ante Vujić, Viktor Shparyk, Snežana Radenković, Celeste Pérez-Bañón, Andrea Aracil, Laura Likov, Santos Rojo: *Textbook phytophagy: close relationships between species of the Merodon constans group (Diptera, Syrphidae) and the Galantheae tribe as host plants.*

10:15-10:30 **Adrián Bosquet-Navarro**, Darío Gijón-Martínez, Andrea Aracil, Celeste Pérez-Bañón, Santos Rojo: *First data on the ovarian development and oocyte evolution of the genus Eumerus Meigen, 1822 (Diptera: Syrphidae) under captive rearing.*

10:30-11:15 **Coffee break**

11:15-11:30 **Andrea Aracil**, Adrián Bosquet-Navarro, Celeste Pérez-Bañón, Santos Rojo: *Effect of pupal cold-storage on five species of eristaline (Syrphidae, Eristalini) and its influence on adult flight ability.*

11:30-11:45 Sergio Leonardo Ángel Villarreal, **Augusto León Montoya Giraldo**, Raúl Giovanni Bogotá Ángel: *Hoverfly (Diptera: Syrphidae) communities associated with pollen transport in three land covers of Andean forest in the Quebrada Las Delicias in Bogotá, Colombia.*

11:45-12:00 **Augusto León Montoya Giraldo**, Juan Luis Parra, Marta Wolff: *Phenological patterns of hoverflies (Diptera: Syrphidae) in Paramo habitats in Colombia.*

12:00-12:15 **Mandisa Ndlela**, Kurt Jordaens, John Midgley: *The first confirmed female of Mesembrius ingratus (Loew, 1858) (Diptera: Syrphidae) from KwaZulu-Natal, South Africa*

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Session Chairs: Wouter van Steenis and John Midgley

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Milosavljević, Snežana Radenković, Ante Vujić: *Transect and landscape – level factors shaping hoverfly (Diptera: Syrphidae) communities: a functional trait perspective.*

14:45-15:00 **Samm K. Reynolds**, Emily J. Forrester, Carolyn Callaghan, Lauren des Marteaux, Jeff Skevington, Andrew Young, Nigel E. Raine: *Syrph-ing habitats: the impact of seminatural habitats in agricultural landscapes on native hoverfly populations in southern Ontario, Canada.*

15:00-15:15 **Anne Loreth**, Annette Herz: *Potential effects of pesticide abandonment and landscape composition on the fitness of Sphaerophoria scripta (Linnaeus, 1758) individuals from field populations (Diptera: Syrphidae).*

15:15-15:30 **Nicola A. Irvin**, Ivan Milosavljević, Mark S. Hoddle: *Enhancing hoverflies in citrus orchards with the use of insectary plantings.*

15:30-16:00 **Announcment of the winner of the best student presentation**

16:00-16:45 **Coffee break** + possibility to buy entomological equipments from Entoprofi

16:45-17:00 **Antonín Hlaváček**: *Information about Friday's excursion to Milovice Nature Reserve.*

17:00-17:15 **Tadeáš Ryšan**: *Information about Saturday's excursion to Prague centre.*

17:15-18:00 **Closing remarks + open discussions**

19:00-24:00 **Gala dinner** (in Hotel Floret)

Friday, 6th September 2024 – Excursion

08:30-09:00 **Bus** from Průhonice to Hrnčířské louky

09:00-10:00 **Excursion** on Hrnčířské louky (wet grassland locality close to Průhonice)

10:00-11:00 **Bus** from Hrnčířské louky to Milovice

11:00-13:00 **Lunch** + free insect collecting in the surrounding of the Milovice Nature Reserve (dry grassland and scrubland vegetation)

13:00-17:00 **Excursion** inside the Milovice Nature Reserve

17:00-18:00 **Bus** from Milovice to Průhonice

19:00-21:00 **Dinner** (in Hotel Floret)

List of poster presentations

1. **Jelena Ačanski, Marina Janković Milosavljević, Tamara Tot, Ana Grković, Snežana Radenković, Ante Vujić**: The first insight of environmental change impact on Syrphidae (Diptera) morphology: wing fluctuating asymmetry analysis of *Merodon aberrans* Egger, 1860

2. **Pablo Aguado-Aranda, Antonio Ricarte, Xavier Lair, Thomas Lebard, Gabriel Nève, Christophe Lauriaut, Martin Speight, María Ángeles Marcos-García**: An overview on the French *Eumerus* Meigen, 1822: diversity, taxonomy and systematic

3. **Bálint Andrási, Hinatea Ariey, Lisette Cantù-Salazar, Alain Frantz, Axel Hochkirch, Stéphanie Lippert, Amanda Luttringer, Jeroen van Steenis, Wouter van Steenis, Sarah Vray, Alexander Weigand, Julian Wittische**: Hoverfly (Diptera: Syrphidae) Atlas of Luxembourg in 2028

4. **Yannis Berle, Gabriel Nève**: Wing shape changes with size in *Sphaerophoria scripta* (Diptera, Syrphidae)

5. **Stian Brønner, Markus Sydenham, Arnstein Staverløkk, Gunnar Mikalsen Kvifte**: Not all pollinators are created equal: Contrasting responses to environmental change in hoverflies (Diptera: Syrphidae) and bees (Anthophila) in Trøndelag semi-natural grasslands

6. **Aleksandra Đorđević, Snežana Popov, Marija Miličić, Ante Vujić, Snežana Radenković**: The influence of linear landscape elements on the diversity and abundance of hoverflies (Diptera: Syrphidae) in Serbia

7. **Emily Forrester, Samm Reynolds, Andrew Young, Jonathan Schmidt**: The malaise of trapping: Measuring variance in pollinator abundance and diversity sampling using Malaise traps in agroecosystems

8. **Ana Grković, Snežana Radenković, Nataša Kočiš-Tubić, Sanja Veselić, Celeste Pérez Bañón, Santos Rojo, Andrea Aracil, Kurt Jordaens, Ximo Mengual, Kevin Moran, Jeffrey Skevington, Gunilla Ståhls, Ante Vujić**: *Eumerus* Meigen, 1822 reshaped: Granting generic status to the *tricolor* species group

9. **Marina Janković Milosavljević, Ante Vujić, Snežana Popov, Snežana Radenković, Marija Miličić**: Status of Serbian hoverflies on the IUCN European Red List of Hoverflies

10. **Kurt Jordaens, Allan Ellis, Venuste Nsengimana, Eugène Sinzinkayo, Catherine Sole, Marc De Meyer, Ella Bert, Eva November, Muriel Van Nuffel, John Midgley**: Syrphidae and the diversity of pollinating Diptera in Afrotropical biodiversity hotspots

11. **Laura Likov, Tamara Tot, Snežana Radenković, Zorica Nedeljković, Ante Vujić**: New data for hoverflies (Diptera: Syrphidae) for Landscape of Outstanding Features "Vlasina" in southeastern Serbia

12. **Umberto Maritano, Monica Vercelli, Valentina Isaja, Yari Roggia, Carola Palladino, Simona Bonelli**: Big challenges in small places: establishing a long-term pollinator transect network and Citizen Science Initiatives in European Bioparks

13. **John Midgley, Georg Goergen, Kurt Jordaens**: The genus *Afroxanthandrus* Kassebeer, 2000 now contains four valid species

14. **Marija Miličić, Snežana Popov, Aleksandra Đorđević, Marina Janković Milosavljević, Ante Vujić, Snežana Radenković**: "It's not the heat, it's the humidity": Comparative influence of environmental parameters on hoverfly diversity versus other pollinators

15. **Luisa Fernanda Moreno Beltrán, Ángela María Montoya Quiroga, Jesús Eduardo Escobar Castro, Augusto León Montoya Giraldo**: Interaction networks of hoverflies (Diptera: Syrphidae) and plants in two wetlands in Bogotá, Colombia

16. **Zorica Nedeljković, Şahin Kök, Marina Janković Milosavljević, Snežana Radenković, Miroslav Barták, Ante Vujić, Tamara Tot**: Description of female of *Paragus glumaci* Vujić, Šimić & Radenković, 1999 (Diptera: Syrphidae) with information about its biology

17. **Snežana Radenković, Ana Grković, Laura Likov, Tamara Tot, Ante Vujić**: Step forward in monitoring of hoverflies (Diptera: Syrphidae) in Serbia

18. **Samm Reynolds, C. Scott Clem, Blair Fitz-Gerald, Andrew Young: Syrphing continents**: a comprehensive review of long-distance hoverfly migration (Diptera: Syrphidae)

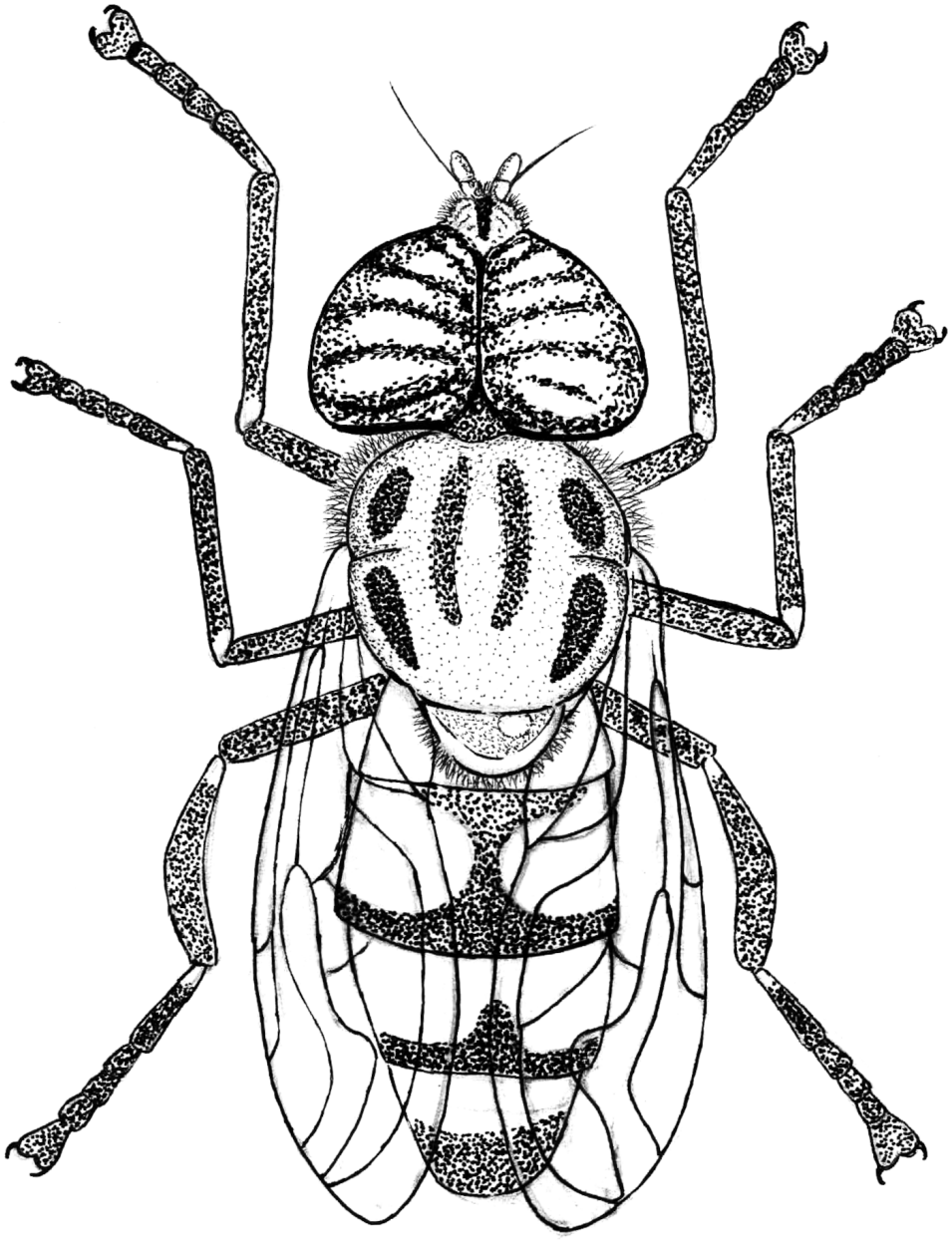
19. **Jeroen van Steenis, Francis Gilbert, Roger Morris, Gerard Pennards, Axel Ssymank, Leendert-Jan van der Ent, Tsung-Hsueh (Bill) Wu**: Journaal van Syrphidae

20. **Leendert-Jan van der Ent, Jeroen van Steenis, Wouter van Steenis and Menno van Zuijen**: Collaboration towards a checklist of Bulgarian hoverflies

21. **Sanja Veselić, Tea Skendžić, Andrijana Andrić, Dušanka Vujanović, Maja Arok, Tamara Tot, Sonja Mudri-Stojnić, Ante Vujić**: Pollinator diversity along roads: impact of traffic and local land use

22. **Julian Wittische, Stéphanie Lippert, Amanda Luttringer, Hinatea Ariey, Antonio Cruz, Balint Andrasi, Dylan Thissen, Anna Schleimer, Frank Drygala, Joerg Mehnert, Ximo Mengual, Lisette Cantú-Salazar, Alain Frantz**: Good news! *Syritta pipiens* and *Myathropa florea* maintain high genetic connectivity across heavily urbanized areas

Oral Presentations



Hoverfly (Diptera: Syrphidae) communities associated with pollen transport in three land covers of Andean forest in the Quebrada Las Delicias in Bogotá, Colombia

Sergio Leonardo Ángel Villarreal [1], Augusto León Montoya Giraldo [2], Raúl Giovanni Bogotá Ángel [1]

1 – Facultad del Medio Ambiente y Recursos Naturales, Universidad Distrital Francisco José de Caldas Bogotá DC, Colombia

2 – Grupo de Entomología, Universidad de Antioquia (GEUA), Medellín, Colombia

Hoverflies are critical in pollination at high elevations where bees tend to decrease. The present study correlates Syrphidae abundance and pollen internal loads in three land covers of Colombian Andean Forest. Adult flies were collected randomly using a hand-net in the warmest hours of the day and were preserved individually in Eppendorf tubes. Pollen was extracted from gut contents and treated using the acetolysis method proposed by Erdtman (1086, 1960). To measure morphotypes diversity, 300 pollen grains were randomly selected per individual. Twenty-six hoverfly species (n=381 individuals) and 25 pollen morphotypes were identified. Based on a principal components analysis of abundance, the hoverfly communities are different on the discontinuous urban area, but similar in the riparian forest and high secondary vegetation. Based on bipartite networks, we identified different types of links between syrphids and plants. Preliminary results showed that the diet of Eristalinae includes abundant pollen of Asteraceae and among them, *Eristalis tenax* L. (n= 23) has the greatest pollen diversity, with 15 morphotypes. Syrphinae diet was diverse in terms of pollen morphotypes, in order of abundance: Cunoniaceae, Piperaceae, Solanaceae, and Rosaceae. In our study, Eristalinae was linked with anthropized covers, correlated with discontinuous urban area. Syrphinae were associated with the less anthropized land cover because its pollen loads belonged mainly to plants from pristine forest and its abundance correlated with riparian forest. This is the first contribution to understand the association among hoverfly communities and pollen transport in the Neotropics; further studies must include analysis about phenology and pollen external loads.

Keywords: hoverflies, ecosystem services, bipartite networks, pollen loads, anthropized covers

References:

Erdtman G. 1986. Pollen morphology and plant taxonomy: Angiosperms. Hafner

Erdtman G. 1960. The acetolysis method. A revised description. *Svensk Botanisk Tidskrift*, 561–564.

Effect of pupal cold-storage on five species of eristaline (Syrphidae, Eristalini) and its influence on adult flight ability

Andrea Aracil[1], Adrián Bosquet-Navarro[1], Celeste Pérez-Bañón[1], Santos Rojo[1]

1 – University of Alicante, Faculty of Sciences, Department of Environmental Sciences and Natural Resources, Alicante, Spain

Massive rearing protocols for hoverflies as pollinators are already available for several eristaline species (tribe Eristalini), and large numbers can be produced in a short time. However, more research is needed to focus on long-term rearing and optimisation processes. A key point is to synchronise the peak of insect production with the flowering period of crops (usually in short periods). Preimaginal storage could then be a useful technique to coordinate both.

The effect of pupal cold-storage (5 ºC) on five species is presented: *Eristalinus aeneus* (Scopoli, 1763), *Eristalis arbustorum* (Linnaeus, 1758), *Eristalis tenax* (Linnaeus, 1758), *Eristalinus taeniops* (Wiedemann, 1818) and *Myathropa florea* (Linnaeus, 1758). Nine treatments were applied: constant cold (CC) storage (5, 10 and 15 days), fluctuating temperature (FTR) treatment (15, 20 and 30 days) and a control treatment without cold exposure (25 ºC). In addition, a preliminary analysis of the flight ability of adults after cold storage was carried out using flight mills.

The main results showed interesting possibilities for the application of this technique in the commercial production of pollinators, but also increased our knowledge of the preimaginal life cycle of these species, as follows. The viability rates decrease with increasing exposure time, more evident for the constant cold treatments. The sensitivity of each species to cold exposure was different. The analysis of flight ability showed that short periods of cold exposure did not affect the flight ability of adults in some cases, but longer periods of exposure (15 or 20 days) could reduce it.

Keywords: pupal cold-storage, massive production, flight-ability, pollination, Eristalini

Going through the checklist of the Ibero-Balearic species of *Cheilosia* Meigen (Diptera: Syrphidae): new records and species

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Of the highly diverse hoverfly genus *Cheilosia* Meigen, 1838 (Eristalinae: Rhingiini), 57 species were listed in the 2017 Spanish checklist of the Syrphidae (Ricarte & Marcos-García, 2017). No additional species are reported from mainland Portugal. The only work dealing with the entire *Cheilosia* fauna of Spain is that of Gil Collado, dating from 1930, but other subsequent papers have provided further species records or even added species new to science, e.g. *Cheilosia lucense* Ricarte, 2014 (Ricarte et al. 2014). In this work, the fauna of *Cheilosia* is reassessed in the Ibero-Balearic region, and an updated species checklist is presented, based on a literature review, fieldwork from 2021-2024, and consultation of collections. Fieldwork took place in various localities of the Pyrenées, including the Ordesa and Monte Perdido National Park, as well as some other protected areas such as Sierra Nevada and Picos de Europa. As a result of this research, the known species richness of *Cheilosia* has increased from 57 to 60 in the Ibero-Balearic region. A few supposedly new species are discussed, including one of the *Cheilosia alpina* group from the Pyrenees. Species such as *Cheilosia insignis* Loew, 1857 have been removed from the checklist and the range of other species such as *C. lucense* is expanded substantially within the Iberian Peninsula.

Keywords: Eristalinae, *Cheilosia*, Spain, *Cheilosia alpina*, new species, checklist

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No significant effect of landscape factors on Syrphid richness at wildflower compensation areas in northern Germany, and comparative results of wildflower eDNA for bees and hoverflies

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Wildflower compensation areas (WCAs) have become an increasingly widespread method of conserving biodiversity in agricultural areas, particularly for pollinating insects. However, the evidence base for their effectiveness has been mixed.

At 41 sites in Schleswig Holstein, Germany, we deployed yellow pan traps and pitfall traps to investigate the interaction between local landscape context and the abundance and diversity of wild insect groups, including bees, hoverflies and carabid beetles. At 30 of our sites, we also used a relatively novel method of testing wildflower eDNA (using three bulk mixed samples of wildflowers extracted in each field). We used remote sensing data to compare diversity and abundance of these groups with habitat quantity, fragmentation, and habitat diversity.

No significant relationship was found for hoverfly diversity and abundance and any of the landscape variables. However, significant positive relationships were identified between both carabid richness and bee richness with the landscape variables. The utility of WCAs in Schleswig Holstein for Syrphidae could be limited by design flaws and the scarcity of permanent habitat.

The eDNA method was extremely promising for Syrphidae, detecting 39 species total, and outperformed yellow pan traps (28 species total at those 30 sites). We found that the detected species richness increased with more bulk samples, and additional samples would have likely yielded higher richness. In addition, eDNA showed promise for other insect groups, particularly Lepidoptera (161 species). However, eDNA was not useful for bees; it detected only 12 species total compared to the 67 species detected with yellow pan traps.

Keywords: landscape ecology, wildflower compensation areas, agri-environmental schemes, eDNA, pollinators

First data on the ovarian development and oocyte evolution of the genus *Eumerus* Meigen, 1822 (Diptera: Syrphidae) under captive rearing

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The genus *Eumerus* Meigen, 1822 (Diptera: Syrphidae) is one of the most species-rich hoverflies with about 170 species in the Palearctic region, with the highest diversity in the Mediterranean area. The species *Eumerus obliquus* (Fabricius, 1805) is distributed throughout the Mediterranean basin and its range seems to be expanding in recent years. To study the life cycle of this species in detail, a successful rearing methodology has been developed under controlled conditions (data unpublished). As a result, we were able to provide the first description of the ovarian and oocyte development of the genus *Eumerus*. Adults were frozen and dissected every 12 hours from emergence until the first oviposition was observed. In total 105 females were dissected. Oogenesis was monitored according to a modified version of Bier's (1963) criteria, while ovarian development was followed according to the stages described by Branquart and Hemptinne (2000).

It was found that *E. obliquus* females have an average of about 133 ovarioles per female, with a range of 110 to 170. Ovarioles do not develop simultaneously, development starting from the basal part and progressing to the apex of the ovary. During the evaluation of oogenesis, it was observed that an oocyte can fully mature between 48 and 60 hours. The number of follicles in the ovaries increases over time (from 2-3 at emergence to 4-5 at 72 hours). In addition, the volume of the abdomen occupied by the ovaries increases from 15% to approximately 90% within 72 hours of emergence.

Keywords: ovarioles, ovary, oogenesis, *Eumerus obliquus*

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Updates in taxonomy of European *Cheilosia* Meigen (Diptera, Syrphidae)

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Cheilosia Meigen, 1822 (Diptera, Syrphidae) is large genus with some 120 species occurring in Europe (Evenhuis & Pape 2024). Here we describe three projects that update the taxonomy of some European *Cheilosia* species. First, *Cheilosia brachysoma* Egger, 1860 is a little known Central European species, classified as Data Deficient on the IUCN red list. After studying the types, it is concluded that *C. sootryeni* Nielsen, 1970 is a junior synonym of a *C. brachysoma*. New distributional records and an identification key are given. Secondly, for a long time is it known that a species close to *C. longula* (Zetterstedt, 1838) occurs in Scandinavia. We are in the process of finally describing this species. Distributional records, an identification key and a genetic tree will be given. Finally, the European species from the subgenus *Neocheilosia* Barkalov, 1983 are revised. The validity of *C. barovskii* Stackelberg, 1930 is confirmed and the male is described for the first time. The identities of *C. morio* (Zetterstedt, 1838) and of its synonyms are reviewed. *C. scanica* Ringdahl, 1937 is established as a junior synonym of *C. morio*. *C. luteicornis* (Zetterstedt, 1838) is re-installed as name for *C. morio* of authors, not Zetterstedt. *C. morio*, *C. luteicornis* and the female of *C. barovskii* are redescribed and lectotype designations are made as necessary. New distributional records, an identification key and a genetic tree for the European species from subgenus *Neocheilosia* are given.

Keywords: *Cheilosia*, DNA barcoding, Europe, identification key, Syrphidae

Reference:
Evenhuis N, Pape T. 2024. Syrphidae. Systema Dipterorum, version 5.2. Available from http://sd.zoobank.org/Nomenclator [accessed 30 June 2024].

Preliminary larval evidence suggesting a new cryptic *Eupeodes* Osten-Sacken (Diptera: Syrphidae) species in North America

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The aphidophagous genus *Eupeodes* Osten-Sacken, 1877 (Diptera: Syrphidae) contains approximately 90 species worldwide. Within the Nearctic *Eupeodes* there is a species complex between *E. americanus* (Weidemann, 1830) and *E. pomus* (Curran, 1921) in which males are distinguished by their genitalia, while females remain indistinguishable. Immatures of different species are easily differentiated by color. Larvae collected throughout Ontario, Canada in 2023 and 2024 and then reared suggest an additional species lies within the complex. Preliminary barcoding confirms genetic similarity with *E. americanus*, while adult specimens appear morphologically similar to *E. pomus*. Larvae of the putative new species, however, are notably distinct from either *E. americanus* and *E. pomus* — primarily by colour. Additionally, natural history data supports species delineation. Species description of the adult and larval stages will include SEM imaging and additional barcoding.

Keywords: larva taxonomy, cryptic species, species description, DNA barcoding

Environmental DNA survey for characterization of pollinator's community

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Biodiversity assessment of invertebrates can be efficiently conducted using eDNA metabarcoding. In this study we have sampled flowers along one pilot site (Glavica, Vojvodina, Serbia) in three different seasons (spring, summer and autumn) and extracted the eDNA in order to determine the present species of Hymenoptera, Lepidoptera and Syrphidae (Diptera). Five replicates were taken for each flower species along the transect. In total, during field work 180 samples (flowers) were collected. Environmental DNA was extracted from each sample using ExtractMe Genomic DNA kit (Blirt). Fragment of mtDNA COI gene, of total length 313bp was amplified. Metabarcoding amplicons were sequenced using Illumina platform, PE 2x250bp. The quality of the raw reads was checked in FastQC (Andrews 2010). The fastq files were processed with APSCALE pipeline v1.6.3 (Buchner et al. 2022). Two different approaches were applied: clustering and denoising sequences. Retained OTUs and ESVs were taxonomically assigned using BOLDigger (Buchner and Leese 2020). Processing of the datasets was performed using TaxonTableTools (TTT) (Macher et al. 2021). Results were filtered to orders Hymenoptera and Lepidoptera, and family Syrphidae. In order Hymenoptera, 16 taxa were detected, among which 15 to the level of species. Six moth species were detected from order Lepidoptera, together with five species of Syrphidae. Detection of species within Hymenoptera and Syrphidae was the most successful during spring season, while species belonging to Lepidoptera were detected with similar resolution over all seasons. Species level detection was less successful than using transect and pan trap data, but provided information of present taxa that were not registered in the field. In next steps, we aim to compare pollinator communities across seasons and plant species.

Keywords: mtCOI gene, hoverflies, Serbia, eDNA

References:

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A new species of the subgenus *Taeniochilosia* from the Balkan Mountains

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In 2019, the first author collected in the high alpine mountain parts (2200 m asl) of Rila NP (Bulgaria) a good number of bare-eyed and black-legged specimens of *Cheilosia* which, following the identification key of *Nigrocheilosia* (i.e. *Taeniochilosia*) from Barkalov and Ståhls (1997), keyed out as *Cheilosia sahlbergi* Becker, *Cheilosia faucis* Becker and *Cheilosia grisella* Becker. However, molecular analysis of some specimens keyed as *Cheilosia sahlbergi* and comparisons with other species showed that it belongs to a new *Cheilosia* species (van der Ent & Ståhls in prep.). We found that this new species clustered within the *Cheilosia crassiseta* group based on the COI barcodes, which includes also *Cheilosia sahlbergi* and *Cheilosia vangaveri* Timon-David. Therefore, specimens of the new species and closely related species were studied to find morphological differences. This will be highlighted in this presentation.

Keywords: Bulgaria, *Cheilosia*, morphological comparisons, new species

Reference:
Barkalov AV, Ståhls G. 1997. Revision of the Palaearctic bar-eyed and black legged species of the genus Cheilosia Meigen (Diptera, Syrphidae). *Acta Zoologica Fennica*, 208, 74pp.

Hoverfly communities across four different forest types in Switzerland

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Hoverflies are relatively well-studied in Europe, both in terms of taxonomy and ecology. Extensive ecological data is available, such as through the Syrph the Net database, which includes information on many habitat types and their characteristic fauna. To characterize the hoverfly fauna across four distinct forest types in Switzerland, for which little information is available, we deployed 8 Malaise traps in 4 sites (one site per habitat type) between March and August of the year 2020. Moreover, we conducted hand netting in these same sites and 2 additional sites per habitat type, twice in 2020 and again twice in 2021. The Malaise traps captured a total of 5000 individuals representing 161 species, while hand netting identified 233 species. Combined, these methods yielded a total of 267 hoverfly species. Among the forest types, Lunario-Acerion exhibited the highest species richness with 166 species, including 11 endangered species according to the IUCN European Red List of Hoverflies, followed by Tilion platyphylli with 138 species including 5 endangered, Ononido-pinion with 135 species including 6 endangered, and Molinio-pinion with 114 species including 2 endangered and one vulnerable species. This study not only enhances our understanding of hoverfly communities in these forest ecosystems but also highlights the complementary nature and efficacy of hand netting and Malaise trapping. Though difficult to conduct because of the often small sized habitats found in Switzerland, this kind of baseline data is also of the utmost importance for the use of hoverflies in future ecological assessments.

Keywords: diversity, collecting method, Diptera, Syrphidae, habitat

Are hoverflies good pollinators of flowers?

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Hoverflies perform two major ecosystem services, pollination and biocontrol. There is a huge literature on both aspects – I report here on a meta-analysis of 735 papers concerning pollination that mention syrphids. A subset of these papers (n=79) have measured the pollen deposited after a single visit to a previously unvisited flower. This allows a more quantitative analysis of hoverfly pollination in relation to bees and other flower visitors. Large hairy Eristalinae are extremely good pollinators – as good as bumblebees, honeybees and solitary bees. The Syrphinae are less good pollinators, about as good as other muscoid Diptera. These data are placed in the context of a general review of hoverfly biology.

Keywords: Eristalinae, literature, meta-analysis, pollination, Syrphinae

What to do when COI is not enough? Genome-wide data shed light on the taxonomy of the *Merodon ruficornis* group (Diptera: Syrphidae)

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Assessment of taxonomic relationships within the genus *Merodon* Meigen, 1803 has been challenging due to the high diversity and limited resolution of present morphological and molecular markers in some of the species groups. Although the COI gene has been proved as a powerful tool for distinguishing a number of hoverfly species, an increasing number of studies report limits of the single-gene. Evolutionary signals originating from shared ancestral polymorphisms and/or introgression may lead to over- or underestimation of true species diversity when only mtDNA variability is considered. By providing insight into multiple loci across both nuclear and mitochondrial genomes, genome-wide approaches have great potential to elucidate the underlying causes of the observed mitochondrial lineages. Considering persisting incongruence between different taxonomic tools as well as the limited resolution of COI fragments in resolving the taxonomy of *Merodon ruficornis* group (Milankov et al. (2008), Ståhls et al. (2009), Vujić et al. (2012), Gorše et al. (2022)), some species from this group still need clarification. Therefore, here we analyzed genome-wide data, using the double digest restriction site-associated DNA sequencing (ddRAD-seq), with the aim of identifying clear taxa boundaries and providing a comprehensive insight into the phylogeny of the group. Our results revealed that a panel of genome-wide ddRAD-seq data represents a valuable molecular tool that distinguishes all examined taxa and successfully elucidates the evolutionary relationships within the *M. ruficornis* group, emphasizing the importance of this approach, not only for taxonomic studies, but also for assessing the phylogeny of closely related non-model species. Therefore, we strongly support the implementation of the ddRAD-seq method to clarify taxonomic challenges within the genus *Merodon*, as well as other hoverfly genera.

Keywords: ddRAD-seq, NGS, mtDNA COI, molecular taxonomy, phylogeny

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Distribution of hoverflies (Diptera: Syrphidae) in protected areas within the Prague city limits

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The importance of natural areas within city limits for biodiversity conservation is being increasingly recognised. Even large cities, such as Prague, often contain parks, gardens, and remnants of natural habitats, which provide opportunities for a diverse set of animal and plant species. Prague is particularly rich in green spaces, with 93 small-scale protected areas within the city limits. To uncover the diversity of hoverflies in Prague, we conducted a survey of all 93 protected areas in 2018 and 2019. Overall, we found 136 species of hoverflies (>30 % of species know in the Czech Republic), with 2 – 38 species per site. We collected a number of species that are rare in the Czech Republic. These included steppe species, such as *Merodon clavipes*, and several woodland species developing in dead wood, such as *Callicera aenea*, *Temnostoma bombylans*, and *Myolepta vara*. Our results show that some of the protected areas within the Prague city limits contain a species-rich hoverfly fauna. The key to the relatively high hover fly species diversity lies in the presence of diverse microhabitats, including dead wood, aquatic habitats, and abundance of flowering plants. Other recent studies showed that urban green spaces may host diverse communities of bees, butterflies and other insects. Our study provides another example of the importance of protected areas in cities for maintenaning biodiversity in a European landscape dominated by human activities. However, appropriate management of these sites is necessary.

Keywords: urban ecology, protected area, faunistics, diversity, Czech Republic

Darwin, DNA and the development of mimicry

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Darwin's explanation of how evolution can take place is often ignored in research on variation. When I did my research on evolutionary genetics, there were two surprising facts. 1. There was far more variation within species than mathematicians thought possible, and 2. There was far more DNA in every cell than molecular biologists thought necessary.

In reality, Charles Darwin was closer to the truth than many experts of the 20th century. Using my own pet subject of mimicry of bees and wasps by hoverflies, I will suggest that we often misunderstand evolution by implying it has a purpose. The end point is not perfection but success.

Mimicry is just one of many characteristics that help survival. Just because it may be the most obvious feature of some hoverflies, it does not necessarily mean that it is the most important. Why then are "imperfect mimics" more numerous than some of the more specialised mimics?

Whether DNA data makes us any the wiser about evolutionary trends is another matter. The big question is just: Why are things different? There are simple observations that raise interesting questions. Why do some male Syrphids hover in their mating strategies while others do not really bother at all?

In most cases we are still faced with Darwin's fundamental mystery about the origin of new species.

Keywords: natural selection, variation, mimicry, the origin of species

Enhancing hoverflies in citrus orchards with the use of insectary plantings

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In southern California citrus, generalist predators, such as hoverfly larvae (Diptera: Syrphidae), feed on important hemipteran pests, including Asian citrus psyllid (*Diaphorina citri*; Liviidae), a notorious citrus pest that vectors the deadly citrus disease huanglongbing. The potential of buckwheat (*Fagopyrum esculentum*), alyssum (*Lobularia maritima*), phacelia (*Phacelia tanacetifolia*), and California poppy (*Eschscholzia californica*) as insectary plants for conservation biological control of *D. citri* was evaluated from April through August, 2018. Alyssum and buckwheat possessed a short sowing to flowering time (30-33 days when sown in March) and significantly attracted 20 and 10 times more hoverflies, respectively, than California poppy. No hoverflies were observed feeding from phacelia. When potted alyssum was placed for 8 weeks in an unsprayed citrus orchard in 2018, the number of hoverfly eggs laid on *D. citri* colonies and abundance of predators was 3.5 times and 2.5 times higher, respectively, when compared to control plots lacking alyssum. Consequently, 10% more *D. citri* nymphs survived to adulthood in the control plots compared to alyssum plots. *Allograpta* spp. were the only hoverfly species found to oviposit on *D. citri* colonies and predate *D. citri* nymphs in the field. Laboratory studies quantifying lifetime consumption of *D. citri* nymphs by individual *Allograpta obliqua* demonstrated that individual *A. obliqua* larvae consumed, on average, 421 *D. citri* nymphs before pupation. Preliminary results from large-scale field trials investigating the effect of maintaining strips of buckwheat and alyssum from March through October, 2022, at two commercial citrus orchards, on hoverfly abundance and populations of important hemipteran pests are also discussed.

Keywords: Alyssum, buckwheat, conservation biological control, hemipteran pests, predators

What do they feed on? Identifying pollen from hoverfly guts using metabarcoding

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In the course of the worldwide decline in local insect populations, agricultural practices are one important factor due to changes in the landscape and the use of pesticides. To counteract this trend, the FInAL project (https://www.final-project.de/en/) is working with farmers to establish various measures and investigate whether these have a supportive effect on insects in order to establish a more sustainable agriculture. In the course of this project, hoverflies are also studied, which play an important role both for biological pest control and pollination.

A simple measure to support hoverflies is to increase the supply of flower resources throughout the year by flower strips or flowering crops. To assess whether these introduced flower resources are used, we must observe the insects in the field when they visit the flowers or, instead, we need to catch them and examine their gut contents. The subsequent morphological identification of pollen is possible, but time-consuming and dependent on high-quality reference material. Alternatively, we tested metabarcoding to examine the gut contents of hoverflies to gain insights into which plants they feed on. We developed a protocol for obtaining samples from different hoverfly preparations (whole insects, gut preparations, fecal samples) for metabarcoding and were able to show that the method works in principle. It was possible to identify pollen from plants that had been offered to the hoverflies in the laboratory and also to assess the relative amount in the diet. We then caught hoverflies in fields with and without measures to obtain their pollen profiles by metabarcoding. The results will help to assess the impact of the measures on local hoverfly populations.

Keywords: Syrphidae, metabarcoding, flower resources, pollen, gut analysis

Overview of recent achievements in Afrotropical hoverfly (Syrphidae) taxonomy and phylogeny

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Over the last 15 years, there has been great progress on the taxonomy and systematics of Afrotropical Syrphidae, especially within the subfamily Eristalinae. These advances have been significantly supported by sustained field observations and sampling efforts. Here, we present an overview of this progress and show how both morphological and molecular approaches have resulted in the detection of new species, improvements of identification keys, the inference of phylogenetic placement of genera, and in resolving intergeneric phylogenetic relationships. We discuss current efforts to further improve the taxonomy of Afrotropical hoverflies and show where taxonomic gaps still exist. Despite the taxonomic gaps, we illustrate how the improvements in taxonomy and systematics have stimulated ecological and biogeographical studies, Citizen Science activities, and Red Listing initiatives.

Keywords: hoverflies, morphology, molecular data, DNA, Red List

New molecular tools for Syrphidae: future perspectives on taxonomy and systematic

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We present two new molecular tools that will facilitate and enhance reliable species identification and delimitation within Syrphidae. The first tool is a novel set of Cytochrome c oxidase I (COI) mini-barcode primers that we have developed for use in Diptera research that facilitate molecular barcoding of old (up to 100 years old), pinned and archived Diptera specimens. We present a modified set of these primers that were specifically designed for use with Syrphidae at subfamily level. The second set of tools are a selection of new nuclear markers and associated PCR primers which were developed for use in Diptera research projects and that have already proven to be useful in Syrphidae phylogenetic studies. Here, we show the potential of these new markers to aid species identification and delimitation in cases where sequencing of commonly selected genes has failed to resolve closely related species, such as COI and internal transcribed spacer (ITS).

These new molecular markers will enable researchers and graduate students with access to a modest molecular lab to generate compelling data for subfamily level, or revisionary studies, with a fraction of the budget, time and technical proficiency required for high-throughput strategies.

Keywords: hoverfly, lab protocol, new marker, primer, species identification

Two-year hoverfly survey in three woodland typologies in the Canton of Ticino, Switzerland

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The main aims of the project were to broaden the knowledge of the Syrphidae fauna of the Canton of Ticino (Switzerland) and investigate the species occurring in three typical forest types of the Southern Alps to evaluate other sites more accurately in the future. The survey was carried out during two years of sampling in 2021 and 2022, in order to have more accurate data and to compare results between the two years. Three types of forest growing in different altitudinal zones, of which two are quite rare in Switzerland, were investigated: *Orno-Ostryon*, throughout the country only found in the southernmost area of Ticino in the foothill zone, *Fagion sylvaticae*, widespread in many southern and central areas of the Canton in the montane zone, and *Junipero-Laricetum*, typical forest type of the subalpine zone in the Southern Alps. Three study sites were chosen for each type of forest, where two Malaise traps were installed. About 6800 specimens belonging to over 150 species were recorded during the survey. The data were used to update the regional species list for the Canton of Ticino, to which 23 new species were added reaching a total of 308. Multivariate analysis was used to compare species compositions and investigate peculiarities of the three forest types.

Keywords: biodiversity survey, forest, Malaise trap, southern Switzerland, Syrph the Net

Potential effects of pesticide abandonment and landscape composition on the fitness of *Sphaerophoria scripta* (Linnaues, 1758) individuals from field populations (Diptera: Syrphidae)

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The decline in insect populations in Germany has been a persistent issue, with the use of chemical pesticides in agriculture and the loss of natural habitats being significant contributing factors. In nature protected areas, the use of particular pesticides is banned and alternative methods for crop protection are needed.

In our study, we examined cereal fields within nature reserves and compared them to conventional fields in agricultural landscapes. We assessed the prevalence of aphids, the primary pests in cereals, as well as the presence of aphidophagous predators, including hoverfly larvae.

Our primary focus is on beneficial arthropods, particularly hoverflies, due to their crucial role in pest regulation within arable crop systems. We investigated potential fitness differences between adult individuals collected in nature reserve fields and conventional fields during the experimental period in summer by measuring the wing length and nutrient levels of *Sphaerophoria scripta* (Linnaeus, 1758), the most abundant species in our samples. The protein, fat, glucose and glycogen content of each of the captured flies was determined. By analysing these parameters, we wanted to find out whether the absence of insecticidal pesticides and the presence of more diverse landscape structures in nature reserves have a positive effect on the fitness of hoverflies. This information is important for understanding how agricultural practices and habitat conservation efforts can be optimized to enhance populations of beneficial arthropods.

Keywords: hoverflies, biological control, fitness, nature protected areas, insecticide

Update of the Italian checklist of Syrphidae (Diptera)

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The Italian fauna of Syrphidae (Diptera) is well studied and ranks as the second richest in Europe after France (Reverté et al. 2023). The research on hoverflies in Italy can be divided into three periods. The first period comprises the second half of the 18th century, where the contributions of two dipterologists dominate the study of hoverflies: Camillo Rondani (1808-1879) and Mario Bezzi (1868-1927). After this period, the research on Syrphidae in Italy was scarce for most of the 19th century, resulting in minimal improvement in the knowledge of Italian fauna. In recent decades (after 1990), the study of Italian hoverflies increased considerably with several project aimed at increasing the knowledge on the biodiversity of hoverflies in natural areas.

In 2023, a project to update the Italian Syrphidae checklist started. The objective of this project is to revise historical information and integrate these data with recent reports, using the Italian regions as a geographical reference base. The list of Italian species has been updated following examination of original descriptions and historical collections. Recent records not only allow to increase the number of Italian species, but also to clarify the taxonomic status of doubtful species (e.g., *Cheilosia atriseta* (Oldenberg, 1916)).

For some regions, especially in southern Italy, the knowledge of the hoverfly fauna is still very limited. Fewer than 100 species are reported for regions as large as Puglia, Basilicata, and Campania, which include a wide variety of habitats and environments. On the other hand, over 300 species have been reported in regions from North Italy such as Veneto and Piemonte, where the research effort has been greatest in recent years.

Keywords: hoverfly, catalogue, distribution, species list, Italy

Reference:
Reverté S, Miličić M, Ačanski J, Andrić A, Aracil A, Aubert M, Balzan MV, Bartomeus I, Bogusch P, Bosch J et al. (2023) National records of 3000 European bee and hoverfly species: A contribution to pollinator conservation. *Insect Conservation and Diversity*, 16(6), 758-775

Acknowledgement: Project partially funded under NextGeneration EU - PNRR, Mission 4 Component 2 Investment 1.4; Project code CN_00000033, Project title NBFC

Rapid invasion of the Afrotropics by the New World Florida Calligrapher, *Toxomerus floralis* (Fabricius, 1798), and the potential for its spread in the palaeotropics

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The native range of the Florida Calligrapher, *Toxomerus floralis*, ranges from the southern USA to southern South America. The species was first recorded in the Afrotropical Region in Cameroon in 2013, and rapidly spread throughout the continent, arriving in South Africa by 2018 and in Oman by 2020. It is now recorded from 25 Afrotropical countries. Specimen locality data from the Global Biodiversity Information Facility, which

includes iNaturalist data, and data from private and public collections, were used to show the invasion potential in the Afrotropical, Palaearctic, Indomalayan and Australasian regions using Species Distribution Modelling. Worldclim Bioclimatic Variables were used as predictor variables for model creation. The resulting models were then used to project the potential future change in distribution using Global Climate Models from two ranges, 2021–2040 and 2061–2080. Climatic conditions in the species' native and introduced range were used to test for niche-conservatism/shift and the current and potential distribution of the species was compared to the distribution of the two known larval food plants. Thirty five percent of records of *Toxomerus floralis* in Africa are from iNaturalist, showing the importance of citizen science in tracking the invasion of this species. Up to 2019, 93% of records were from private collections, but from 2020 to 2024 this dropped to 38%, as iNaturalist records became dominant. Engaging with citizen scientists will allow more accurate monitoring should the species invade other regions.

Keywords: biological invasion, species distribution models, invasive species

Syrphidae of Poland – towards a checklist of Polish hoverflies

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The hoverfly fauna of Poland is relatively well-known. After World War II and the loss of important natural history collections, large-scale efforts were initiated aimed at their comprehensive rebuild. These activities were conducted from the 1950s onward by researchers from the Polish Academy of Sciences and focused on the most valuable natural areas of the country such as the Nida River Valley, the Carpathian Mountains, the Sudeten Mountains, and the Białowieża Forest. These studies were published by Regina Bańkowska, however they now require verification of the identification due to taxonomic changes. From the late 1970s onward, a significant part of valuable materials, especially Syrphidae, was collected by Bogusław Soszyński. He was a pivotal figure in popularizing Syrphidae and Diptera research and in collecting Diptera for 40 years. Major milestones in understanding the country's fauna include the national species lists published in 1991 and 2007, which documented 369 and 396 Syrphidae species respectively (Soszyński 1991, 2007). Since 2011, regular Syrphidae workshops have been organized, combined with intensive collection in valuable natural areas and often connected with annual meetings of Polish Dipterists, being members or supporters of the Polish Entomological Society. The integration of the syrphidologist community has contributed to the initiation of national reviews of genera (e.g., *Psilota* Meigen, 1822, *Brachyopa* Meigen, 1822, *Mallota* Meigen, 1822) and the discovery of a number of species new to Poland. A review of museum collections is also being conducted, providing a new view on old faunistic reports.

Keywords: entomological collections, review of material, species lists, workshops

References:

Soszyński B. 1991.Syrphidae. In: Razowski J. (ed.) Checklist of Animals of Poland, Zakład Narodowy im. Ossolińskich, Wydawnictwo PAN, Wrocław, Warszawa, Kraków, 2, 162-169.

Soszyński B. 2007. Bzygowate (Syrphidae). In: Bogdanowicz W, Chudzicka E, Pilipiuk I, Skibińska E, eds. Fauna of Poland – characteristics and checklist of species. pp. 102-105 193-197. Muzeum i Instytut Zoologii PAN, Warszawa, 2, 505 pp.

Phenological patterns of hoverflies (Diptera: Syrphidae) in Paramo habitats in Colombia

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Hoverfly phenology is not well understood in Tropical Andes highlands. We conduct twelve bi-monthly samples of ten consecutive days at Santa-Inés-Belmira (2016 and 2017) and Sonsón (2018 and 2019) Paramo complexes in Colombia. Flies were collected using Malaise traps, pan-traps and sweeping throughout 18 stations distributed among three habitats: paramo, forest, and grassland. Seasonality composition of functional groups was plotted using a circular analysis. Voltinism patterns were defined based on species temporal abundance. Seasonal diversity estimators were calculated. A total of 2783 specimens, belonging to 41 genera and 148 species were collected. Rainy season had the highest diversity, coinciding with the flowering period. *Lepidomyia* and *Macrometopia* (in paramo), *Mimocalla*, *Pipunculosyrphus* and *Sphiximorpha* (in forest) and *Chalcosyrphus* (in grassland) were exclusive to dry season. *Toxomerus paragrammus*, *T. paraduplicatus*, *Dasysyrphus lotus* and *Platycheirus punctulatus* were frequently collected (35% of all individuals) in all habitats and sampling seasons. Eighteen species were very common (38%), followed by eighteen common (14%), 50 less common (10%), 62 considered rare, including 44 singletons (2%) and 18 doubletons (1%). Circular analysis revealed that zoophagous and saprophagous functional groups were constantly present throughout the sampling time, reaching the highest diversity during the rainy season, as it also was xilosaprophagous groups. Our analysis shows that 65 species of 29 genera are multivoltine (n=2583 individuals), 68 species of 11 genera are univoltine (n=122), and 17 species of 2 genera are bivoltine (n=78). The diversity estimators indicated that expected richness would be higher in the rainy season suggesting favorable climatic conditions and the availability of breeding sites for sensitive groups such as xilosaprophagous, in these extreme highland environments.

Keywords: circular analysis, climatic seasonality, functional trophic groups, monthly abundance, Tropical Andes, voltinism

Unraveling a hodgepodge – The limits of the subfamily Eristalinae revealed at last

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Exon-capture sequencing cuts through the stubborn knot represented by the paraphyletic subfamily Eristalinae (Diptera: Syrphidae) to reveal a new hypothesis of Syrphidae relationships. The study utilizes probes developed specifically for use with Syrphidae and samples 1291 orthologous genes. 136 of 145 valid genera within Eristalinae are sampled. The use of pinned museum specimens allowed for inclusion of rarer genera, for a total sampling of more than 350 taxa. We present here, the final version of the Eristalinae tree. The current concept of Eristalinae is revealed as a paraphyletic assemblage of four monophyletic clades. Furthermore, multiple Australian-Chilean relationships are revealed, raising the question of whether Syrphidae underwent Trans-Antarctic dispersal or Gondwanan vicariance.

Keywords: Eristalinae, phylogenetics, Trans-Antarctic relationships, Next-Gen Sequencing

Understanding beginners' identification issues

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Until the advent of digital photography and social media, we had very little idea of the problems that beginners had in getting to grips with hoverfly identification. Moreover, we in Britain probably assumed too much ability in the case of some contributors of records. There has been a paradigm shift in that understanding in the past ten years and it is now possible to quantify some of the more consistent issues. This presentation uses data from the iRecord platform broken down into two data streams – those data from iRecord and those from iNaturalist and highlights the common issues that are important to bear in mind when developing identification guides.

It also evaluates data quality – an issue that is of increasing relevance as these datasets are seen as a way forward for biological recording. There are numerous data parameters that might be useful at some point but, starting with the basics, we can see how ease of platform use does not equate to maintenance of data quality. These results point to a need not only in education of contributors, but also of data users – data quality is the key to analysis and the limitations of datasets must be appreciated.

Keywords:hoverfly identification, beginner challenges, digital photography, social media impact, iRecord platform

Hoverfly (Diptera, Syrphidae) pollinators in continuous pan trapping in the Finnish National Pollinator Monitoring Scheme PÖLYSEURA 2022-2023

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A national pollinator monitoring scheme was launched in Finland in summer 2022, focusing on four pollinator groups: hoverflies, solitary bees, butterflies and bumblebees. The monitoring follows the proposal for an EU Pollinator Monitoring Scheme (EUPoMS, Potts et al. 2021) and the Finnish National Pollinator Strategy (2022).

The implementation of monitoring differs from the EUPoMS in several ways, as to include a wide variety of study sites with the given resources. Monitoring data is collected on a five-year cycle, with comprehensive samples taken every five years, and a more limited variety of study sites in the intervening years. The study sites consist of six distinct habitats: meadows, commercial forests, protected forests, forest road verges, cultivated field margins and alpine fells. Monitoring of hoverflies is based on pan traps, with four sets of three pan traps (blue, white and yellow) used on each study site. The pan traps stay on the study sites for up to 60 days and are checked every 11 days on average. More than 3300 specimens of hoverflies were collected in 2022 and 2023 consisting of more than 140 species. Out of these, the most abundant genera were *Xylota* and *Sericomyia*, with *Xylota segnis* and *Sericomyia silentis* being the most abundant species.

The initial results of hoverfly sampling in the Finnish National Pollinator Monitoring Scheme (PÖLYSEURA) from the first two years, 2022 and 2023, are presented here.

Keywords: pollinators, monitoring, Finland

Reference:

Potts S, Dauber J, Hochkirch A, Oteman B, Roy D, Ahnre K, Biesmeijer K, Breeze T, Carvell C, Ferreira C, Fitzpatrick Ú, Isaac N, Kuussaari M, Ljubomirov T, Maes J, Ngo H, Pardo A, Polce C, Quaranta M, Settele J, Sorg M, Stefanescu C, Vujić, A. 2021. Proposal for an EU Pollinator Monitoring Scheme, EUR 30416 EN, Publications Office of the European Union, Luxembourg

Ympäristöministeriö. 2022. Kansallinen pölyttäjästrategia ja toimenpidesuunnitelma. Ympäristöministeriön julkaisuja 2022: 9 [Ministry of the Environment. 2022. National Pollinator Strategy and Action Plan. Publications of the Ministry of the Environment 2022:9]

The first confirmed female of *Mesembrius ingratus* (Loew, 1858) (Diptera: Syrphidae) from KwaZulu-Natal, South Africa

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Many knowledge gaps exist in hoverfly (Diptera: Syrphidae) taxonomy. Many Afrotropical genera require revision, but even in recently revised genera, gaps exist. The genus *Mesembrius* has 58 described species occurring in the Afrotropical, Australasian and Oriental Regions, as well as the Mediterranean Basin in the Palaearctic Region. The Afrotropical species have recently been revised and 23 valid species are known in the region. Of these, eight are known from one sex only, making identification challenging. The description of unknown sexes may help resolve some of these identification challenges and may provide insight into their evolutionary history. A case in point is *Mesembrius ingratus* (Loew, 1858) of which, so far, only males are known. Males of this species were collected in South Africa in 2023, along with an unknown female specimen. DNA barcodes and morphology showed these to be conspecific. We show high quality images of fresh specimens of *M. ingratus* and describe the female for the first time. As expected from the male morphology, the DNA barcodes cluster close to those of *Mesembruis sulcus* Jordaens, Goergen & De Meyer, 2021 and to those of *Mesembrius tarsatus* (Bigot, 1883) but the three species show interspecific distances of approx. 1% and can thus be unambiguously identified. These relationships are briefly discussed, in the context of morphological and DNA barcode data.

Keywords: Africa, Afrotropical Region, DNA barcoding, female description, morphology

Textbook phytophagy: close relationships between species of the *Merodon constans* group (Diptera, Syrphidae) and the Galantheae tribe as host plants

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5 – Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine

The results of a multi-year project on the study of the relationships between species of the *Merodon constans* group and Galantheae host plants are summarised. The *M. constans* group (within the *M. albifrons*-lineage) comprises a total of 15 species (Vujić et al. 2020). The larvae of nine species of this group distributed around the Black Sea and the western Mediterranean (Ukraine, Georgia, Armenia, Turkey, Greece, and Serbia), were found to inhabit 13 species of snowdrops (*Galanthus*) and one species of snowflake (*Leucojum*). This study represents a significant advancement in our understanding of the host plants for most members within a single *Merodon* species group. Furthermore, it serves to reinforce the notion of the *Merodon* constants group's natural unity and its narrow larval trophic habits associated with Galantheae.

Additionally, a new methodology for studying of these phytophagous hoverflies preimaginal stages, which are minimally invasive to plant populations, are presented and illustrated (Popov et al., submitted).

Keywords: phytophagous hoverflies, snowdrops, snowflakes, field methodology, new species

Reference:
Vujić A, Radenković S, Likov L, Veselić S. 2021. Taxonomic complexity in the genus Merodon Meigen, 1803 (Diptera, Syrphidae). *ZooKeys*, 1031, 85.

Syrph-ing habitats: the impact of seminatural habitats in agricultural landscapes on native hoverfly populations in southern Ontario, Canada

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Pollinator activity is critical for economically sustainable yields of 75% of global food crops and pollination services valued at $577 billion USD annually. Increased native pollinator diversity improves pollination success, increases seed set and yields in many agroecosystems. Although critical to understanding the abundance and diversity patterns of insect communities, pollinator habitat studies at a species-specific level are lacking in Canada. As such, there is a dire need for more research investigating the species-specific niches (including the nesting and foraging requirements) of native pollinators associated with various landscape compositions. Our objectives were to understand how pollinator biodiversity is affected by habitat type, patch size and connectivity. To do this, we assessed differences in pollinator diversity (restricted to wild bees (Apoidea) and hoverflies (Syrphidae)) and abundance among three habitat types (forest, field margin and restored prairie grass) on agricultural land in southern Ontario. We deployed 10 or 20 Malaise traps per habitat of interest in 2018 and 2021 respectively. Samples were collected every three days, over an eight-week sampling period. Our research provides novel data on species-level identification of hoverflies inhabiting different habitat types within agricultural ecosystems in southern Ontario. Preliminary results show unexpectedly high diversity of hoverflies in the region, as well as pockets of unusually high aphidophagous hoverfly abundance. Further analyses into the hovefly abundance and diversity in each habitat will be presented. Our results will inform government policy on agricultural landscape design to improve pollinator abundance and diversity benefitting farmers, landowners, and NGOs.

Keywords: flower flies, hoverflies, landscape ecology, seminatural habitats, pollination, habitat study, sustainable agriculture

Studying Syrphidae (Diptera) in a Biosphere Reserve: an assessment of the species from Menorca, Balearic Islands

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The incorporation of hoverflies to pollinator monitoring in Europe, as well as the high amount of knowledge gathered of them, has led to the elaboration of an IUCN red list of hoverflies at the European level. Despite declared as a Biosphere Reserve in 1993, the Balearic island of Menorca lacked recent studies focusing on hoverflies. Therefore, the main aim of this research was to provide an updated assessment of the island's hoverfly diversity, serving as a baseline for further more-specific investigations and facilitating pollinator monitoring. Hoverflies were sampled in 19 localities with hand net, between April and October in 2022/2023, resulting in the identification of 43 species. After a bibliographic review, the number of recorded species on the island increased to 52. Ten species turned out to be first records for Menorca, three of them were also first records for the Balearic area as a whole. The possible presence of undescribed taxa is discussed and the systematic position of the Balearic-endemic *Neoascia balearensis* Kassebeer, 2002 is evaluated. Among all identified species, three are Endangered according to the IUCN red list, *Callicera macquartii* Rondani, 1844, *N. balearensis* and *Riponnensia longicornis* (Loew, 1843). The assessment of the conservation status of these three species at the insular level is planned under future research.

Keywords flower flies, pollinators, species inventory, habitats, Spain

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An overview of the role of hoverflies in non-conventional economic and environmental issues

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Despite the lack of knowledge of the life cycles of many species (even today), the economic importance of Syrphidae has long been recognised. For example, since the beginning of the 20th century, the importance of the larvae of predatory species as active biological control agents for pests has been well known in various parts of the world. The importance of the adult stage as a pollinator of flowers has also been known for a long time, although the recognition of their usefulness in agriculture came somewhat later. However, hoverflies also play a role in other unconventional economic and environmental issues that have generally gone unnoticed due to their limited commercial reach or lack of subsequent development. This study will explore some of these relatively little-known uses and applications, as well as their potential and importance in the context of the 21st century.

Keywords: life cycles, economic relevance, unconventional uses, Syrphidae

Transect and landscape – level factors shaping hoverfly (Diptera: Syrphidae) communities: a functional trait perspective

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Integrating data on functional traits with taxonomic diversity is crucial for understanding biodiversity's impact on ecosystem functioning and environmental factors shaping it. Hoverflies, especially their larval feeding habits, play a key role in ecosystems, affecting functions like pollination and decomposition. This study aimed to (i) investigate hoverfly species richness and abundance in relation to transect and landscape variables, and (ii) examine the relationship between transect and landscape variables and hoverfly larval food traits. Transect variables included: total flower cover (TFC) and vegetation height (H); landscape variables included: land cover percentages of forest (FO), grassland (GR), and agricultural (AGR) habitats. These percentages were calculated within a 1-km radius buffer using Corine Land Cover maps and QGIS. Sampling occurred at 26 sites in Vojvodina, Serbia, with three samplings conducted during three different seasons in 2022. All transects (500m long, 2m wide) were positioned within calcareous grasslands. We used Generalized Additive Models (GAMs) to analyze the relationship between hoverfly richness and abundance, and transect and landscape variable; the best fitting model was selected according to AICvalues. Spearman correlation was used to examine relationships between transect and landscape variables and larval trait categories. In total, sixty-six species were recorded, with the number of species per site ranging from 3 to 27. The findings revealed that TFC significantly influenced hoverfly species richness. Significant positive correlations were found between TFC and both phytophagous (roots) and zoophagous larval feeding trait, and between GR and saproxylic species. Surprisingly, the landscape variables such as FO and AGR had no statistically significant effect on the distribution of larval feeding traits. These findings underscore the complexity of factors influencing hoverfly populations and the need to consider multiple variables when studying their ecology.

Keywords: hoverfly, functional traits, flower cover, vegetation height, land cover

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Gathering knowledge to conserve hoverfly communities: a case study of Dolomiti Bellunesi National Park

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Since 2020, the Dolomiti Bellunesi National Park (PNDB) (Northern Italy) started a project to implement the knowledge of hoverflies (Diptera: Syrphidae) and using them as bioindicators. The project was part of a national initiative promoted by "MASE Ministry" aimed to evaluate the conservation status of pollinators, within global warming scenario. Hoverflies were sampled using three methods (Malaise traps, pan traps, hand netting). Preliminary results of the project are presented and discussed. A total of 203 species were recorded, representing 38% of the Italian fauna, thus confirming the very high hoverfly biodiversity of PNDB. Some species are first records for the Italian fauna, such as *Anasimyia lunulata* and *Helophilus hybridus*. The percentage of habitats, particularly unimproved grasslands, pasture, pine forests and screes, within a 500 m radius was the best predictor of hoverfly community. The list of hoverfly species and habitats type in the PNDB were used as input data to apply Syrph the Net, a standard protocol developed to assess habitat conservation. All habitats, with the exception of scree and running water edges, had more than 50% of the expected species, showing a generally good conservation status. A Citizen Science project, focusing on saproxylic species, was promoted in 2024. The hoverfly project in the PNDB is an interesting example of monitoring aimed at establishing a baseline of the hoverfly fauna, which is crucial for future research and to provide important information on the conservation status of habitats.

Keywords: Syrphidae, Syrph the Net, Italy, monitoring, landscape effect

Acknowledgement: Project partially funded by NextGeneration EU - PNRR, Mission 4 Component 2 Investment 1.4; project code CN_00000033, project title NBFC and by the Dolomiti Bellunesi National Park with funds from the Ministry of the Environment and Energy Security as part of the project "Study of pollinators in the PNDB".

Hoverflies in the EU policy context - the EU Pollinators initiative and preparing the EU Pollinator monitoring

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After the alarming news of the heavy insect decline of more than 75% in 27 years published by Hallmann et al. (2017) based on long term standardized malaise trapping of the Entomological Society Krefeld e.V., many papers on insect decline followed worldwide and politicians got alerted. The international IPBES pollinator assessment from 2016 still largely focused on wild bees.

In 2018 the EU Pollinators Initiative was launched as a strategic plan to stop and reverse the decline of pollinators, focusing on four main pollinator groups being the butterflies, moths, wild bees and hoverflies. After four years of activities, a complete review of all actions was carried out which lead to an enhanced second version of the EU pollinators Initiative in 2023. Many activities had started in parallel – updated or new European Red lists for all pollinator groups, planning, testing and preparing the implementation of an EU wide pollinator monitoring scheme (EUPoMS), capacity building, launching a new EU Pollinator working Group with EU Member States under the lead of DG Environment of the EU-Commission with a number of ad hoc task forces. In June 2024 the EUPoMS was integrated in a binding legal framework at EU level, the Nature Restoration Law. Before the EUPoMS was "only" an EU recommendation within the EU Biodiversity Strategy. In addition a revised methodical approach for the monitoring ("STING2" report) became available.

I will present a short insight in the actual state of play of EU pollinator conservation at policy level and the activities needed in order to be able to implement the EUPoMS.

Keywords:EU Pollinator Initiative, Nature Restoration Law, Pollinator Monitoring, Hoverfly conservation

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Recent developments of the Taxo-Fly project – an EU funded Service Contract to generate Taxonomic Resources for European hoverflies

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The task of the three-year Taxo-Fly project (2021-2024) is to generate Taxonomic Resources for European hoverflies by identifying and capturing taxonomic and other information (ecology, distribution), and to make these data openly available on a public web platform. The taxonomic resources compiled within this project will be available for open download in the form of species and genus factsheets. High-quality digital images of all hoverfly species generated within the project will constitute a new resource of standardized hoverfly images, with diagnostic characters clearly portrayed. The status and the recent developments of the project will be presented.

Keywords: digital images, identification, genus factsheet, project status, species factsheet

Four years of hoverfly (Diptera: Syrphidae) transects in Nijenrode, The Netherlands

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Pollinator monitoring is becoming increasingly important, both because of increased interest in pollinators and the rapid decline of many pollinators. One of the proposed monitoring methods is 50m transects. There is a lot of experience with walking transect in regard of butterflies and dragonflies. However, the published experience with hoverflies is rather small.

In 2021, 10 linear transects of 50m were initiated in Nijenrode, the Netherlands (DD 52.16, 5.00). They range from open fields to forest trails. The transect counts were conducted an average of 10 times per year, 2024 still counting. This study presents the first results and highlight aspects such as the location of the transect, the time of walk, the weather, the change to record all species present, number of visits required for a 'complete' species list etc.

The same area was visited several times in the period 2006-2012 providing randomly collected data for comparison with the transect counts conducted from 2021 to 2024.

Keywords: flowerflies, hoverflies, long term, monitoring, pollinators

Revision of the taxonomic status of some Western Palaearctic chrysogasterine taxa (Diptera: Syrphidae)

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The taxonomy, systematics and evolutionary relationships of the chrysogasterines recently have undergone numerous changes. Although currently placed in the polyphyletic tribe Brachyopini, the genera *Chrysogaster* Meigen, 1803, *Chrysosyrphus* Sedman, 1965, *Lejogaster* Rondani, 1857, *Melanogaster* Rondani, 1857, *Orthonevra* Macquart, 1829, *Riponnensia* Maibach, Goeldlin et Speight, 1994 are referred as Chrysogasterini in published literature. The taxonomic status of certain species within these genera remains unresolved and prompt for a taxonomic clarification. Our study, conducted using material from various museums and collections, has led to the identification of several synonyms and the discovery of new species; more specifically, a new *Orthonevra* species has been found in Turkey and Georgia, bearing similarities to *Orthonevra nobilis* (Fallén, 1817). In addition, the taxonomic status of *Chrysogaster hirtella* var. *claripennis* Stobl, 1909 has been revised and it is recognized as a valid species, *Melanogaster claripennis* (Strobl, 1909), with new synonyms established. Moreover, a potential new chrysogasterine genus, which shares a combination of morphological characters with *Melanogaster*, *Chrysogaster*, and *Riponnensia* has been discovered in Greece and Turkey, expanding our understanding of the diversity within this group.

Keywords: Chrysogasterini, new species, *Orthonevra*, synonyms, taxonomy

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Malaise trap or pan trap - which works best for the long-term monitoring of hoverfly populations?

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Reports of global declines have highlighted the need for reliable long-term estimates of insect populations to identify potential drivers of declines, perform taxa-specific risk assessments, and to measure potential effects of implemented conservation strategies. In this context, data on taxonomic groups providing important ecosystem services is of particular interest. The MonViA project (https://www.agrarmonitoring-monvia.de/en/), aims to address this by establishing a comprehensive long-term monitoring in agricultural landscapes in Germany.

As part of this project the long-term monitoring of hoverfly populations ("nützLINK") will serve as an indicator for the condition of agricultural management on a wider spatial scale. In this study, a monitoring approach for hoverflies was developed and tested using orchard meadows as stable habitats embedded in the agricultural landscape as spatial matrix. Using mainly conventional insect traps, we found that the different trapping systems had a significant impact on the captured hoverfly community. Pan traps and Malaise traps differed in both capture rate and species composition. Overall, Malaise traps caught more individuals (71%) and more species (60%) than standard yellow pan traps, although some species were exclusively caught by one trap type and not the other. In addition, the effectiveness of the standard yellow pan trap will also be compared to a frequently used trap system with three coloured bowls (blue, red and yellow) this field season.

The concept of this monitoring program and the comparison of the capture characteristics of the trap types based on the data from the 5-year pilot phase (2020-2024) are presented in this paper.

Keywords: Syrphidae, orchard meadows, automated monitoring, Malaise trap, pan trap

Acknowledgements: We would like to thank all owners and managers of the orchard meadows for kindly allowing us to work on their property.

Do mimic hoverfly spatially match their bumblebee models?

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It has long been posited that Batesian actors (model and mimic species) must co-occur in space for Batesian mimicry to be successful. There have been emerging studies that suggest partially sympatric or allopatric range distribution of Batesian mimics with their putative models. The range for many species involved in Batesian mimicry remains unclear and regardless of niche overlap (whether full, partial overlap, or allopatric niche), studies on how climate change may disrupt the spatial overlap pattern within the Batesian complex still lack enough attention. Using occurrence records of model bumblebees species grouped based on colour space (*Bombus terrestris sensu latos*, *B. pascuorum sensu lato*, *B. lapidarius* and *B. pratorum*) and their hoverflies mimicking them specifically good mimic *Volucella bombylans* and all its colour morphs in Norway, we modelled ecological niche with coordinates spatial thinned to 1km distance between points. We retrieved elevation data together with bioclimatic variables (Bioclim) at 0.5o resolution. To facilitate modelling, we mapped occurrence records at the same resolution as climate data while removing highly correlated variables to reduce collinearity. Employing four modelling algorithms ranging from regression models (generalized linear and generalized additive model) and machine learning-based techniques (Maxent and Random Forest), habitat suitability predictions are rescaled and merged into an ensemble model, which predict potential niche of model bumblebee and mimicking hoverflies species. We utilize ENMtools to determine the degree of niche overlap and if there is a predicted shift in range between the model and mimics. Understanding the climate change response of this Batesian-mimicry complex is essential to averting climate-driven spatial mismatches within the system.

Keywords: Batesian mimicry, co-occurrence, ecological niche modelling, spatial mismatch, climate change

Strong decline of hoverflies (Diptera, Syrphidae) in the Netherlands over the last decades

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For the first time, a Red List for the dutch hoverflies was composed, comparing the current abundance with that of 1950 and the trend between the two periods. Trend is based on a Bayesian estimate of the probability to observe a species in a 5x5 km. square. In order to get a proper comparison, only squares with both old and new data are included in the analysis.

Nearly half (46 %) of all species considered indigenous in the Netherlands is present on the dutch Red List. This percentage is only slightly less than for bees (55 %) and generally comparable with neighbouring regions, though slightly worse.

Thirty species are not recorded over the last 10 years and are therefore considered nationally extinct. A separate study showed that extinction rates for hoverflies rapidly increased around 1992, whereas those for bees did not. It is hypothesized that the negative effect of pesticides is much stronger than previously anticipated ("silent summer").

Currently, hoverflies seem to be even more in decline than bees. All analysis show that hoverflies with phytophagous larvae are performing worst, followed by zoophagous. Species with saproxylic larvae perform best, with the exception of most *Xylota Meigen*, 1822 species. Species in wetlands and dry habitats are in strong decline, while ubiquitous species are doing much better on average.

Keywords: insect trend, insect decline, trend analysis, pesticides

The hoverflies (Diptera: Syrphidae) of Te Aotearoa – New Zealand

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The hoverfly fauna of New Zealand is one of the understudied faunas in the world. Far from other landmasses and long isolated, New Zealand has a very interesting hoverfly fauna. All native species, except one are New Zealand endemic (Thompson, 2008). Miller (1911, 1921, 1924, 1950) was the first to study the New Zealand hoverflies in detail. More recently, Thompson (2008) published his "conspectus" on this fauna, stating there are 48 yet to describe New Zealand endemic species, besides 37 already descripted species. Since then, only two more species has been published (Thompson & Thompson, 2010). New Zealand was visited for two southern hemisphere summers (2022/23 & 2023/24), during which adult hoverflies of a broad range of New Zealand species (groups) were collected. Specimens were studied morphologically and molecularly using an integrative approach. *Helophilus* (*Pilinasica*) is one of the three radiated genera in New Zealand with 12 described species. The genus has an impressive variation in morphological characters and ecology. Molecular data supports the known species. With the data collected till now we expect 7 more species to be described. Field observations helped us to answer on some ecological questions. The first result are presented.

Keywords: flower flies, Australasian, new species, taxonomic revision, DNA barcoding

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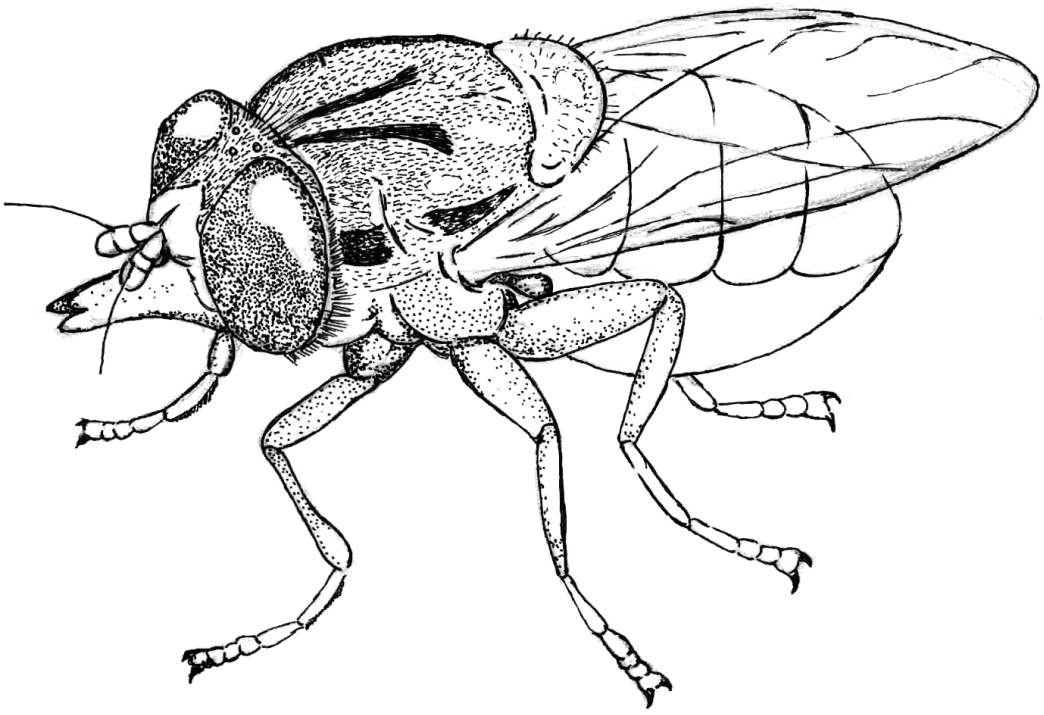

The first insight of environmental change impact on Syrphidae (Diptera) morphology: wing fluctuating asymmetry analysis of *Merodon aberrans* Egger, 1860

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Throughout Earth's history, climate has changed continuously, but at a much slower pace than currently observed. In Serbia average temperature increase over the territory is 1.2 °C for the period 1996-2015 with respect to the period 1961-1980, with the highest increase of maximum daily temperature during the summer season, 2.2 °C. Climate change is a complicated phenomenon, with various changes including shifts in limits (maxima and minima), average conditions, and variance, which can all be measured at different temporal and spatial scales. Insects are ectothermic and critically depend on environmental temperature throughout all aspects of their life history, but also other niche aspects are changing—precipitation, humidity, cloud cover, weather extremes, biotic interactions—with potentially dramatic impacts.

Our research delves into a relatively unexplored area, as there is currently no insight into the impact of environmental change on the Syrphidae morphology. To investigate this, we selected populations from a single natural habitat with insignificant anthropogenic influence. The impact of environmental change on Syrphidae morphology was measured through fluctuating asymmetry (FA) of wing shape. FA represents slight and random deviations from bilateral symmetry normally distributed around a 0 mean. Increased FA reflects the stress an organism undergoes during development, which may be caused by environmental and genetic stress.

We studied populations of *Merodon aberrans* Egger, 1860 from the Vršac Mountains, Serbia, from the 1980s and 2020s, and compared the wing asymmetry between these two temporal populations. Results showed that the 2020s population exhibited greater wing FA compared to the 1980s population, with a statistically significant difference. These indicate that environmental change affects the asymmetry of hoverflies, which, according to numerous studies, is negatively correlated with organism fitness. Further studies are crucial to expand this analysis to other species within this family, encompassing all forms of larval development if feasible, and to compare their response to environmental change.

Keywords: environmental change, fluctuating asymmetry, hoverfly, temporal populations, wing shape

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An overview on the French *Eumerus* Meigen, 1822: diversity, taxonomy and systematics

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With over 300 known species, *Eumerus* Meigen, 1822 (Eristalinae: Merodontini), is one of the most speciose hoverfly genera worldwide. The Mediterranean Basin hosts high values of taxonomic diversity and endemicity of this genus. Nevertheless, recent findings of species new to science suggest that the species inventory is far to be completed in the Mediterranean Basin. A total of 37 species of *Eumerus* have been reported from France (including Corsica). The aims of the present work are (1) to update the taxonomic and diversity knowledge of the French *Eumerus* and (2) to assess the systematic positions of two species following an integrative approach (morphological and molecular data), one species from Southern France supposedly new to science and the other one from Corsica, *Eumerus excisus* van der Goot, 1968. The new species matches the morphological concept of the *Eumerus minotaurus* Claußen & Lucas, 1998 species group. Additional taxonomic and faunistic data of *Eumerus* species from France are provided.

Keywords: hoverfly, Merodontini, western Mediterranean, male genitalia, integrative study

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Hoverfly (Diptera: Syrphidae) Atlas of Luxembourg in 2028

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Hoverflies play a pivotal role in ecosystems, but despite their ecological importance, their distribution and diversity in Luxembourg have been insufficiently documented. Funded by the Action Plan for Pollinators from the Luxembourgish government, the initiative was set out to create a comprehensive national hoverfly atlas, a crucial step towards understanding and conserving the region's biodiversity. This project aims to fill this knowledge gap through extensive field surveys, literature reviews, and citizen science. Earlier projects include a checklist led by W.van Steenis, due 2025, and a monitoring program (MONIPOL). Hundreds of field visits have been conducted across diverse habitats from 2023 to 2024, encompassing forests, grasslands, urban areas, and agricultural landscapes, and will continue until 2028. Standardized sampling methods, including netting and pan traps, were employed. Historical records and specimen data from other sources are being reviewed and integrated. This should eventually amount to 40 000 specimens and more than 200 observed species. There have already been some notable findings, including rare and threatened species. A detailed map of visits, records, and habitats will be provided. The project aims to establish an online-first dynamic atlas that utilizes spatial distribution models. During several public events in Luxembourg, outreach efforts regarding hoverflies were conducted with the public. Citizen science was harnessed through iNaturalist and Observation.org, engaging local communities in data collection and raising awareness about threats. Future work will focus on increasing our spatial and taxonomic coverage and expanding public engagement to foster a deeper connection with local biodiversity.

Keywords: citizen science, field surveys, literature reviews, national hoverfly atlas, pollinator action plan

Wing shape changes with size in *Sphaerophoria scripta* (Diptera: Syrphidae)

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Intraspecific variation involves both shape and size. Are these two components of variation interdependent in *Sphaerophoria scripta*?

Wing shape variation in *S. scripta* was investigated using 15 landmarks on the left wings. Shape variation was assessed by full Procrustes superimposition, which involves translation, rotation and scaling. Wing size was assessed by wing centroid size.

Samples from two lowland localities in south France were pooled in order to have a sample of 33 male and 32 female *S. scripta* specimens. The size was not different between the two sites. Landmark data were input using TPSDIG on photographs of wings set in Hoyer's medium mounted on microscope slides. All analyses were performed using the geomorph package in R software. In this sample, the size of the largest female was 36 % larger than the smallest one, whereas in males the difference was 25 %. An ANOVA Procrustes analysis with permutation (function procD.lm) shows that wing shape changes with sex (P=0.001) and size (P=0.017), with size effect on shape significant in females (P=0.031: large females tend to have rounder wings than smaller ones) but not in males (P=0.176).

Differences in wing shape and size may affect both flight speed and acceleration and may therefore influence the dispersal ability of the individuals.

Keywords: Syrphidae, wing shape, allometry, geometric morphometry

Not all pollinators are created equal: Contrasting responses to environmental change in hoverflies (Diptera: Syrphidae) and bees (Anthophila) in Trøndelag semi-natural grasslands

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Semi-natural grasslands are considered hotspots of pollinator species richness and abundance. Both pollinators and semi-natural grasslands decline drastically on a global scale due to climate change and habitat degradation. Both precipitation and temperature are predicted to increase markedly in Trøndelag in the coming century. As semi-natural grasslands deteriorate from lack of appropriate management, tree cover is likely to increase because of overgrowth. We used pan traps to survey species richness (SR) and abundance (AB) of hoverflies (Diptera: Syrphidae) and bees (Anthophila) in 20 semi-natural grassland sites in Trøndelag, yielding 1463 specimens of 41 species of bees and 42 species of hoverflies. We then modelled SR and AB with relation to temperature, precipitation and tree cover density as measured with remote sensing tools; after drop selection of generalized linear models evaluated by AICc only precipitation and tree cover remained in the final model. Both solitary and social bees showed significantly contrasting relationships to hoverflies in relation to annual precipitation, as hoverfly SR and AB decreased and bee SR and AB increased with higher precipitation levels. For tree cover density, both social bee and hoverfly SR and AB were found to increase with higher tree cover. This suggests, surprisingly, that increased future precipitation in Trøndelag may be detrimental to hoverflies and beneficial to solitary bees, whereas semi-natural grassland degradation may benefit both hoverflies and social bees.

Keywords: habitat degradation, species richness, species abundance, remote sensing

The influence of linear landscape elements on the diversity and abundance of hoverflies (Diptera: Syrphidae) in Serbia

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Linear landscape elements can have contrasting effects on organism population: 1) enhancing connectivity and 2) acting as potential barriers. Given the limited knowledge of their impact on hoverflies, the main objective of the present research is to evaluate the effect of linear landscape elements on diversity and abundance of hoverflies, with the goal of promoting positive effects and mitigating negative impacts in the future.

Data were collected from 30 sites during three seasons (spring, summer, and autumn) and two years of sampling (2022 and 2023). Hoverflies were sampled using two monitoring methods: transects and pan traps. At the same 30 sites, data on linear landscape elements were recorded, and categorized into natural and artificial groups.

Preliminary analyses in R Studio, using the type and number of landscape elements as variables, indicate that neither natural nor artificial linear elements significantly impact hoverfly abundance at surveyed sites. The only exception is the natural linear element of rivers and streams, which showed a statistically significant correlation with the number of species. These results are expected due to the study's focus on natural and semi-natural habitats, where the characteristics of these habitats likely reduce the influence of other linear landscape elements. Future analyses will include attributes such as the length and spatial configuration of these landscape elements, and will explore additional predictors to better inform landscape management strategies and conservation policies.

Keywords: landscape ecology, corridors, barriers, flower flies, species richness, abundance

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Collaboration towards a checklist of Bulgarian hoverflies

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The Bulgarian hoverfly fauna is not very well documented and many records from literature are from before 1990. Collecting trips by the authors to Bulgaria in 2022 and 2024 and limited sampling by the first author in 2019 revealed into many new species of hoverflies for the Bulgarian fauna (van der Ent et al. prep.). This study presents the preliminary results of the collecting trips and provides a current checklist of Bulgarian hoverflies. However, more data on distribution of hoverflies are needed from different parts of Bulgaria, especially northern Bulgaria, and also data from different seasons like early spring, summer or fall. Data from observado.org and National museum in Sofia – when labelling is done – will be included. All additional data from recent (partly) genus revisions as well data from private and museum collections still have to be added.

Keywords: additional species, Syrphidae, Bulgaria, checklist

The malaise of trapping: Measuring variance in pollinator abundance and diversity sampling using Malaise traps in agroecosystems

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Malaise traps are largely recognized as an effective tool to survey a variety of flying insects in high abundance. They are traditionally used in biodiversity surveys to detect species presence but are now increasingly employed in ecological studies. However, the switch to ecological use comes without understanding the variation associated with the proportions of insects caught in a single Malaise trap and the interaction of multiple traps in one field, which could affect the statistical analysis of these studies. This study examines the variance in pollinator sampling using individual Malaise traps in three crop fields in Southern Ontario, Canada. Five Malaise traps were deployed 50 m apart along a single field margin at each farm, with weekly collection from June to July in 2022 and 2023. Bees (Hymenoptera: Anthophila) and hoverflies (Diptera: Syrphidae) were sorted from each sample, and species richness and abundance were compared between traps. Comparisons of trap catch revealed that there is not a reliable estimate of variance over time and between locations that can be associated with using Malaise traps. Without reliable amounts of variation when collecting pollinators, additional testing is needed for dependable use in ecological research. With the chosen spacing, traps do not interfere with one another, and the addition of multiple traps has been found to increase the reliability of trap catch when used for sampling pollinator abundance and diversity. By optimizing the methodology, future pollination studies across the agricultural sector that utilize Malaise traps will have increased confidence in their results.

Keywords: agriculture, population estimates, passive sampling, Syrphidae, native bees

Eumerus Meigen, 1822 reshaped: Granting generic status to the *tricolor* species group

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In recent decades, taxonomic and phylogenetic analyses of *Eumerus* Meigen, 1822 have presented challenges to researchers. Among the species groups, the *tricolor* group has emerged as the largest and most distinct, characterised by a set of unique morphological characters. Its systematic position within the genus *Eumerus* is particularly contentious, especially as previous studies within the tribe Merodontini have not confirmed the monophyly of the genus *Eumerus* (Doczkal & Pape, 2009, Doczkal et al., 2016). In this study, we propose elevating the *tricolor* species group to the rank of a separate genus, providing diagnostic characters and compiling a comprehensive list of known species within this genus, which will retain the name *Eumerus* because of the type species *Eumerus tricolor* (Fabricius, 1798). Additionally, we present a phylogenetic analysis based on molecular data encompassing representative species from related taxa. Consequently, all species that previously belonged to the genus *Eumerus* but do not belong to the *tricolor* species group will be assigned to a different genus.

In Europe, *tricolor* group species represent approximately one-fourth of all *Eumerus* species. Many species from the *tricolor* group are western and central Asian species. Therefore, both as the *tricolor* species group currently and as the *Eumerus* genus in the future, the taxon exhibits a Palaearctic distribution. Some notes on its biology concerning phytophagy and immature stages will also be discussed.

Keywords: *Eumerus*, *tricolor* species group, taxonomic analysis, phylogenetic analysis, Palaearctic distribution

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Status of Serbian hoverflies on the IUCN European Red List of Hoverflies

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The IUCN Red List represents the list of species at risk of extinction. Considering the global loss of pollinators, their assessment according to the IUCN criteria is of utmost importance. Our study focuses on hoverflies, the second most important group of insect pollinators. The research was conducted in Serbia, aiming to: A. compare the EU Red List categories with state of protection of the species in Serbia; B. whether Protected Areas (PAs) and Prime Hoverfly Areas (PHAs) cover a relevant part of distribution of threatened species and C. test the importance of area size for occurrence of threatened species.

The results for A. indicated different patterns for strictly protected and protected species: most of the strictly protected species were categorized as Endangered at the European level, while most of the protected species were assessed as Least Concern. For B. we found several areas significant for the preservation of threatened species. Testing the importance of size (C) revealed there was a moderate positive correlation between the size of the PHAs and the number of EN species recorded, while in all other cases no such correlation was observed. Our results show that Red List categories are also relevant for Serbia. However, regardless of category, there is a need to give hoverflies a well deserved attention in nature protection in general in Serbia, and reduce negative human impact on important hoverfly habitats, inside and outside of PAs and PHAs.

Keywords: conservation, protected species, Syrphidae, threatened categories

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Syrphidae and the diversity of pollinating Diptera in Afrotropical biodiversity hotspots

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In line with the implementation of DIPoDIP ["Diversity of pollinating Diptera in Afrotropical Biodiversity Hotspots" (2024–2028)], a collaborative project financed by the Belgian Directorate-General for Development Cooperation and Humanitarian Aid (DGD) within the framework agreement with the AfricaMuseum (=Royal Museum for Central Africa), we aim to study the biodiversity of true fly families (Diptera) in biodiversity hotspots of the Afrotropical Region (AR). The project will improve the taxonomy and identification of these families and provide basic data on their distribution and pollination ecology. Specifically, it uses Syrphidae (hoverflies) as a focus to illustrate the ecological importance of flies, and their usefulness in encouraging citizen science and contributing to conservation policy development. The project partners from Rwanda, Burundi, South Africa and Belgium, will train officials, young entomologists and conservationists (including PhD and MSc students) in the AR about the taxonomy of Diptera, and conduct joint research, publication, and outreach. Workshops with local partners and stakeholders will help translate the results into policies, leading to improved conservation strategies for true fly biodiversity in the AR. Local communities will be strongly involved through the initiation of Citizen Science projects (e.g., on iNaturalist) and the development of educational tools. These efforts will highlight the positive aspects of true flies, especially true fly families that contribute to food security by pollinating agricultural crops. The results will be disseminated via institutional websites, a Facebook page, newsletters, published papers, and promotional videos.

Keywords: citizen science, hoverflies, pollination networks, sub-Saharan Africa, taxonomy, training

New data for hoverflies (Diptera: Syrphidae) for Landscape of Outstanding Features "Vlasina" in southeastern Serbia

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The Landscape of Outstanding Features (LOF) Vlasina is located in southeastern Serbia and occupies a relatively small area of 127 km2. Despite that, LOF Vlasina has many endemic and protected species due to the presence of different types of habitats, such as mires, wetlands, forests, meadows and grasslands. This area is already known as a biodiversity hotspot for birds (IBA), plants (IPA), butterflies (PBA) and hoverflies (PHA) (Tot et al., 2018; Vujić et al., 2016).

In 2018, Tot et al. proposed a first species checklist of hoverflies for LOF Vlasina, including 76 hoverfly species from 32 genera. During the realization of the national project SPAS (Serbian Pollinator Advice Strategy - for the next normal) (in 2022 and 2023), using both entomological net and pan traps, an additional 17 species were recorded for the fauna of this protected area. In this way, the number of species of hoverflies in LOF Vlasina increased to 93, which is almost a quarter of the total fauna of hoverflies in Serbia (in total 412 (Vujić et al., 2018)).

Among the newly identified taxa, three are rare species, namely: *Cheilosia longula* (Zetterstedt, 1838) and *Cheilosia fraterna* (Meigen, 1830), which are protected in Serbia, while *Merodon desuturinus* Vujić, Šimić & Radenković, 1995 is strictly protected in Serbia and belongs to Vulnerable species in Europe based on IUCN Red List (Official Gazette of RS, nos. 5/2010 and 47/2011; Veselić & Radenković, 2021).

Keywords: new data, Syrphidae, LOF Vlasina

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Big challenges in small places: establishing a long-term pollinator transect network and Citizen Science Initiatives in European Bioparks

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In Europe, zoological gardens are institutions known to welcome millions of visitors every year, who are attracted by the opportunity to observe exotic or hard-to-see species. Today known as Bioparks, these places have evolved to play a crucial role in conservation, research, and education. The challenge proposed here is to take advantage of the visibility of these places for the in situ conservation and dissemination of pollinator insects. In the ZOOM Torino Biopark (Italy), two Butterfly Monitoring Scheme (BMS) transects of around 500 meters were designed for the first time. One of them is an internal pedestrian walkway while the other is an external field near to the zoo. For the first time in a zoological park, three different pollinator taxa were paired together. Overall, in more than two years of monitoring taken by professional entomologists 35 species of Syrphidae, 35 species of Apoidea, Anthophila and 28 species of Rophalocera were observed. Knowledge on the species richness of the taxa has increased respectively of 33, 34 and 17 species compared to previous data taken in a 5 km buffer. Recorded abundance data is the starting point for long-term comparisons. Regardless of the environmental surroundings altered by tourist activities, some observed species were of conservation interest such as *Paragus constrictus* (a hoverfly endangered according to the IUCN Red List). The attempt to involve other European zoos in pollinator monitoring actions starts with Nordens Ark (Sweden) and Zagreb Zoo (Croatia). The aim is to involve a large portion of the 700 zoos present in Europe creating a new network to support local efforts in the conservation of pollinators. The role of these institutions will be pivotal with the potential to raise the awareness and engage the visitors in educational activities and citizen science initiatives in dedicated pollinator areas fostering positive and conservation-friendly attitudes.

Keywords: Insect pollinators monitoring, hoverflies, bees, butterflies, zoos

The genus *Afroxanthandrus* Kassebeer, 2000 now contains four valid species

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The hoverfly (Diptera: Syrphidae) genus *Afroxanthandrus* Kassebeer, 2000 was recently revised based on morphological and molecular characters, prompted by the collection of new field material. Two new species are described, while *Xanthandrus magnificus* Thompson, 2019 is recognized as a junior synonym of *Afroxanthandrus congensis* (Curran, 1938). The total current number of recognized species in this genus is four. Colour photographs, distribution and identification notes for all species are presented.

Keywords: taxonomy, flower flies, new species, species identification, forest biodiversity

"It's not the heat, it's the humidity": Comparative influence of environmental parameters on hoverfly diversity versus other pollinators

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The SPAS (Serbian Pollinator Advice Strategy) project (2022-2024), funded by the Science Fund of the Republic of Serbia deals with monitoring the status and trend of pollinating insects (wild bees, butterflies and hoverflies) in Serbia.

This project formed the foundation for the present study, aiming to delve into the intricate relationship between various environmental parameters, such as temperature, air humidity, air pressure, UV radiation, wind strength, flower cover and green cover, and the populations of hoverflies, wild bees, and butterflies. Leveraging the Random Forest algorithm, we scrutinized how these factors affect both the number and abundance of different pollinator groups. The data collected from 30 sites over three seasons (spring, summer, and autumn) and across two years (2022 and 2023) were analyzed.

Humidity emerged as a pivotal factor for hoverflies, exerting a significant influence on both the number of hoverfly species and their abundance, with values of %IncMSE of 33.6 and 26.9, respectively. Moreover, total flower cover emerged as almost equally crucial, exhibiting %IncMSE values of 26.8 and 19.9. Temperature appeared as a dominant force shaping the diversity and abundance of butterflies, commanding %IncMSE values of 47.4 and 28.1, respectively. Yet, flower cover also played a substantial role, with %IncMSE values of 28.1 and 18.6. As for wild bee species, flower cover emerged as the linchpin, demonstrating %IncMSE values of 32.8 and 22.7 for diversity and abundance, respectively.

The study highlights the unique importance of humidity for hoverflies and temperature for butterflies, while also identifying flower cover as influential across all three pollinator groups, thus emphasizing the multifaceted nature of environmental conditions in supporting diverse pollinator communities essential for ecosystem health.

Keywords: pollinator diversity, syrphids, flower cover, humidity, temperature

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Interaction networks of hoverflies (Diptera: Syrphidae) and plants in two wetlands in Bogotá, Colombia

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Hoverflies (Diptera: Syrphidae) are essential pollinators, contributing to ecosystem balance. Hoverflies can respond to the richness and structure of plants, determining the shape of their interaction networks. We studied interaction networks of hoverflies and flora in two wetlands (Burro and Techo) located in Bogotá, Colombia at 2550 m. Ten sampling points of 20 meters in diameter were established in each wetland. Adults visiting flowers were collected using an aspirator and hand-net between 10:00 a.m. and 3:00 p.m. from September to December 2023. Functional composition, origin and habit of hoverflies and plants were analyzed. A total of 301 hoverflies were collected, belonging to 10 genera and 16 species, which had generalist interactions with 39 botanical species of 35 genera and 16 families. *Mimocalla gigantea* was exclusive to Burro's wetland, whereas *Allograpta obliqua*, *Eristalis tenax* and *Toxomerus pallipes* were unique to Techo. Hoverflies preferred small, open and flattened flowers, mostly belonging to Asteraceae (n=49, 25%, 14 spp., 36%). Native Neotropical hoverflies dominated the networking, meanwhile, introduced plants were abundant (56%). Two species had the highest interactions number. One of the largest species, *Palpada florea*, had a preference for shrubs and trees (78% of Burro interactions), meanwhile, one of the smaller taxa in size, *Toxomerus watsoni*, was mainly collected in undergrowth herbaceous plants (71% of Techo), suggesting that weight and physiology determine a partition in foraging altitude. This study represents a baseline and first approach to understanding Syrphidae-plant interactions in urban wetlands. Future research should evaluate whether visited plants are being effectively pollinated.

Keywords: floral visitors, interaction networks, pollination, urban wetlands

Description of female of *Paragus glumaci* Vujić, Šimić & Radenković, 1999 (Diptera: Syrphidae) with information about its biology

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The genus *Paragus* Latreille, 1804 comprises small-sized hoverflies characterized by distinctive features such as a well-developed tergite 1 and unsegmented aedeagus in males. Their larvae, like those of other members of the subfamily Syrphinae, are aphidophagous. This genus has a wide distribution, with approximately 98 known species globally. *P. glumaci* Vujić, Šimić & Radenković, 1999 is distinguished by its mainly orange-brown abdomen, absence of dusted stripes on the tergites, elongated basoflagellomere, and darkened wings. Males can be confidently identified based on the structure of male genitalia characterized by a distinctively shaped lingula, a tooth-like projection of the edeagal apodeme, and elongated, narrow surstylus. The females are morphologically most similar to *P. bicolor* (Fabricius, 1794), but they can be distinguished by a narrow facial stripe occupying 1/6 to 1/8 of the facial width, well-developed triangular-shaped white dusted markings on the frons, and simple tergite 7. This species has been documented in Montenegro, North Macedonia, and Greece. It has now also been observed in Turkey, representing a new addition to the hoverfly fauna of this country. Eleven specimens, consisting of 5 males and 6 females of *P. glumaci*, were collected in Musaköy Village, Turkey. The association of males with females in this locality made it possible to provide a description of the female, which was previously unknown. The species was also recorded in another locality in Turkey, 8 km south of Cine, along the river bank. During the study, data related to the biology of *P. glumaci*, particularly its interactions with aphid species were recorded.

Keywords: aphid, hoverfly, new record, *Paragus*, Turkey

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Step forward in monitoring of hoverflies (Diptera: Syrphidae) in Serbia

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Different investigations point out the decline of pollinators, with potentially negative effects on the functioning of ecosystems and food security (IPBES 2016). To stop this negative trend European Commission established Pollinators Initiative and set up Pollinator Monitoring Scheme (EUPoMS) according which hoverflies, together with wild bees and butterflies, should be monitored in a standard way throughout the Europe (https://wikis.ec.europa.eu/pages/viewpage.action?pageId=23462107). In Serbia, the national pollinator initiative or strategy has not been established yet, but within national project Serbian Pollinator Advice Strategy (SPAS) during 2022-2024, abundance and diversity of these three groups of pollinators have been monitored on 30 sites, three times annually. Simultaneously, different environmental parameters such as flower cover, weather conditions, soil type, land use and land cover changes, have been detected. Here we compare results on abundance and species richness of hoverflies among investigated years and seasons. The huge difference has been observed in the abundance between 2022 and 2023, with around 2000 more specimens observed in 2023 than in 2022, while the species richness was almost the same. Differences in weather conditions (especially precipitation and temperature) can be at the origin of the observed differences: climatic conditions were probably more suitable for hoverflies in 2023 than in 2022.

Keywords: abundance, diversity, EUPoMS, pan trap, syrphids, transect walk

Reference:
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Syrph-ing continents: a comprehensive review of long-distance hoverfly migration (Diptera: Syrphidae)

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A significant number of hoverfly species (Diptera: Syrphidae) are now known to exhibit migratory behaviour, and its wider significance is starting to be recognized and understood in scientific circles. In this review, we summarize the past 150+ years of global hoverfly (also called flower flies in North America) migration research from >60 published studies. We outline the different methodologies used for studying these migratory phenomena, the biological mechanisms for migration, the associated ecological and economic impacts and the potential consequences of climate change on these migratory flies. Forty-six species of hoverfly, mostly from Europe, are considered migratory and the most well studied of these species are discussed in detail. Recent literature has investigated hoverfly migration in North America, Asia, the Middle East, and Australia and we review all known migratory pathways from these works. The migratory behaviour of hoverflies has substantial impacts on ecosystem services and can be linked to long-distance gene flow for flowering plants through pollen transport along migratory paths. These insects are also likely to be contributing and redistributing their biological control services at a continental scale on an annual basis, which has major consequences for the management of crop pests (e.g. aphids). The expanded use of technology will continue to reveal exciting insights and improve our understanding of hoverfly migration. Meanwhile, improved public awareness and greater appreciation of true flies will lead to increased scientific research to expand our global knowledge on hoverfly migration.

Keywords: hoverflies, flower flies, insect migration, movement ecology, pollination, biological control, entomological radar, isotopes

Journaal van Syrphidae

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An overview is presented on the research published in the Journaal van Syrphidae, a free online and open access journal for all topics concerning Syrphidae (Diptera). This journal started as part of the Syrphidae Foundation to enhance the possibility of publishing papers concerning Syrphidae. The review and publication speed is presented. Furthermore the citations found in several online platforms are shown. Finally a discussion is given on the future financing and publishing capacity of the journal.

Keywords: Syrphidae Foundation, free online, achievements, future

Pollinator diversity along roads: impact of traffic and local land use

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Pollinators provide important and well recognized ecosystem service. Numerous action plans and strategies have been initiated with an aim of assessing the drivers and impacts of decline in insect pollinators worldwide. The goal of the present study was to contribute to understanding of the effects of traffic and local land use on pollinator diversity and abundance along road verges. Three major pollinator groups (hoverflies, bees and butterflies) were surveyed at 24 sites in northern Serbia in May, June and July during the year 2023. The transects (250m long, 2m wide) were conducted along the verges of two types of roads within areas dominated by either agriculture or semi-natural habitats. During the transect walk, a greater number of pollinator species was recorded in semi-natural areas compared to agricultural areas. Lower pollinator diversity and abundance was detected in verges next to the large busy roads within agricultural areas, compared to smaller roads within semi-natural areas. Among 19 recorded hoverfly genera (30 species), *Eristalis* Latreille, 1804, *Sphaerophoria* Le Peletier & Serville, 1828 and *Episyrphus* Matsumura & Adachi, 1917 were represented with most specimens. In order to quantify the direct traffic-related insect mortality, the method of car-mounted sticky traps placed under the car plate was used, by driving 1.25 km (in both directions) at a fixed speed along the roads adjacent to transects. A total of 476 insect specimens were documented on sticky traps, only 12 pollinators of which four hoverflies (all *Eupeodes corollae* (Fabricius, 1794)), two butterflies and six bees. No disparity was observed in the number of insects caught in relation to traffic volume across surveyed sites, potentially suggesting that traffic does not significantly impact the mortality of hoverflies and other pollinators.

Keywords: hoverflies, bees, butterflies, traffic, local land use

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Good news! *Syritta pipiens* and *Myathropa florea* maintain high genetic connectivity across heavily urbanized areas

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Hoverflies (Syrphidae) play a crucial role as pollinators, and their significant decline poses a serious threat to both plant diversity and agricultural productivity. However, our understanding of hoverflies' dispersal abilities in urban environments is limited, which hampers our grasp of the spatiotemporal dynamics of plant-pollinator systems and diminishes our capacity to conserve biodiversity in the face of global change. Previous research has not explored how urbanization impacts the functional connectivity of hoverflies or whether dispersal influences their population dynamics. In this study, we investigated the spatial genetic structure of two nonmigratory hoverfly species in two urban areas of Western Europe. In 2021, we collected over a thousand specimens each of *Syritta pipiens* and *Myathropa florea* through hand netting in urbanized study areas totaling 490 km^2 and 460 km^2, respectively. We genotyped these specimens at 14 and 24 microsatellite loci, respectively, and analyzed them using spatial and nonspatial Bayesian clustering methods. Our results did not reject the null hypothesis of panmixia, indicating that both species exhibited substantial genetic connectivity despite urbanization. Allele frequencies showed no correlation with geographic distance, suggesting that isolation-by-distance was negligible at the spatial scale studied. Although human-induced changes to land cover typically have profound effects on biodiversity, these hoverfly species maintain robust connectivity, implying that dispersal may not significantly constrain their metapopulation dynamics in urban settings. Nonetheless, the large effective population size complicates confidently assessing landscape impacts on gene flow for these species. Ensuring habitat preservation or restoration could facilitate rapid recolonization, even within urban areas.

Keywords: Diptera, flower flies, landscape genetics, spatial ecology, urbanization

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