Ecological-economic importance of saproxylic hoverflies:

assessing pollination potential in old forests in Serbia

Markov Ristić* Z[1]., Vujanović D[2]., Popov S[1]., Veličković A[1]., Mudri-Stojnić S[1]., Vujić A[1].

[1]University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology, Trg Dositeja Obradovića 2, Novi Sad 21000, Serbia [2]Biosense Institute - Research Institute for Information Technologies in Biosystems, Dr Zorana Đinđića 1, 21000 Novi Sad, Serbia

*zlata.markov@dbe.uns.ac.rs

INTRODUCTION

- Saproxylic hoverflies (Diptera: Syrphidae) are associated with old trees, tree hollows, and dead wood, and are widely recognized as indicators of forest continuity and habitat quality.
- While their conservation relevance is well known, the pollination role of adults remains understudied.
- This limits our understanding of their broader functional value, including their contribution to pollination-related ecosystem services supported by old-forest natural capital.

AIM

This study aimed to:

- assess the pollination potential proxy (PPP) of saproxylic hoverflies using functional traits,
- identify species that may contribute disproportionately to pollination capacity in old-forest microhabitats

MATERIALS & METHODS

- 81 saproxylic hoverfly species were compiled from published records for Serbia
- 5 species were excluded due to missing trait data
- Final dataset: 76 species
- Functional traits used: body size, vestiture, phenology, flower visits, mobility
- Trait data source: Species Accounts of European Syrphidae (Speight, 2024)
- A composite Pollination Potential Proxy (PPP) was calculated for each species
- Three weighting scenarios were compared: balanced (M1 – an equal weight model), interaction-focused assigning greater importance to ecological traits (M2), and morphology-focused assigning greater importance to biological traits (M3)
- Ranking robustness was assessed using Spearman correlation and Top-10 overlap
- Species were grouped into low, medium, and high PPP clusters

ANALYTICAL WORKFLOW

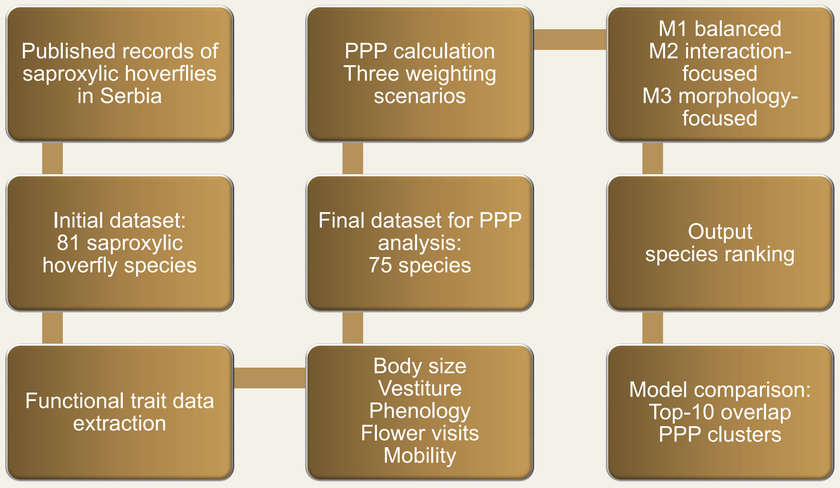




Photo: Zlata Markov Ristić

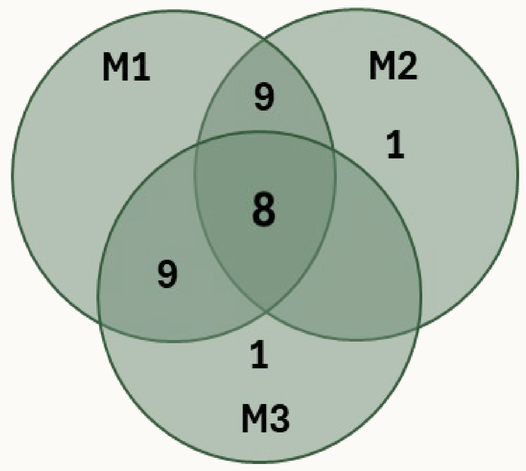
RESULTS

Model agreement (Spearman's ρ)

	M1	M2	M3
M1		0.981	0.974
M2	0.981		0.926
M3	0.974	0.926	

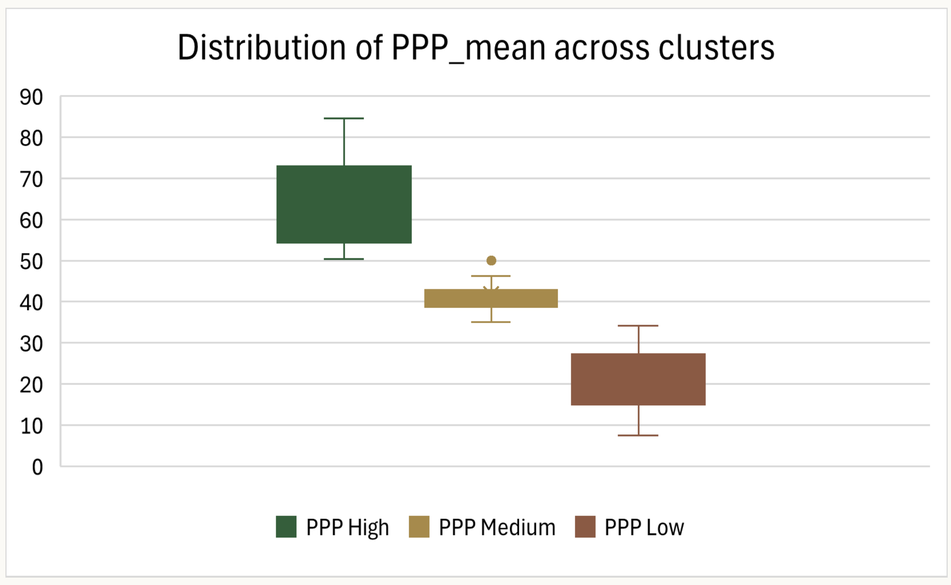
- Species rankings were highly consistent across alternative weighting scenarios.
- All three PPP models produced highly concordant species rankings.
- Spearman's rank correlation coefficients exceeded 0.9 in all pairwise model comparisons, indicating strong ranking stability.

Top-10 overlap among models



Overlap analysis showed that a stable set of species was consistently retained among the highest-ranked taxa across models. Eight species were shared by all three Top-10 lists.

PPP by cluster



- Species formed three functionally distinct groups with low, medium, and high estimated pollination potential, indicating functional heterogeneity within the saproxylic hoverfly fauna.

Core top-ranked species

- *Brachypalpus chrysites*
- *Brachypalpus valgus*
- *Callicera aurata*
- *Caliprobola speciosa*
- *Criorhina ranunculi*
- *Matsumyia berberina*
- *Myathropa florea*
- *Xylota segnis*

ECOLOGICAL-ECONOMIC PERSPECTIVE

Veteran trees, tree related microhabitats, and dead wood can be viewed as **natural capital** and **ecological infrastructure** of old forests. These structures support not only biodiversity, but also functional hoverfly diversity linked to pollination. Their conservation therefore carries **insurance value** and **option value** for the long-term maintenance of pollination functions.

DISCUSSON & CONCLUSIONS

- Saproxylic hoverflies represent a **functionally heterogeneous** pollinator group
- Species rankings were **highly stable** across alternative weighting scenarios
- A stable set of **core top-ranked species** was identified across all models
- Old-forest microhabitats support taxa with distinct pollination-potential profiles
- From an ecological-economic perspective, veteran trees and saproxylic microhabitats represent natural capital supporting pollinator functional diversity and long-term pollination capacity.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grants No. 451-03-33/2026-03/200125 and 451-03-34/2026-03/200125).