Peer Community In Zoology

A comparative study of flight performance and the factors affecting the flight behaviour of oak-associated Agrilinae (Coleoptera: Buprestidae)

Pedro Abellan *based on peer reviews by 2 anonymous reviewers*

Elodie Le Souchu, Aurélien Sallé, Stéphanie Bankhead-Dronnet, Mathieu Laparie, Daniel Sauvard (2024) Intra- and interspecific variations in flight performance of oak-associated Agrilinae (Coleoptera: Buprestidae) using computerised flight mills. bioRxiv, ver. 2, peer-reviewed and recommended by Peer Community in Zoology.
https://doi.org/10.1101/2024.07.01.601558

Submitted: 09 July 2024, Recommended: 13 December 2024

Cite this recommendation as:
Abellan, P. (2024) A comparative study of flight performance and the factors affecting the flight behaviour of oak-associated Agrilinae (Coleoptera: Buprestidae). *Peer Community in Zoology*, 100354. 10.24072/pci.zool.100354

Published: 13 December 2024

Some insects are known to be phytosanitary threats on a wide diversity of plants and can have important economic and ecological impacts in their native area. This is the case of some species within the jewel beetle subfamily Agrilinae (Coleoptera: Buprestidae), which are associated with broadleaf forest declines and diebacks (Jendek & Poláková, 2014). These thermophilous borers are expected to be favoured by climate change and the global deterioration of forest health, and ultimately expand their range and damage.

Active flight plays a crucial role in the life strategies of most insects, facilitating essential activities such as mate searching, locating trophic resources, finding favorable environmental conditions, and dispersing to or colonizing new geographic areas (Dudley, 2002). Studying flight capacities provides valuable insights into the ecology of these species and helps estimate their ability to spread within new environments. Assessing the flight capacities of pest and alien species is therefore critical for evaluating their dispersal potential and for designing effective monitoring and control strategies.

The study by Le Souchu et al. (2024) aimed to assess intra- and interspecific variability in active flight of several Agrilinae species and to evaluate the effects of sex and mass on this variability. Using computerised flight mills, they assessed the flight performance of twelve species, most of them associated with oaks. A key feature of the study is the extensive dataset used, which reveals significant variability in flight distance and capacity among species and individuals. Body mass positively influenced flight capacity in some species, while

no sexual dimorphism was observed. The findings suggest a generally low average dispersal propensity within these species and highlight the critical role of rare, exceptional individuals in driving colonization and spread patterns at both population and species levels.

Overall, the study provides a valuable comparative analysis of flight behavior and performance in several Agrilinae species associated with oak forests. Because flight behaviour and performance of these insects are poorly known despite their critical role in dispersal inside and outside native ranges and their relevance for management purposes, this study contributes to filling this gap. From a broader perspective, the findings revealed several common traits among the studied species and provide insights into the influence of different factors on flight activity.

References:

Dudley, R. (2002) The biomechanics of insect flight: form, function, evolution. Princeton University Press, Princeton, N.J. https://doi.org/10.1515/9780691186344

Jendek, E., Poláková, J. (2014) Host Plants of World Agrilus (Coleoptera, Buprestidae). Springer International Publishing, Cham. https://doi.org/10.1007/978-3-319-08410-7

Le Souchu, E., Sallé, A., Bankhead-Dronnet, S., Laparie, M., Sauvard, S. (2024) Intra- and interspecific variations in flight performance of oak-associated Agrilinae (Coleoptera: Buprestidae) using computerised flight mills . bioRxiv, ver.2 peer-reviewed and recommended by PCI Zoology https://doi.org/10.1101/2024.07.01.601558

Reviews

Evaluation round #1

DOI or URL of the preprint: https://doi.org/10.1101/2024.07.01.601558
Version of the preprint: 1

Authors' reply, 05 December 2024

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Decision by Pedro Abellan, posted 19 September 2024, validated 19 September 2024

Dear authors

First of all, I would like to apologize for the extended wait in reaching an editorial decision on your manuscript. One of the reviewers who agreed to assess the preprint requested an extended deadline of six weeks. Unfortunately, this period has now expired, and their review has not been completed, resulting in an unnecessary delay in the handling process.

This manuscript has been reviewed by two experts. Both the reviewers, see great value in this manuscrip. However, they raised concerns about the methodology and the interpretation of the results. The weaknesses of the study should also be better highlighted. Please revise your manuscript accordingly to take advantage of these supportive reviews considering all issues mentioned in the reviewers' comments carefully: please outline every change made in response to their comments and provide suitable rebuttals for any comments not addressed. Please note that your revised submission may need to be re-reviewed.

Looking forward to your revision.

Kind regards,
Pedro Abellan

Reviewed by anonymous reviewer 1, 23 August 2024

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Reviewed by anonymous reviewer 2, 22 August 2024

This study presents comprehensive data on the flight behavior of Agrilinae beetles. I was particularly impressed by the extensive dataset, which has significant value for pest management. The methods are scientifically sound. Introduction is easy to follow as well and no need to be revised. However, the manuscript contains some redundancy and is difficult to follow especially Results and Discussion part. I recommend reconsidering the presentation and summary of the results. My specific comments are as follows:

Tables and Figures: I believe that Table 2, which highlights the main findings, is essential. However, Figures 2-8 include a lot of unnecessary information. I suggest removing these figures or moving them to the Supplementary Materials unless they are crucial for discussing key aspects of beetle biology and management. For instance, is the latency to the first flight bout depicted in Fig. 2 critical? If so, please clarify its importance. Fig. 3 is quite difficult to read, and its relevance to the discussion is unclear. Fig. 4 either needs revision or should be removed. What key message are you trying to convey here? Consider focusing on biologically significant correlations and using scatterplots to represent them. For example, the strong correlations between total flight duration, total flight distance, and the number of flight bouts are fairly obvious and may not need detailed description in main text with figures. The sentences in lines 495-497 are unclear. I don't understand the logical connection between "the high correlation between the number of flight bouts and total distance flown" and "spreading by performing a series of short flights". I suggest emphasizing the importance of repeated short flight bouts leading to long distances covered, rather than the correlation between the number of flight bouts and total distance flown.

Figure 5: Some results in Fig. 5 are intriguing, but it's unnecessary to display all parameters for each species. Instead, select one or two representative parameters, such as the total flight distance for species with sufficient sample sizes. Scatterplots would be more informative than bar plots in this case.

Figure 6: The results in Fig. 6 should not be described as "Evolution" (line 415) since they reflect intra-generational changes. Consider revising the terminology.

Figures 7 and 8: It would be better to remove these figures unless you can clearly articulate their relevance to the discussion.

Additional Comment:
The sentences in lines 466-468 appear to rely on the outdated concept of "naïve group selection" (e.g., traits evolve for the benefit of the species). I recommend revising or removing these sentences to align with current evolutionary theory.

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