**Responses to Reviewers’ Comments**

**Reference number**: 24-0020-EEN

**Title of article**: Free ride without raising a thumb: A citizen science project reveals the pattern of active ant hitchhiking on vehicles and its ecological implications

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Dear Dr. XXX,

Thank you for inviting us to submit a revised version of the manuscript. We greatly appreciate the valuable comments and feedback from you and the reviewers. We have carefully considered each comment and incorporated most suggestions. In particular, we have made the following major changes:

* Corrected the citation format issue and added several recent articles to the manuscript to better reflect the current status of IGP research.

Please also see the following section for our detailed point-by-point responses. All line numbers refer to the changes we made in the revised manuscript. We believe that the revisions based on the review comments have improved the quality of this manuscript, and we hope that the manuscript is now suitable for publication in *Ecological Entomology*.

Sincerely,

XXX

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**Editor's comments**  
  
**Comment 1** > The manuscript "Free ride without raising a thumb: A citizen science project reveals the pattern of active ant hitchhiking on vehicles and its ecological implications" takes an interesting approach to looking into ant dispersal and possibly invasion biology. I think that with the revisions suggested by the reviewers, it will be a great short communication for the *Ecological Entomology* readers.

**Response** > Thanks for the positive feedback on this manuscript. We have made our greatest effort to incorporate the suggestions from the reviewers.

**Reviewer 1's comments**

**Comment 1** > The study of ant hitchhiking is novel and provides a unique angle to look into how human activity changes ant behavior, potentially affecting the ecology.  The manuscript could provide more information: 1) Are the hitchhiking species also presented in the destination area? 2) Is there any food in the vehicles (If not, it can rule out the possibility of foraging rather than migration)? 3) How do we know if the ant is hitchhiking rather than relocating the nest? In that case, is there any evidence showing the ants would leave the vehicles after arriving at the destinations?

**Response** > Thanks for the suggestions. Below we address the three questions raised:

1. Are the hitchhiking species also presented in the destination area?

We do not have distribution data for all hitchhiking species. However, the most frequent hitchhiker, the invasive black cocoa ant (*Dolichoderus thoracicus*), are currently distributed in central Taiwan (where the hitchhiking events of this species mostly took place) but not at the destination areas. We have added this information to the discussion section (Line XXX).

1. Is there any food in the vehicles (If not, it can rule out the possibility of foraging rather than migration)?

In most cases, there was no food present in or on the vehicles. We have added this information in the discussion section (Line XXX).

1. How do we know if the ant is hitchhiking rather than relocating the nest? In that case, is there any evidence showing the ants would leave the vehicles after arriving at the destinations?

As we mentioned in the manuscript, most vehicle owners would attempt to remove the ants before departing, and therefore we did not have direct evidence showing that the ants would leave the vehicles after arriving at the destinations. However, we think this is likely to happen if the environmental conditions were suitable at the destinations. Moreover, the more such dispersal events, the higher the probability that the ants would successfully disperse and colonize the new area. We have revised the discussion section to clafiry this (Line XXX).

**Reviewer 2's comments**

**Comment 1** >

**Response** >

Reviewer: 2  
  
Comments to the Author  
In this study, the authors collected self-reported social media data on the presence of ants in cars and scooters, as well as the intended distance of the next destination of the vehicle, the length of time the vehicle was parked, and the enviromental conditions and season. They received 52 reports, of which 3 included a report of a queen, and 8 (potentially overlapping the previous 3) included brood. They conclude that vehicles have the potential to spread ants even without the transport of nesting substrate (i.e. soil, plant matter).  
  
This study asks a sensible question which is interesting to invasion biologists. However, it is also very small, and some critical information is missing. Most importantly, we do not know what the sampling effort was like, so we cannot estimate in any way the scale of the issue raised. Is hitchhiking common? My guess would be yes, because the chances of people becoming aware of the facebook group are low, so the overlap of those people and people who note an ant infestation should be even lower. Perhaps some sort of discussion of how common this behaviour is would be useful.

> Add a few sentences to say that we attempted to collect as many cases as possible, but this might represent only a fraction of the actual cases because not all owners are aware of this behavior, and even if they do notice, only a small proportion of them will post the information or report it to our Facebook group. Although we did not have systematic survey (e.g., via questionnaires), we were able to recorded 52 cases over the five year period, so we believe that this phenomenon should be relatively common.  
  
The definitions are not quite clear: are ALL events of ants on vehicles noted - including just some workers walking around outside or inside the vehicle? Or are only situations considered where it looks like ants are moving in: many individuals grouped together in a small gap or hidden space? This needs clarifying, as I do not think a forager or two walking on the surface of a car is ecologically interesting, while the presence of brood and queens certainly is. I think occasions of a few workers on the outside of the car should not be included in the dataset.

> We inspected the photos provided by the vehicle owners and and only cases where there were groups of ants were considered as “hitchhiking”. We have clarify this in the methods section (Line XXX).  
  
The finding that most of these hitchhiking events occurred under trees, especially in contact with trees, is very useful, as is the seasonal data. This could lead to clear guidelines about parking cars, for example when they are stored en-masse for later transport, or of rental cars. With that said, it seems unlikely that the vast majority of people will be willing or able to change their behaviour based on such guidelines.

> We provided evidence for what factors may increase the porbability of hitchhiking, and suggestions, and this information may be used to provide parking guidelines for the owners. The focus of this study is not to implement such guidelines, but this will be the next step for the management.  
  
Useful would be some sort of information about where in the car the ants were found – especially the incidence with queens or brood.

> Mostly on the surface of the car.  
  
Finally, I am not quite sure how relevant the work is to the journal Ecological Entomology. This work seems to belong more in a specialist invasion biology journal. But this is an issue for the editor.  
  
Overall, this work provides a nice proof of principle that cars can act as a dispersal mechanism for ants. As such, I think it is a worthwhile piece of work and should be published. Whether this journal is the right venue for it, is not quite clear.

> Thanks for the positive comments.  
  
I will end with some minor comments.  
  
Abstract – please mention specifically how many of the incidents involved queen or brood  
Line 54 pg 3 – this is not systematic data collection.  
Line 54 pg 3 – this is not metadata. It is data. Metadata is essentially the description of what the different data categories are.  
Line 31 pg 4 – did the 8 incidents of brood include the 3 incidents of queens?