

Final Evaluation Report

Your Details	
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Project Title	Effects of agricultural intensification on open-country bird populations: implications for land-use management
Application ID	33376-1
Grant Amount	£6000
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Date of this Report	Feb 2022

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To provide data on the diversity of the open-country species and their habitat associations in the central plains of Thailand				Bird diversity data were collected at 1,413 sample points throughout the central plains of Thailand. 239 species were recorded, comprising 167 land bird and 72 waterbird species; 25 land bird species and 10 waterbird species were of conservation concern according to IUCN (globally) and the Thai Office of Natural Resources and Environmental Policy and Planning (ONEP) (nationally). As we are still working on the statistical analysis section, we are in the process of understanding their habitat associations.
To assess the scale of potential threats of agricultural netting, and identify the bird species impacted by nets and other similar preventive measures in the central plains of Thailand				Based on 1,312 road-survey transects (2 km length × 0.4 km width) in paddy fields and agriculture landscapes, we found 1,881 nets and barriers of parallel cords on 196 (15%) of the transects, with substantially (and significantly) more observed in aquaculture ponds. Vertical nets were the most commonly observed type overall (n=1,299). We documented 735 individuals of at least 45 bird species caught in nets and parallel cords, including many species not regarded as pests.
We proposed training of government officers in relevant government departments and establishing an outreach programme to promote awareness of threats from agricultural practices harmful for open-country birds (e.g., bird-exclusion netting) and how farmers				Due to Covid-19, we have not yet undertaken the outreach programme onsite, but we have presented information at an international conference (1 st Asian Ornithology Conference) and submitted one manuscript for publication in a peer-reviewed international journal (Conservation Science and Practice). Also, we are going to have a virtual meeting to

Objective	Not achieved	Partially achieved	Fully achieved	Comments
could benefit from having more bird-friendly farms (i.e., pest control, eco-tourism).				<p>present data to government organisations and non-government organisations (i.e., Bird Conservation Society of Thailand) to propose more bird-friendly policies, particularly pushing for restrictions on the use of agricultural netting.</p> <p>As soon as clearer Covid management strategies are enacted, we will run at least one outreach activity, specifically in the location where we observed a relatively large number of species of conservation concern and a large amount of agricultural netting to raise awareness of the collateral damage from agricultural netting on open-country birds.</p>

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

- Conducting research in non-forest habitats is difficult because many sites are on private lands and therefore often inaccessible. However, talking with local farmers to explain briefly about our project objectives they would often allow us to do the bird surveys surrounding their lands. At the same time, this was an opportunity for us to understand the local context/local perspectives on the perceived threats from birds and the use of nets and other barriers and use that information to propose more practical management solutions.
- Creating the shortest and fastest travel routes to multiple destinations (survey points) to conduct the surveys covering a large area (~100–200 km/day) was a bit difficult, but the benefit of many smartphone applications nowadays such as Google maps (including satellite images and google street view in the app) did help us a lot.

3. Briefly describe the three most important outcomes of your project.

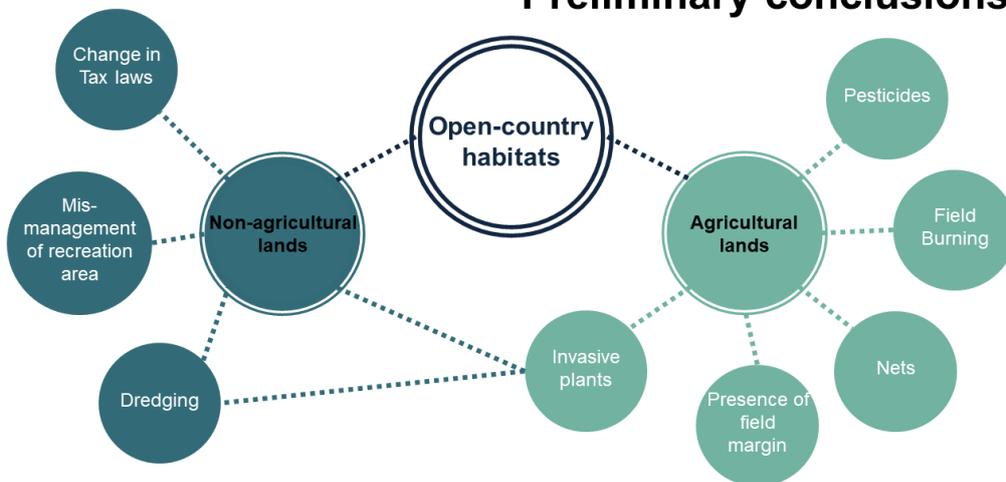
- We contributed a large dataset of open-country bird surveys derived from 1,413 survey points which were distributed throughout the central plains of Thailand (covering an area of ~56,100 km²); areas recognised as an Important Bird and Biodiversity Area (IBA) by BirdLife international. Furthermore, during these surveys we found many new, unreported sites of several species of global conservation concern including the vulnerable

Manchurian reed warbler *Acrocephalus tangorum* and the critically endangered, yellow-breasted bunting *Emberiza aureola*.

- As the analyses regarding the effects of agricultural intensification on open-country bird populations have not yet been completed, our preliminary conclusions here were based on our field experience and observations. The areas with high numbers of species of conservation concern were either large continuous patches composed of extensive heterogeneous, natural reedbeds, or paddy fields with a relatively large amount of semi-natural habitat in the field margins.

Open-country habitats in our study area can be separated into two main types, agricultural and non-agricultural lands. The main issues regarding bird diversity loss in agricultural lands are likely to be mostly attributed to rice intensification (including, pesticides used and field burning), agricultural netting by farmers against birds presumed to be agricultural pests, presence of field margins, and invasive plants. Within the non-agricultural lands, changes in tax laws (highest tax rate charged for “unused or abandoned” lands such as grasslands, reedbeds, and scrublands), mismanagement of recreation areas (paved riverbanks with concrete and plant many exotic flowering plants) and dredging (clear all natural reedbed habitats) were suggested to be the key factors associated with species occurrence.

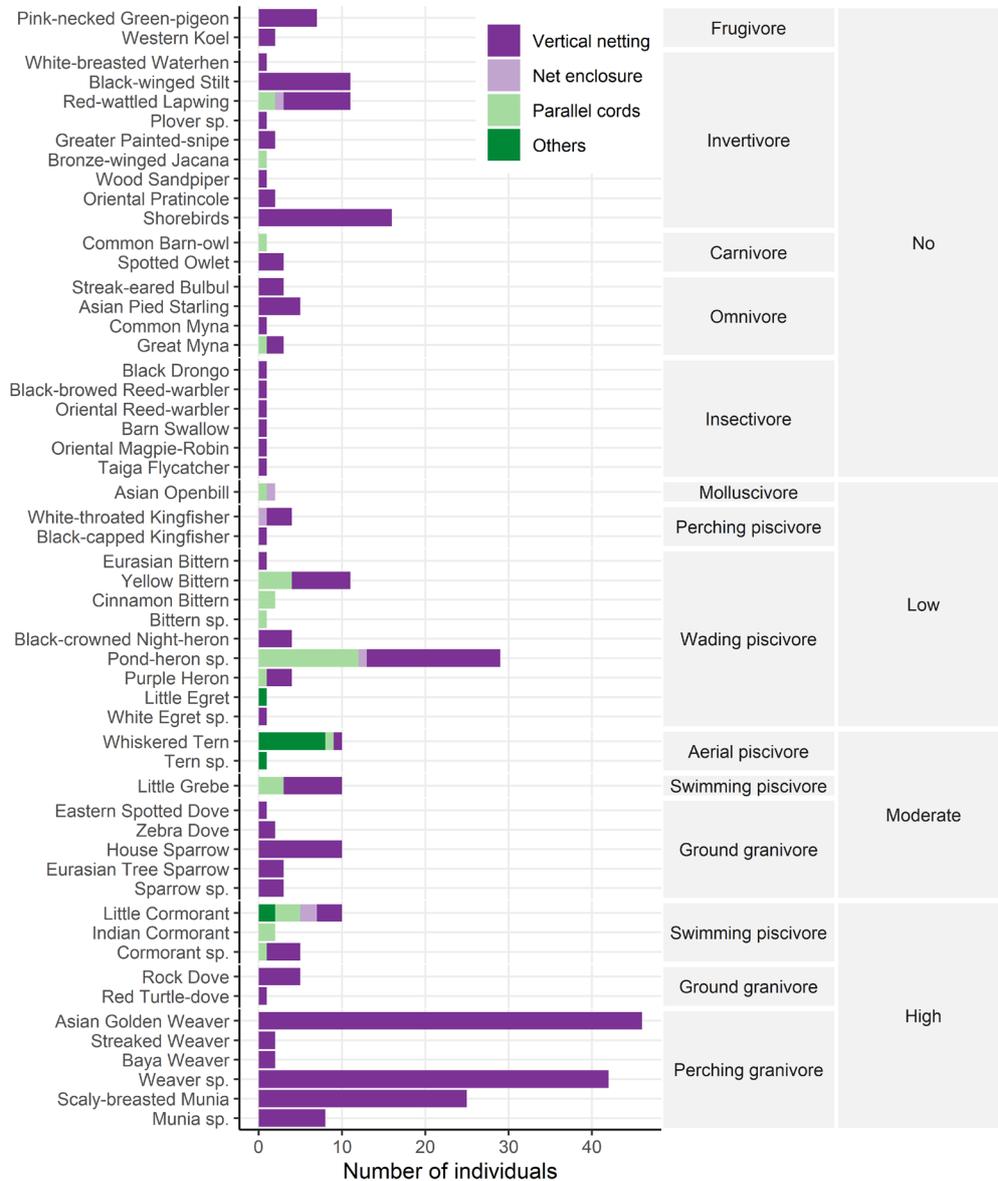
Preliminary conclusions



Flowchart of our preliminary conclusions regarding open-country bird conservation

- While netting has long been used to catch birds for multiple purposes (e.g., trapping for consumption, protecting crops/fish stocks), we provide one of the first assessments of the effects of netting for protection of agricultural products in Asia on wild birds. Nets provide a physical separation (albeit an often fatal method for birds) of the agricultural resource and the pest species, which is one form of mitigation for this human-wildlife conflict. However, our assessment suggests that the current approach is detrimental to non-target species, especially in aquaculture ponds and many species were non-

targeted bycatch, while at the same nets are not particularly effective at protecting the agricultural products and are relatively expensive.



List of species and number of individual birds entangled in different gear types found in the central plains of Thailand. Species were grouped into their specific feeding guilds and perceived pest level to crops/stocks based on interviews with local people (high, moderate, low, and no). Only individual birds/carcasses identified to species, genus, or group (e.g., shorebirds) were plotted.

4. What do you consider to be the most significant achievement of this work?

Open-country bird species are in steep decline worldwide but data from Southeast Asia and Thailand are still lacking, one important outcome from our research is a set of data that could help us to understand the status of current populations as well as factors that could affect their future population trends. We believe that we have fully achieved our results objectives regarding the extent and levels of agricultural

netting impacts on birds in the central plains of Thailand. We presented our findings at the Asian Ornithology conference (visit official website: <http://www.chinabird.org/xhhyjkb/2021-03-04/1103.html>), many researchers were interested in this topic, and informed us that this problem also still exists in their countries (mostly in Southeast Asia).

Impact of agricultural netting on open-country bird populations in the central plains of Thailand

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Background

Nets are used across a wide variety of agricultural landscapes to control perceived avian pests, but netting impacts remain mostly unquantified, particularly in rice fields. Here we examined the scale of agricultural netting impacts on bird populations in the central plains of Thailand, a region dominated by rice fields with aquaculture ponds often interspersed.

Methods

Net and other potentially harmful deterrents (vertical nets, cord nets, net enclosures, and other types), number of individual birds, and species caught were recorded using 1,312 road-survey transects (2-km length × 0.4-km width).

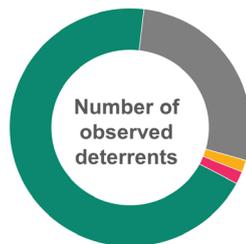


Results

We found 1,881 nets on 196 of the survey transects (including nets comprised of only horizontal parallel cords). The highest net counts were from aquaculture ponds ($n=1,735$) followed by rice fields ($n=128$) and other habitats (i.e., cropland, human settlement areas, reedbeds; $n=18$) respectively. The number of observed nets was significantly different from expected based on land-use area proportions, with the number set in aquaculture ponds ~13 times higher than expected.



- Vertical nets were the most commonly observed net type overall ($n=1,299$).



- Among aquaculture ponds, the number of birds caught in vertical nets was significantly higher relative to those caught in the cord nets.
- Within the vertical nets, the number of entangled birds in rice fields was significantly higher than those in aquaculture ponds.

735 individual birds found caught, at least 45 species were identified; most were caught in vertical nets

- Although considered as a significant pest by farmers, the globally near-threatened Asian Golden Weaver (*Ploceus hypoxanthus*) was the most frequently recorded victim

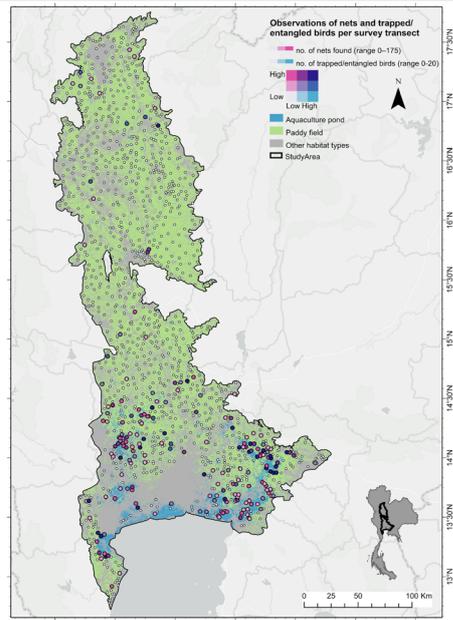


Figure: Numbers of nets and entangled birds observed from each survey transect throughout the central plains of Thailand.

Conclusion

- We suggest that these nettings haphazardly trap a wide range of species with roughly 20% of individuals caught in paddy fields and 95% at aquaculture ponds being non-target bycatch.
- Furthermore, although not observed in nets during our study, at least 15 other species of global concern, including highly localized populations of globally critically endangered Yellow-breasted bunting (*Emberiza aureola*), are likely at risk.
- Raising awareness of agricultural netting impacts on birds as well as the problem of easy availability of nets is vital for reducing this threat. However, netting appears to be fairly localized suggesting that targeted outreach to farmers in selected regions may also help reduce this problem.
- Further studies should investigate the efficacy of less deleterious, but low-cost deterrents practical for farmers.

Acknowledgements

We are grateful to W. Limparungpatthanakij for his outstanding efforts in fieldwork and insight sharing. Thanks for D. Ngprasert, P.D. Round, and L.A. Powell for comments and suggestions on the project ideas and analysis, and M. Gore for reviewing the interview methodology. This research was supported by the Rufford Foundation. Financial support for RA provided by King Mongkut's Petchra Pra Jom Klao Ph.D. Research Scholarship.

Ongoing data collection

Data on observations of birds being trapped in nets is currently being collected as part of our ongoing study: <https://www.naturalist.org/projects/netting-trapping>



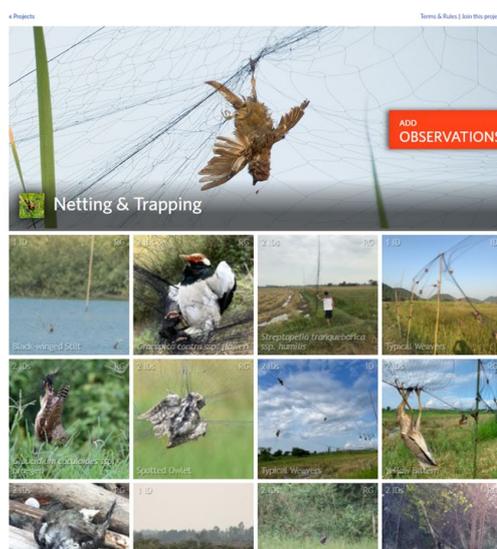
Poster that we prepared for the 1st Asian Ornithology Conference 2021.

5. Briefly describe the involvement of local communities and how they have benefited from the project.

In addition to bird and net surveys, we have collected interviews with local farmers to understand their perspectives on potential threats of land use change, nets, and agricultural intensification on the open-country birds. During the interviews, we also had a chance to exchange our knowledge regarding important bird species found in their areas and important ecosystem services beneficial to farmers provided by birds. Moreover, further outreach activities with local communities are planned once data is analysed; without the involvement of local communities in changing their behaviour regarding using agricultural netting and agricultural practices, the conservation of birds that live in these landscapes (mostly outside protected areas) would not be successful.

6. Are there any plans to continue this work?

- We are continuing our data analysis which will include habitat data (both local and landscape scales), rice intensification levels, and insect biomass and diversity (which could be related to levels of pesticide used) in bird density and population estimation models.
- We have created an online project in iNaturalist.org (<https://www.inaturalist.org/projects/netting-trapping>) to continue collecting observations of dead, injured, and entangled animals due to netting, trapping, or other deterrents. The more data we can gather, the more likely we can provide policymakers clear recommendations for mitigating these problems for both the livelihoods of people and wildlife conservation. We hope that this project may help us to sort out the extent and impact of this conservation problem at both local and landscape levels.



Click here



<https://www.inaturalist.org/projects/netting-trapping>

- We would like to apply for a 2nd Rufford Small Grant to continue research on open-country birds in other areas in Thailand to have adequate data for

conserving these birds.

7. How do you plan to share the results of your work with others?

- All bird observations are now available online in the eBird website; and after we fully complete the project, we will publish our data online in an open science database.
- We have already presented a part of the research regarding the impact of agricultural netting on the open-country birds in the 1st Asian Ornithology Conference 2021 [oral presentation; online], entitled "*Impact of agricultural netting on open-country bird populations in the Central Plains of Thailand*".
- We are planning to present our results at two more national and/or international conferences.
- We will publish at least two research articles in international peer-reviewed academic journals, one article has been submitted for publication in the Conservation Science and Practice journal.
- The project final report will be submitted to the organisation directly responsible for conservation and management of wildlife and habitats in Thailand Department of National Parks, Wildlife and Plant Conservation.
- We are planning to present our results to local farmers to raise awareness of agricultural netting impacts on birds.

8. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

The Rufford Small Grant was used to cover expenses from March to July 2021 which was the actual length of the field portion of the project (and some initial analysis). We expect that ~6 more months (until February 2022) are required to fully achieve all project objectives including outreach activities and one more publication preparation which needs further analyses of a big data set of bird records and habitat maps from our 1000+ survey locations.

We think that the outreach activities that we proposed to accomplish in February or March 2022 need to be postponed because of the Covid-19 situation in the country. However, we have already contacted a local conservation group *Pak Pli Raptor Club* (<https://www.facebook.com/PakpliRaptorClub>), which is based in one of our targeted communities, to discuss about the project. When the Covid-19 situation is improved, we will proceed in our outreach activities and send the event overview along with relevant materials to The Rufford Foundation.

9. **Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.**

Item	Budgeted Amount (Rufford)	Actual Amount	Difference	Comments
5% university overhead	300	300		
Accommodation	1000	1237	+237	We need to stay overnight at a hotel nearby survey sites which the prices were sometimes higher than we expected.
Transportation (Car rental and gas)	2720	1294	-1426	The actual transportation cost for the whole project was £2798 which is very close to our proposed budget. But because we started our fieldwork a bit earlier before the grant was transferred, a part of the transportation expenses was covered by the co-funding*
Temporary research assistants	1800	3014	+1214	As we used the budget from the co-funding* which was originally planned for additional research assistants (for map preparation, insect classification, data management) to cover the transportation expenses instead, we then used the remaining budget from this Rufford grant to pay for assistants
Materials	180	154	-26	The cost was slightly lower than expected because outreach activities and onsite presentations/ meetings have not yet taken place due to COVID-19.
Total	6000	6000		The exchange rate when the grant was transferred (03/03/2021, Bank of Thailand daily rate): 1 GBP = 41.80 Thai Baht

* **Budget Note:** Rongrong received co-funding from King Mongkut's University of Technology Thonburi Petchra Pra Jom Klao Ph.D. Research Scholarship. The funds (£3588.52) will be used for materials for education programs and meeting events, temporary staff, and publication fees.

10. Looking ahead, what do you feel are the important next steps?

- Distributing the findings from this project to other conservation bodies (both government and non-governmental organisations) and local communities.
- Collaborating with other conservation organizations in Thailand to establish an open-country bird long-term monitoring program would give us better knowledge to help conservation. As many open-country bird species are relatively easy to detect and identify, encouraging volunteer birders to be involved in data collection will also be useful.

11. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

The Rufford Foundation logo was used in our presentation and poster for the 1st Asian Ornithology Conference 2021 (see above). Rongrong also used the logo in all of her thesis progress presentations. The logo will be included in presentations, booklets, posters, and any other materials that are yet to be developed. We will also acknowledge The Rufford Foundation in every publication derived from this project.

12. Please provide a full list of all the members of your team and briefly what was their role in the project.

Rongrong Angkaew—Lead the project, conducted fieldwork, analysed data, interpreted the results, and wrote the original draft of all publications.

Wich'yanan Limparungpatthanakij—Conducted fieldwork, provided comments on fieldwork plan, and assisted with manuscripts preparation.

George A. Gale, Dusit Ngoprasert, Philip D. Round and Larkin A. Powell—Helped conceptualize the study, provided advice on data analysis, and assisted with manuscripts preparation.

13. Any other comments?

Without the support from The Rufford Foundation, our project would have greatly struggled to find financial support for all the field activities needed. We greatly appreciate the flexibility and opportunity that The Rufford Foundation provides for small conservation initiatives including students and early career researchers.