

TAC meeting #5: 18/04/23

TAC meeting #1: 24/05/21
TAC meeting #2: 6/12/21
TAC meeting #3: 26/04/22
TAC meeting #4: 18/11/22

Project 1: Local scale crop compositional heterogeneity suppresses the abundance of a major lepidopteran pest of cruciferous vegetables (**published in *Basic and Applied Ecology***)

Project 2: Biodiversity benefits from spatial heterogeneity in agricultural landscapes: A meta-analysis (**at final stage of editing after the comments provided by the co-authors**)

Project 3: The effects of invertebrates on ecosystem functions and services (**Almost done with the data collection**)

Project 4: A meta-analysis reveals that dragonflies and damselflies can provide effective biological control of mosquitoes (**a major revision submitted to *Journal of Animal Ecology***)

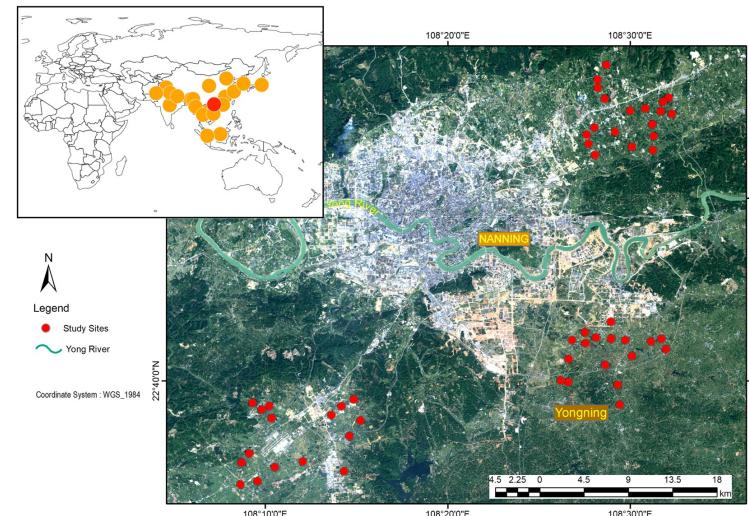
Project 5: The effects of fine scale heterogeneity in urban road verges on butterfly communities (**yet to start**)

Project 1: Local scale crop compositional heterogeneity suppresses the abundance of a major lepidopteran pest of cruciferous vegetables (published in *Basic and Applied Ecology*)



<https://www.youtube.com/watch?v=md5HHmrAiXq&t=3s>

Cruciferous crops (cabbage, oilseed rape, and pak choi)

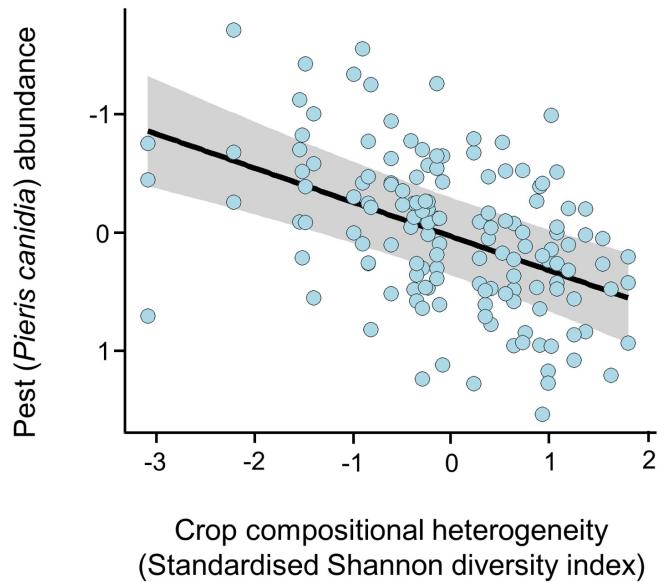
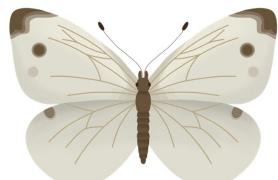


Pieris canidia is a major pest of cruciferous vegetables in Asia (see CABI Invasive Species Compendium [CABI ISC, www.cabi.org/isc/])

<https://doi.org/10.1016/j.baae.2023.03.001> (Priyadarshana et al., 2023)

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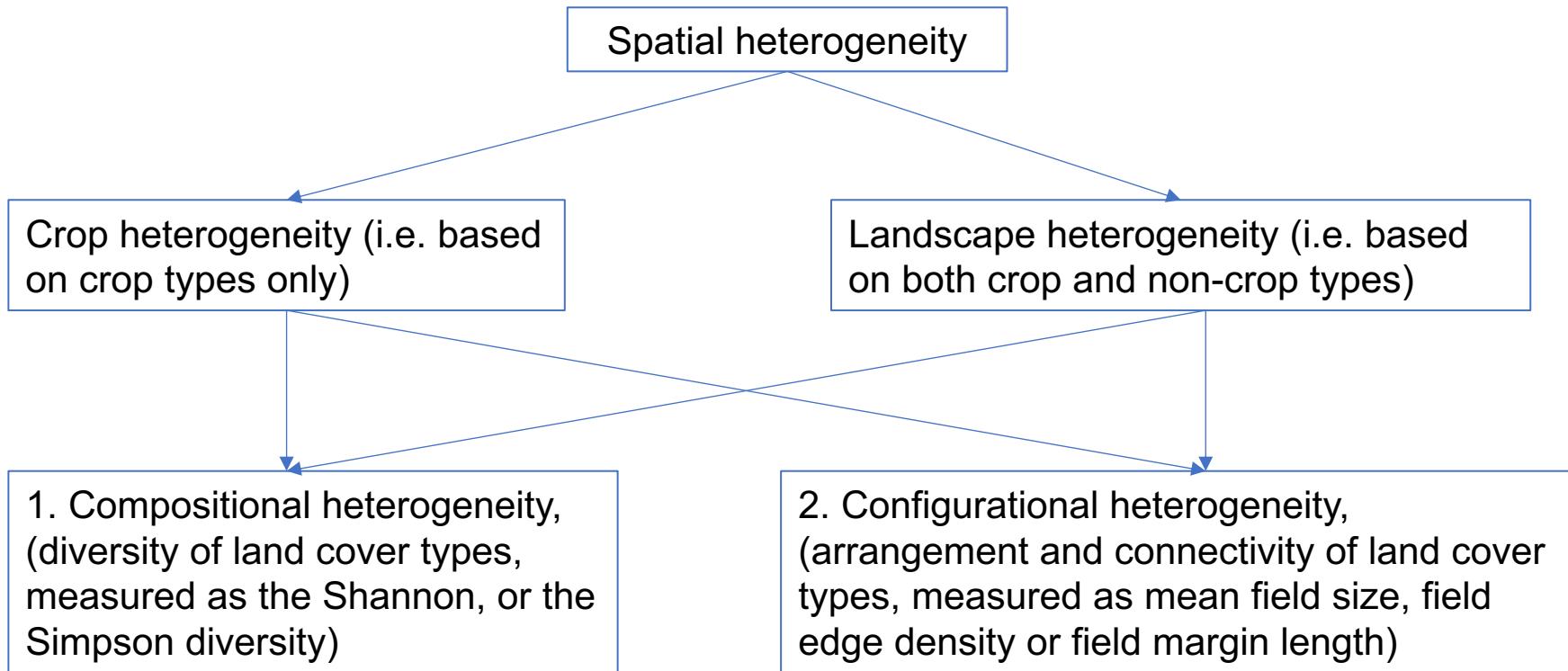
- *P. canidia* abundance decreased with increased crop compositional (i.e. crop diversity) heterogeneity at 100m radius.



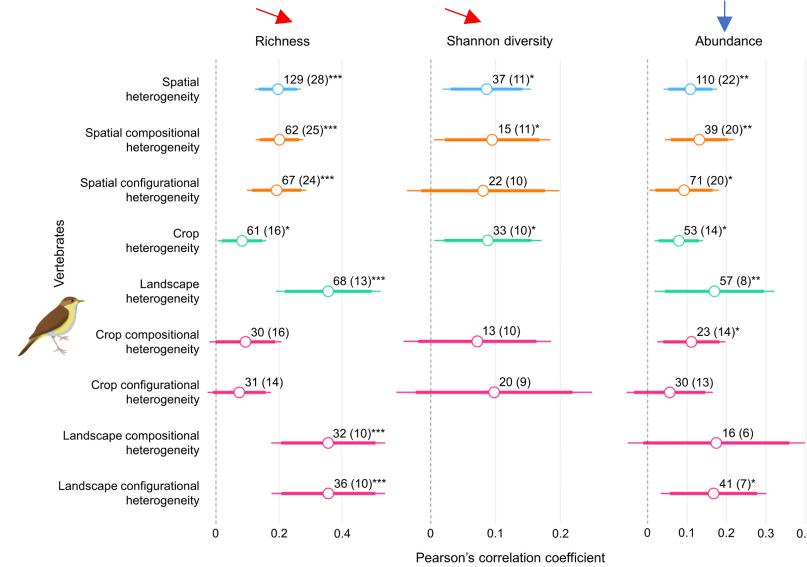
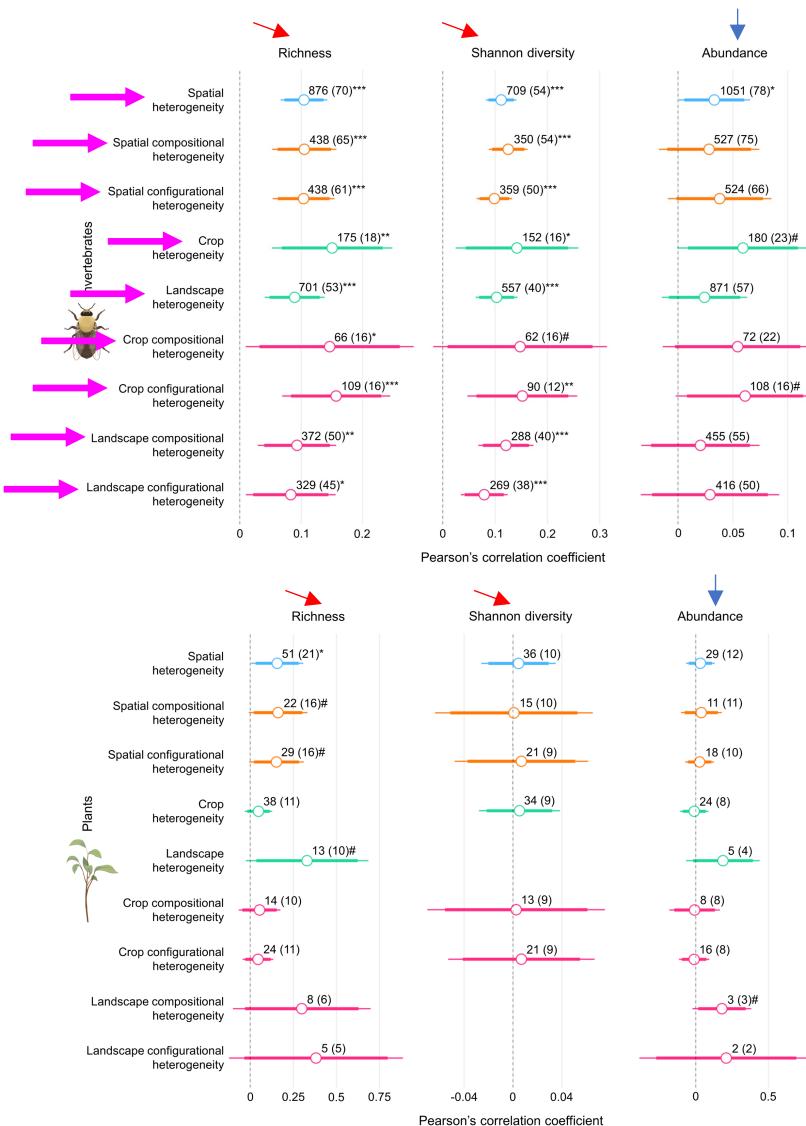
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Project 2: Biodiversity benefits from spatial heterogeneity in agricultural landscapes: A meta-analysis (at final stage of editing after the comments provided by the co-authors)

- 59 studies to 122 (3203 farmlands to 6397 from Asia, Europe, and North and South America)
- 60 major agricultural production regions in 24 countries across
- 30 taxonomic groups that belong to five functional groups



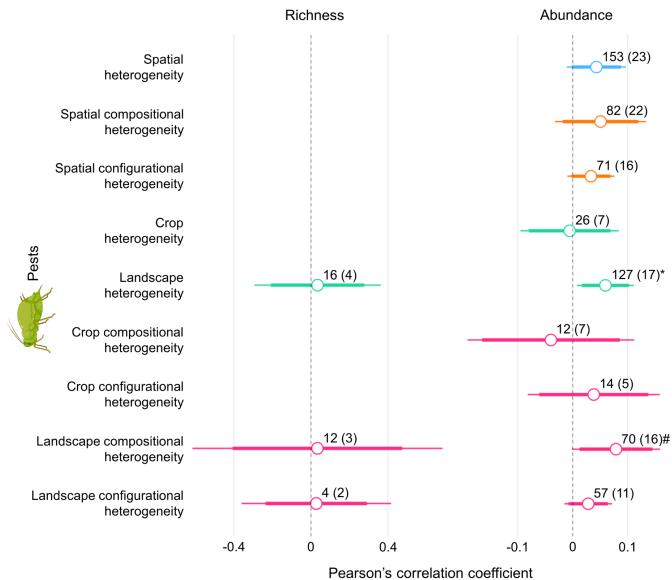
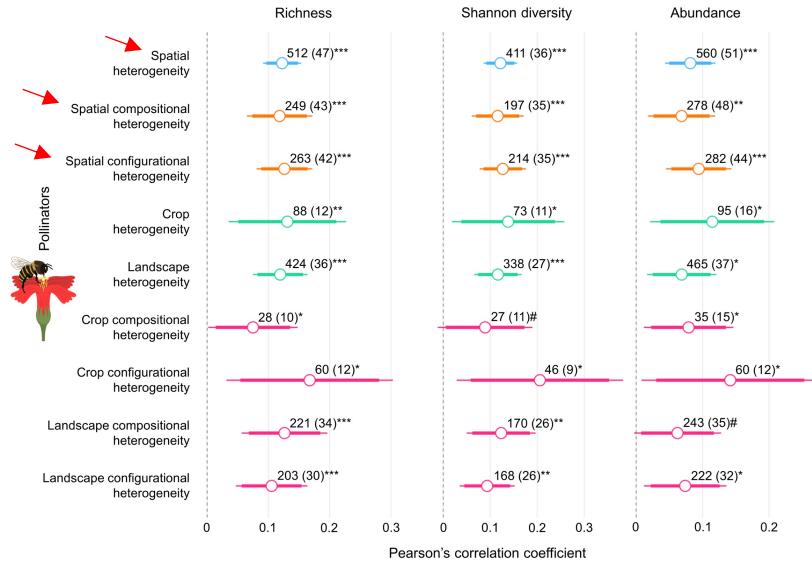
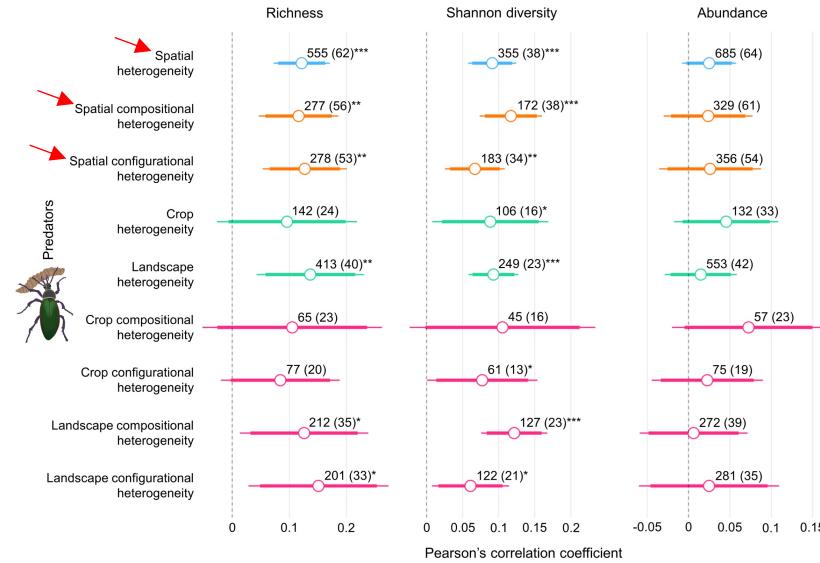
Project 2: Biodiversity benefits from spatial heterogeneity in agricultural landscapes: A meta-analysis (at final stage of editing after the comments provided by the co-authors)



– Positive relationships between crop/landscape heterogeneity and alpha-level biodiversity of vertebrates, invertebrates, and plants

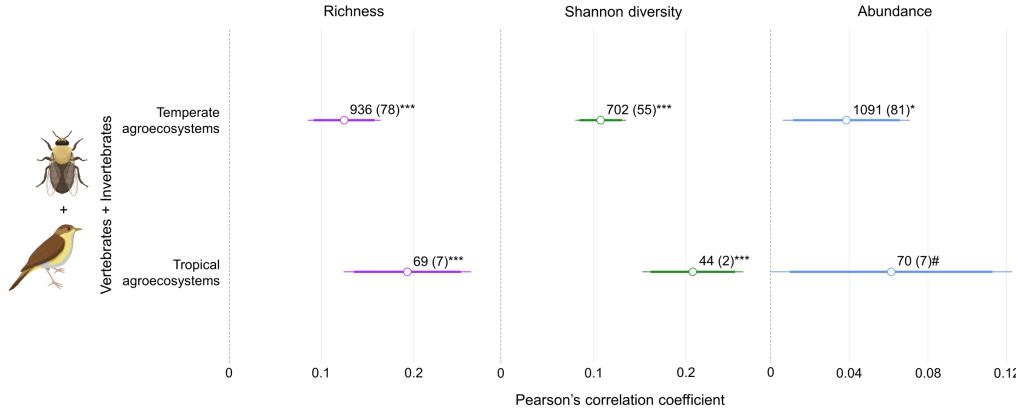
– Limited relationships between crop/landscape heterogeneity metrics and abundance of these groups

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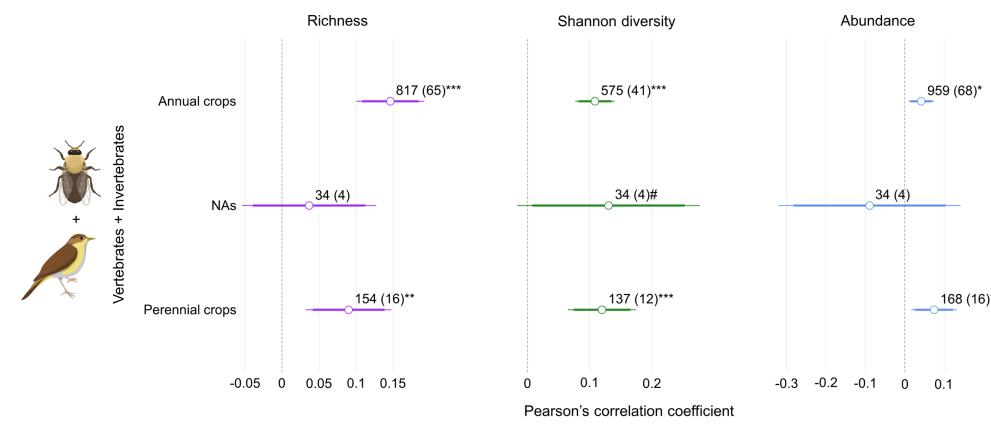


– Increased spatial heterogeneity through both crop and landscape heterogeneity metrics simultaneously provide more benefits for biodiversity

Project 2: Biodiversity benefits from spatial heterogeneity in agricultural landscapes: A meta-analysis (at final stage of editing after the comments provided by the co-authors)



- Similar results were found in both tropical/subtropical and temperate agroecosystems, and in both annual and perineal cropping systems.



- Promoting cover type diversity by incorporating structurally diverse crops and/or semi-natural habitats
- Increasing connectivity between cover types by making smaller crop fields with more field margins/edges

Project 3: The effects of invertebrates on ecosystem functions and services (Almost done with the data collection)

(“fruit set*” OR “seed set*” OR
“yield” OR “pest control*” OR
“biological control**” OR “natural
enem*” OR “decomposition” OR
“breakdown” OR “decay*” OR “mass
loss” OR “mass remaining” OR
“nutrient cycl*” OR “dung removal*”
OR “dung burial”) AND (“species
richness” OR “diversity” OR
“biodiversity”) AND (“insect*” OR
“arthropod*” OR “inverte*” OR
“macroinvertebrate*” OR
“detritivore*”) AND (“ecosystem
function*” OR “stability” OR
“ecosystem proces*” OR
“ecosystem service*”)

2580 studies by August 2022 in WOS



2387 screened (93%)



Data are completed for 411 studies

1. Pollination (144/825)

2. Pest control (113/820)

3. Decomposition (111/763)

4. Dung removal (43/67)

Project 3: The effects of invertebrates on ecosystem functions and services (Almost done with the data collection)

1. Ecosystem functions/
services (Y)

~

Richness, Diversity, Functional diversity,
Abundance, Presence/Absence, Visitation
frequency, Species identity (X)



Positive, neutral or negative ?



Conduct a χ^2 -tests

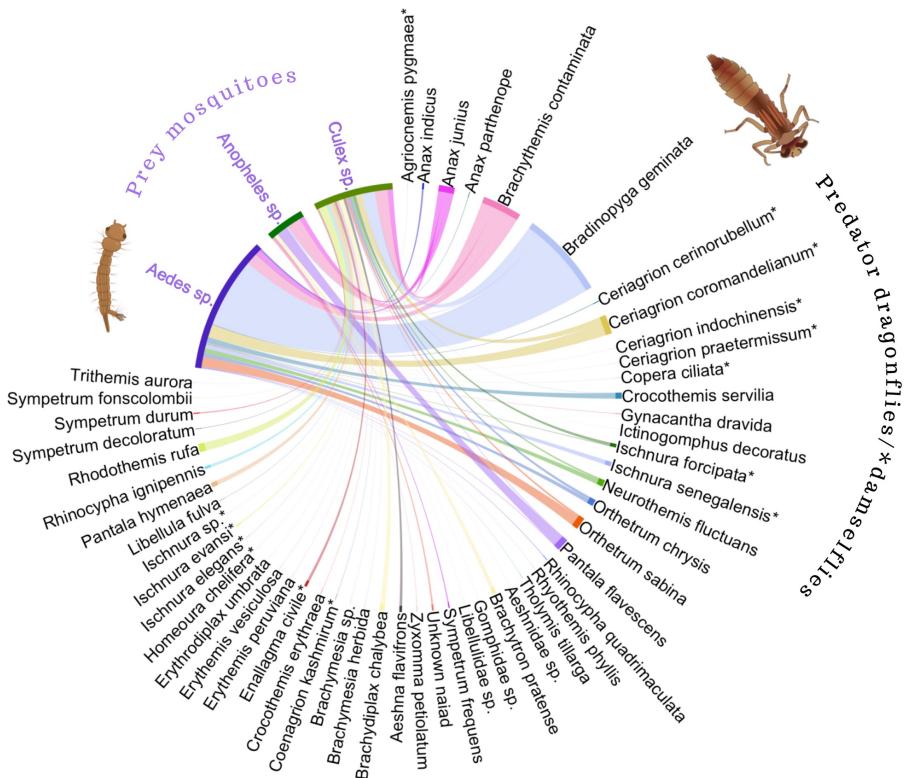


Positive relationships are more or
less common than negative and
neutral relationships

2. Naturally assembled communities vs Controlled experiments

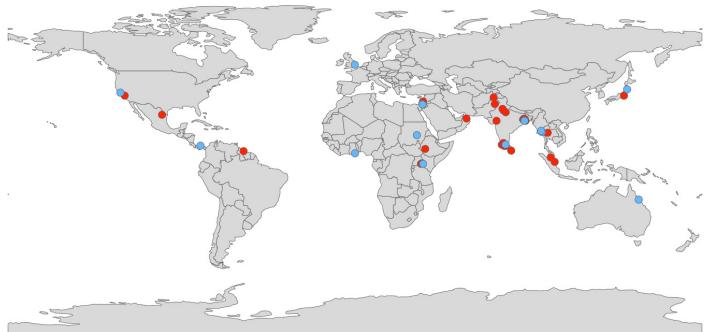
3. Biodiversity vs Functional diversity

Project 4: A meta-analysis reveals that dragonflies and damselflies can provide effective biological control of mosquitoes (a major revision submitted to *Journal of Animal Ecology*)



Dragonflies and damselflies provide mosquito control

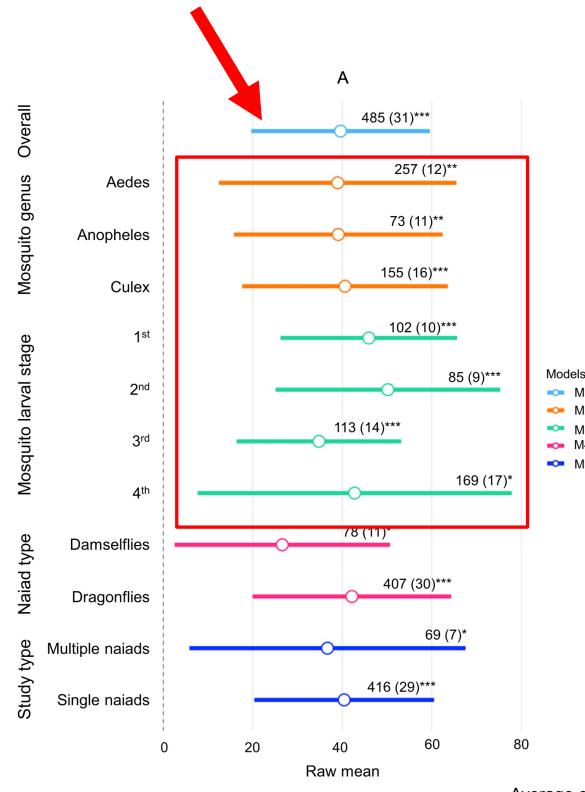
47 dragonflies/damselflies species feeding on and nine species of mosquitoes belonging to *Aedes*, *Anopheles* and *Culex* (n = 31)



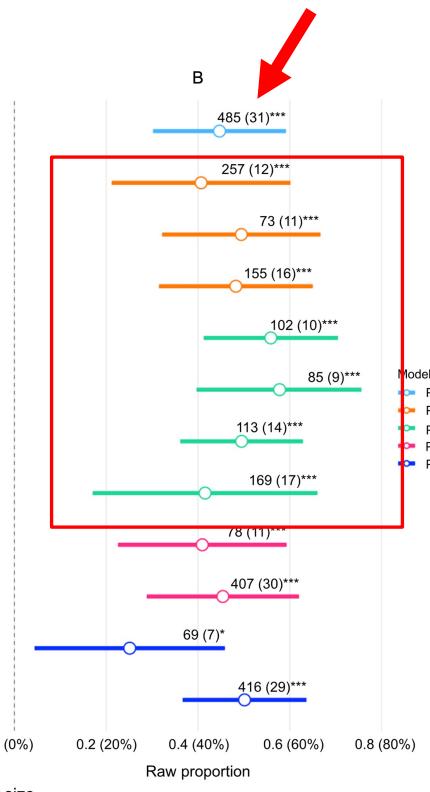
A map of the studies included in this study

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40 mosquitos on average per day by a single dragonfly/damselfly

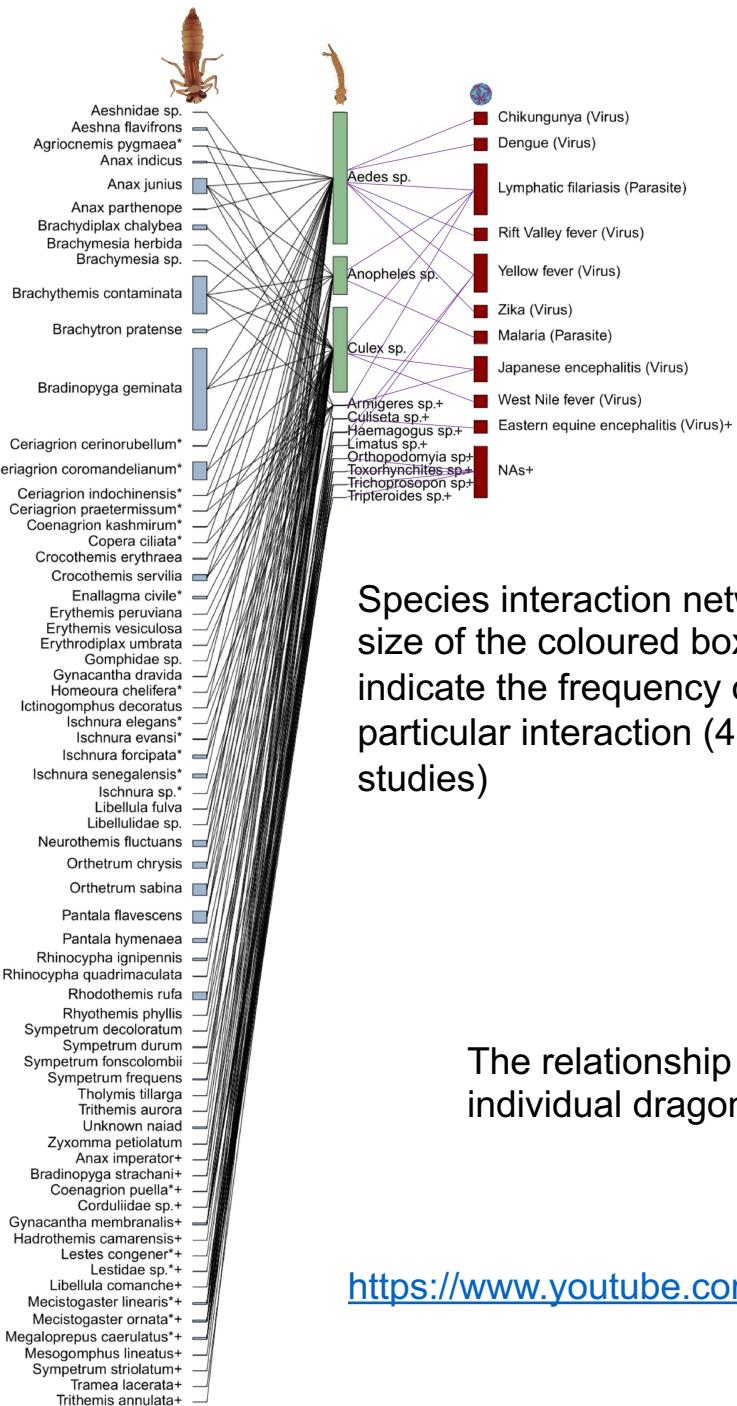


45% reduction of the mosquito population per day



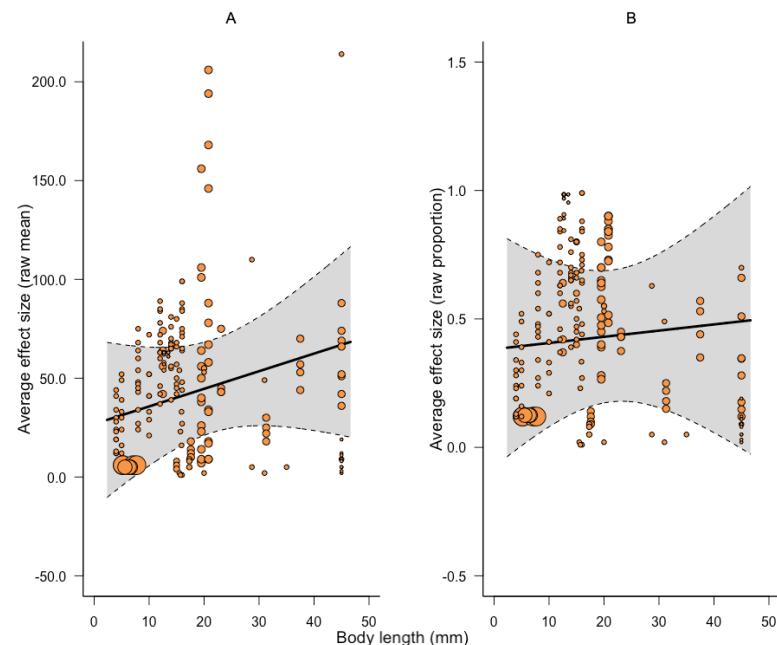
Estimated average effect sizes in percentage with 95% Confidence Intervals(CIs)

- (i) they can consume large numbers of mosquito larvae each day
- (ii) they are non-selective predators
- (iii) they are widely distributed geographically and commonly-found in urban environments
- (iv) they are solitary predators with low intra-guild predation
- (v) they are long-lived compared to their prey



Species interaction networks,
size of the coloured boxes
indicate the frequency of a
particular interaction (45
studies)

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The relationship between the estimated average predation success of a single individual dragonfly/damselfly per day on mosquito larvae and its body size

<https://www.youtube.com/watch?v=XrBbG-QFv34> (a 3 minutes talk about this project)

Project 5: The effects of fine scale heterogeneity in urban road verges on butterfly communities (yet to start)

Butterfly diversity
(functional and
biological) in road
verges



Fine-scale heterogeneity road verges
compositional (richness of cover plants) and
configurational heterogeneity (length and width)

+

Fine-scale structural components
(e.g. height, distance to the main disturbances, cut or uncut)

+

Dark diversity (a set of
species that are absent
from a particular site at
a given time)



Dispersal ability related traits
Stress-tolerance traits

Hypergeometric method

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