Informing more sustainable development of the oil palm industry

Michael Pashkevich
Department of Zoology
St Edmund's College

@MDPashkevich
mdp48@cam.ac.uk

St Edmund's College
University of Cambridge

Marshall Scholarships

GATES Cambridge

GLOBAL FOOD SECURITY

Biodiversity Ecosystem Function Tropical Agriculture

sinarmas agribusiness and food

GVL GOLDEN VEROLEUM LIBERIA

MUSEUM OF ZOOLOGY

Outline

- Intro to oil palm

Outline

- Intro to oil palm
- **Oil palm management in Indonesia**

Outline

- Intro to oil palm
- Oil palm management in Indonesia
- **Establishing new oil palm plantations in Liberia**

Why so controversial?

- Hugely profitable

Global Trade Magazine

Why so controversial?

- Hugely profitable
- Highest yielding vegetable oil crop globally

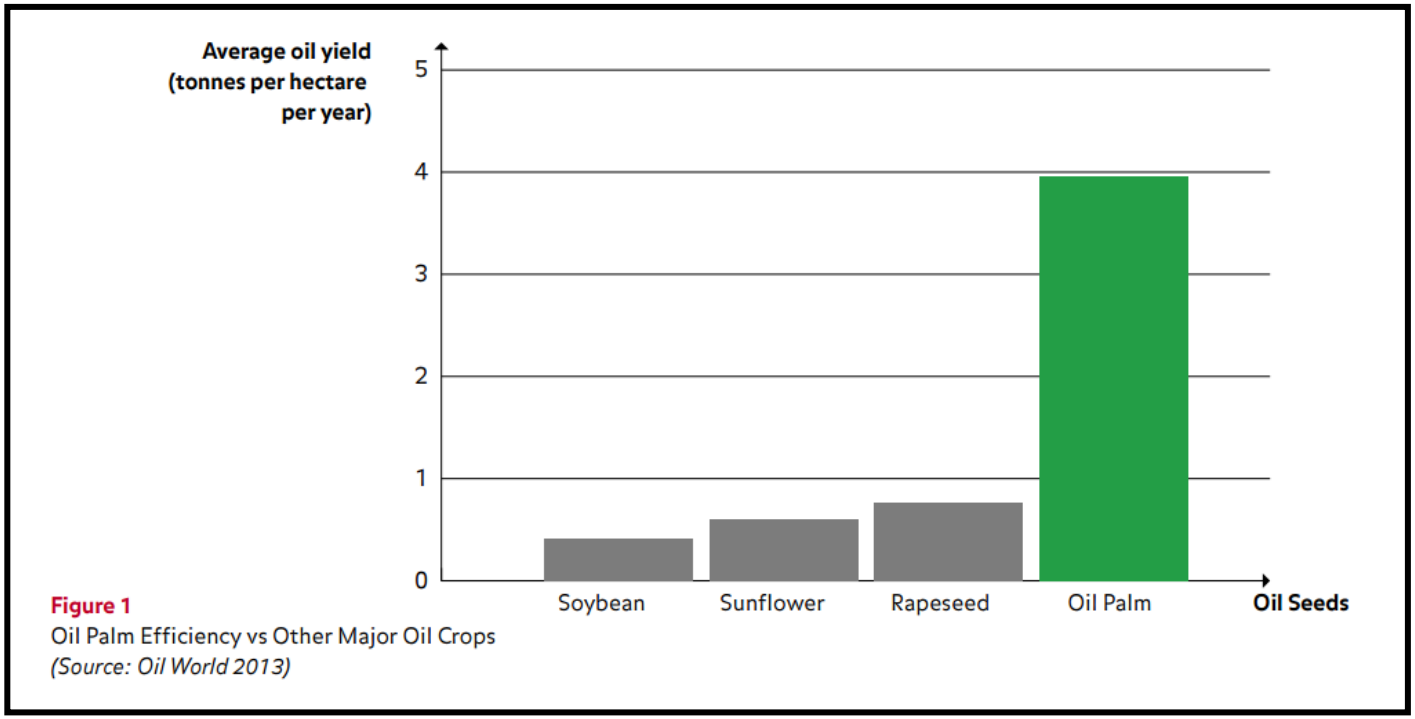


Figure 1
Oil Palm Efficiency vs Other Major Oil Crops
(Source: Oil World 2013)

Why so controversial?

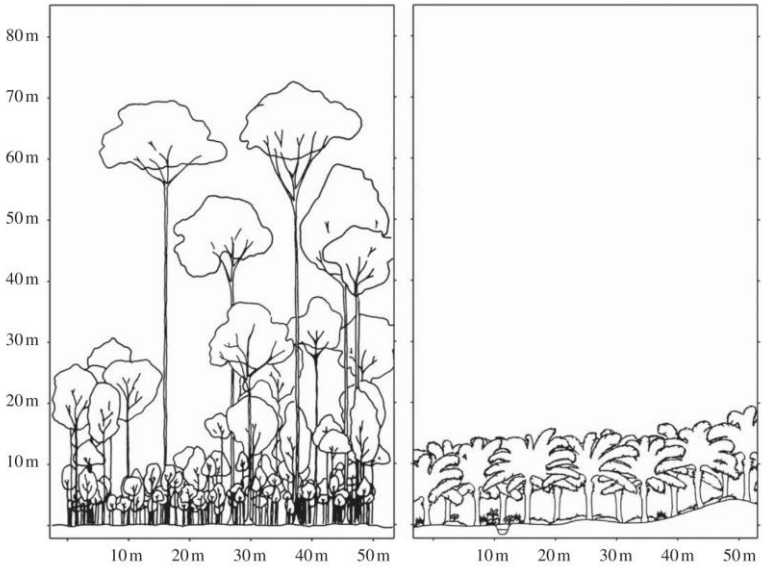
- Hugely profitable
- Highest yielding vegetable oil crop globally
- Palm oil can be used for many purposes

CIFOR Activist News

Why so controversial?

- Ecological impacts of production

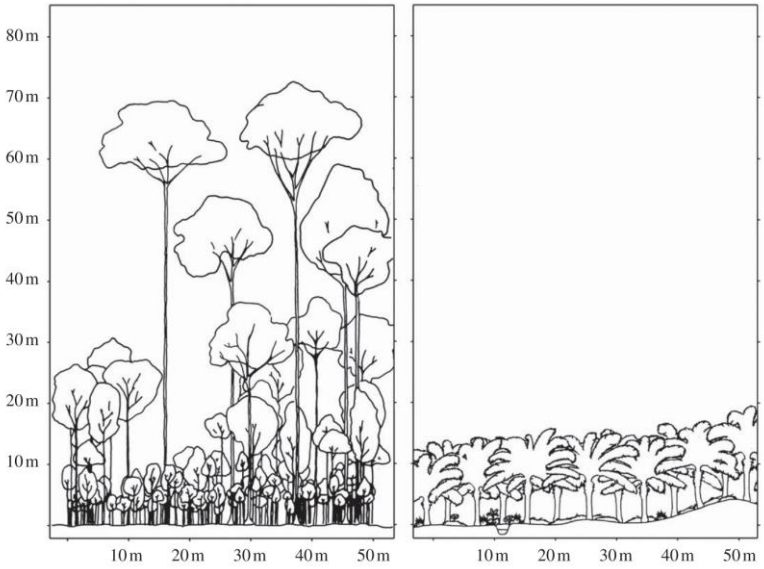
Why so controversial?



- Lower levels of vegetation complexity and diversity

Foster et al. (2011) Phil. Trans. Proc. B.

Why so controversial?

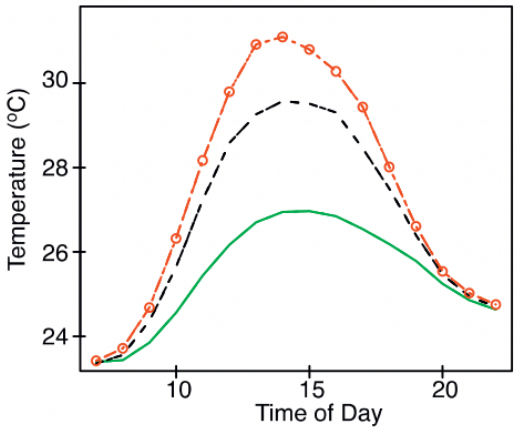


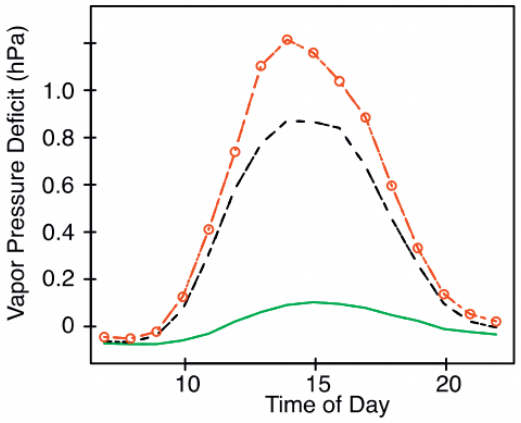
- Lower levels of vegetation complexity and diversity

Foster et al. (2011) Phil. Trans. Proc. B.

- Hotter, drier, and more variable microclimates

Luskin & Potts, (2011) Bas. App. Eco.





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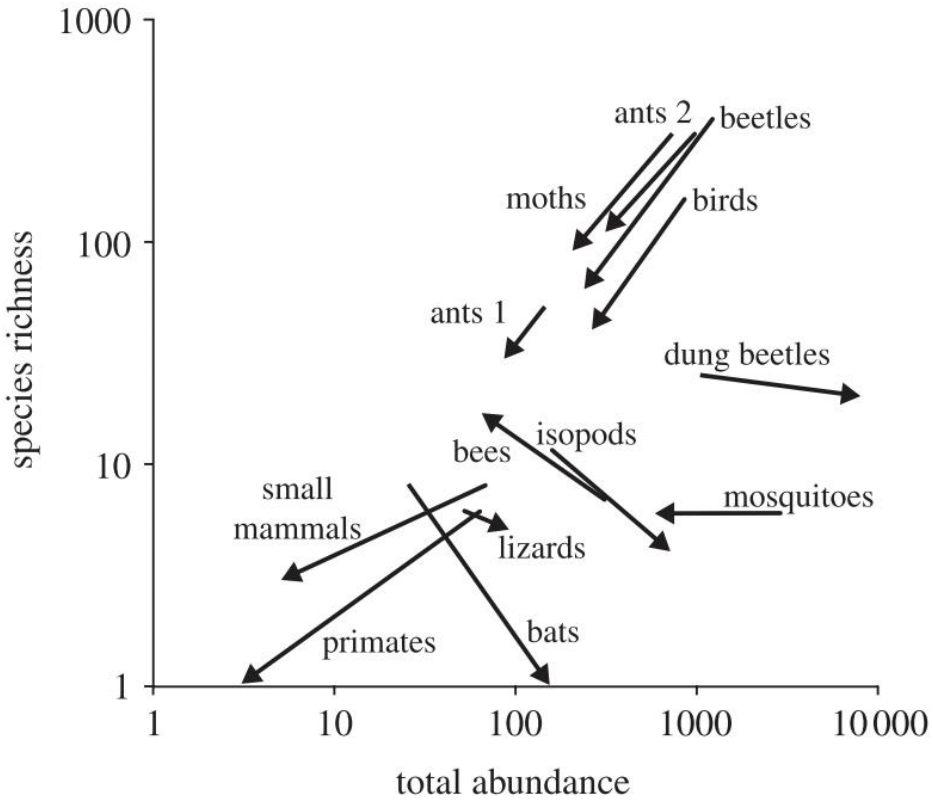

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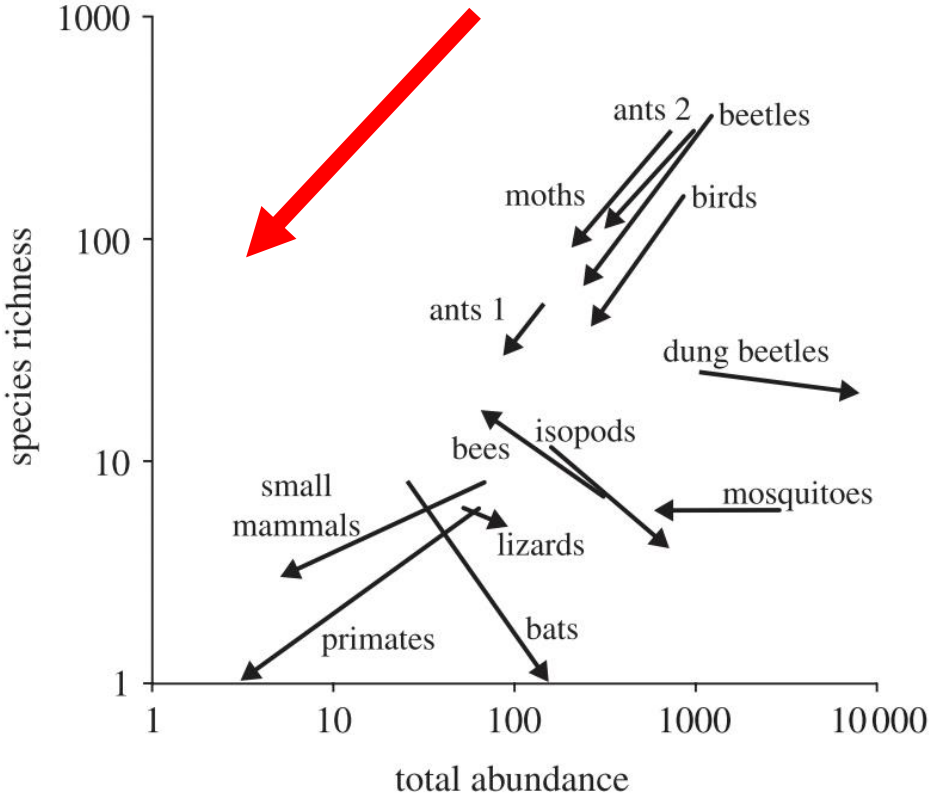

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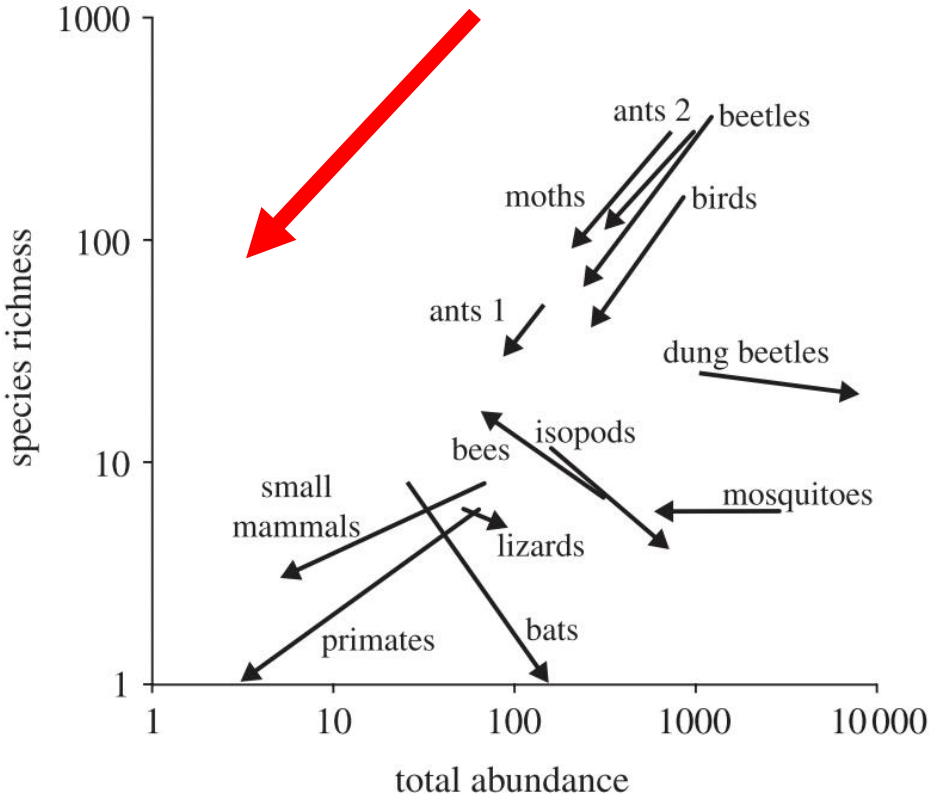
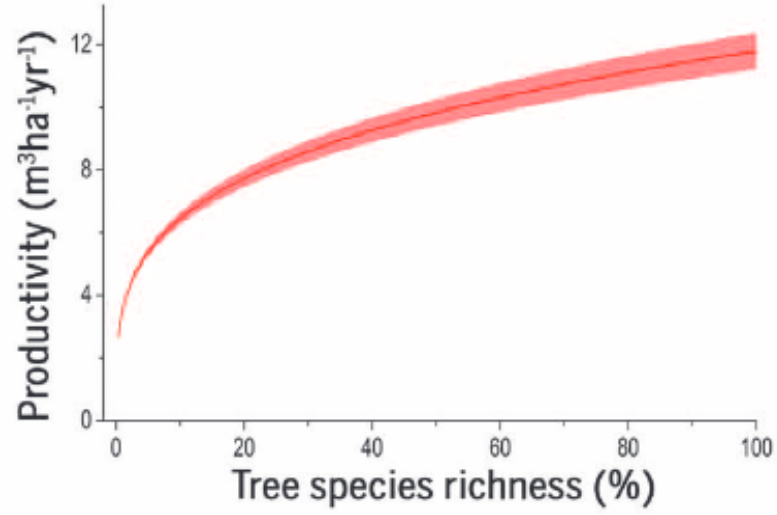
Why so controversial?



Foster et al. (2011) Phil. Trans. Proc. B.

Changes in management practices

Changes in management practices

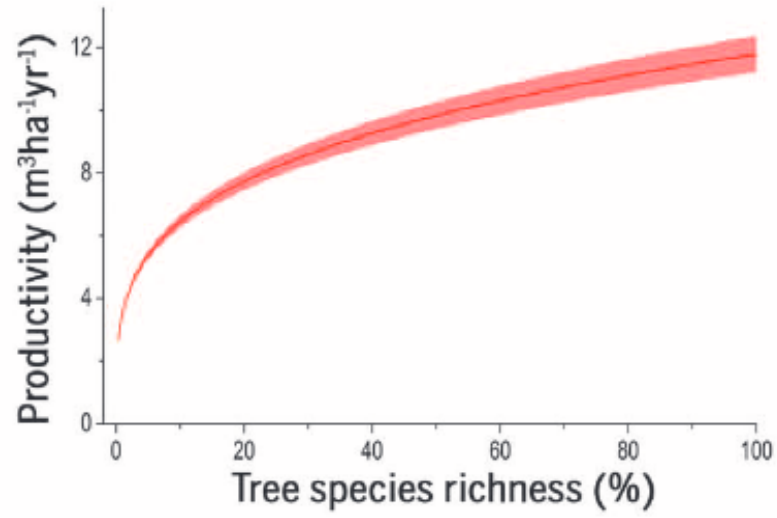


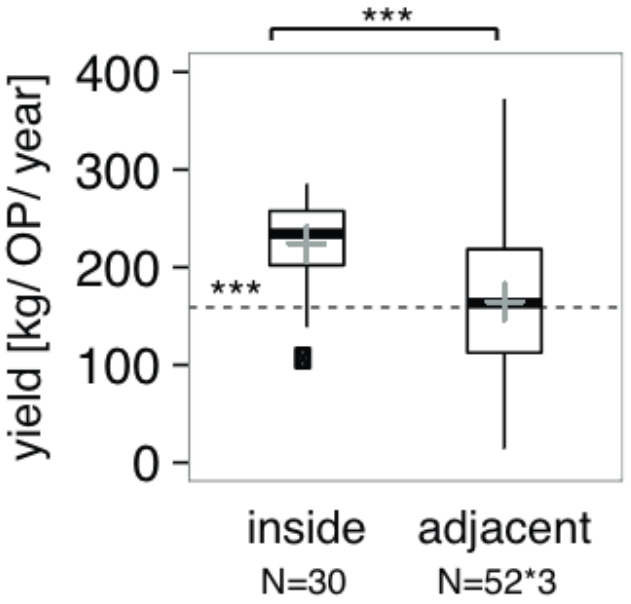
- Generally, there is a positive relationship between biodiversity and productivity (i.e., yields)

Liang et al. (2016) Science

Gérard et al. (2017) Agri. Eco. Environ.

Changes in management practices





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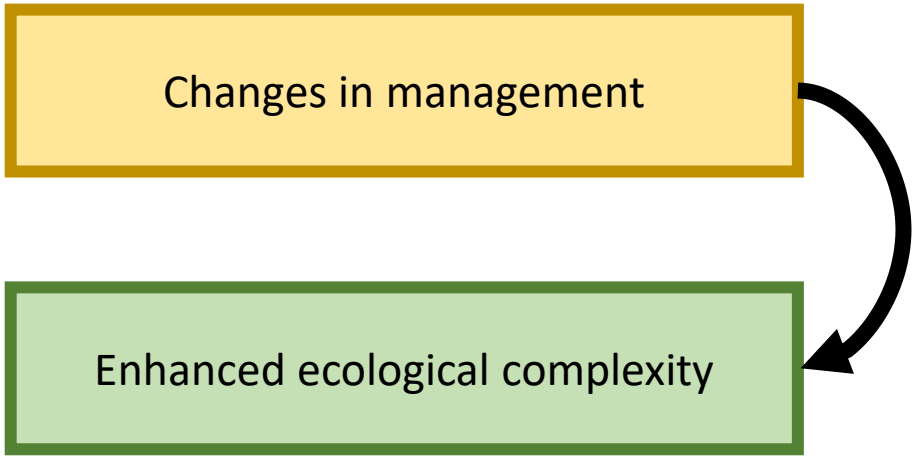
Gérard et al. (2017) Agri. Eco. Environ.

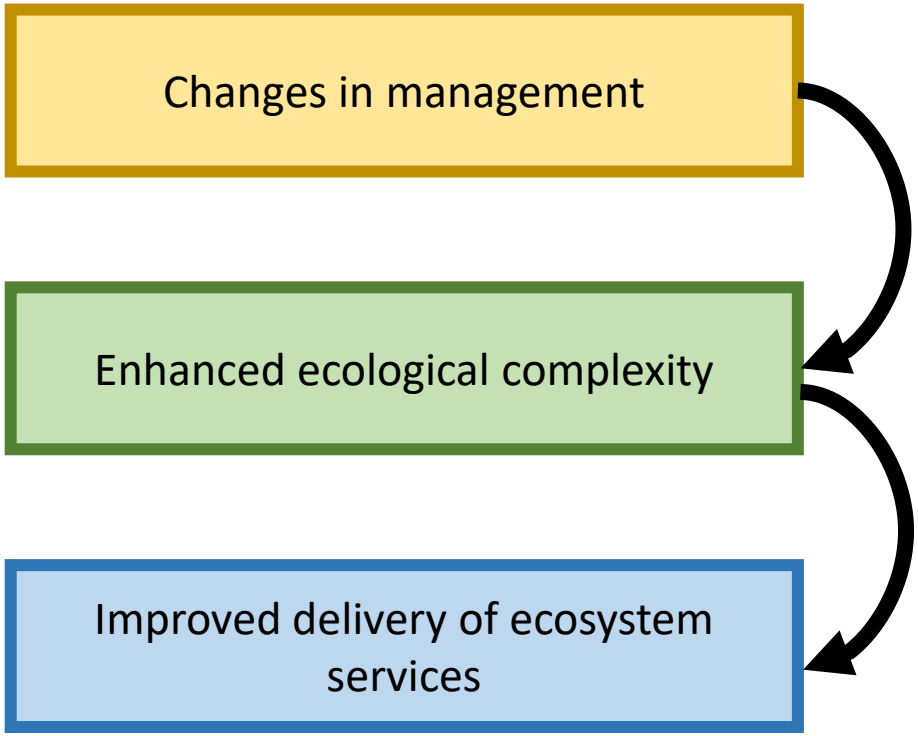
Changes in management practices

Changes in management

Changes in management practices



Changes in management practices



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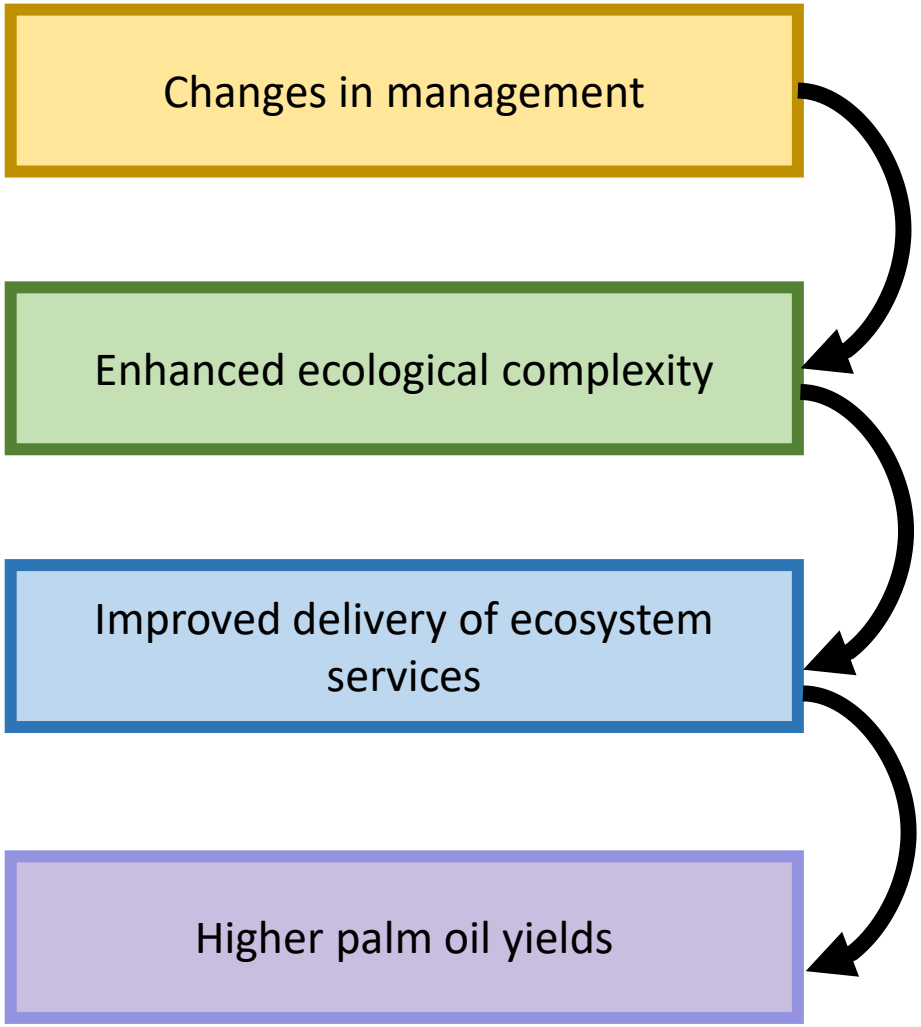
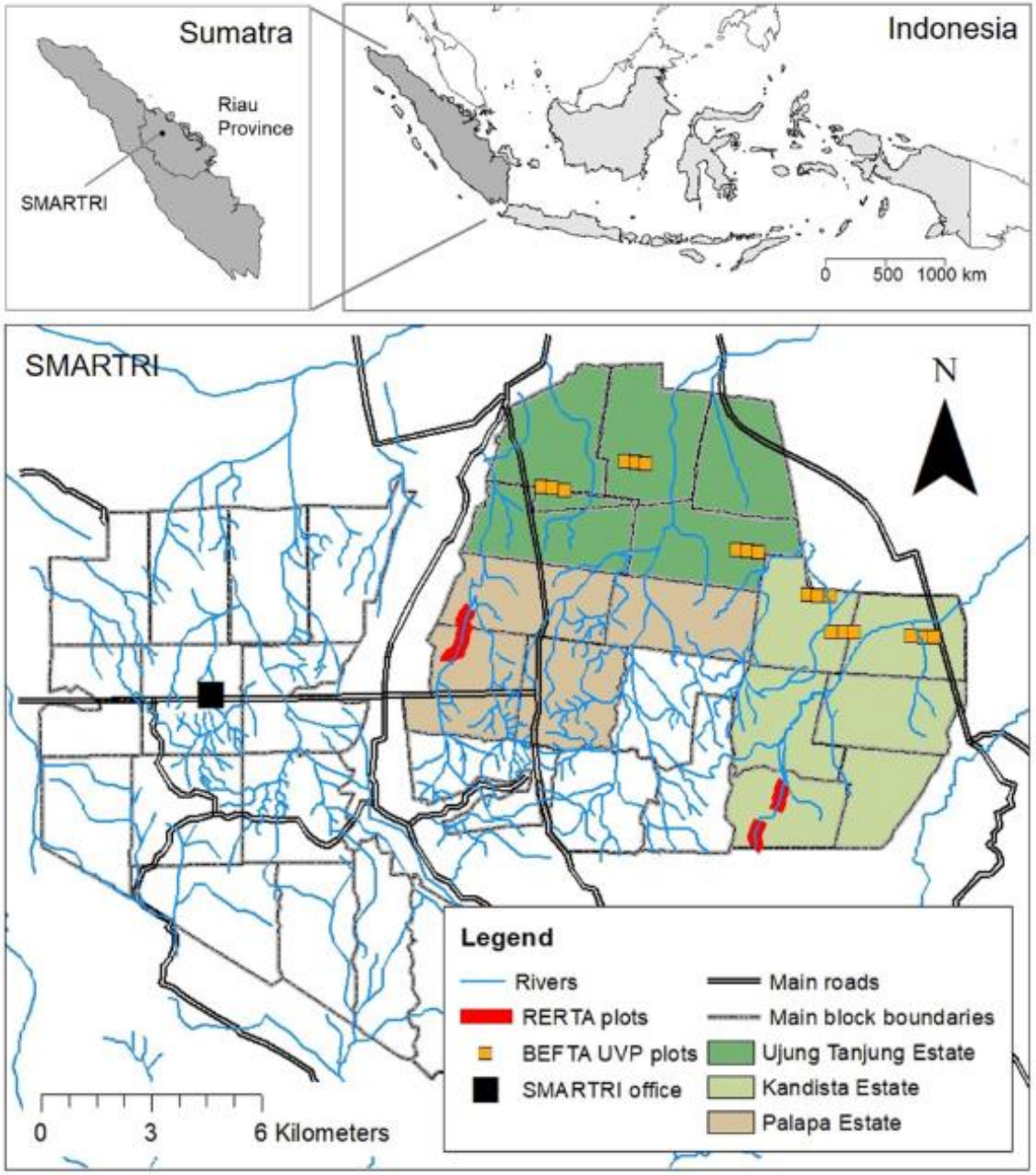


Testing strategies to improve oil palm management

1. Replanting

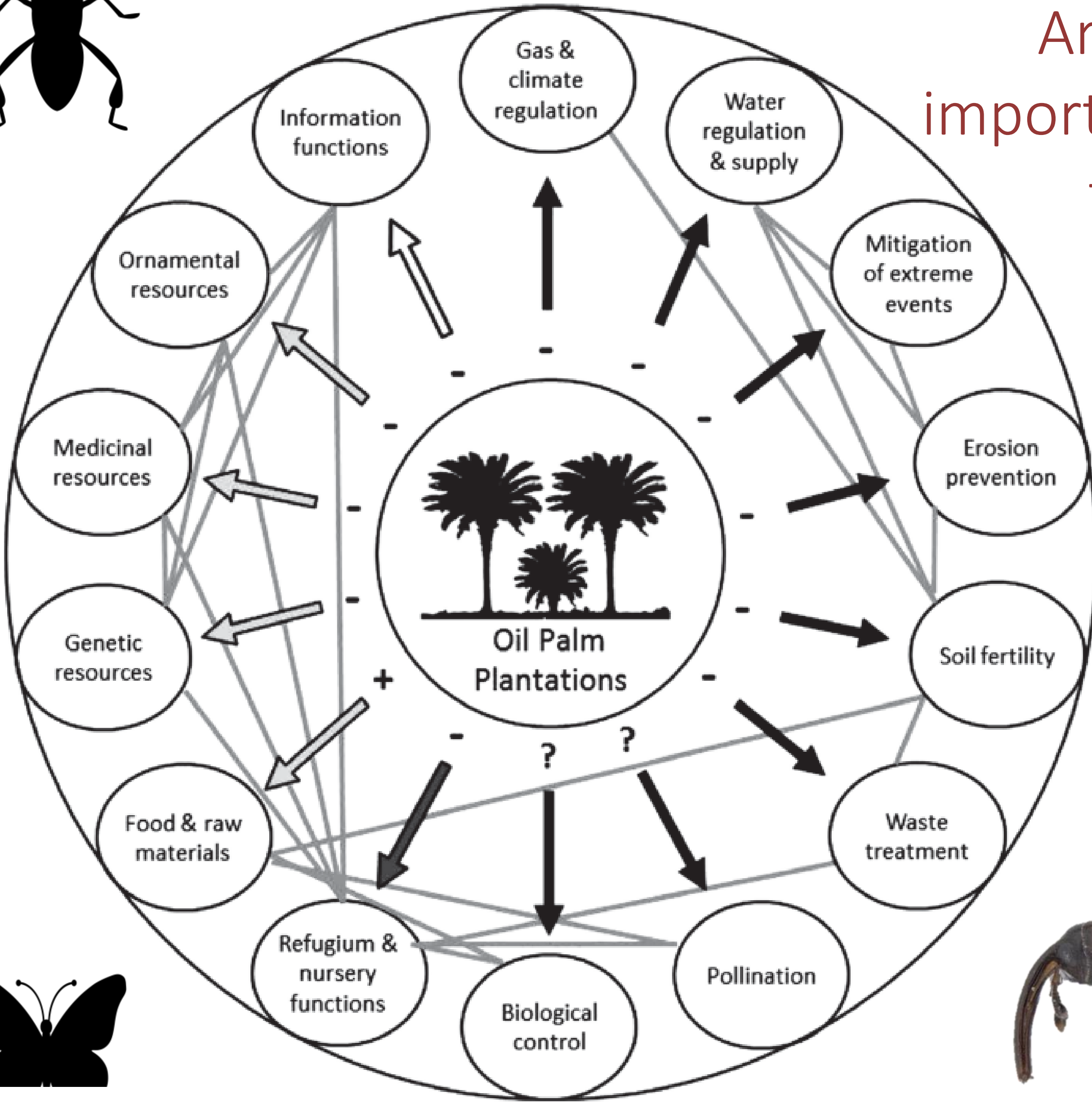
Testing strategies to improve oil palm management

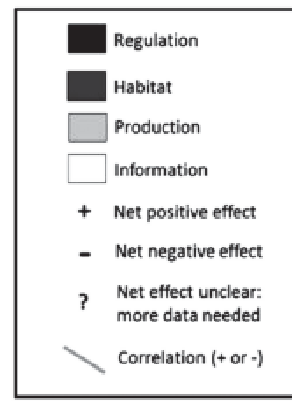
1. Replanting
2. Application of herbicides

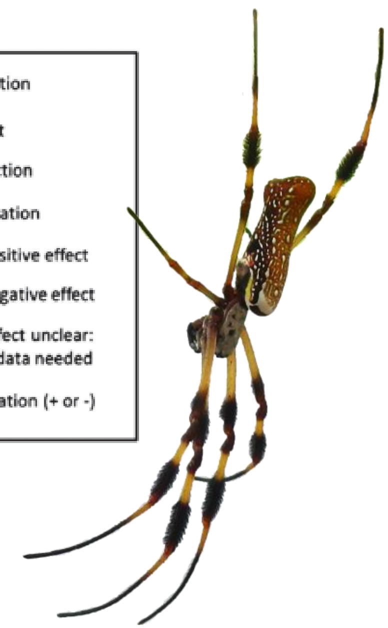


- Industrial oil palm plantations in Sumatra, Indonesia

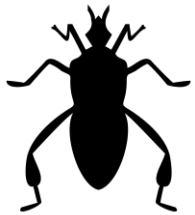
Arthropods are important to ecosystem functioning

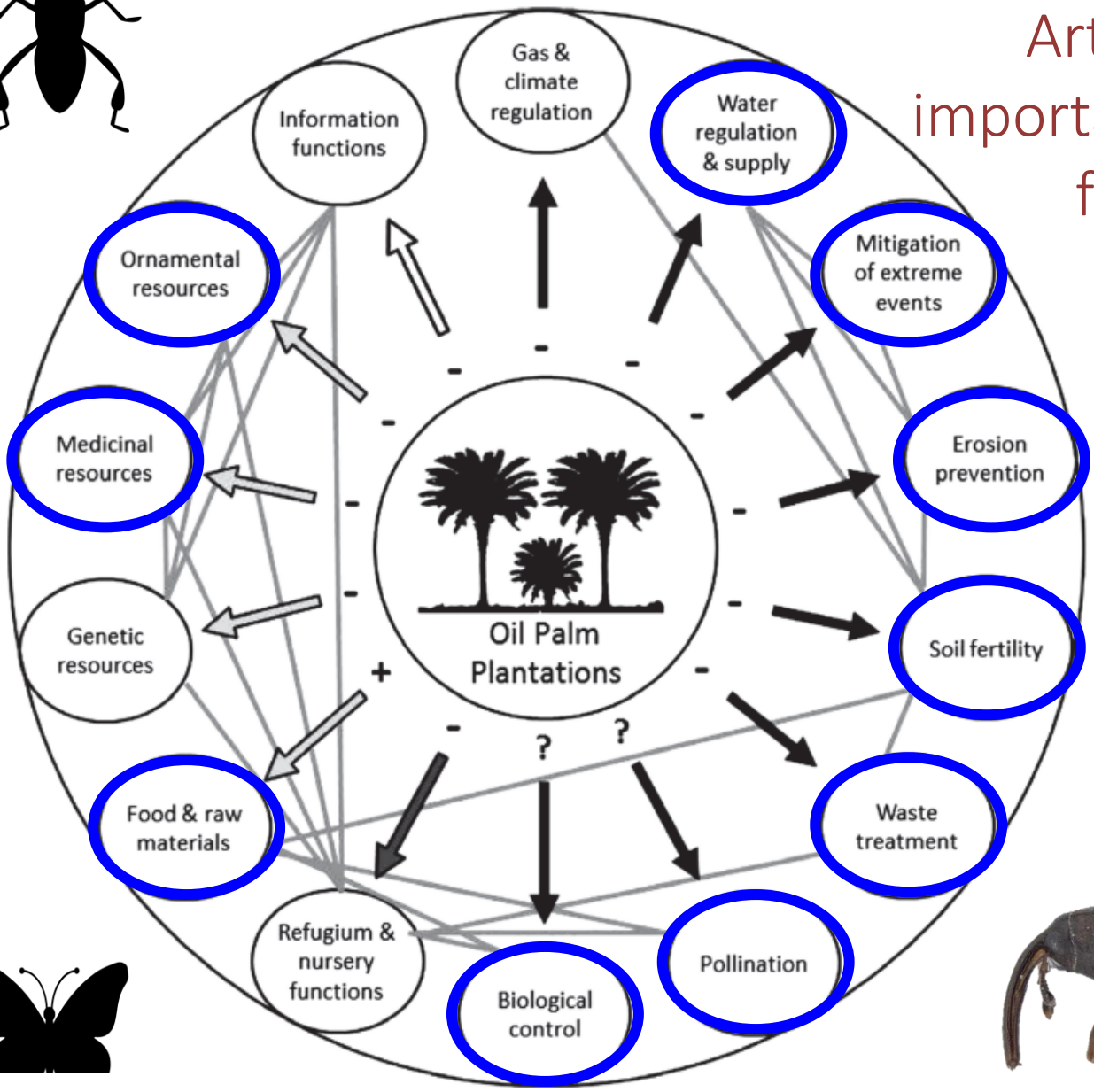


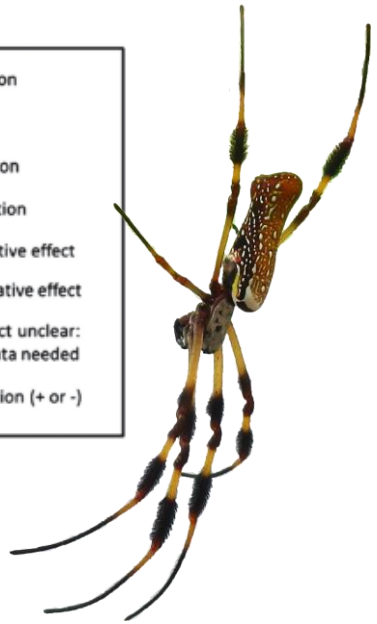




Arthropods are important to ecosystem functioning

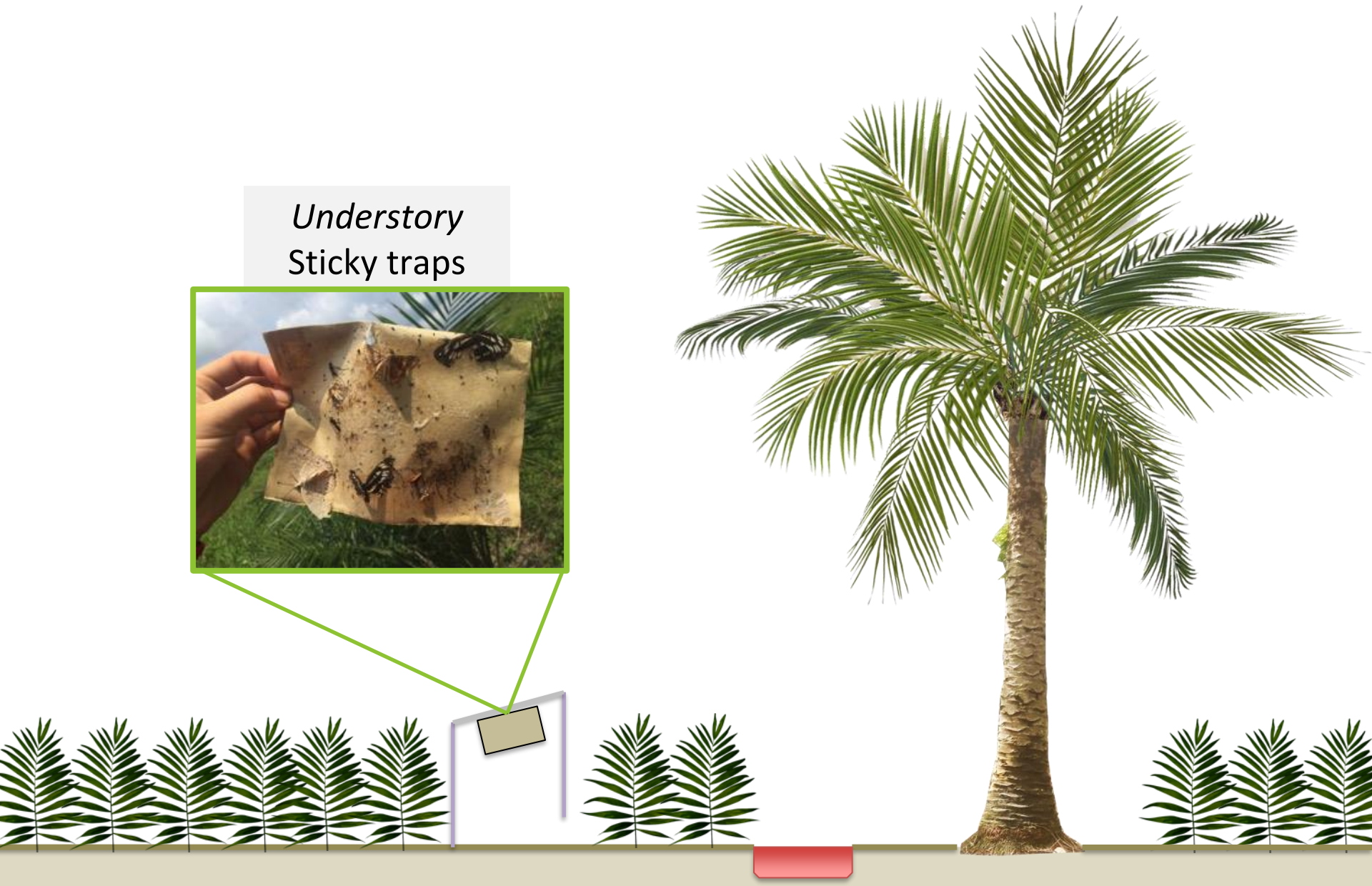






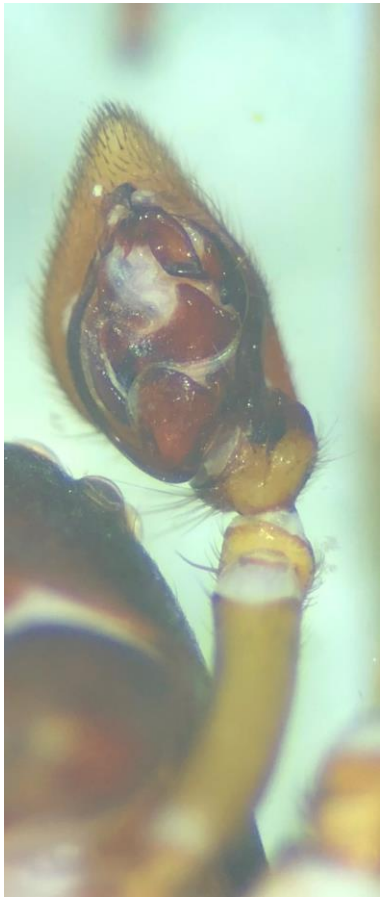
Canopy
Insecticide
fogging

Understory
Sticky traps

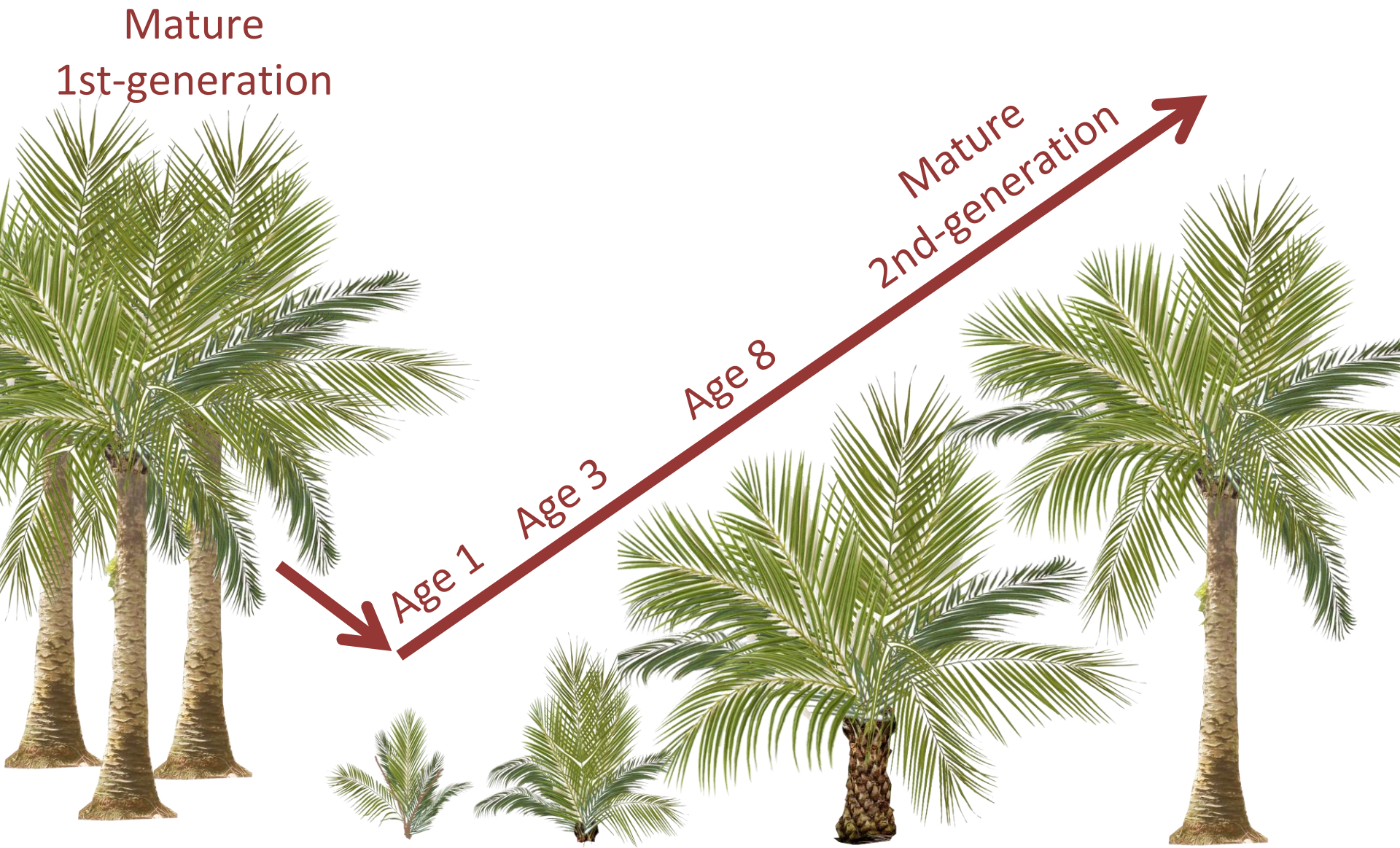


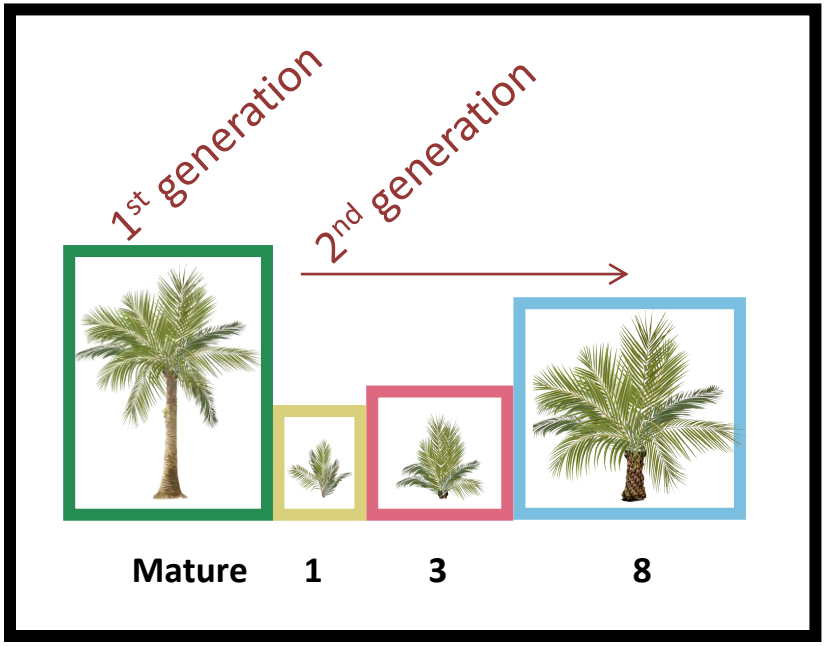
Ground
Pitfall traps

Species-level spider surveys

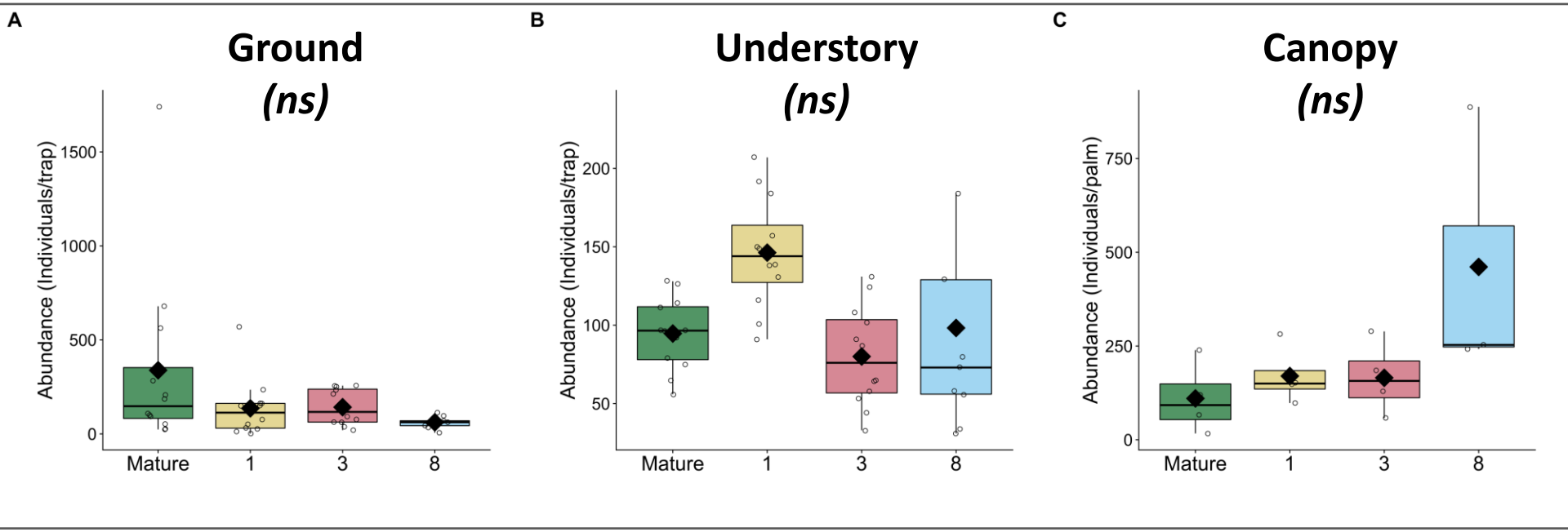



CAT


Mature
1st-generation
Age 1
Age 3
Age 8
Mature
2nd-generation


1st generation
2nd generation
Mature
1
3
8

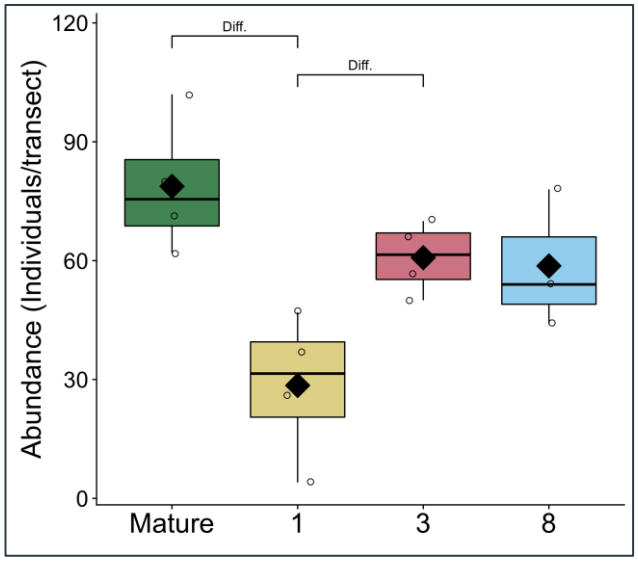
All arthropods



- No significant differences in total abundance of arthropods
- Microhabitat- and taxonomic-specific trends were observed

Pashkevich et al. (2021) Jour. App. Eco.

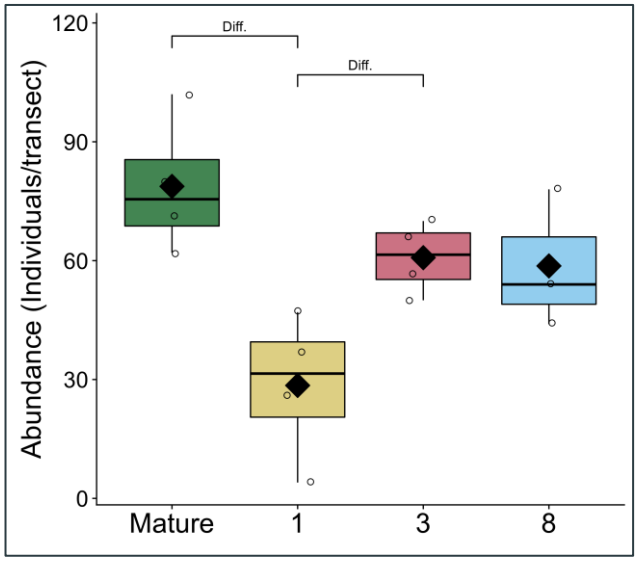
Understory spiders

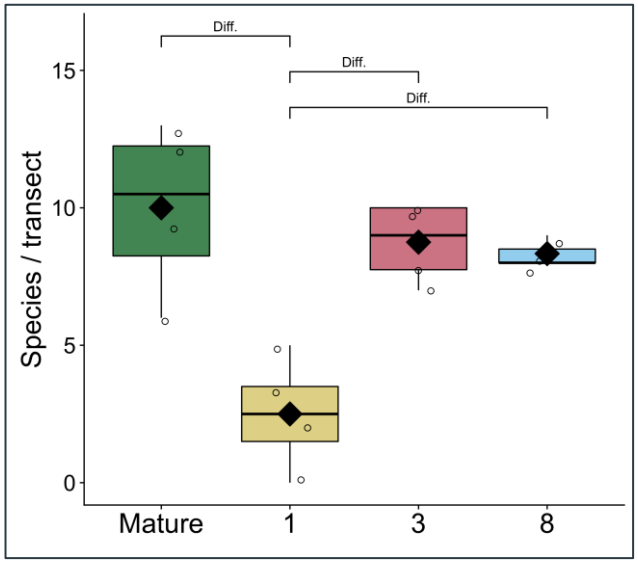


- Short-term declines in abundance after replanting, but no long-term declines.

Pashkevich et al. (2021) Jour. App. Eco.

Understory spiders

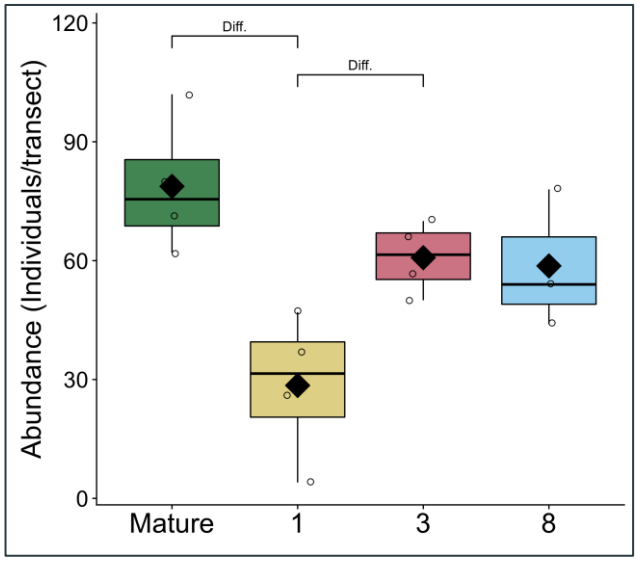


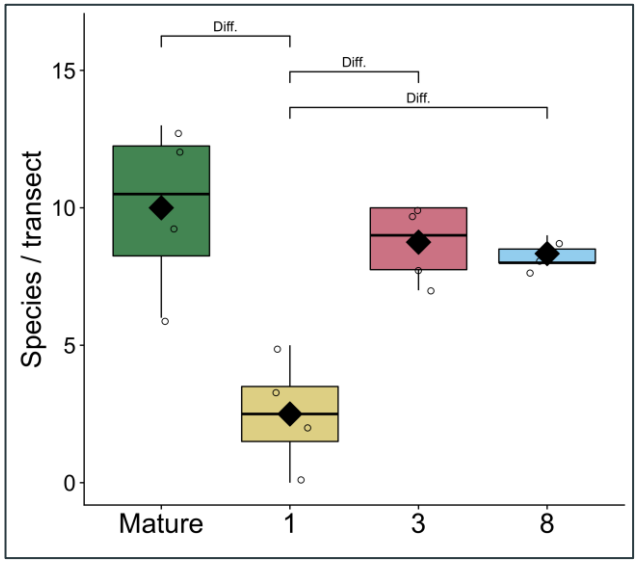


- Short-term declines in abundance after replanting, but no long-term declines.
- Short-term declines in species richness, but no long-term declines.

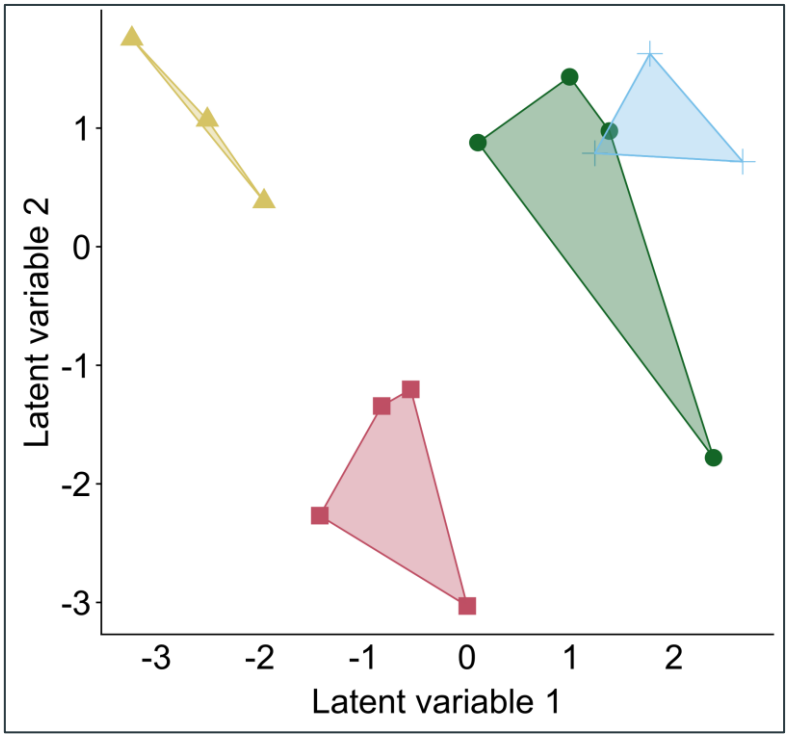
Pashkevich et al. (2021) Jour. App. Eco.

Understory spiders



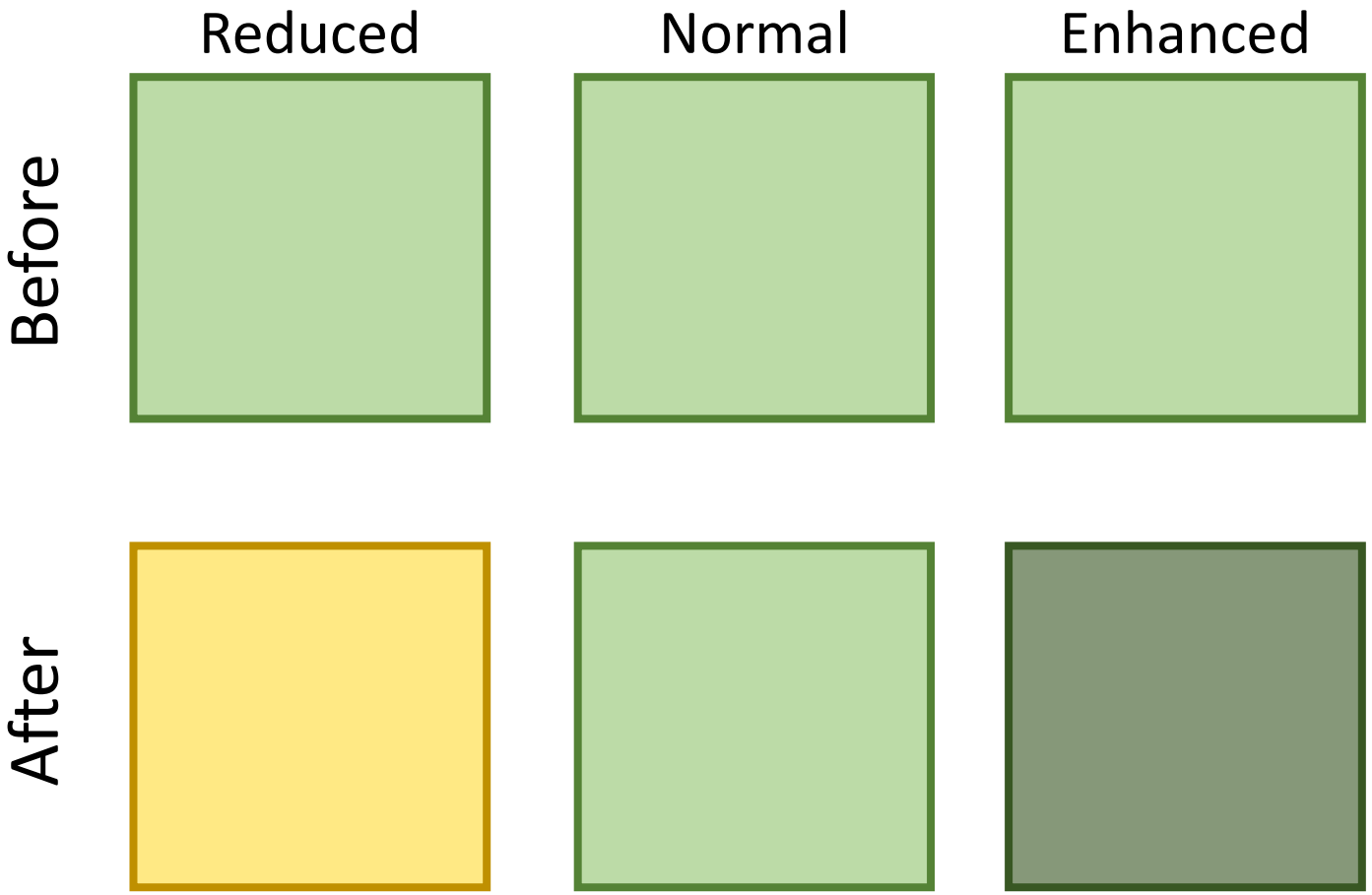


- Strong differences in community composition across sites



Pashkevich et al. (2021) Jour. App. Eco.

China Dialogue

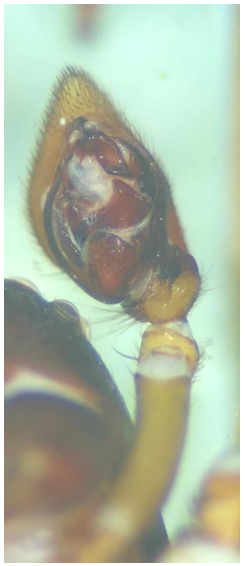

Reduced
Normal
Enhanced
Before
After

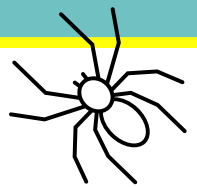
Reduced

Normal

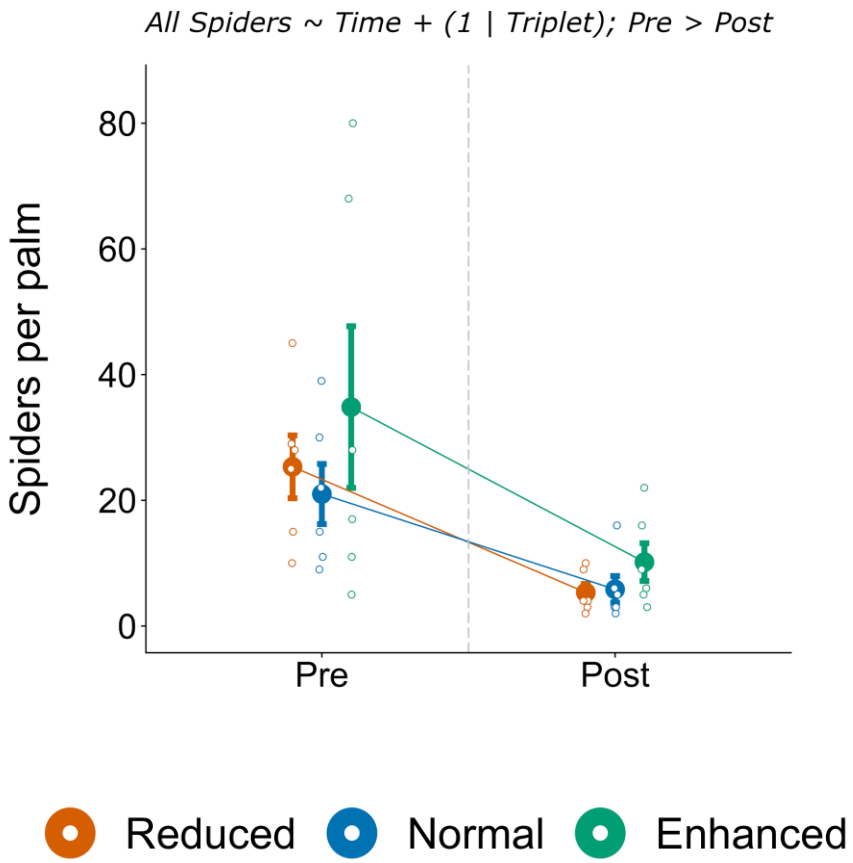
Enhanced

- Effects of these management practices on spiders



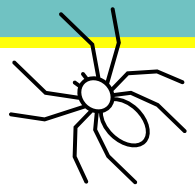


Abundance

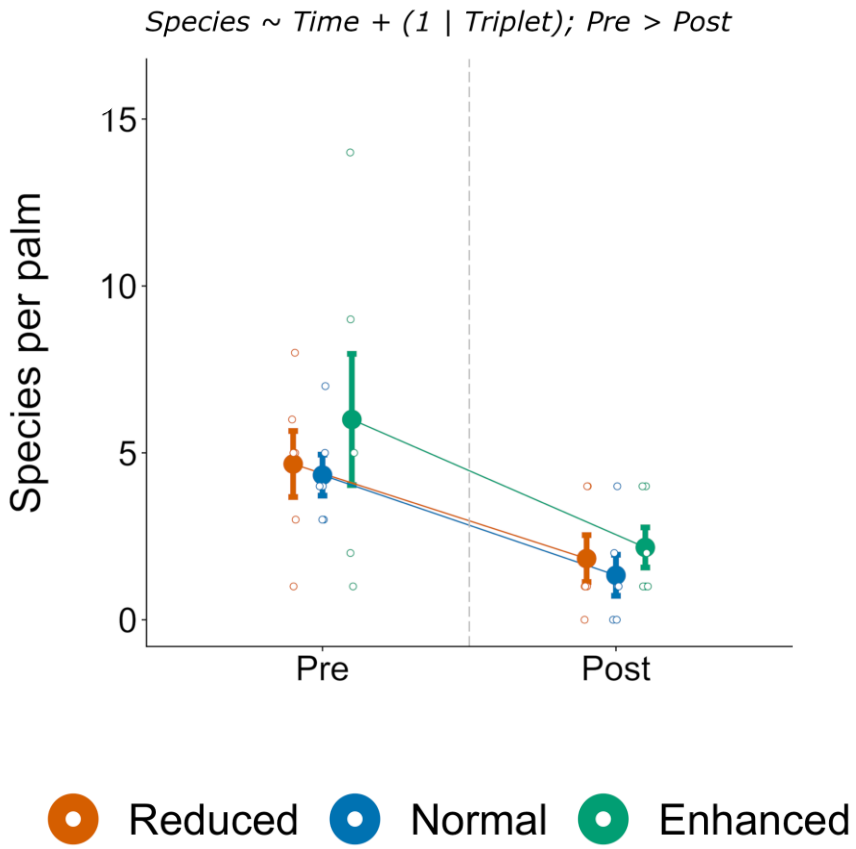


- No changes caused by BEFTA-UVP treatments
- Fewer spiders in all treatments over

Pashkevich et al. (2022) Bas. App. Eco.



Richness



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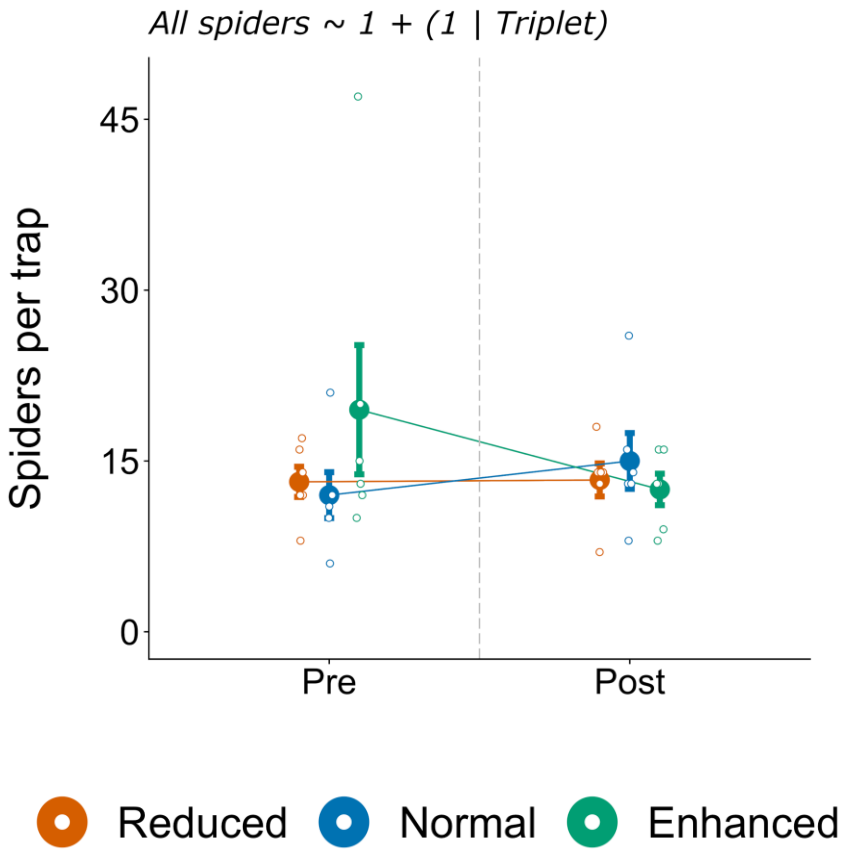
Pashkevich et al. (2022) Bas. App. Eco.

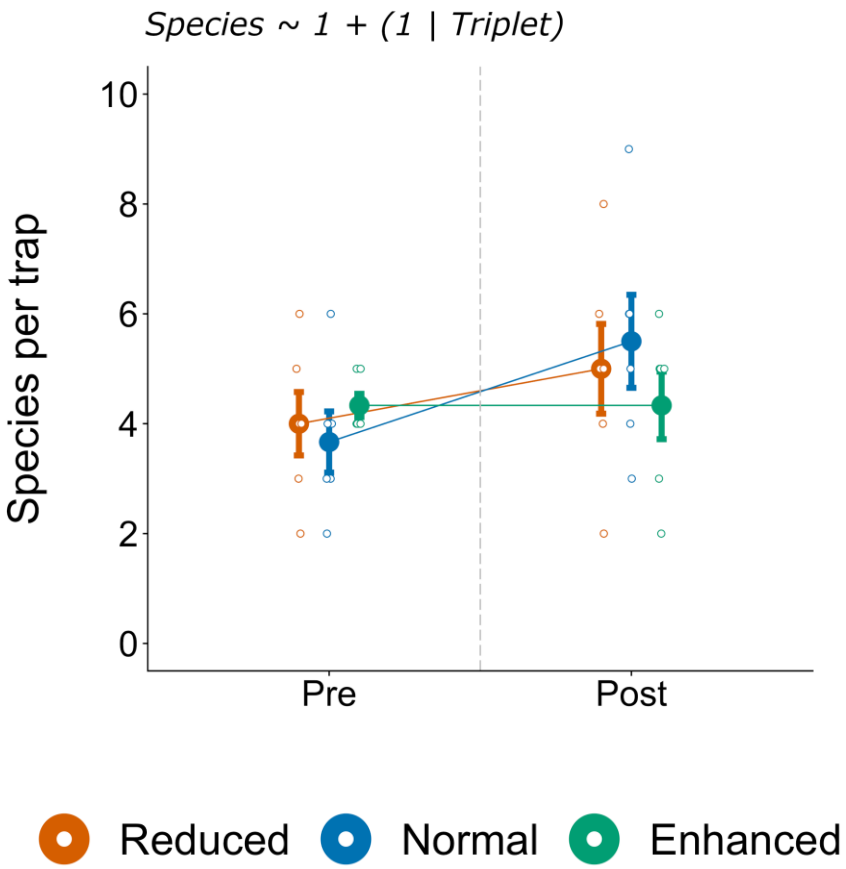
Abundance



- No changes in abundance

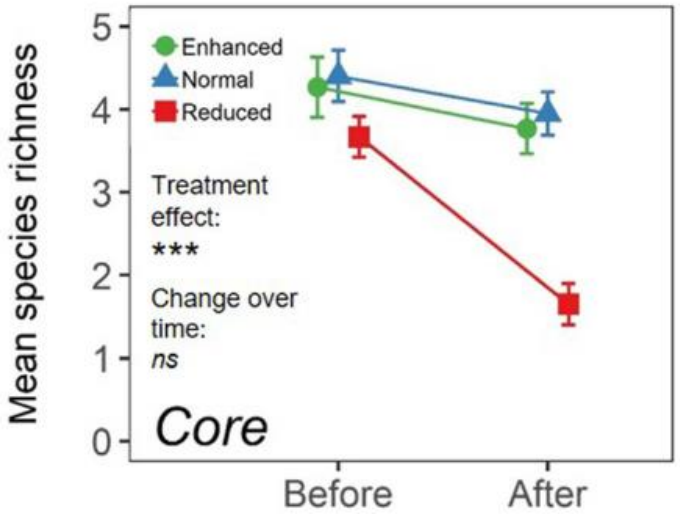
Pashkevich et al. (2022) Bas. App. Eco.

Abundance



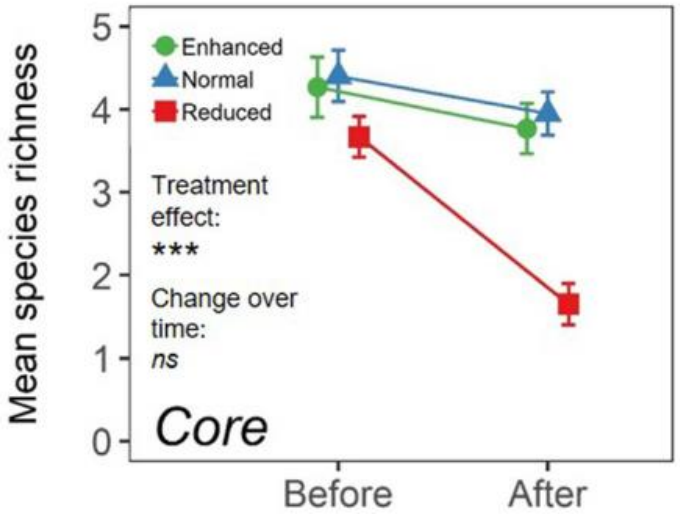
- No changes species richness

Pashkevich et al. (2022) Bas. App. Eco.

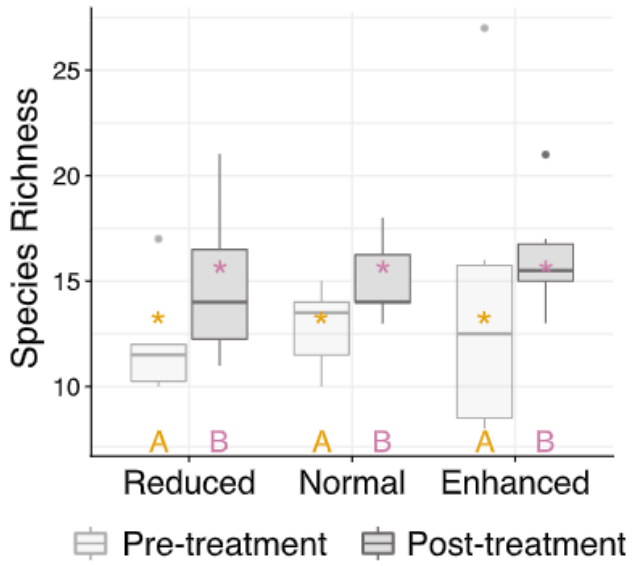


- **Fewer plant species and coverage in ‘Reduced’ plots**

Luke et al. (2020) Fron. For. Glo. Change; Hood et al. (2020) Bas. App. Eco.; Luke et al. (2020) Biotrop.



- Fewer plant species and coverage in ‘Reduced’ plots
- **No effect of treatments on ant species richness**



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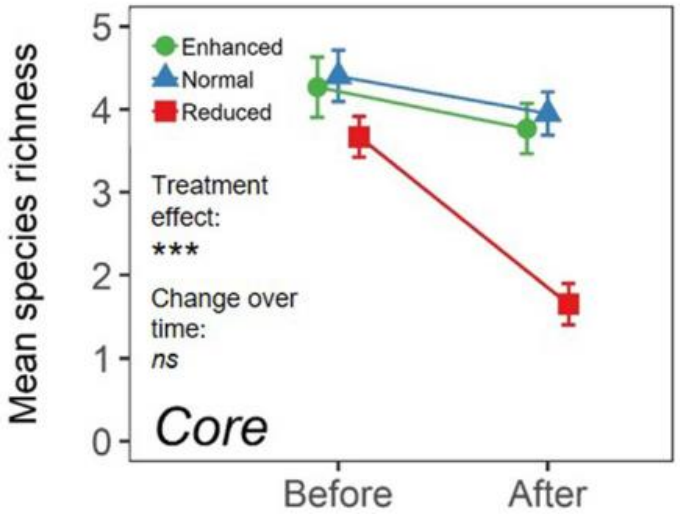
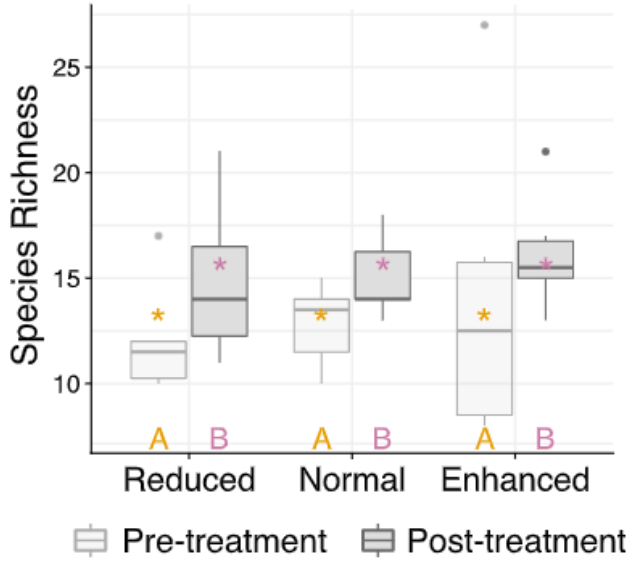




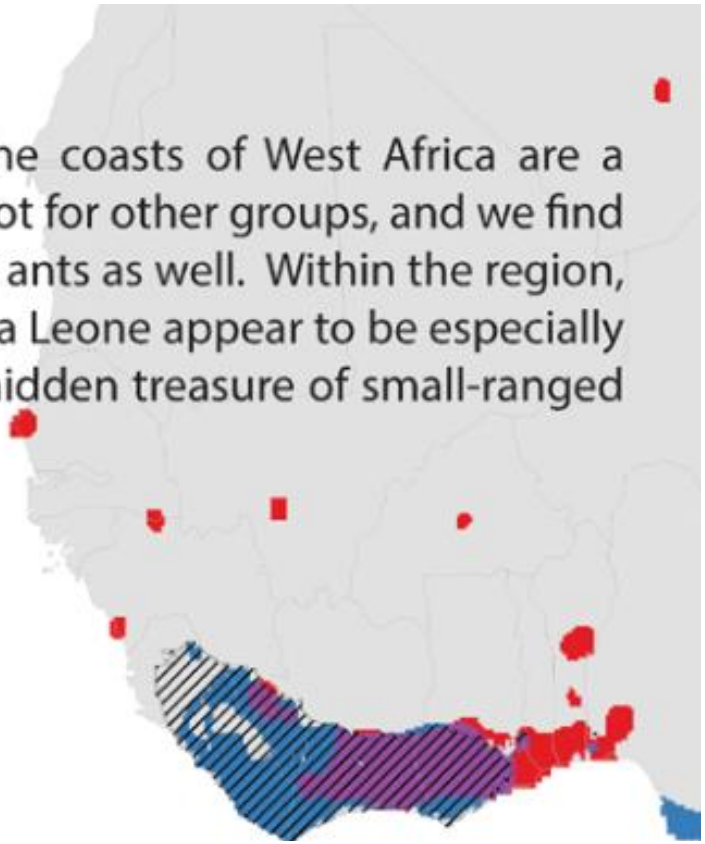
- Findings across BEFTA-UVP studies indicate that application of herbicides has taxonomic-specific effects on biodiversity

Luke et al. (2020) Fron. For. Glo. Change; Hood et al. (2020) Bas. App. Eco.; Luke et al. (2020) Biotrop.

- Liberia, West Africa

West Africa

The Guinean forests along the coasts of West Africa are a recognized biodiversity hotspot for other groups, and we find them an area of high rarity for ants as well. Within the region, the forests of Liberia and Sierra Leone appear to be especially undersampled and harbor a hidden treasure of small-ranged ant species.



"Missing" ant centers that are predicted to be revealed with future sampling

Kass et al. (2022) Sci. Adv.

West Africa

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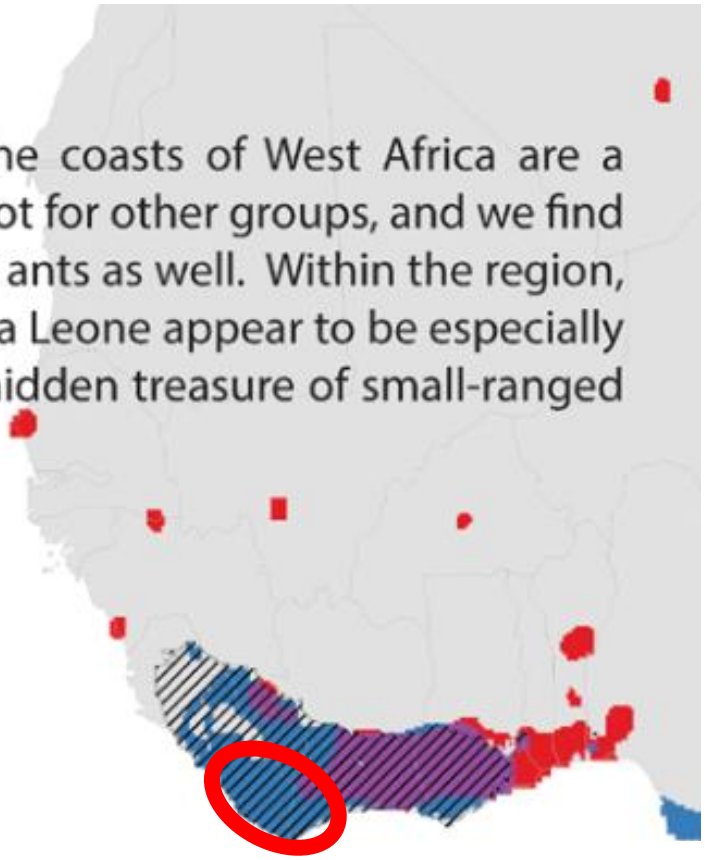
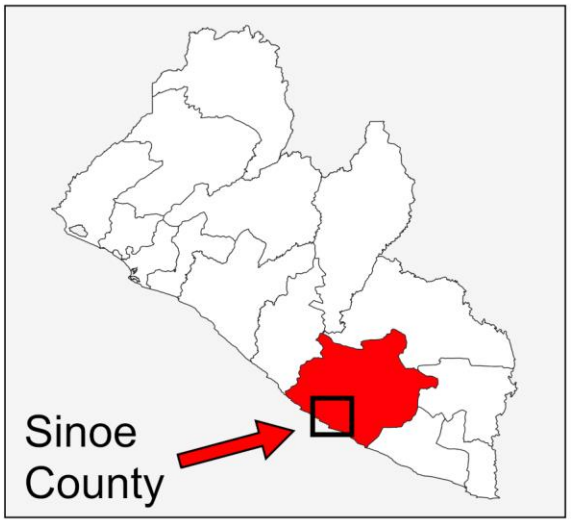
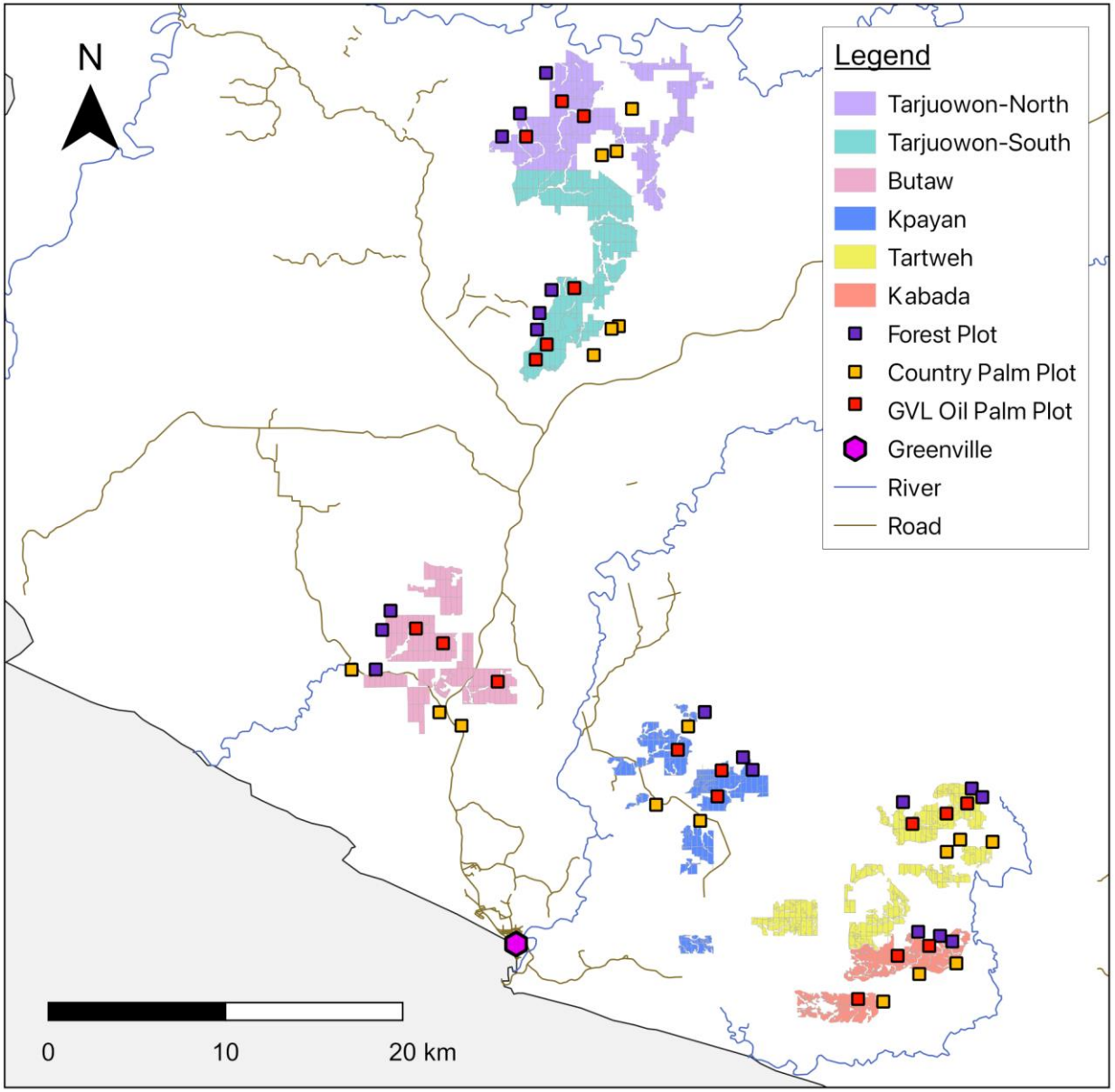


"Missing" ant centers that are predicted to be revealed with future sampling

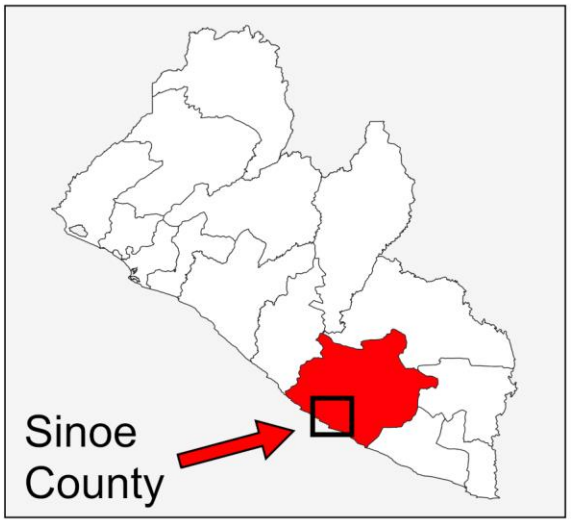
Kass et al. (2022) Sci. Adv.

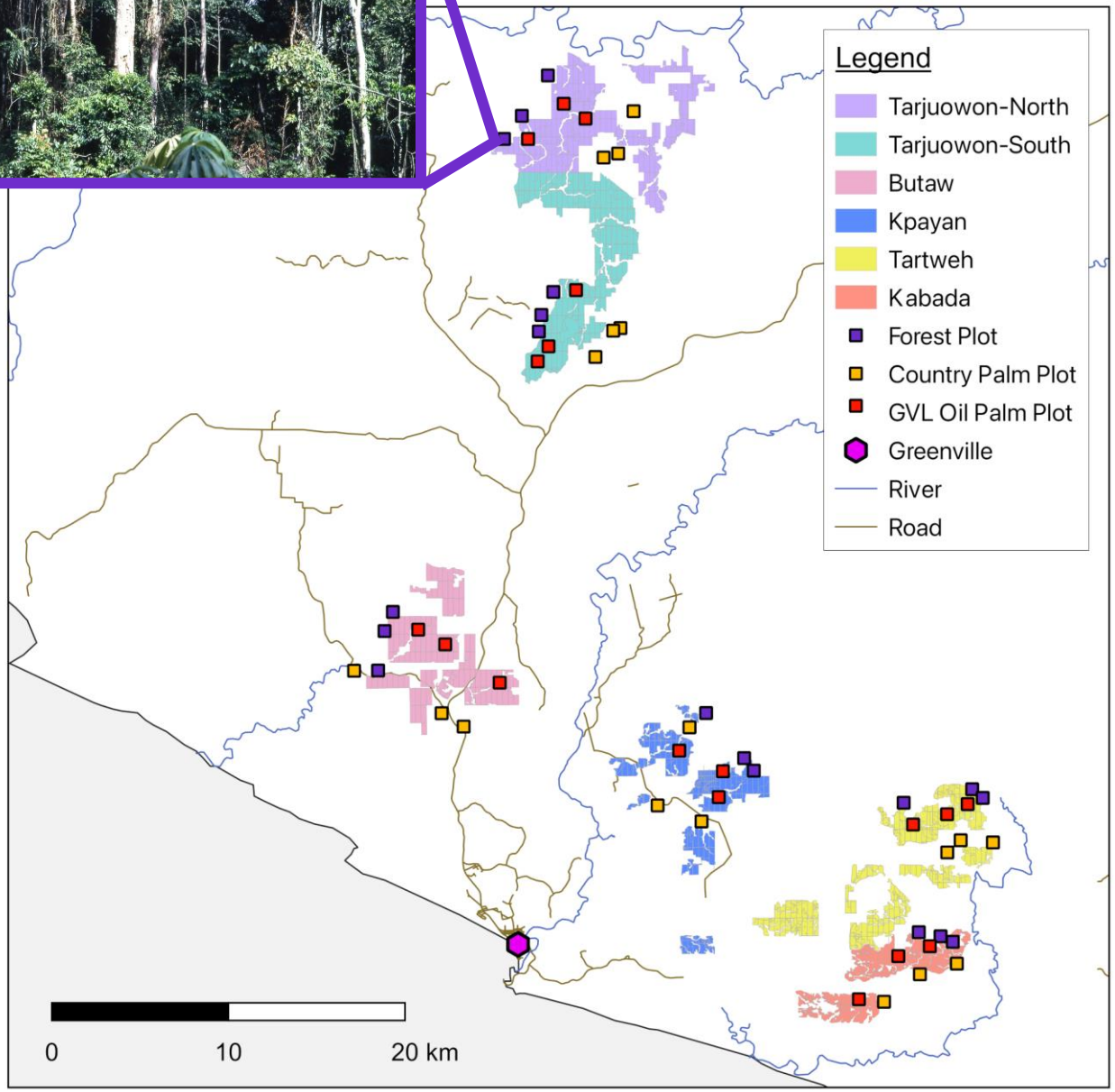

Liberia


Sinoe
County

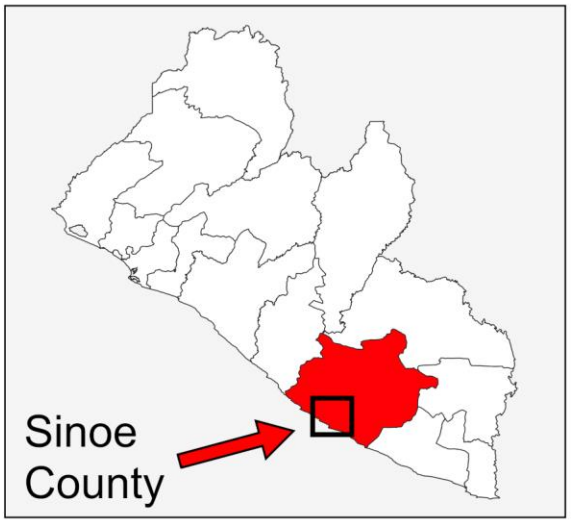

N
Legend
Tarjuowon-North
Tarjuowon-South
Butaw
Kpayan
Tartweh
Kabada
Forest Plot
Country Palm Plot
GVL Oil Palm Plot
Greenville
River
Road
0
10
20 km

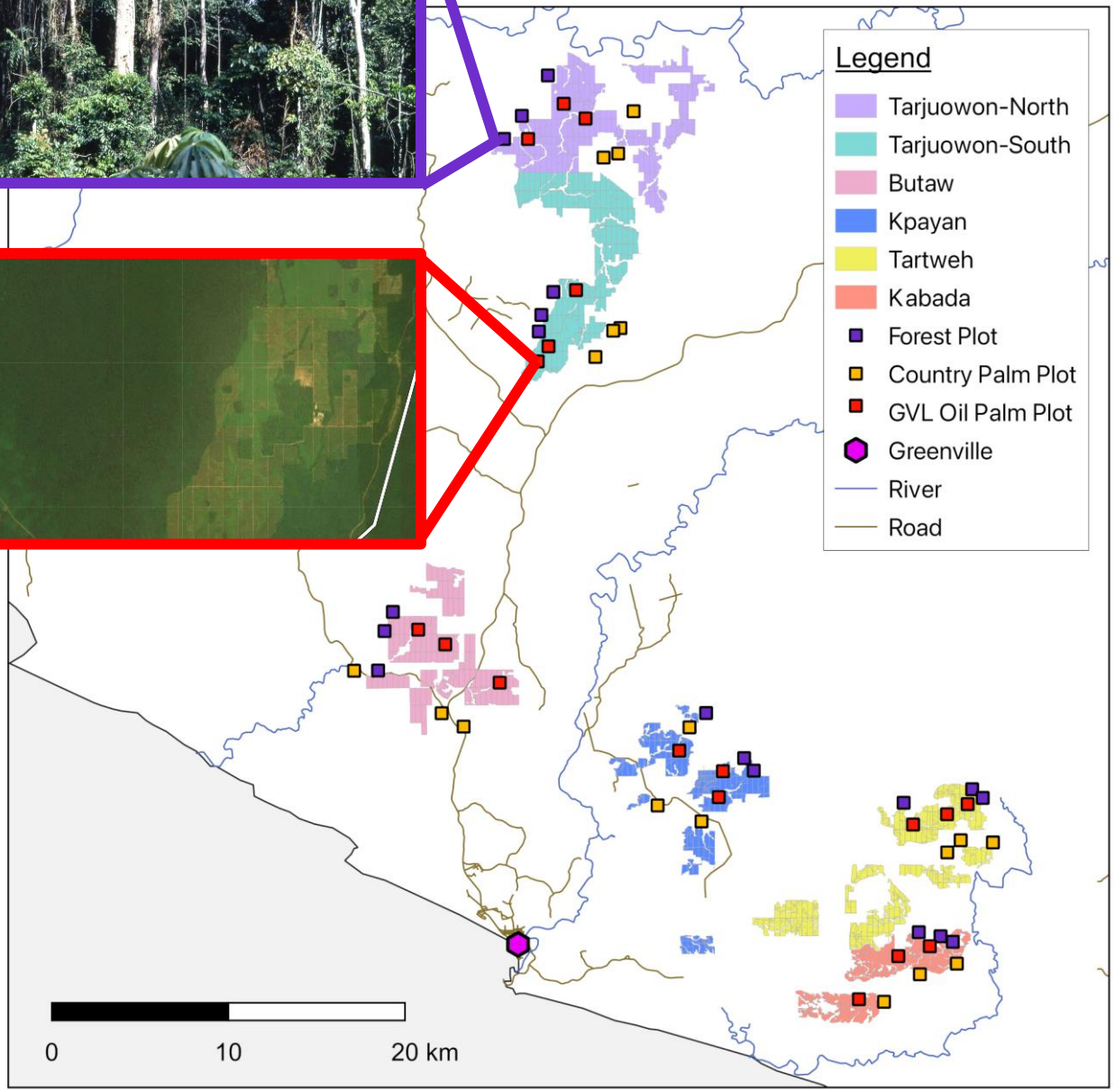

Liberia


Sinoe
County

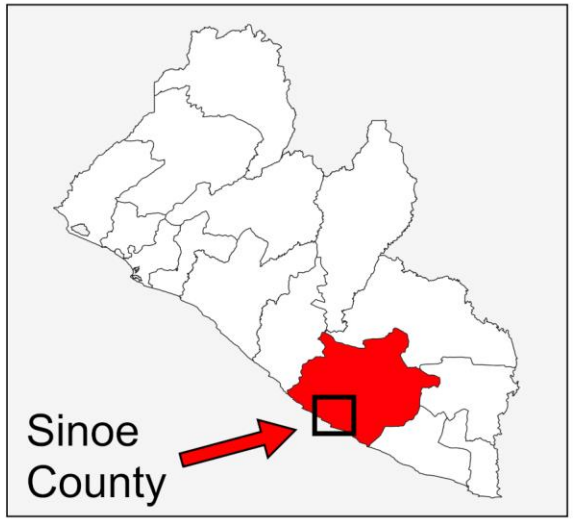

Legend
Tarjuowon-North
Tarjuowon-South
Butaw
Kpayan
Tartweh
Kabada
Forest Plot
Country Palm Plot
GVL Oil Palm Plot
Greenville
River
Road
0
10
20 km

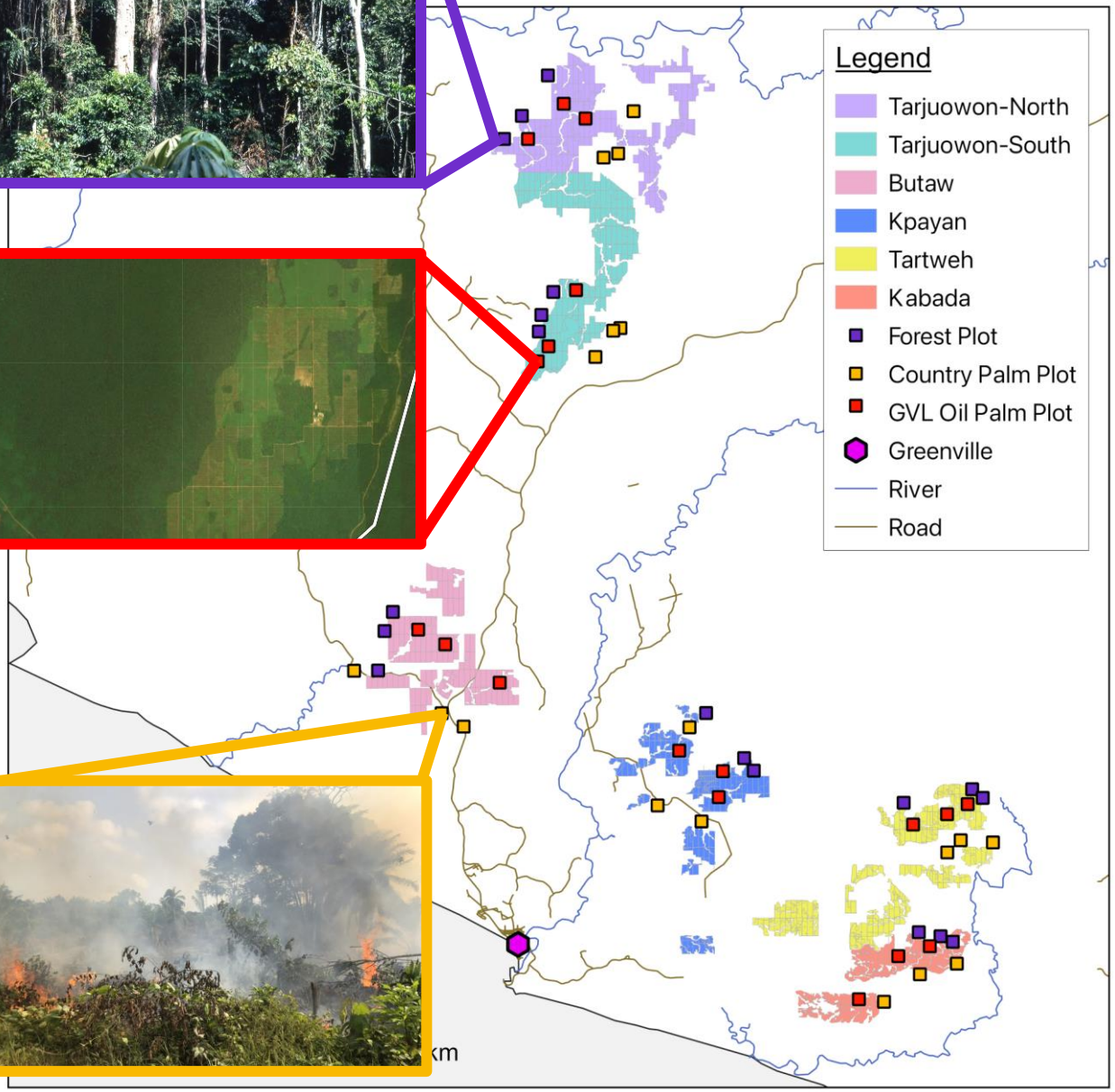

Liberia


Sinoe
County


Legend
Tarjuowon-North
Tarjuowon-South
Butaw
Kpayan
Tartweh
Kabada
Forest Plot
Country Palm Plot
GVL Oil Palm Plot
Greenville
River
Road
0
10
20 km


Liberia


Sinoe
County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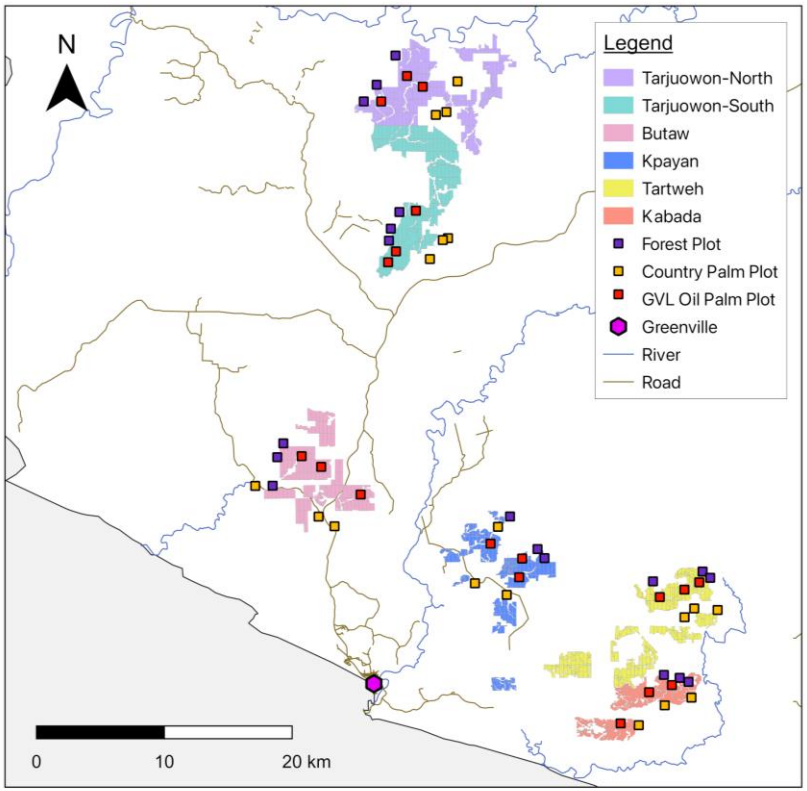
Forest Plot
Country Palm Plot
GVL Oil Palm Plot
Greenville
River
Road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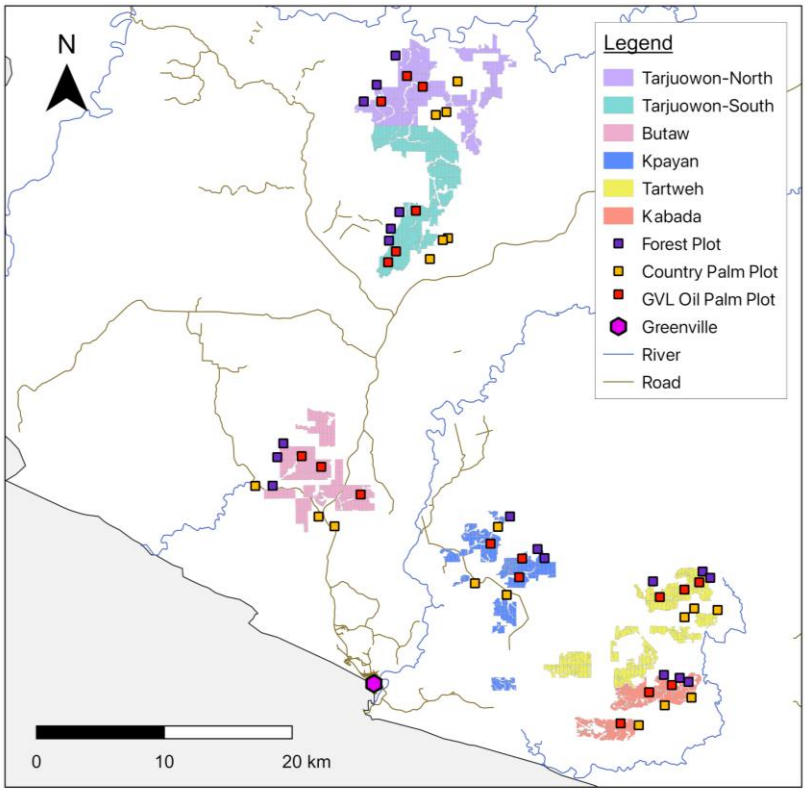
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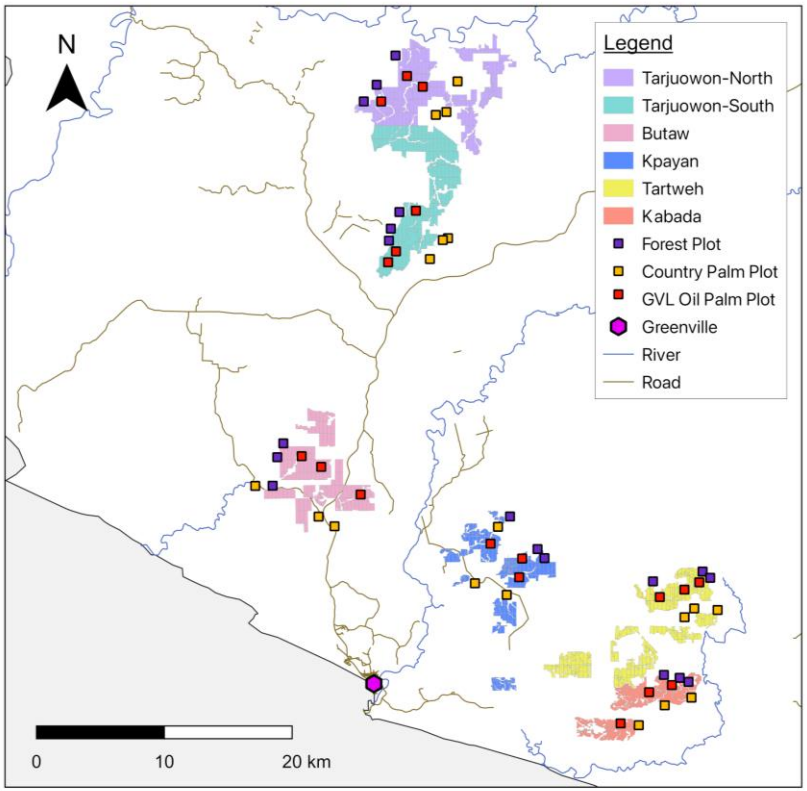
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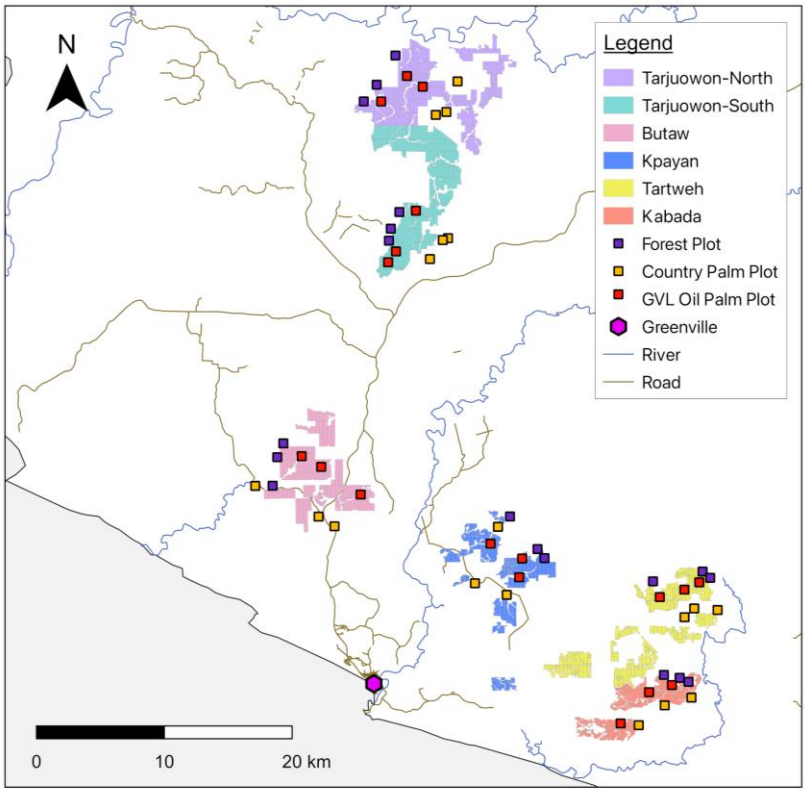
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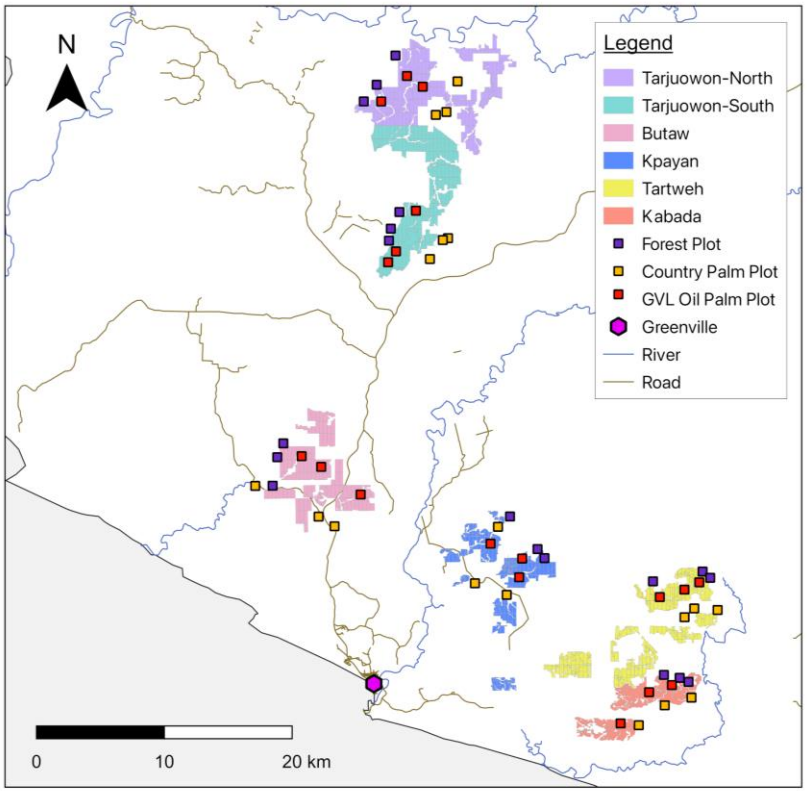
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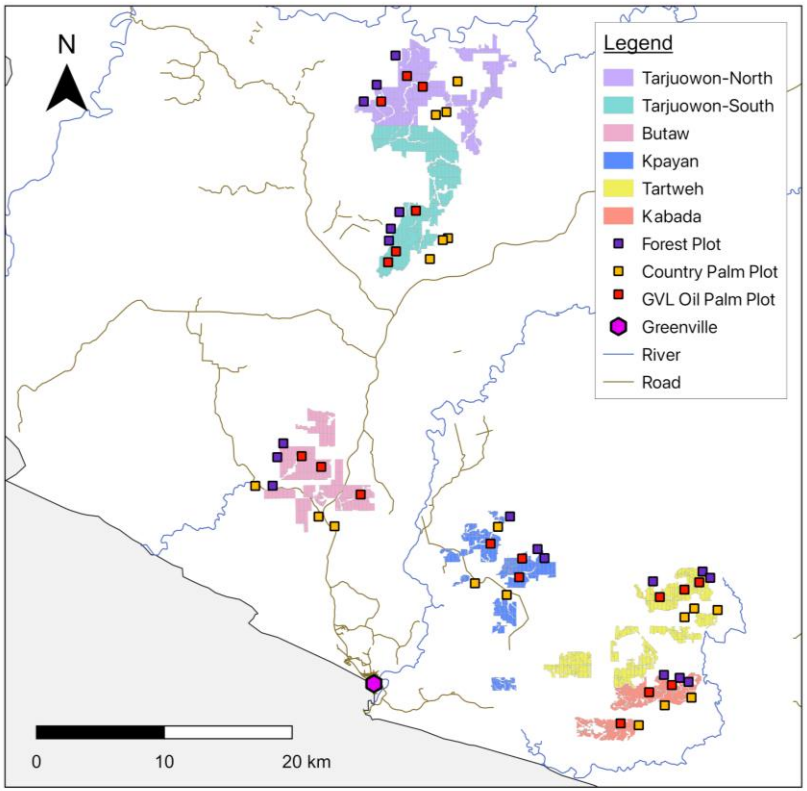
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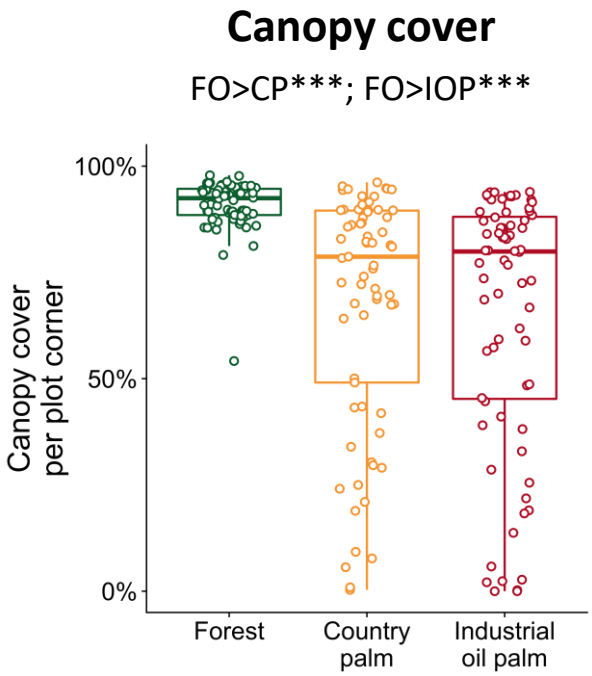
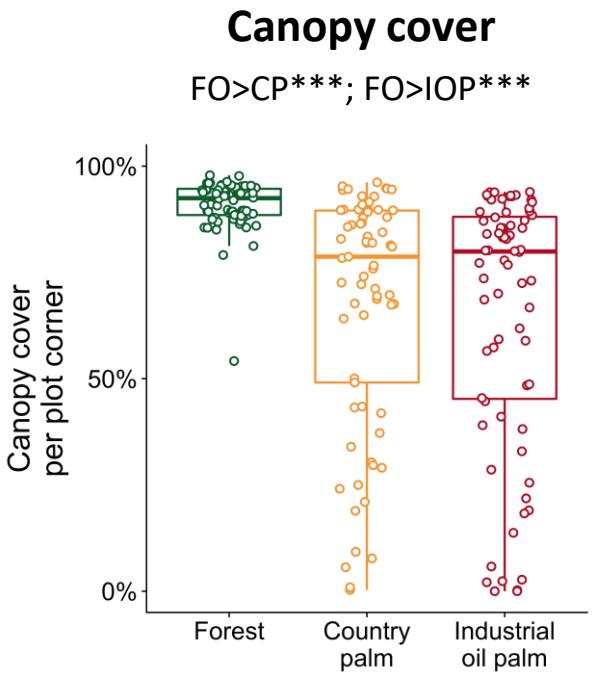
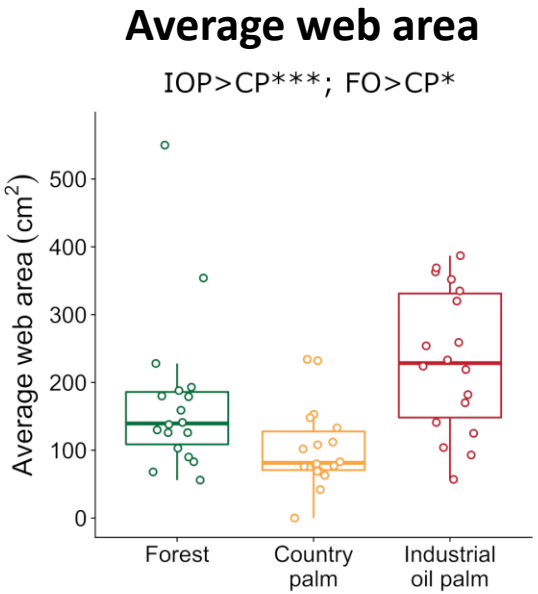
Ecological impacts

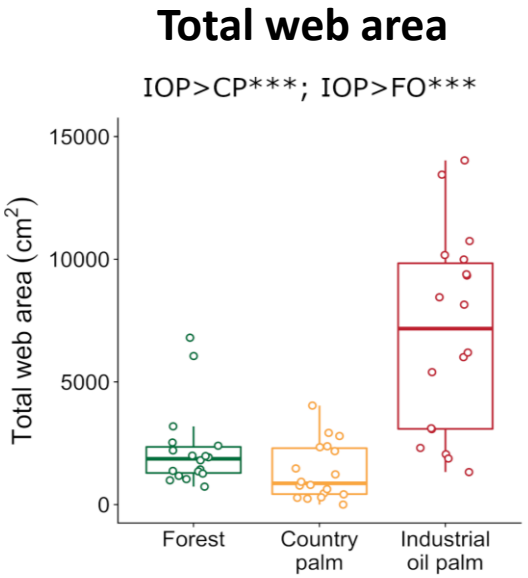


- **Cultivation of oil palm opens the canopy**

Ecological impacts





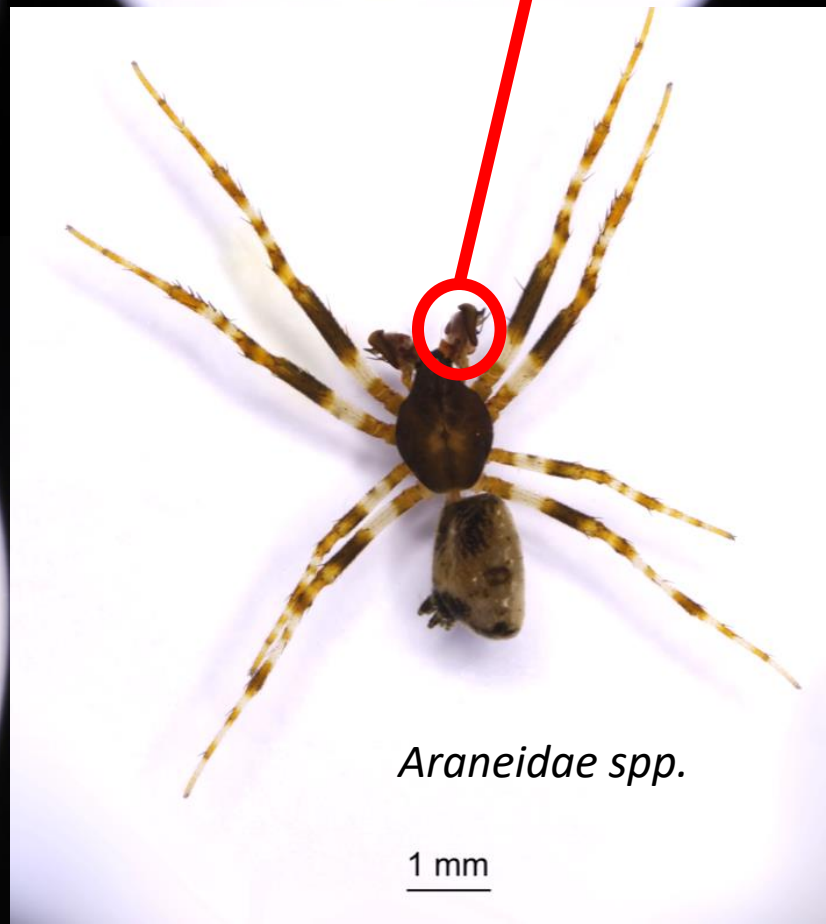


- Cultivation of oil palm opens the canopy
- **This benefits the biodiversity of certain web-building spiders (although certainly not all…)**

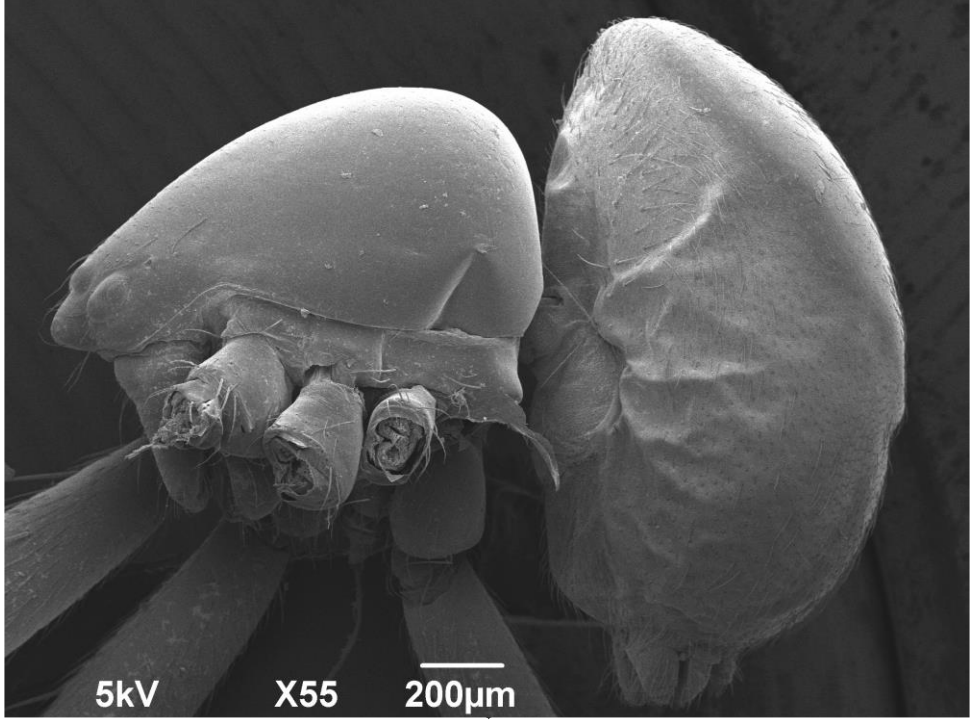
Gasteracantha curvispina

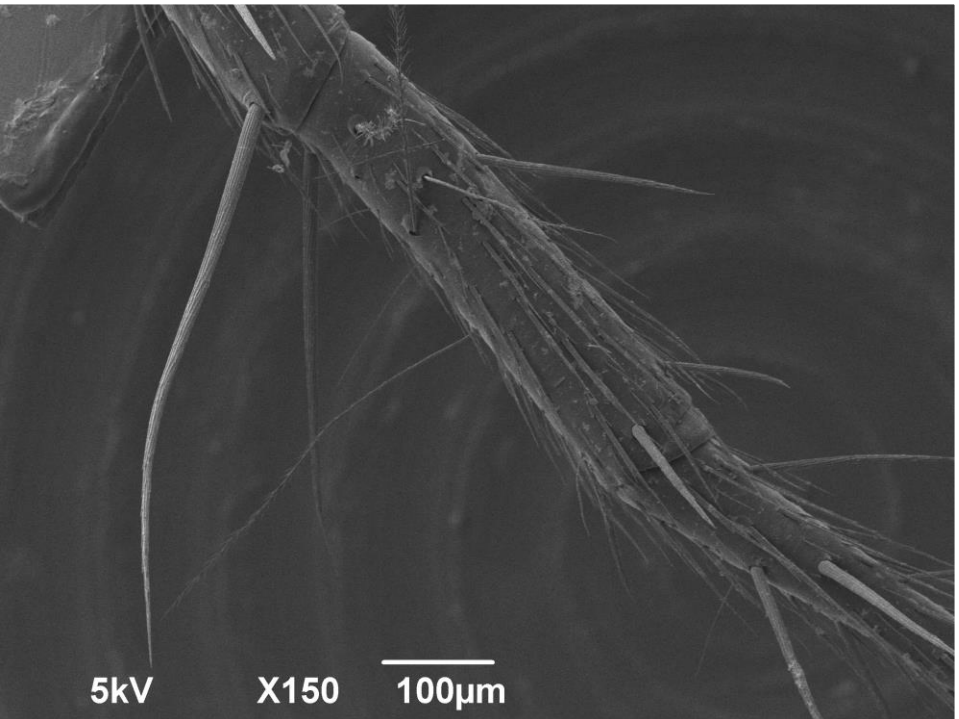

10 mm

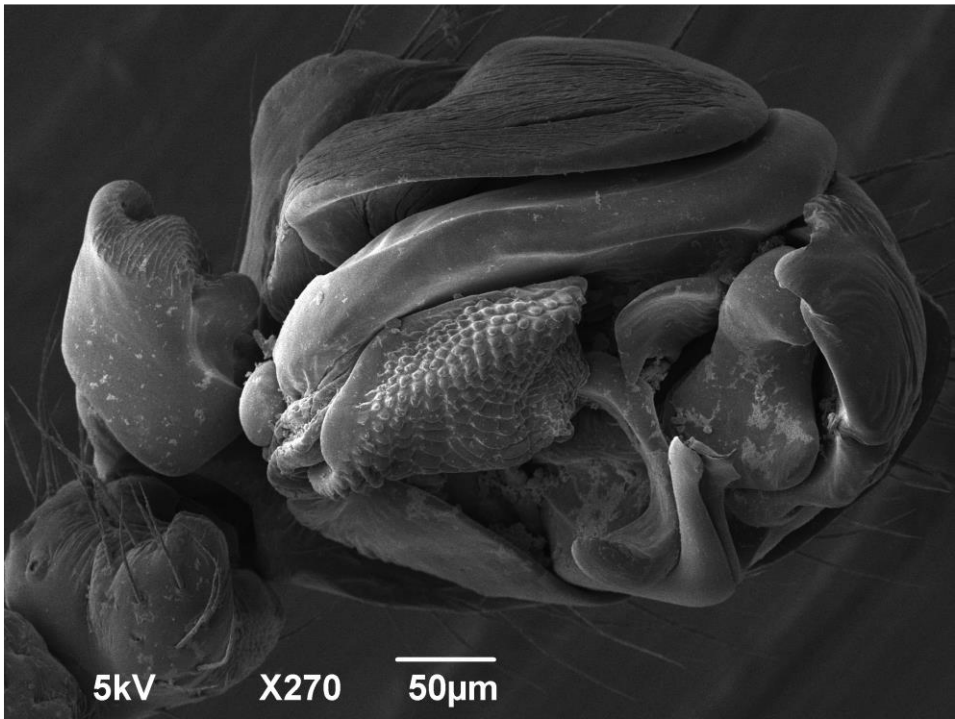

1 mm


Araneidae spp.
1 mm

Mangora spp.







- Yan
- Aby
- Ed Turner
- Agung Anak Ketut Aryawan
- Helen Waters
- Sarah Luke
- Nadine Dupérré
- KSDA
- Jean-Pierre Caliman
- Mohammad Naim
- Soeprapto
- Amelia Hood
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- Forestry Development Authority (Liberia)

@MDPashkevich
mdp48@cam.ac.uk

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