



Biodiversity

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Introduction – The Study Area

- Mixed deciduous forest
- Regrowth forest and homegardens
- Located in Nayang Tai, Luang Prabang Province



Geographical locations of the sampling plots

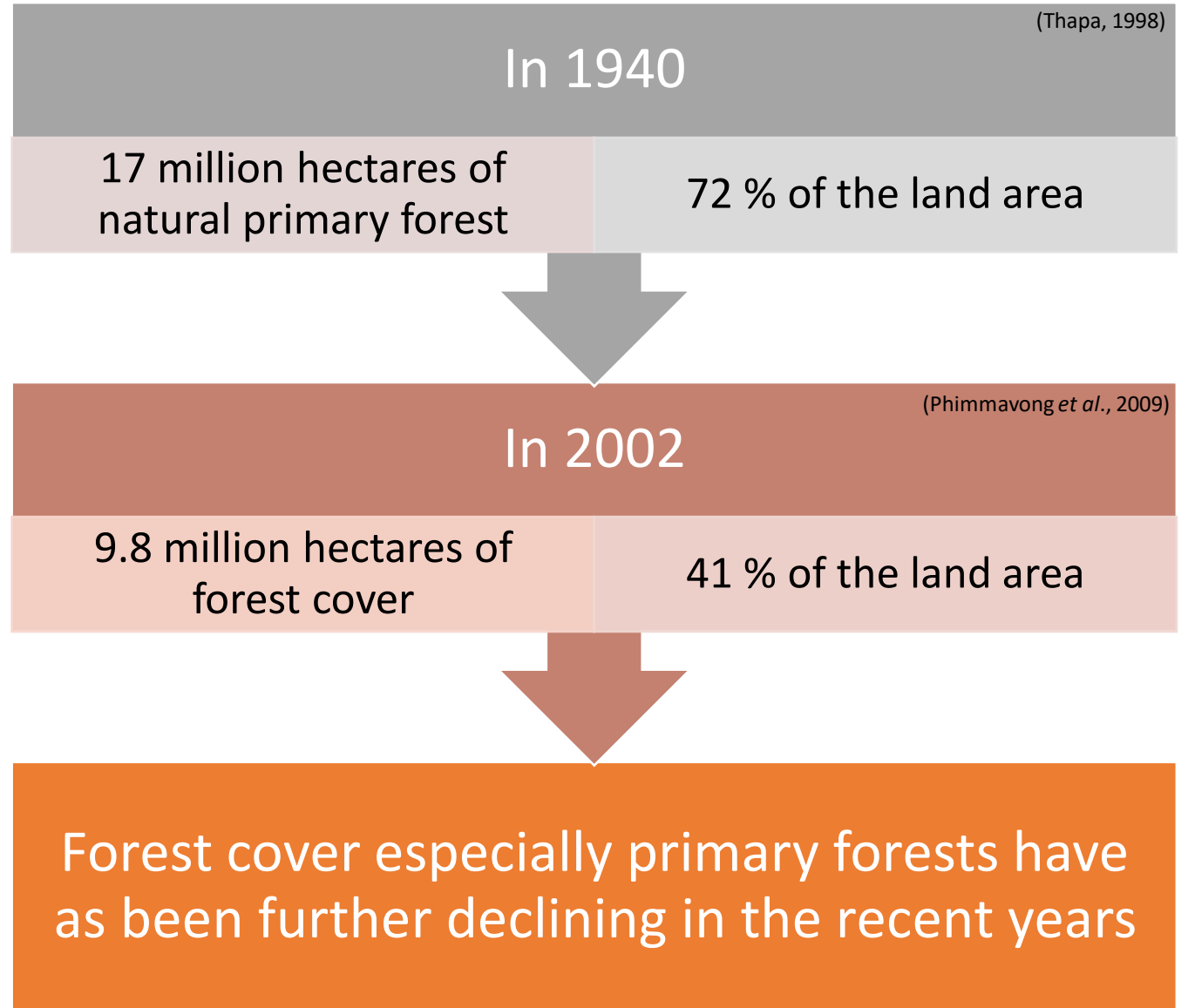




Biodiversity in Laos

- Biodiversity in Laos is one of the richest in the Himalayan, Indo-Malayan, and Chinese regions (Myers, 1992)
- Part of the Indo-Burma hotspot
 - One of the 25 biodiversity hotspots in the world defined by Myers *et al.* (2000)

Declining forest cover in Laos



Loss of biodiversity in Laos

- Laos has experienced a severe forest degradation and loss of forest cover particularly loss of primary forests
- Many flora and fauna species have become threatened or extinct due to the forest degradation and deforestation (Thapa, 1998)



Reasons for biodiversity loss

- Shifting cultivation is considered as one of the main reasons for forest loss as well as forest and land degradation in Laos (Phompila *et al.*, 2017)

Direct drivers of biodiversity loss

- Agricultural expansion
- Fuel wood consumption
- Slash and burn farming
- Forest fires
- Illegal logging
- (JICA, 2014)

Indirect drivers of biodiversity loss


- Population growth
- Lack of alternative sources of income
- Inappropriate governance and law enforcement
- Large-scale concessions





Objectives

- To investigate the woody species diversity in regrowth forests
- To compare of woody species diversity in younger and relatively older regrowth forests
- To investigate the biodiversity present in homegardens



Methods – Interviewing the locals

- A short interview with the local key informants about the site history including:
 - change in the forest conditions,
 - fauna diversity,
 - and access rights.

Site history – from the locals' perspective

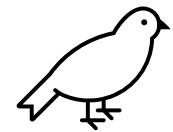
Previously the forest used to be:

- More intact natural forest
- With an abundance of large woody trees and wildlife



These days the forest is:

- Secondary, regrowth forest with an abundance of bamboo, but less big woody trees
- With no large mammals, which disappeared about 10 years ago due to overhunting
- Some birds still remain



The study site – information from the locals

- The research site is a community owned forest
- The villagers are allowed to:
 - Collect bamboo and small amounts of firewood
 - Collect NTFPs such as bamboo shoot and mushrooms
 - Collect large trees with a special permission given by the village committee
- There is a fire prevention activity on the site

Sampling methods



- Systemic plot sampling method
 - Circular sampling plots, 200 m² in size, plots approximately 50 meters apart
- Using the same sampling plots as in 2019, first of which was originally randomly selected
 - To avoid the edge effect, originally the sampling plots were located at least 20 m inside the forest
- In total of 25 plots

Classification by age group

- Woody species were classified according to size into four different age groups:
 - Germinants, height < 5 cm (not included in the research)
 - Seedlings, $5 \text{ cm} < \text{height} < 1.3 \text{ m}$
 - Saplings, height > 5 cm, DBH < 2.5 cm
 - Mature, height > 1.3 m, DBH > 2.5 cm





Biodiversity measurements on each plot

- Measuring the physiographic features of the plots
- Counting and identifying all woody species except germinants (< 5 cm)
- Estimating epiphytic flora stem cover
- Determining the structure of the forest including canopy openness and DBH measurements of trees with $\text{DBH} > 2.5$ cm
- Identifying lianas and vines

Herbaceous species sampling

- 5 times 1 m x 1 m grids inside plots
- Herbaceous cover estimation
- Ground cover percentage of herbs and forbs in each grid was averaged for ground cover estimation of the plot
- Dominant herbs and forbs were identified



Homesteads

- Identifying all existing species and classifying them by use
- Discussions with the owners about the use of the species existing in their homesteads
- A total of 10 homesteads were visited in Nayang Tai village



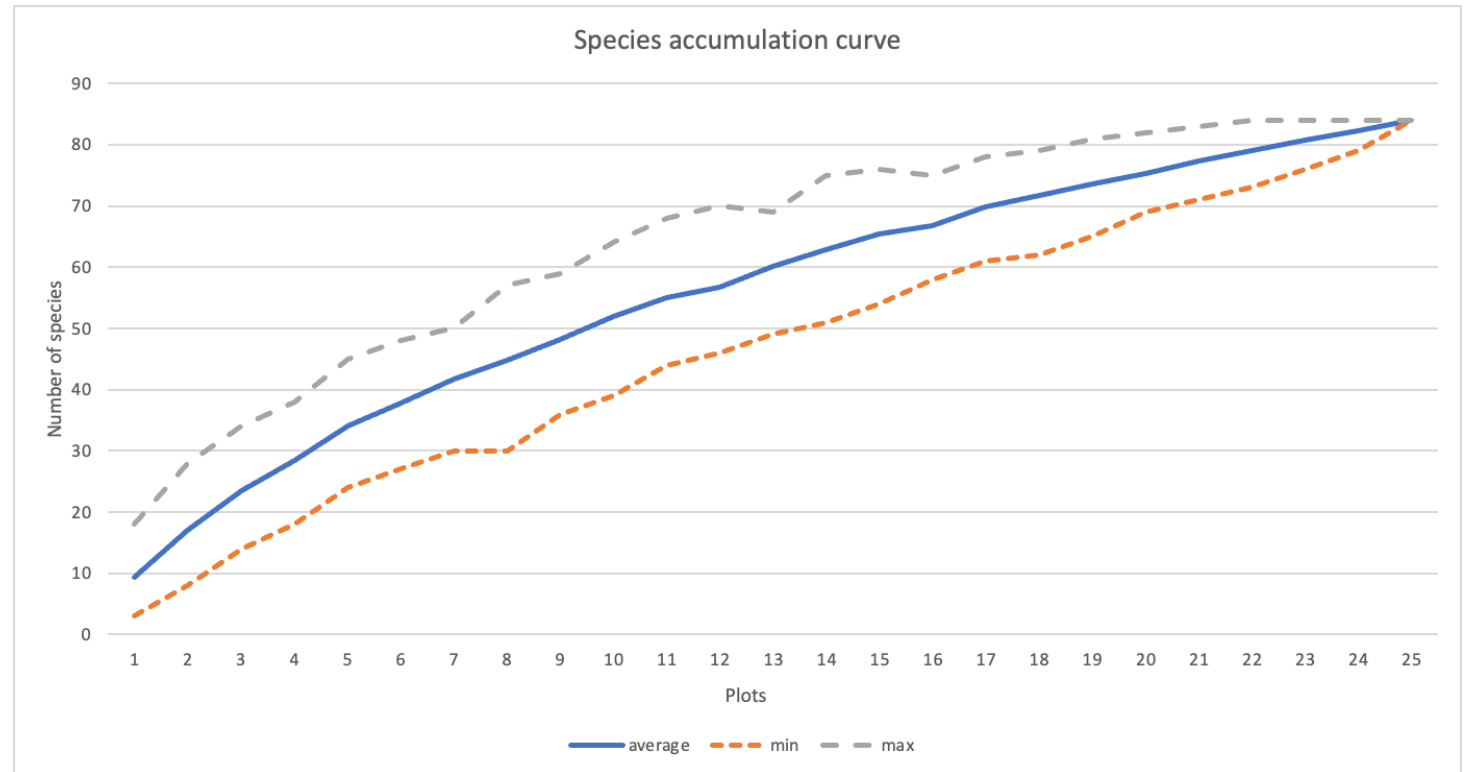


Data analysis

- Was done with Excel for descriptive data analysis
- Species accumulation curve was done with AccuCurve software
- Diversity indices were calculated using the BiodiversityPro software

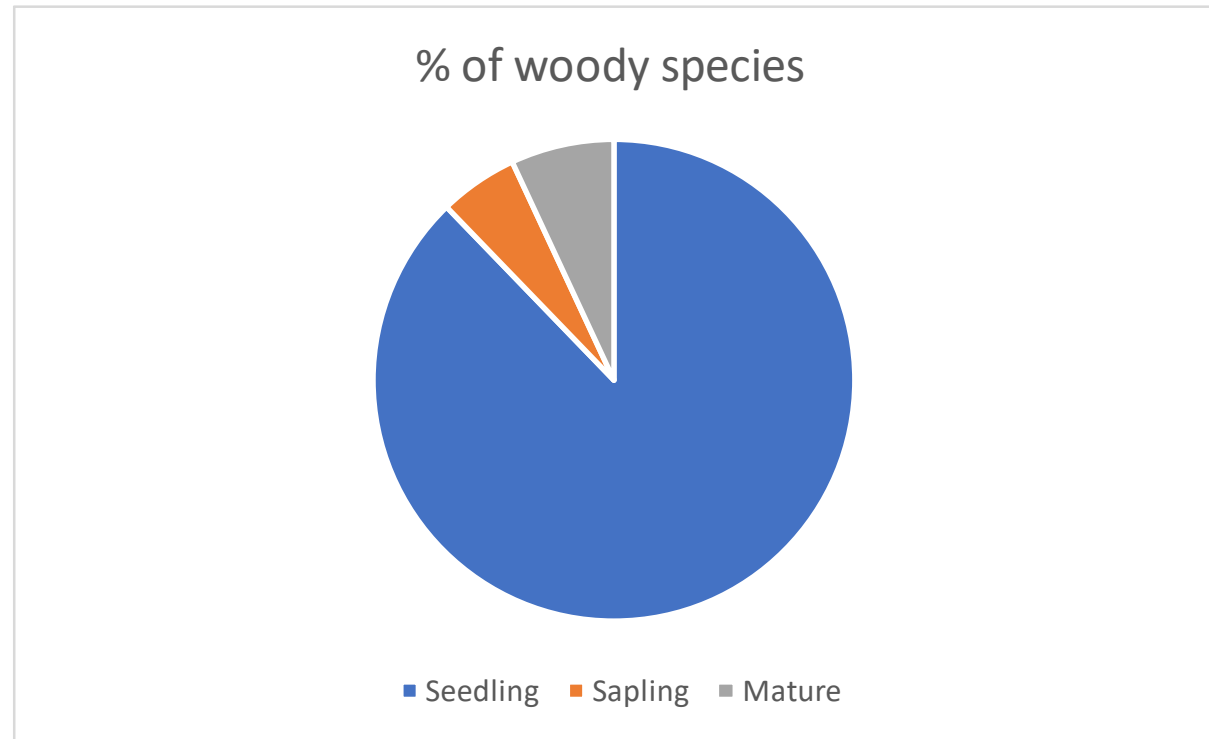
Results – Woody species inventory

- The woody species count started to level down but did not reach the maximum
- This indicates that we need more sampling

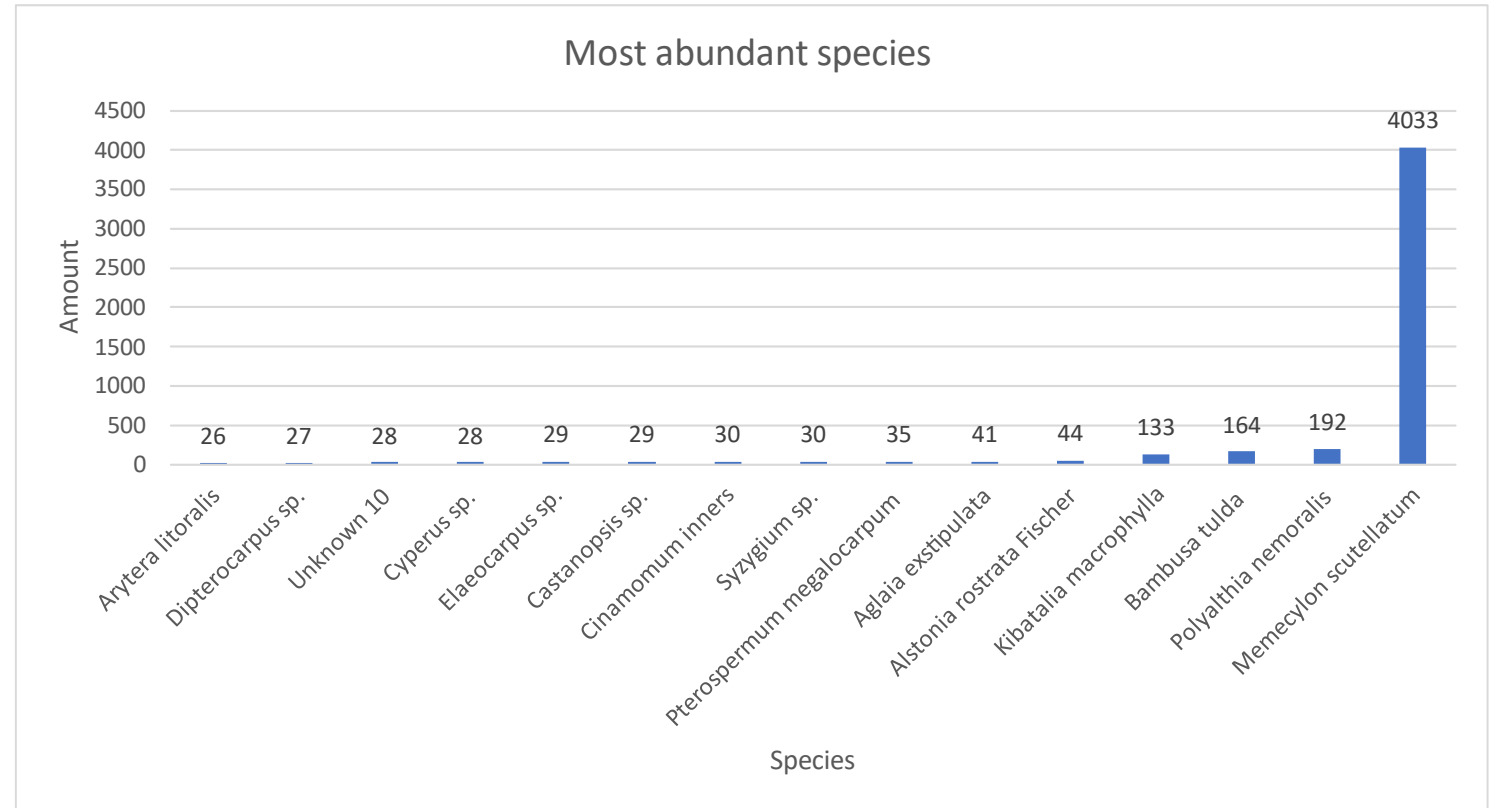


Results – Secondary forest measurements I

- The total number of woody species was 85
 - Seedlings 88 %
 - Saplings 5 %
 - Mature 7 %



Results – Secondary forest measurements II



- 15 most abundant woody species

Diversity indices

- Woody species richness: 85

Stand	Nayang Tai
Species No.	9.48
Abundance	25.5
Shannon index	0.778
Simpson index	0.216
Shannon evenness	0.830



Results – Herbaceous species cover

- The average ground cover was ~30 %
- The minimum was ~8 % and the maximum was ~69 %
 - These were the average of five measurements done per plot
- Most popular herbaceous species by frequency:

No	Scientific name
1	<i>Eugenia sp.</i>
2	<i>Diplazium esculentum</i>
3	<i>Aganoneroin polymorphum</i>
4	<i>Ormosia cambodiana</i>
5	<i>Scleropyrum wallichianum</i>
6	<i>Aporosa sp.</i>
7	<i>Amomum sp.</i>



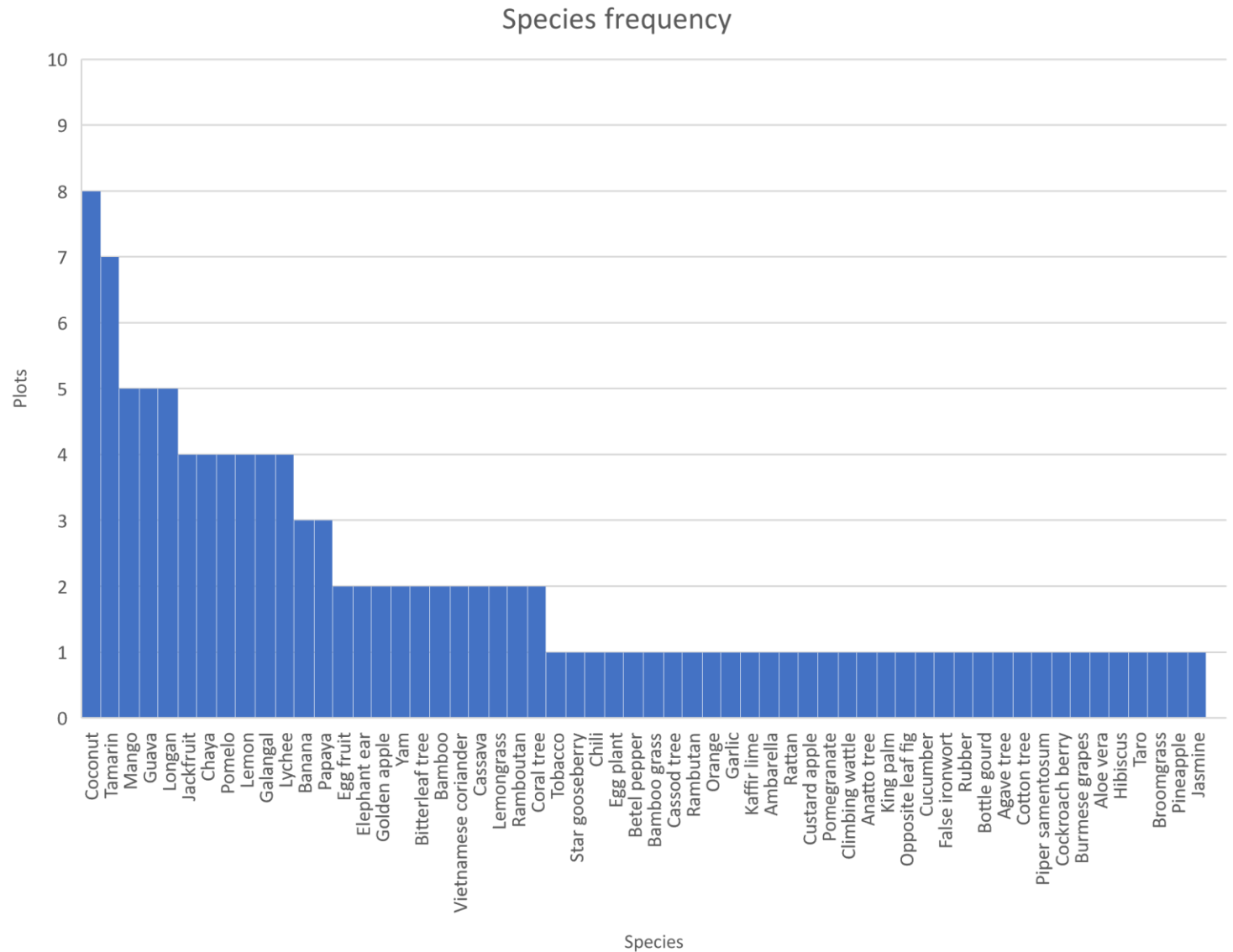


Results – Lichen cover

- The estimated average lichen cover at all (measured) sites was ~28 %
- The minimum lichen cover was 2 % and the maximum was 90 %
- Other epiphytic species such as mosses and herbs were not found within the sampling plots

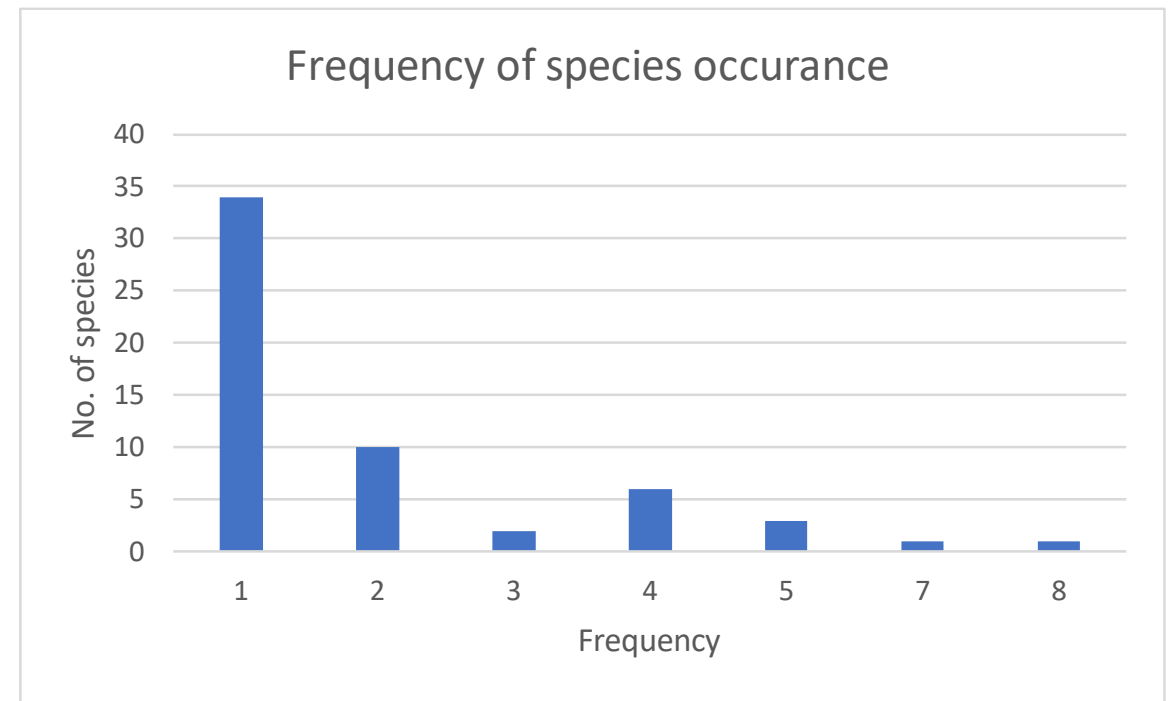
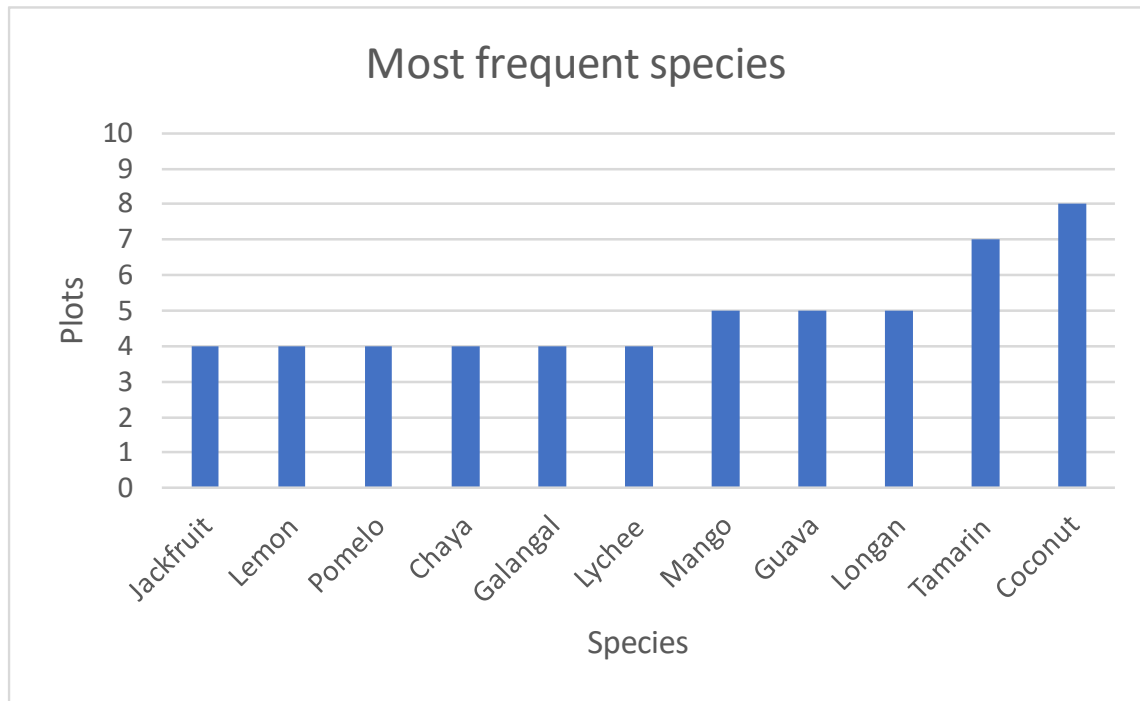
Results – Homegarden measurements I

- A total of 58 species were found in the homegardens

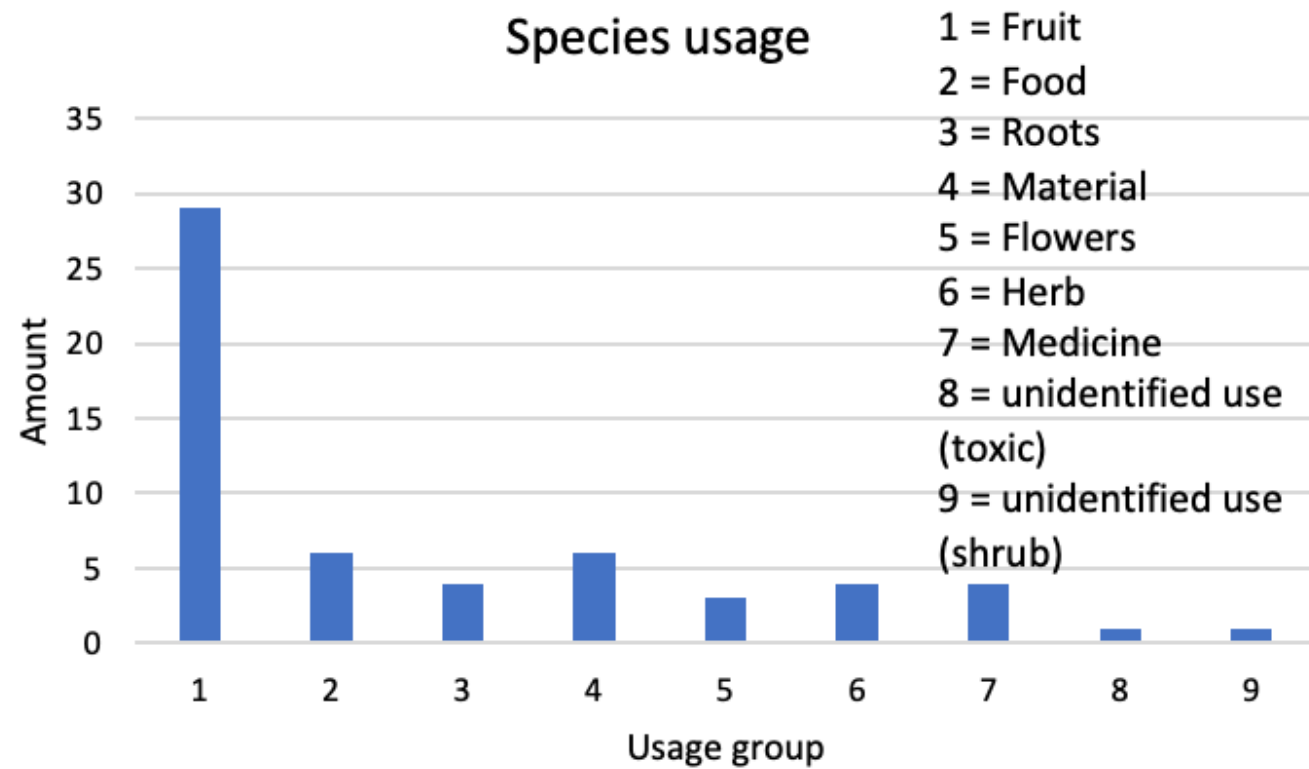


Results – Homegarden measurements II

- Most species only occurred once in all of the ten homegardens we measured



Results – Homegarden measurements III





Conclusions

- The regrowth forest had a simpler structure compared to old-growth forest
- The ground was mostly covered with woody species instead of herbaceous species
- Bamboo was found in all regrowth forest sites
- Lichens were almost the only epiphytic flora in the study
- Homegardens were more diverse than expected

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Thank you!