CRC 990
Ecological and Socioeconomic Functions of Tropical Lowland Rainforest Transformation Systems Sumatra, Indonesia

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B09

Aboveground patterns of biodiversity and associated ecosystem processes across tropical rainforest transformations

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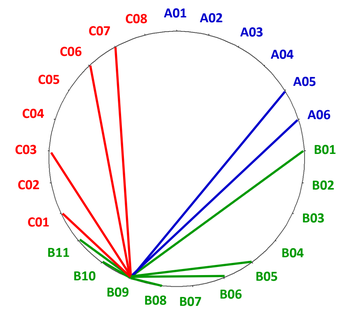
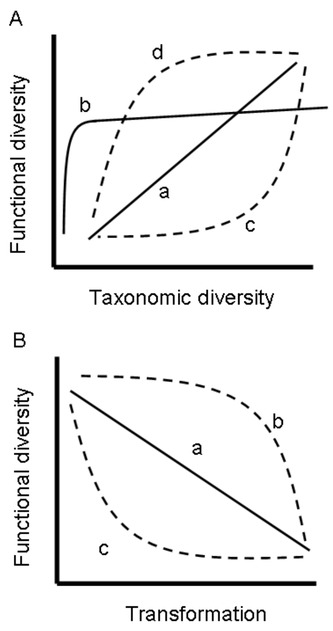


Background

Little is known on the differences between rainforest transformation systems in *spatial distribution* of *taxonomic* and *functional diversity* of aboveground animals, as well as the *functions* they exert. How these patterns are driven by *socio-economic context*, and how they relate to *human welfare* or *nutrient fluxes* is largely unknown. We approach these questions using *observational* and *experimental studies*, replicated in lowland rainforest, jungle rubber, plantation rubber and oil palm, and tight *collaboration* with other scientific projects.

Lowland rainforest | **Jungle rubber** | **Rubber plantation** | **Oilpalm plantation**

Response of aboveground biodiversity to rainforest transformation



Hypothetical relationships between:
A) Functional and taxonomic diversity: low functional redundancy (a), high functional redundancy (b), functionally unique species lost first (c), functionally unique species lost last (d). B) Functional diversity affected by rainforest transformation: if species are lost at random or if taxonomic and functional diversity are linearly related (a), if species are functionally redundant or functionally unique species are lost last (b), or if species are functionally complementary and/or functionally unique species are lost first (c). Modified after Flynn et al. (2009).

Aim: Quantify differences in *taxonomic* and *functional diversity* for ants and birds between rainforest and transformation systems, both *locally* and in terms of *species turnover* between subplots within core plots (CPs), between CPs within landscapes and between landscapes; compare the relationship between taxonomic and functional diversity across the different systems.

Bird taxonomic diversity investigated using acoustic recording and point counts. Ant taxonomic diversity determined from baiting and leaf litter samples. Ant species traits will be based on morphometric measurements and *nitrogen isotopic signature*, behaviour at baits, predation of exposed prey items and field ecological observations. Bird species traits will be based on literature, existing unpublished data and faecal samples from netted birds.

Subplot data available for ants will be analysed jointly with herb and soil invertebrate data.

Response variables: Taxonomic and functional composition of birds and ant communities.

Update: Acoustic surveys (periodically over one year) and bird point counts have been completed in all core plots. Ants have been sampled in all core plots twice (both baiting and leaf litter sampling). Almost all ants from first surveys are identified. Birds for all plots have been identified using a collaborative internet platform called SoundEFForTS.

What next? Finishing two more ant surveys and identifying birds in other seasons and times of the day. Complete ant morphometric measurements before the end of 2013. Isotope analysis will begin as soon as export permit is obtained. Analysis of taxonomic diversity data could begin in early 2014.

Cooperation: *B01 Brose, B06 Kreft* and *B08 Scheu/Maraun*

Functional analysis of Birds

Aim: Determine the ecological and socio-economic function of birds

Response variables: Dietary composition, social use and economic value of birds

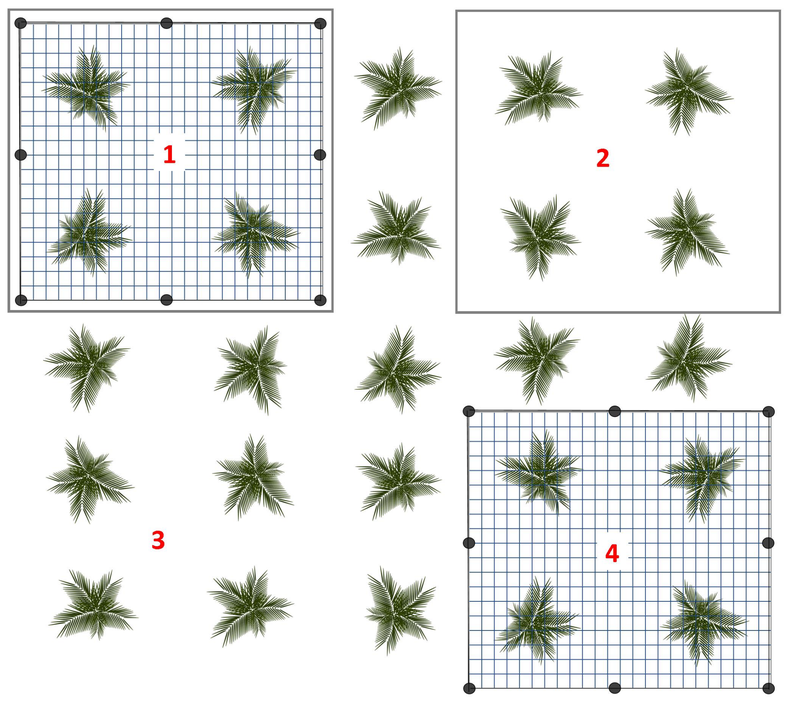
Update: The bird market survey in Jambi city has been running over 9 months

What next? Bird feeding experiments will be carried out to determine their diet and trophic role.

Cooperation: *CO7 Qaim/Schwarze*

Impact of ants and birds in oil palm: exclusion experiment 1

Layout of the Exclusion Experiment in young oil palm plantations: 1) flying vertebrate and ants exclosure, 2) ants exclosure, 3) control, 4) flying vertebrates exclosure. There are one-row oil palm buffers between treatments.



Aim: Exclude organisms that impact lower trophic levels via predation to investigate top-down forces in food-webs and associated ecosystem functions. in Oil Palm plantations. Exclusion of birds is done using fishnets, exclusion of ants using aluminium barriers with sticky glue dug into the soil and toxic baits.

Response variables: Impact on arthropod communities above- and belowground herbivores, pollinators, pollination, herbivory, decomposition rates and yield

Update: Experiment set up and running since beginning of September 2013. Yield data being collected continuously, and sound recordings (for bird diversity) every 2 months.

What next? Measure herbivory & pollination every 4 months, decomposition over 6 months starting December 2013. Intensive invertebrate collection at completion of experiment (after one year).

Changes in impact of ants : exclusion experiment 2

Aim: Determine relative effect of ants across different habitat types. Paired ant and control plots in beside each of the 16 core plots in the Harapan transformation system. Exclusion methods similar to experiment 1

Response variables: Impact on above- and belowground invertebrates, vegetation, soil nutrients and decomposition.

Update: Talks with landowners/plantation keepers have begun to confirm placement of exclosures beside core plots. Informed REKI of plans to build exclosures in the forest and a request for an assistant to manage them has been made.

What next? Establish 6 plots (3 paired ant exclosure and control) at each core plot. Vegetation surveys in every plot (November 2013). Begin ant exclusion before the end of 2013. Experiment will run for at least one year.

Cooperation: *B08 Scheu/Maraun*