Tropentag, October 6-8, 2009, Hamburg

"Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources"

Spider Web Density in Indonesian Cacao Agroforestry in Relation to Habitat Variables at three Different Spatial Scales: Tree, Plot and Landscape

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Abstract

Web-building spiders are recognised as obligate insectivorous predators which reach high abundances in all terrestrial habitats. However studies on the functional role of spider communities and the impact of vegetation structure and landscape context on spider web-density especially in complex tropical agroecoystems such as agroforests are still rare. The relationship of five web-building spider guilds to habitat variables and to the presence of the numerically dominant Philidris-ant species at three different spatial scales: tree, plot and landscape was determined. In Sulawesi, Indonesia, we surveyed the distribution of several spider-web types within 420 cacao trees of 42 different managed cacao plantations. We fitted linear mixed model, selected the best model subset using information-theoretic criteria and calculated the model-averaged estimates. In addition we correlated the density of different web types to the incidence of the local main pests cacao pod borer (*Conopomorpha cramerella*) and cacao pod sucker (*Helopeltis sulawesi*). The analysis showed a significant impact of habitat heterogeneity on spider web abundance on different spatial scales whereas the requirements on plant structural complexity and environmental conditions diversified among web-building spider guilds. The orb- and line-weavers, that dominated the web guild structure on cacao trees showed a high dependence on tree structural complexity, while the abundance of tangle-, lattice- and sheet-weavers was additionally influenced by environmental conditions. Concerning to the pest controlling potential of each web-building spider guild and with respect for their interactions with *Philidris* sp., the multi-model inference generated no significant reduction in fruit damages trough *Helopeltis sulawesi* or *Conopomorpha cramerella*.

Keywords: *Araneae*, cacao agroforest, *Conopomorpha cramerella*, *Helopeltis sulawesi*, Indonesia, management strategies

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