The Function of the Soil Macrofauna in Decomposition Processes in Central Amazonian Polyculture Systems and Forests

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A study of macrofauna and decomposition in three central Amazonian ecosystems (a primary and a secondary forest and two polyculture tree plantations) has shown the high importance of the macrofauna for the litter decomposition. Whereas in the primary forest Lumbricida and Isoptera dominated the decomposer fauna in abundance and biomass, in the secondary forest and the polyculture areas Diplopoda and Isopoda became dominant. Dominances and group spectra were clearly different. Macrofauna biomass was highest in the primary forest and lowest in the secondary forest. It differed strongly between the two polyculture areas, probably due to different micro-climatic conditions near the ground as influenced principally by density of secondary vegetation (cover) and shading by the neighboring forest.

Decomposition rates of a standard litter in the primary forest were much higher than in all other areas, but in one of the two polyculture areas where climatic conditions appeared less extreme an abundant decomposer macrofauna (different species than in the forest) was able to come close to the efficiency of the original fauna in decomposition. Decomposition rates in litterbags of mesh widths of 20 µm and 250 µm were less than 50% of the rates in coarse litterbags. The same decrease in decomposition rates by experimental exclusion of macrofauna was shown in three other systems (rubber-tree and peach palm monocultures and fruit-tree polyculture). Decomposition rates were significantly correlated with the abundances of the macrofauna decomposers and the biomass of earthworms and arthropod decomposers. C/N-ratio of the standard litter decreased during the decomposition and this effect was strongest in the primary forest area. In consequence the relative N-content in the resting litter after one year was significantly higher there than in the other areas. N-contents in litterfall and soil were also higher in the primary forest.

In summary litter decomposition in the central Amazon polycultures follows the same principles than in primary forest, e.g. the macrofauna regulates the decomposition rates. However the structure of the decomposer community differs clearly and lower decomposition rates and higher C/N-ratios show that the fauna in anthropogenic systems does not reach the same efficiency in decomposition and nutrient transfer. The results are the basis for a future experimental study of the effects of mulch application on macrofauna and decomposition and finally on nutrient release, soil organic matter building and soil structure.

Modelling the Role of Termites in the Carbon Cycle of Neotropical Forests

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Termites (Insecta; Isoptera) are important decomposers of plant material in tropical ecosystems. They play one of the key roles in the turnover of dead phytomass, since they exclusively feed on organic material. Their biomass is much larger than previous estimates suggest, since they are based on soil fauna assessments. Therefore, termites in arboreal and epigeal nests and those in standing dead tree trunks have not been considered. Current ecosystem models that deal with carbon pools are often based on abiotic factors (i.e. relative evapotranspiration) alone and do not include faunal data. The integration of faunal data in carbon models, however, is imperative, as macrofauna determines the initial decomposition rates, and hence, the turnover time of carbon in terrestrial ecosystems. We provide respiration