Light-demanding canopy tree species are not indicators of past human disturbance in the Yangambi rainforest (Democratic Republic of the Congo)

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Context. Central African rainforests are characterized by an abundance of light-demanding tree species, which are aggregated in the canopy but underrepresented in the understorey. A popular explanation is that these forests are recovering from slash-and-burn farming activities preceding relocation of settlements during the colonial era. In a previous paper, using an approach that focused on the spatial distribution of the most abundant light demanders, we showed that the abundance of light-demanding tree species in the Yangambi Biosphere Reserve (central Congo basin) cannot be unambiguously attributed to past human disturbances (Luambua et al., 2021).

Aims. As the former study was inconclusive, the present study aims to further test the assumptions behind the 'recovery from human disturbance hypothesis', by considering all species in the forest of Yangambi. We addressed four specific research questions: (i) Do light demanders occur in large 'pockets' occupying large areas of forest? (ii) Are light demanders abundant? (iii) Do they exhibit a regeneration deficit? (iv) Is species composition in pockets of light demanders different from the surrounding forests?

Methods. We identified location and size of pockets of light demanders in several transects cumulating to 50 km. We installed permanent inventory plots within and outside these pockets and calculated diameter and age distributions of light demanders within each pocket. We assessed whether pockets of light demanders are different from surrounding forests, using plot clustering analysis.

Results. Our results showed that light demanders were aggregated, but the pockets were small, scarce and represent a minor fraction of the total forest area. Furthermore, light demanders were not abundant, even in pockets where they were aggregated. Their age distributions did not show a regeneration deficit. Finally, species composition in pockets of light-demanders did not differ substantially from surrounding forests where they were scarce or absent.

Conclusions. We conclude that light-demanding canopy species do not indicate past human disturbance in Yangambi and that they are an intrinsic component of old-growth forests rather than a transient feature of successional forests. Our insights show that the large carbon sink observed in mature forests in this region, is not driven by successional forest dynamics.

Keywords

Central African Rainforest, Forest Composition, Forest History, Recovery from Human Disturbance Hypothesis, Yangambi Biosphere Reserve

Reference

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