Patterns and drivers of liana community structure across five forest ecosystem types in Ghana

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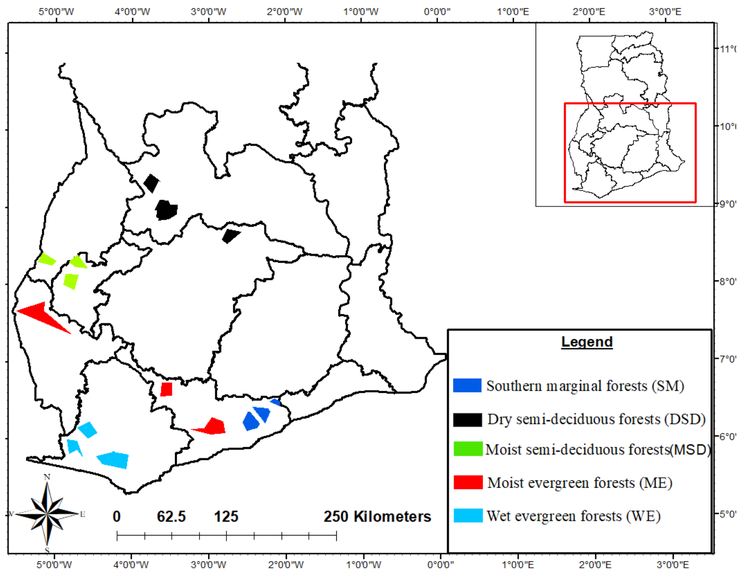
Introduction

- Woody climbing plants or lianas, require tree support to access the light rich canopy. They provide ecosystem services such as fibre and poles for construction; bark, roots, leaves and seeds for medicinal purposes and certain types such as melons, gourds, grapes, and some legumes for food[1-3].
- What determines where one finds lianas of interest? Where are lianas most abundant and most diverse and what factors are responsible for these?



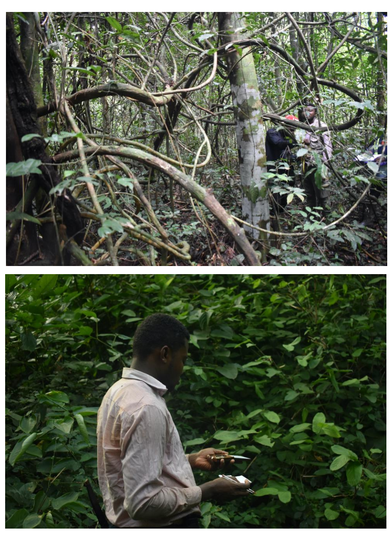


Fig. 2 Map of study area (L). Forests were selected across the high forest zone of Ghana and also to reflect rainfall gradient. Pictures on the right show some field methods

Fig. 1 Lianas are a common feature of tropical forests. They require tree support (L) and their fruits (R) are important food for wildlife.

Methods

- ✓ Seventy-five (75) 40 m × 40 m plots evenly distributed among five forest ecosystem types in Ghana from dry to wet forests.
- ✓ At plot level, lianas with diameter at breast height (dbh)>1 cm and trees with dbh > 10 cm were identified and enumerated. Canopy cover, slope and soil physicochemical parameters determined. Climate data was obtained from Ghana Meteorological Agency.
- ✓ Data analysis employed multiple regression and canonical correspondence analysis (CCA) to determine drivers of liana diversity, density and distribution.

Results – drivers of liana diversity and density

- ➢ Liana species richness, abundance and basal area were supported by tree species richness but not tree abundance.
- ➢ Mean annual precipitation positively influenced liana community attributes (species richness, abundance relative to trees and basal area).
- ➢ Sodium and organic matter positively affected liana species richness, and total exchangeable bases and exchangeable acidity positively predicted liana abundance.

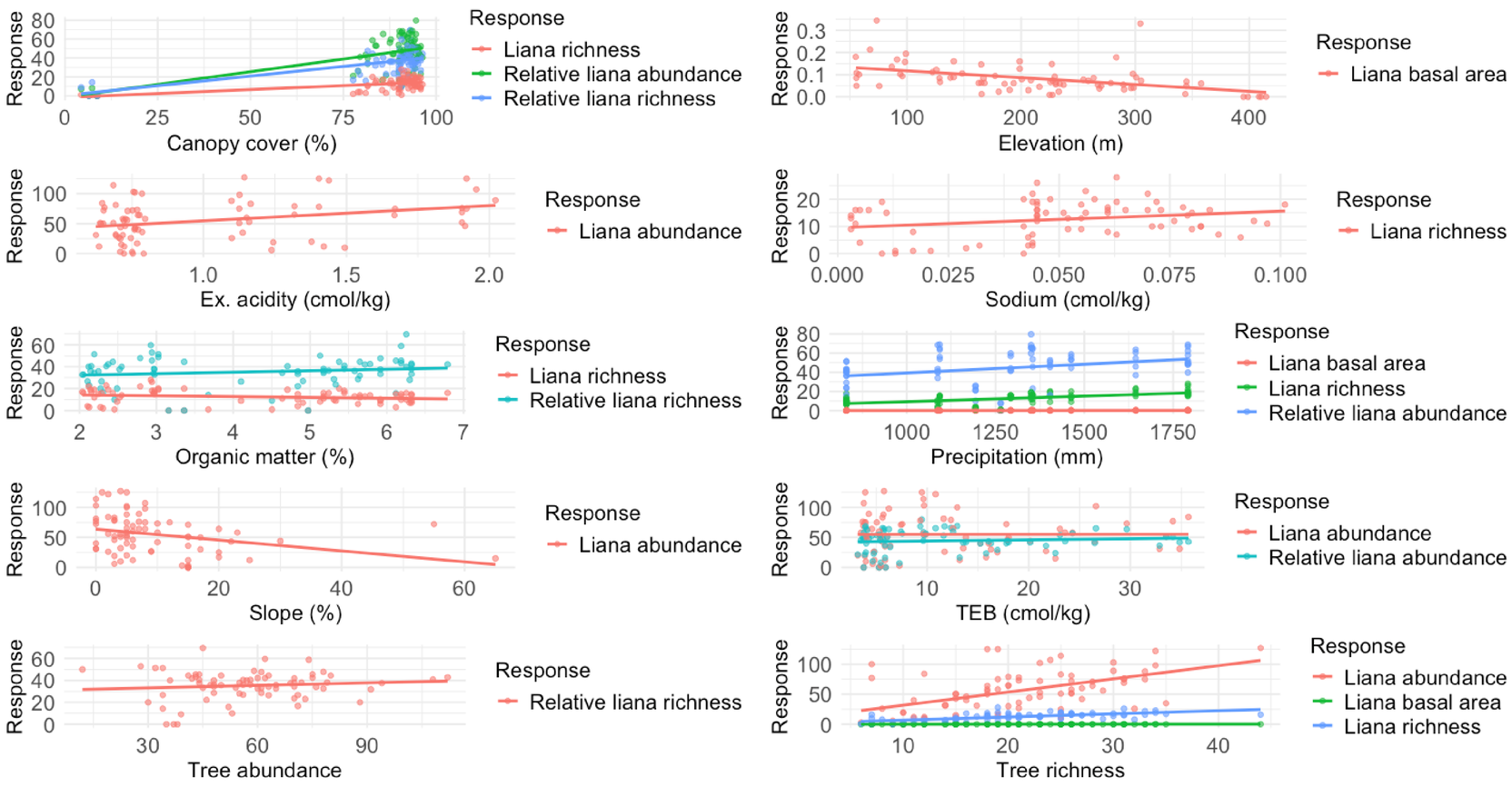


Fig. 3 Significant predictors of liana species richness, liana abundance, liana basal area, relative liana species richness and relative liana abundance across five forest ecosystems in Ghana.

Results – determinants of liana species distribution

- ➢ Some liana species were strongly associated with the Wet Eevergreen (WE) forest with higher MAP and exchangeable acidity levels: e.g., *Combretum tarquense* (Com.ta), *Leptoderris miegei* (Lep.mi), and *Dalbergia oblongifolia* (Dal.ob).
- ➢ Other species preferred lower levels of MAP and exchangeable acidity and occurred in Southern Marginal and Moist Semi-deciduous forests (e.g. *Artabotrys insignis*—Art.in, *Dalbergia saxatilis*—Dal.sa, *Griffonia simplicifolia*—Gri.si).
- ➢ Liana species which occurred in the Dry Semi-deciduous forests showed a strongly negative correlation with humidity: e.g., *Uvaria afzelii* (Uva.af), *Combretum aphanopetalum* (Com.ap), and *Dalbergia hostilis* (Dal.ho).

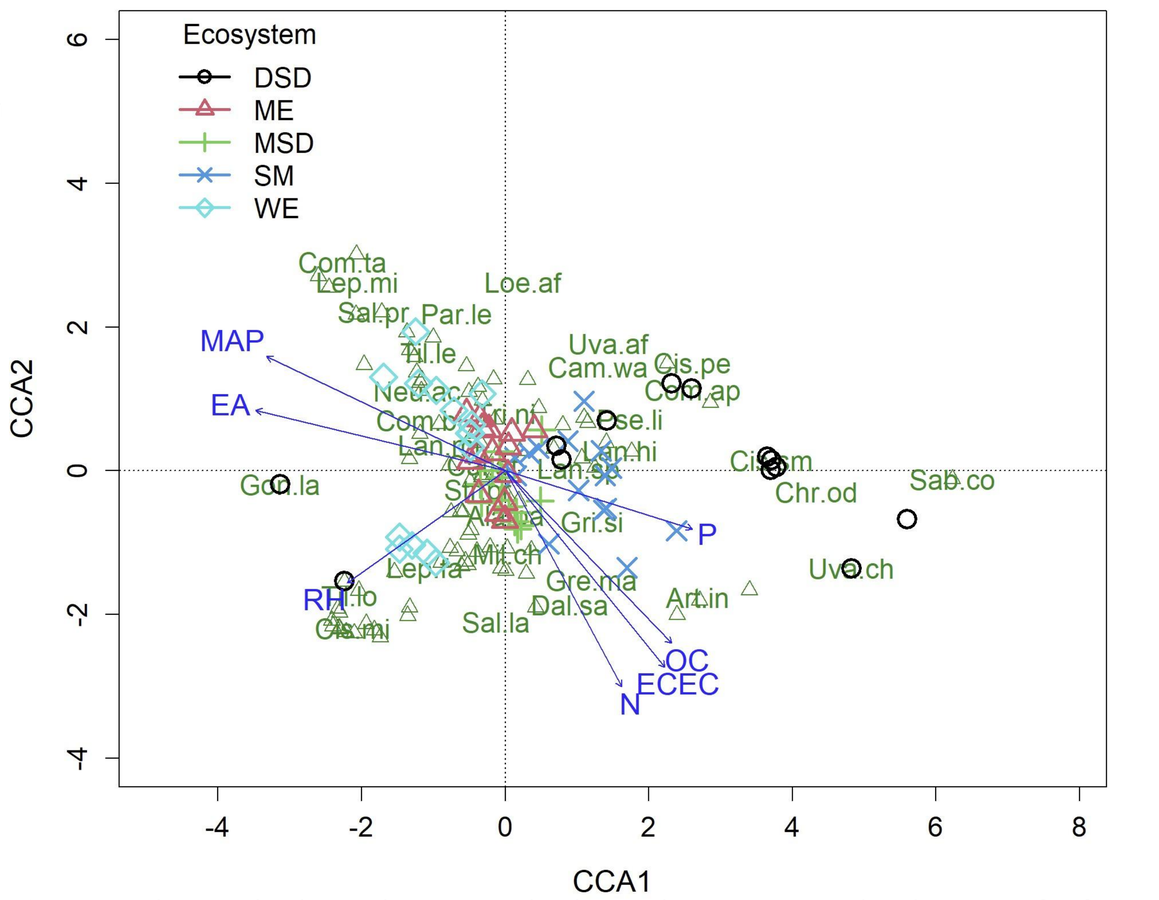


Fig. 4 CCA ordination plot showing liana species distribution along environmental gradient across five forest ecosystems in Ghana. EA, exchangeable acidity; ECEC, effective cation exchange capacity; MAP, mean annual precipitation; N, total nitrogen; OC, organic carbon; P, total phosphorus; RH, relative humidity. Please refer to paper for full species names.

Conclusion

- ○ Overall, liana diversity, abundance and basal area were influenced mainly by tree species richness, precipitation and soil nutrients.
- ○ Lianas showed marked distribution patterns mainly along climatic and edaphic gradients.

References

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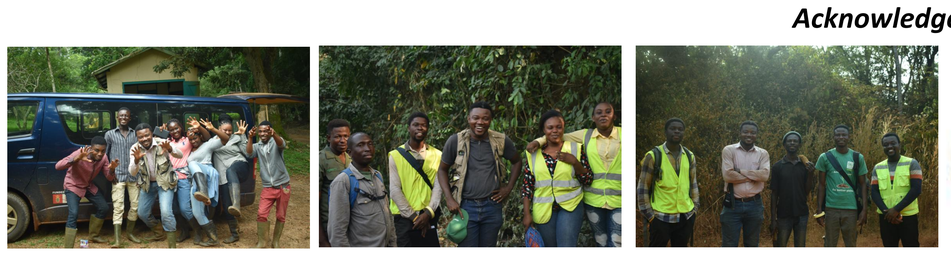

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