



Relationships between habitat characteristics and acoustic ecological indicators in cocoa agroforestry systems of Ghana Amanda Cooke

Co-authors: Wätzold M., Abdulai I., Wenzel A., Wollni M., Ocampo-Ariza C.

Introduction

- Cocoa agroforestry systems (AFS) promise to provide win-win solutions for yield and biodiversity
- However, the effects of cocoa AFS habitat characteristics on biodiversity are poorly understood in West Africa

Research question

Which habitat characteristics lead to the greatest outcomes for biodiversity, as indicated by acoustic ecological indicators? **Novelty**

- Use of acoustic ecological indicators
- Large geographic coverage

Western

Conceptual framework

Data collection (November 2022- March 2023)

Central



 Acoustic ecological indicators: acoustic indices (AIs), avian abundance and species diversity, bat occupancy and frequency class diversity.

Results

Indicators

Temporal Variation of the Acoustic Complexity Index (ACI) and Bioacoustic Index (BI) Relative Variable Importance of Habitat Characteristics for the ACI and BI Spearman Correlations between Als and Avian and Bat Metrics



ACI

BI

900 - 1000

1000 - 1100

1100 - 1200







Averaged Best Generalized Linear Models (GLMs) for Habitat Characteristics and Avian and Bat Metrics

Avian abundance	Bat occupancy					
Predictor	Estimate	SE	z value	Pr(> z)		Predictor
(Intercept)	3.340	0.024	136.348	<0.001	***	(Intercept)
Understory vegetation cover (%)	0.040	0.025	1.617	0.106		Understory vegetation cov
Vertical heterogeneity	0.059	0.026	2.279	0.023	*	Vortical botorogonaity
Tree species diversity (Hill-Simpson)	0.011	0.025	0.422	0.673		
Standing deadwood volume (m ³ /ha)	0.016	0.024	0.657	0.511		Cocoa density (trees/na)
Cocoa density (trees/ha)	0.016	0.026	0.608	0.543		Forest area (na)
Cocoa tree age (yrs)	-0.029	0.026	-1.125	0.261		

derstory vegetation cover (%)	-0.116	0.049	-2.358	0.020	*	
rtical heterogeneity	0.101	0.049	2.049	0.043	*	
coa density (trees/ha)	-0.091	0.050	-1.835	0.069		
rest area (ha)	0.049	0.047	1.037	0.302		

Estimate

2.982

SE

0.048

t value Pr(>|t|)

62.379 < 0.001

Conclusion

- Results indicate that AIs are more sensitive to farm-level habitat changes than avian abundance or species diversity metrics or bat occupancy or diversity metrics, potentially due to the inclusion of other taxa such as insects with smaller home ranges.
- Als were positively associated with increasing crown area, vertical heterogeneity (structural complexity), tree diversity, and understory vegetation cover. Avian abundance and bat occupancy were positively associated with vertical heterogeneity. Complex and diverse cocoa agroforestry habitat is important for multiple taxa.
- More research is needed to establish AIs as proxies for avian and bat abundance and diversity in cocoa agroforestry systems.
 <u>Amanda.Cooke@stud.uni-goettingen.de</u> MSc Tropical and International Forestry student, Georg-August-Universität Göttingen