The urban forest's structure, composition and tree-related microhabitats in Greater Kumasi, Ghana

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Urban biodiversity is important for ecosystem functions and provision of ES

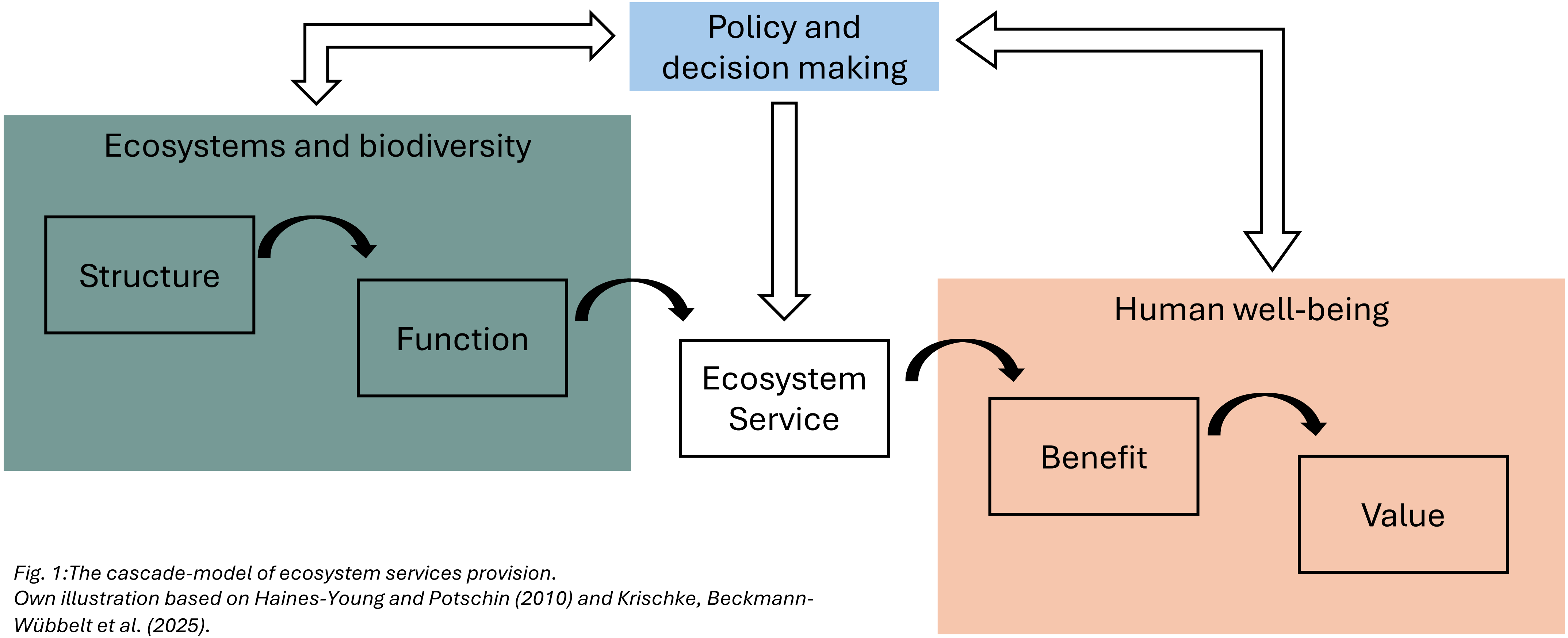

Fig. 1:The cascade-model of ecosystem services provision.
Own illustration based on Haines-Young and Potschin (2010) and Krischke, Beckmann-Wübbelt et al. (2025).

Tree related microhabitat serve as a proxy for taxonomic diversity

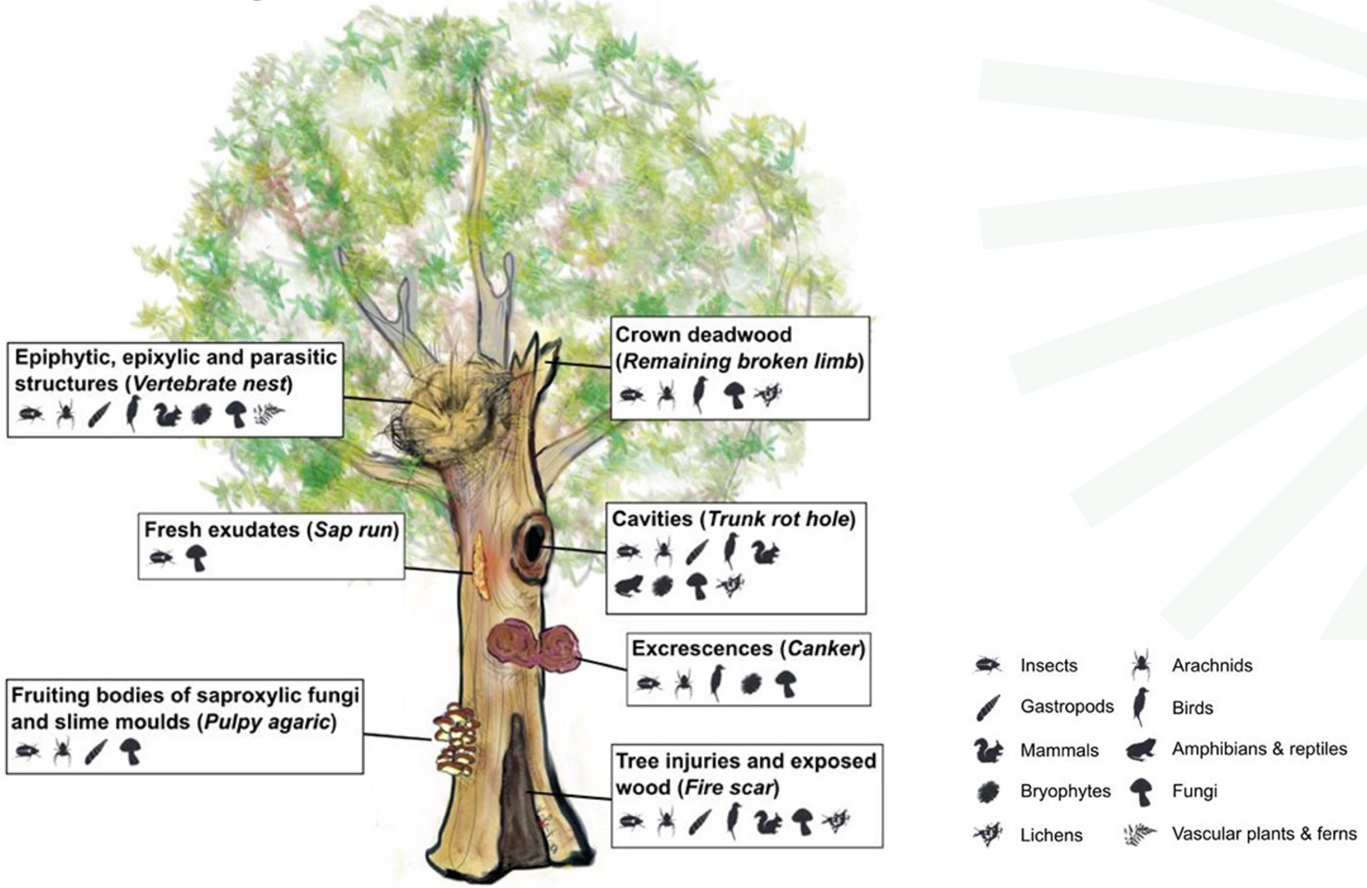

Fig. 2: Seven TreM forms by Larrieu et al. 2018. Tree drawing by Valentina Buttò and taxa drawings by Celine Emberger (from Martin et al. 2022).

Loss of biodiversity and lack of knowledge on current status of the urban forest

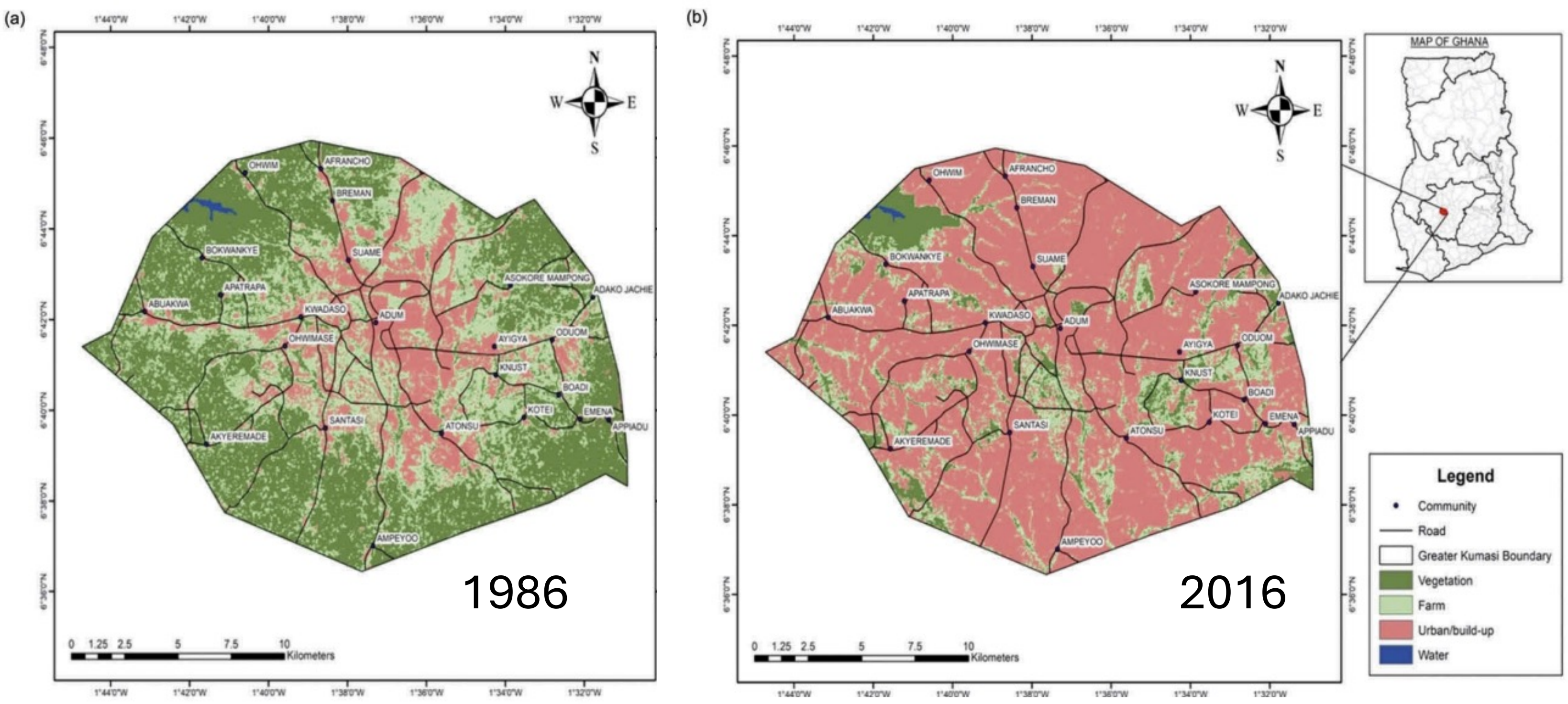

Fig. 3: Urban sprawl in Kumasi in a) 1986 and b) 2016 (Afriyie et al. 2019)

Research questions:

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How does the structure and composition of the urban forest differ between the urban area and the forest and semi-natural areas in Greater Kumasi?

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How do urban forest characteristics, including tree species composition, trait attributes, and size structure, both in stand-forming and individual trees, impact the abundance and diversity of tree-related microhabitats?

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Methodology: Field data collection

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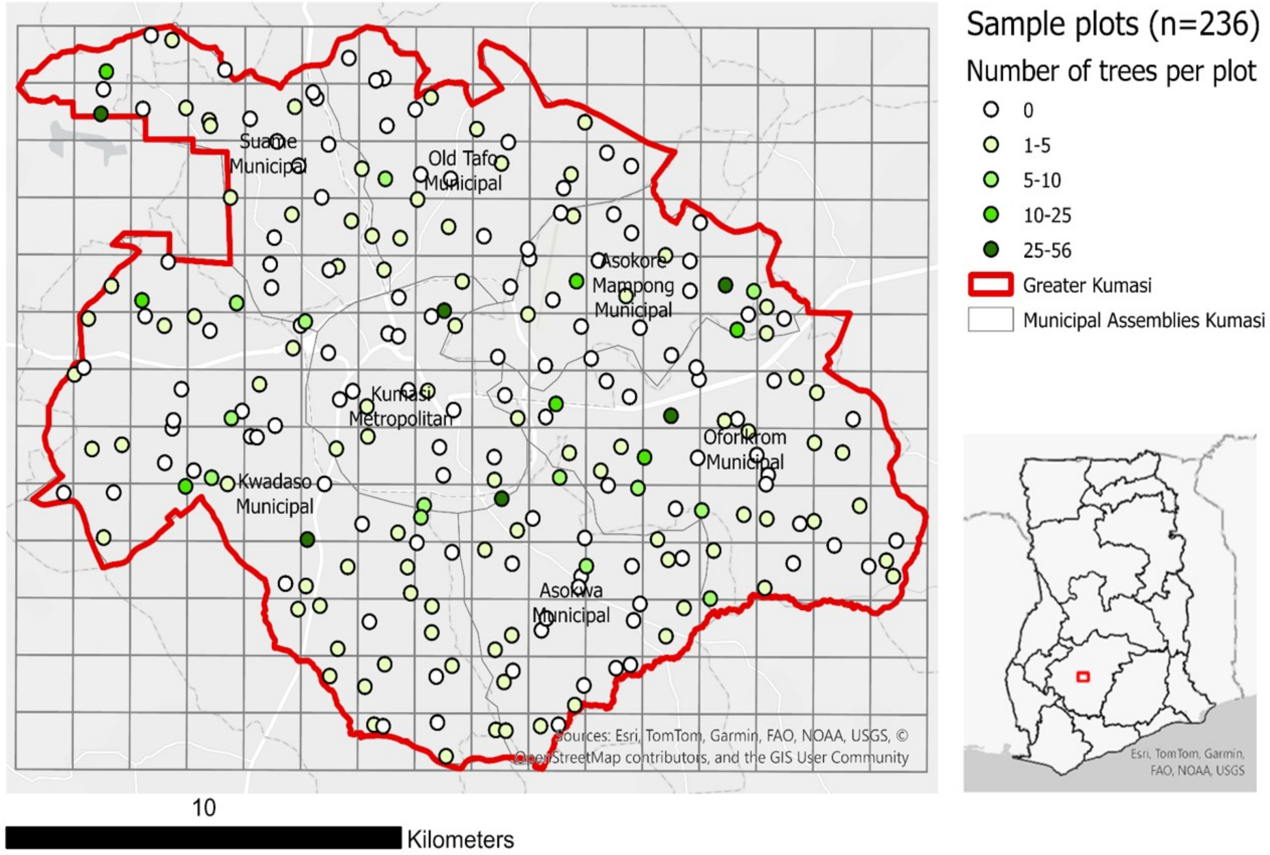

236 plots **646 trees** **94 species**

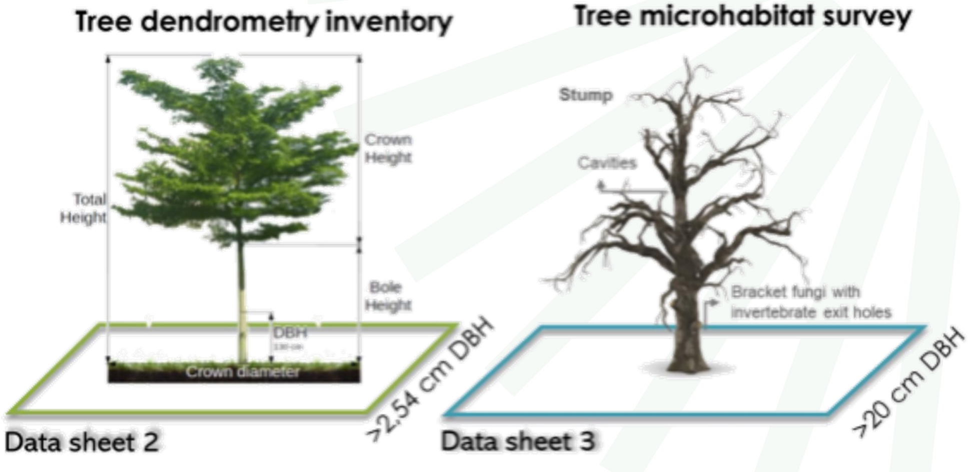

Fig. 4: Overview of the study area and research plots in Kumasi (left) as well as the data collected (right).

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Unique species composition in distinct land cover classes

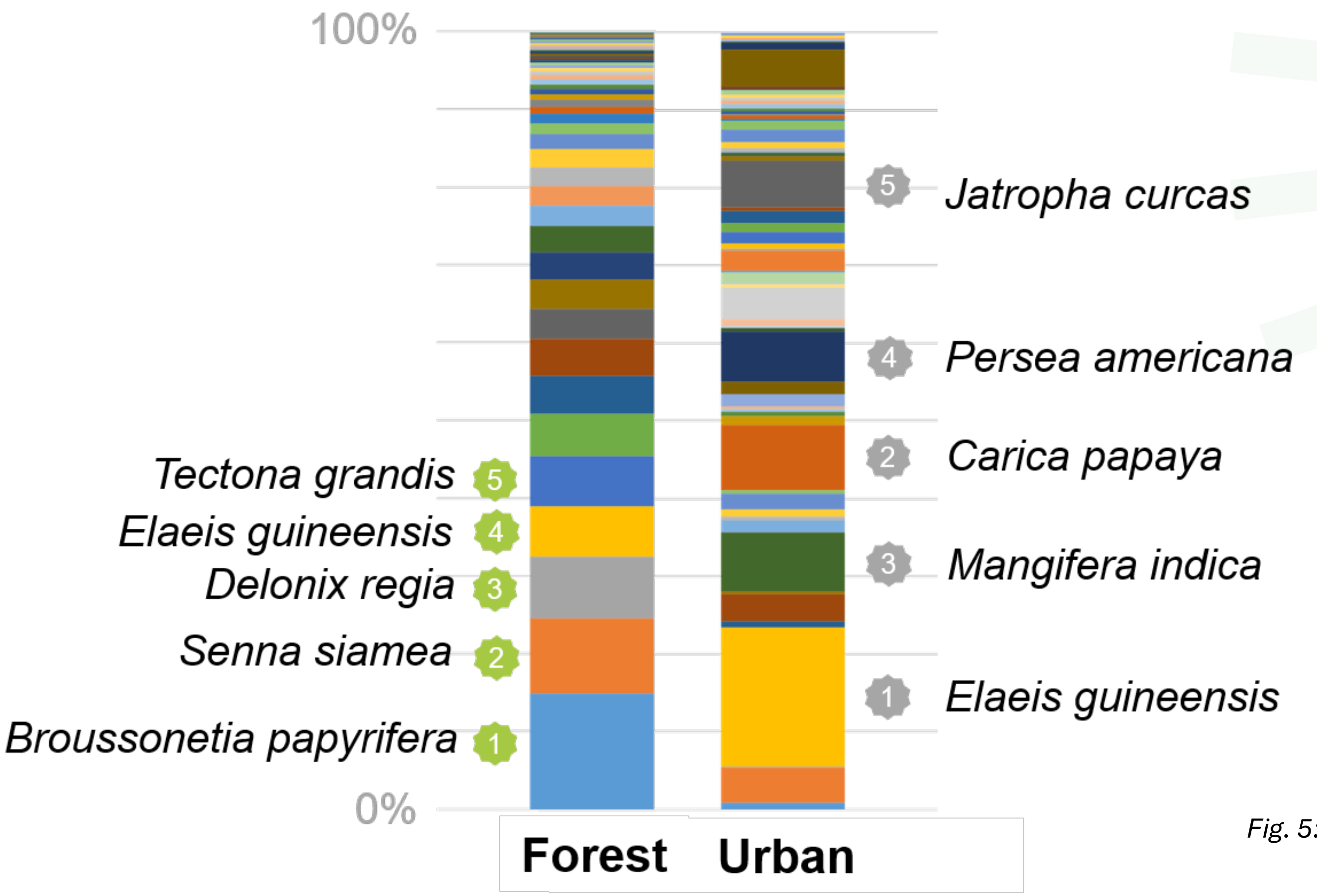

Fig. 5: Most common species in the two land cover classes (based on number of individuals)

Lower species richness in urban areas

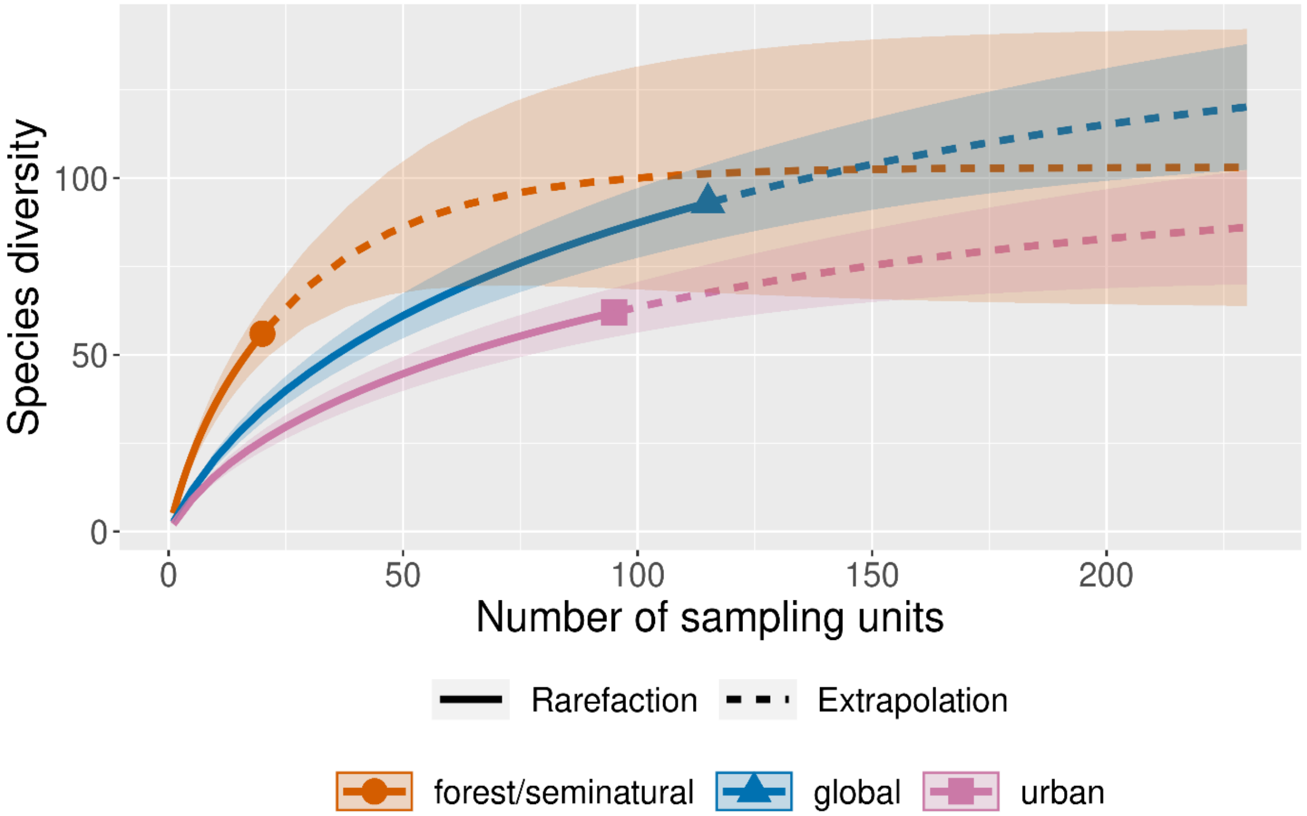

Figure 6: Rarefaction curve showing the woody species richness in Greater Kumasi study area (Global) and the distinct land cover classes included in the study.

Absence of large trees

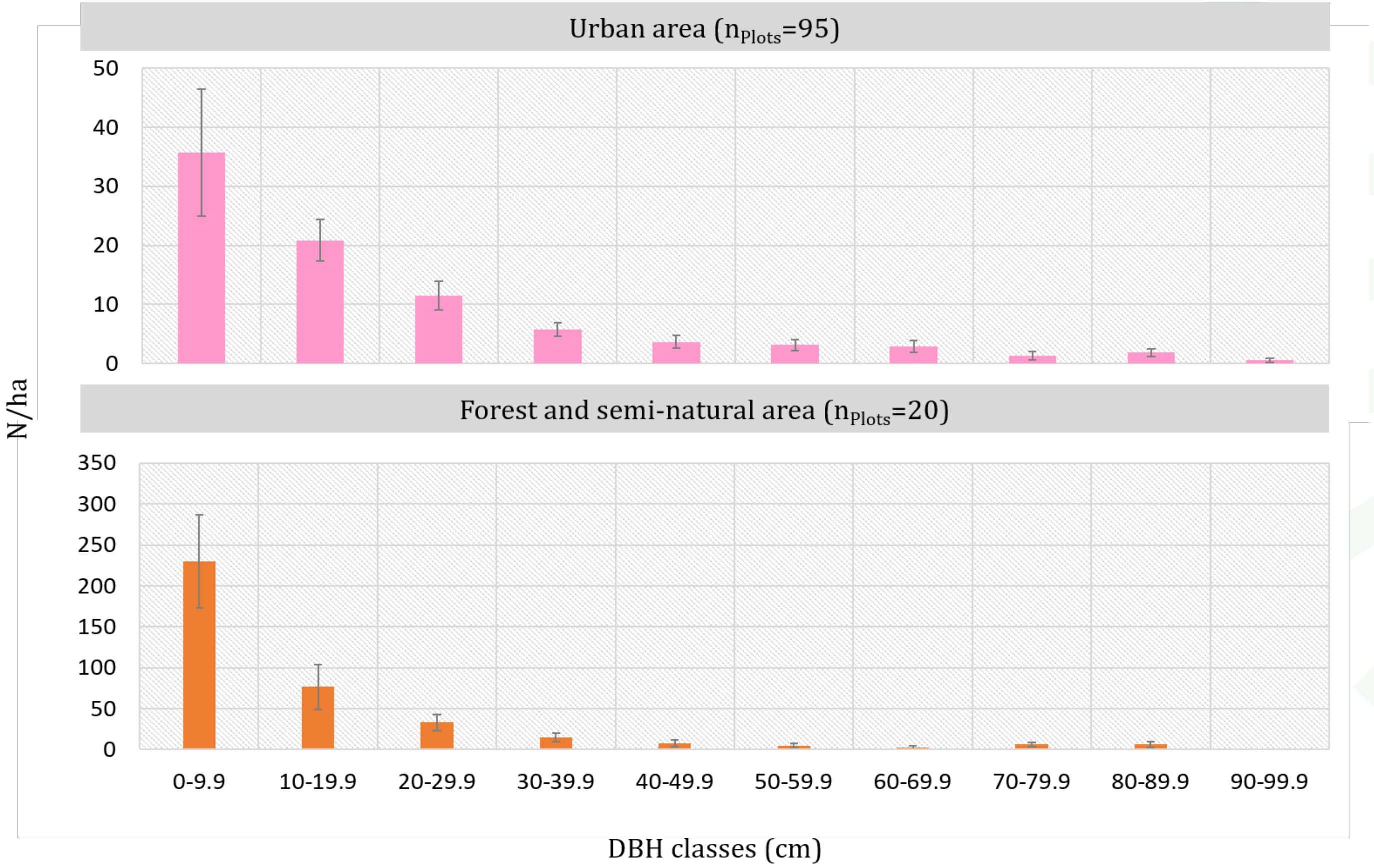

Figure 7: DBH distribution in the two observed land cover classes based on the mean number of individual trees per ha in the research plots including standard errors (SE).

No differences in microhabitat type richness in urban and forest/semi-natural areas

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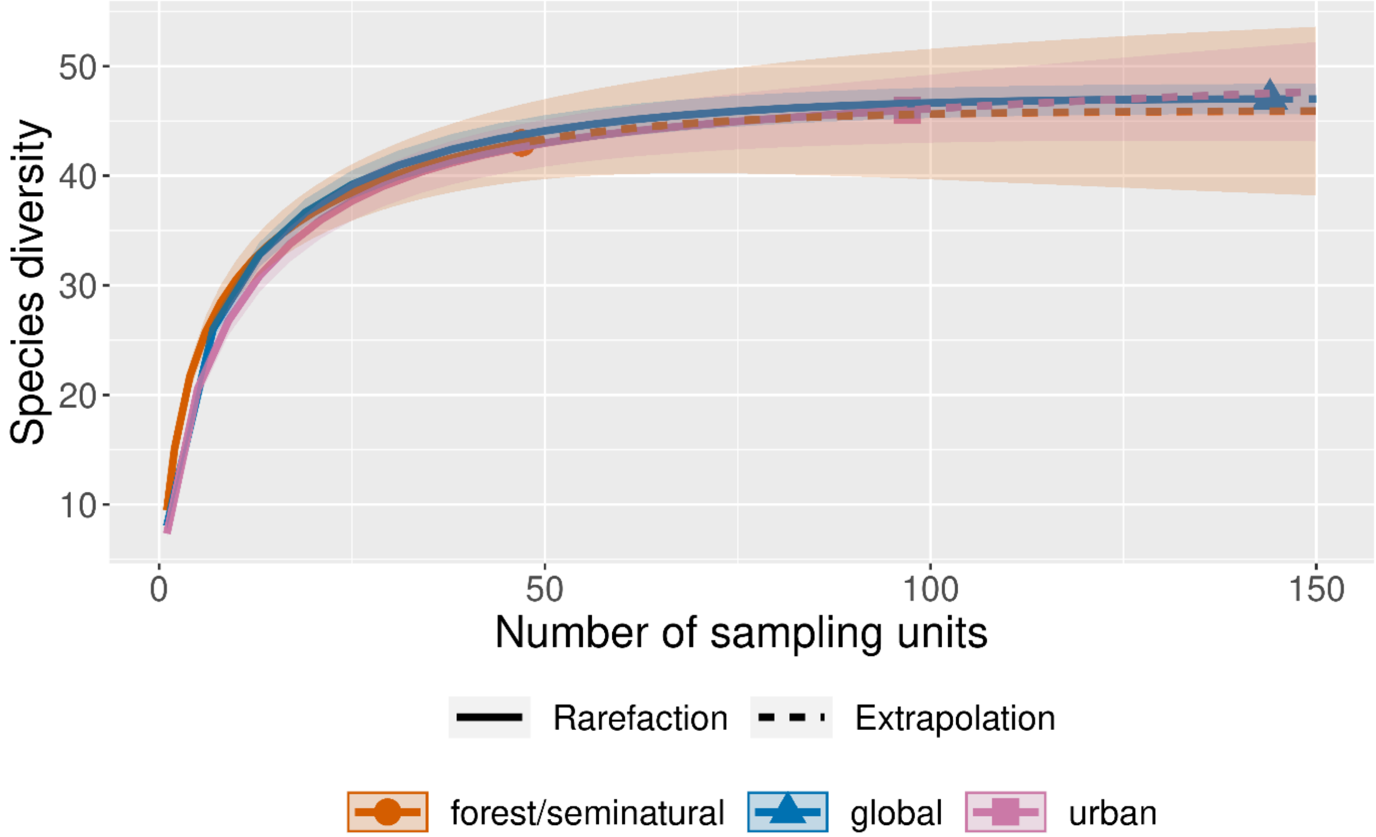

Figure 8: Rarefaction curve showing the TreM type richness in Greater Kumasi study area (Global) and the distinct land cover classes included in the study.

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DBH, Nativeness and Vitality influence the abundance of microhabitat abundance

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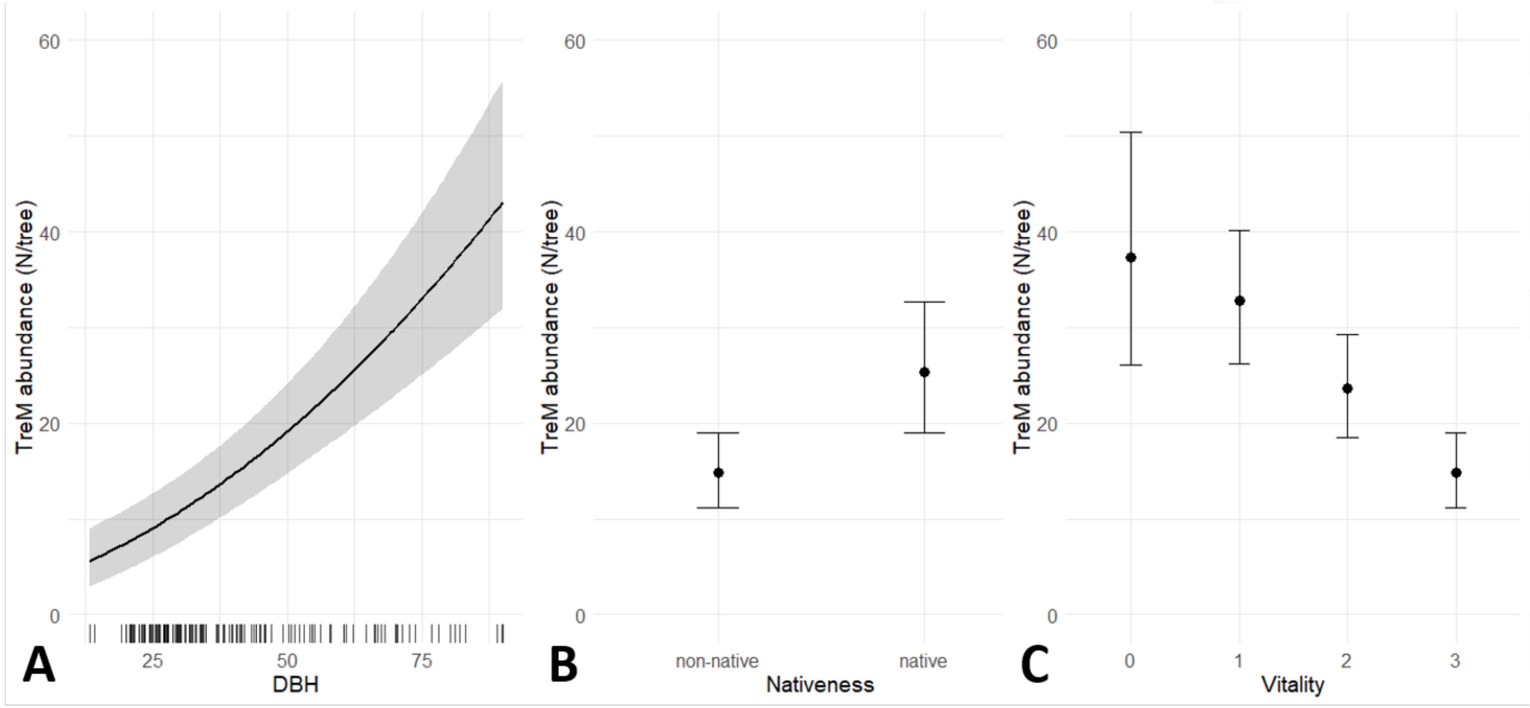

Figure 9: TreM abundance versus independent variables (A) DBH, (B), Nativeness, and (C) Vitality. The gray band indicated the 95% confidence interval of the standard error of the model estimates.

DBH, Leaftype, Growthform and Vitylity influence microhabitat type richness

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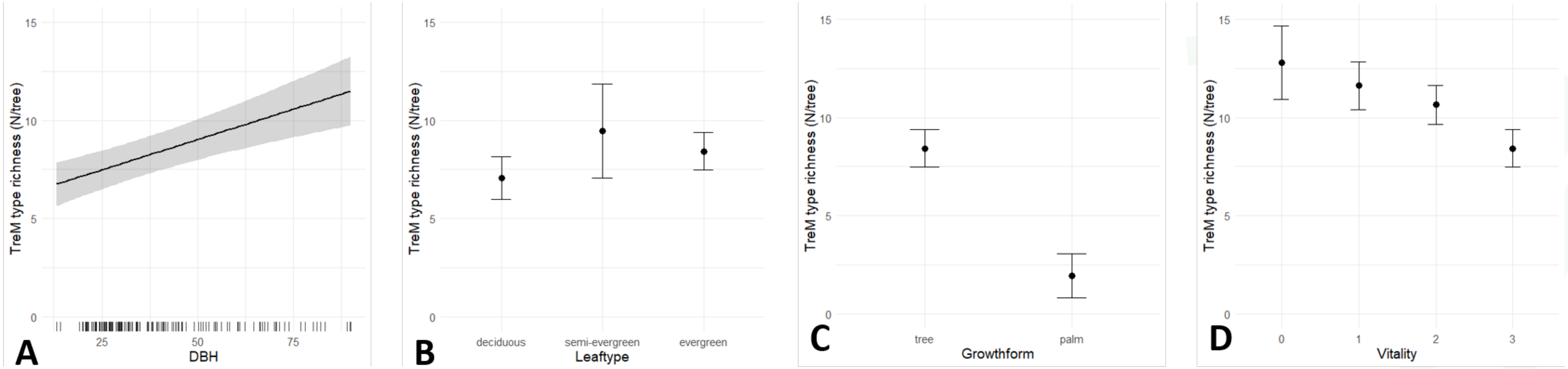

Figure 10: TreM type richness versus independent variables (A) DBH, (B), Leaftype, (C) Growthform, and (D) Vitality. The gray band indicated the 95% confidence interval of the standard error of the model estimates.

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Take-home messages

- A high species diversity and a large number of cavities and epiphytes indicate the high ecological importance of the urban trees for the city's biodiversity.
- Low numbers of old habitat trees stress the need for improved protection that complements already existing measures of planting activities.
- The results further emphasize the importance of conserving native trees to protect ecologically valuable epiphytes. A high number of non-native, economically exploited species in the study tends to lower the tree-related habitat richness.
- Trade-off analysis between biodiversity needs and urban trees' economic and cultural use should be integrated into a newly developing fields of urban forestry in West Africa.

Fig. 11: Visit at the newly established horticultural department in Kumasi (own photo)

Fig. 12: Advertisement for Green Ghana (own photo)

Thank You.

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