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Conference Abstract

Harnessing Citizen Science for Urban Biodiversity: Insights from the Hyderabad Annual Tree Biodiversity Survey

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Abstract

Rapid urban expansion in Hyderabad continues to present significant challenges to sustaining urban biodiversity, particularly the intricate fauna-flora relationships underpinning city ecosystem health. To address these challenges, the Hyderabad Annual Tree Biodiversity Survey—a collaborative citizen science program led by WWF-India's Hyderabad office—was conducted for the second consecutive year in 2025, building on the model and findings of the 2024 survey.

The 2025 survey mobilized over 150 volunteers across 32 teams and 18 locations encompassing all six city zones. Volunteers underwent a structured two-part training series, covering survey protocols, biodiversity identification, and mobile app usage (iNaturalist, Merlin Bird ID, eBird), resulting in improved data collection quality and participant engagement. Tree biodiversity, and the faunal biodiversity found exclusively on the trees, were surveyed extensively for avenue and park trees with diameter at breast height (DBH) greater than 10 cm, employing community-led observations, photographic documentation, and digital citizen science platforms.

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A total of 837 unique trees were documented, representing 108 species, along with 1,885 faunal observations—primarily ants/termites, birds, and spiders. Notably, avenue trees (trees beside broad city or town roads) comprised over 82% of the sample and supported 93% of the observed animals (Fig. 1), highlighting their immense contribution to urban biodiversity. Flora-fauna records increased to 923 entries in 2025, reflecting deepened community involvement and broader spatial coverage compared to 2024, with 23 locations surveyed from 6 city zones and 753 unique trees recorded from 797 entries.

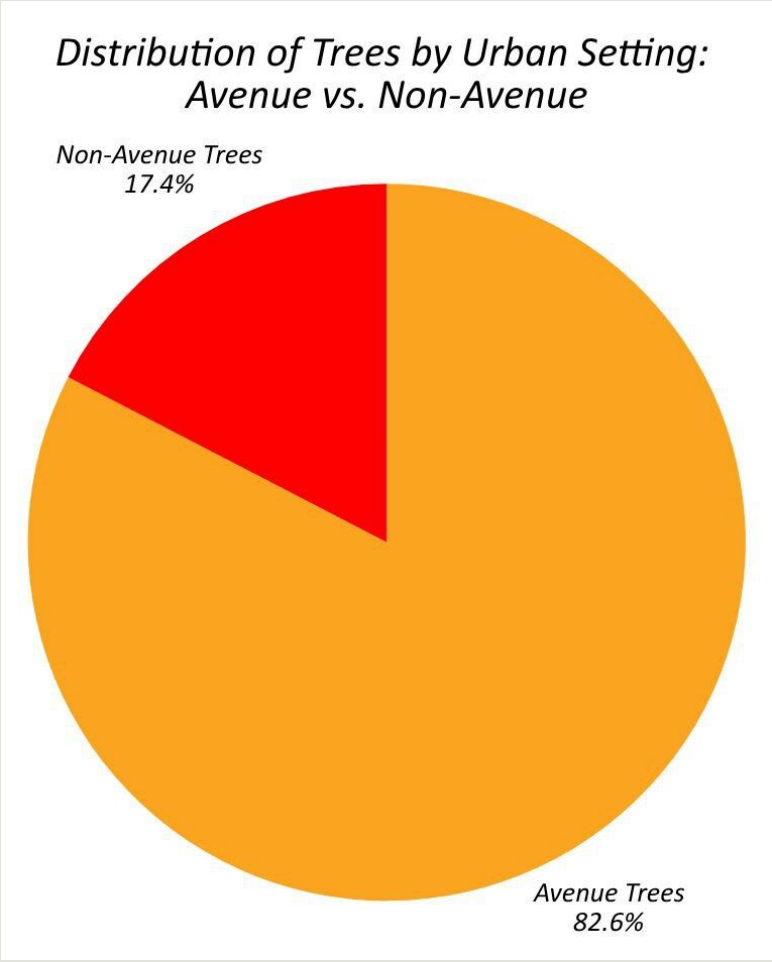

Figure 1.

Distribution of Trees by Urban Setting: Avenue vs Non-Avenue (A, Vaishnav, Bhat and Tampal CC-BY 4.0).

The top three tree species covered in the 2024 survey were *Peltophorum pterocarpum* (Copperpod), *Azadirachta indica* (Neem), and *Milletia pinnata* (Pongamia). This result does not vastly differ, with the top three tree species covered in 2025 survey being the same (Fig. 2).

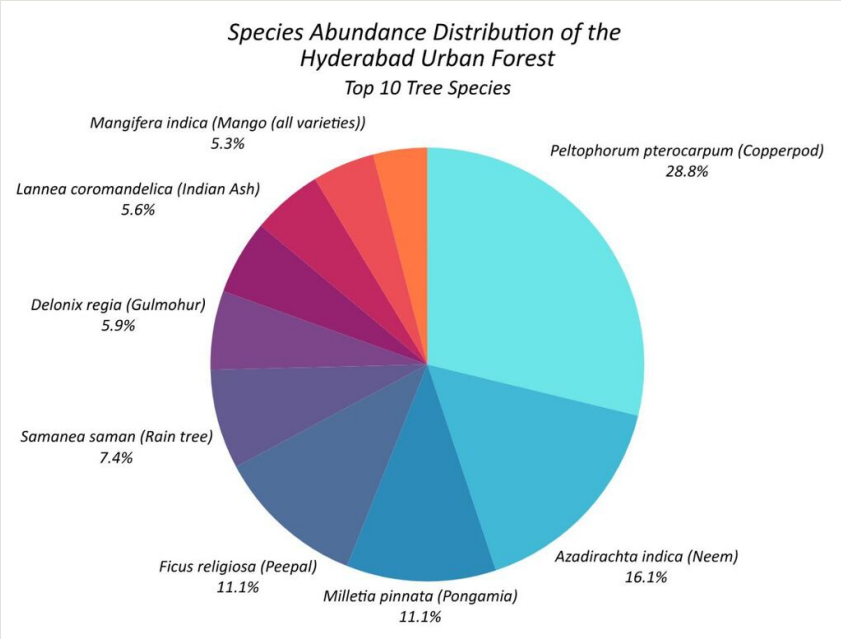

Figure 2.

Species abundance distribution of the Hyderabad Urban Forest (A, Vaishnav, Bhat and Tampal CC-BY 4.0).

Native species findings reaffirmed that trees native to India and Telangana hosted a higher diversity of animal life (Fig. 3). However, overall faunal observations were lower than last year, possibly due to sampling time, Air Quality Index (AQI) variation, and urban noise factors. More than half of surveyed sites exhibited “Poor” AQI, correlating with reduced animal abundance, and 42% of the samples corresponded to high vehicular activity zones—underscoring the dual pressures of pollution and traffic on urban ecological health.

The trees were also compared on the basis of the faunal diversity hosted on them, in order to see the effect of the species, the nativeness, and the location (avenue vs non-avenue), and the top 5 trees were thus sorted on the basis of the absolute value or the total faunal abundance (Fig. 4), and the mean faunal diversity (Fig. 5).

Key improvements in the data collection process, learned from previous year's survey, included enhanced digital workflows, publicly available forms for data entry, standardized morphometric measures (DBH), and use of GBIF to make the dataset accessible for wider research and replication. Persistent challenges involved data consistency, incomplete fields, difficulties with citizen sciene app registration, and some mismatch between faunal observations and tree records. Volunteer feedback stressed the need for offline data entry options, more comprehensive training, and expanded urban habitat coverage to further improve reporting accuracy and inclusiveness.

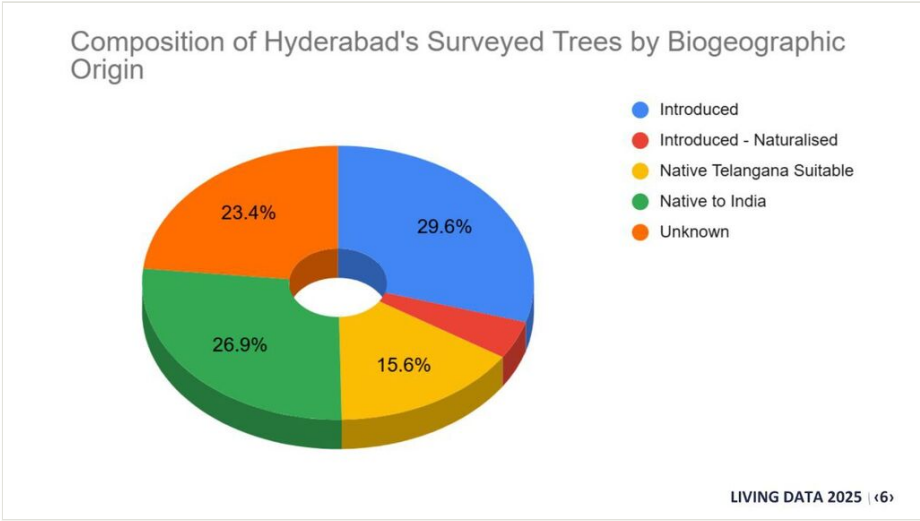

Figure 3.

Composition of Hyderabad's surveyed trees by biogeographic origin (A, Vaishnav, Bhat and Tampal CC-BY 4.0).

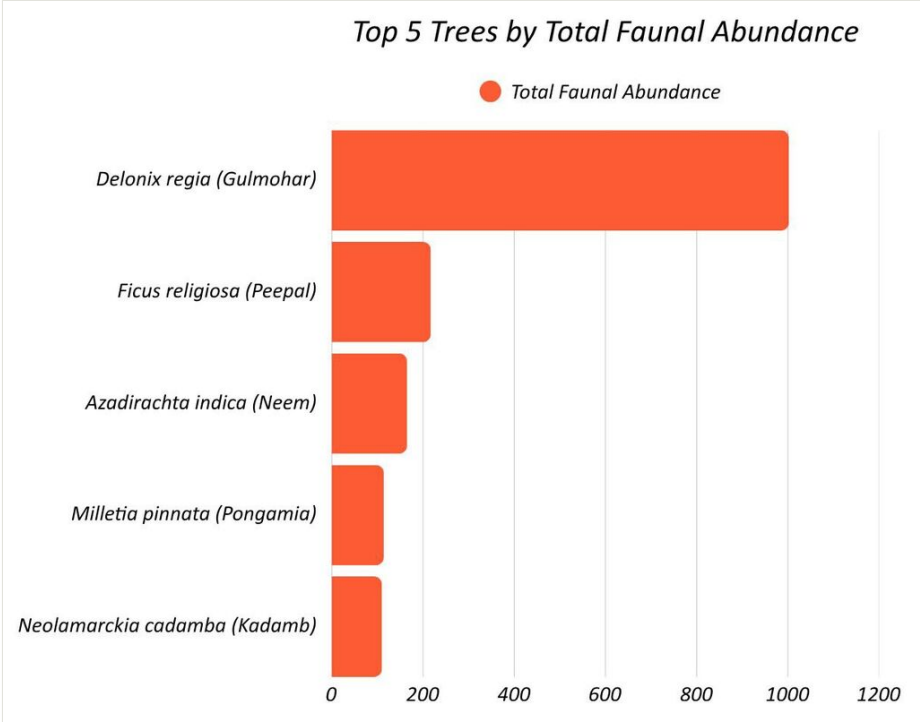

Figure 4.

Top 5 Trees by Total Faunal Abundance (A, Vaishnav, Bhat and Tampal CC-BY 4.0).

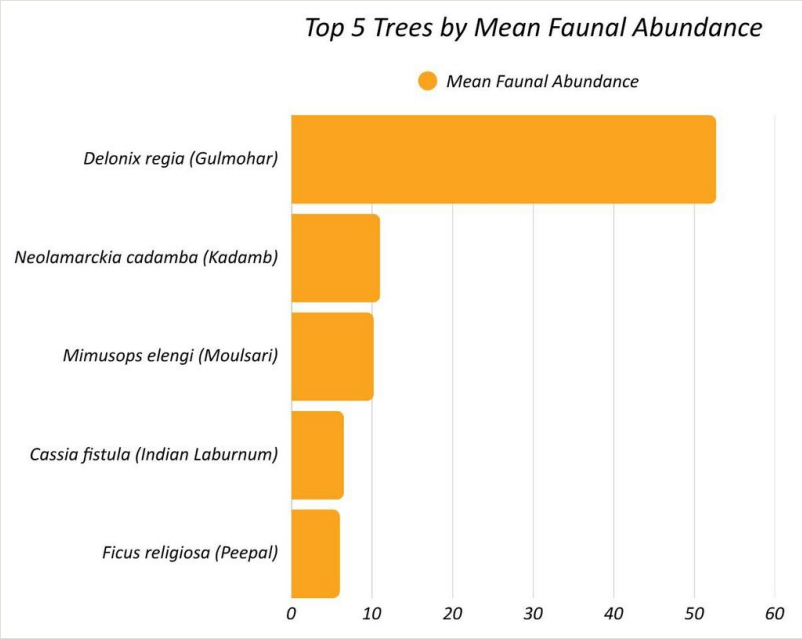

Figure 5.

Top 5 Trees by Mean Faunal Abundance (A, Vaishnav, Bhat and Tampal CC-BY 4.0).

The survey's outcome demonstrates both the vulnerability and resilience of Hyderabad's urban biodiversity. It advocates for prioritizing native species in urban greening, pollution mitigation efforts, and wider adoption of citizen science approaches. Future recommendations include protocol refinement for insect and individual counts, unbiased sampling across city habitats, and ongoing offline training and support for volunteers. The survey not only fosters a robust ecological inventory but also strengthens public stewardship essential for sustaining biodiversity in fast-growing urban landscapes.

Keywords

iNaturalist, community-based monitoring, participatory conservation, ecological baseline data

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Conflicts of interest

The authors have declared that no competing interests exist.