

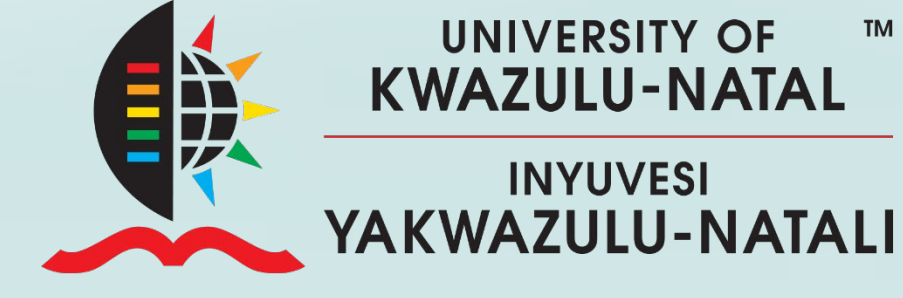


Urban refuge or ecological trap? Energy expenditure and space use of African Crowned Eagles in Durban

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STUDY SYSTEM AT A GLANCE

N = 19

GPS-tagged eagles

AKDE = 6.8 km²

average home range size of urban eagles

20 Hz

Accelerometry sampling rate

ODBA

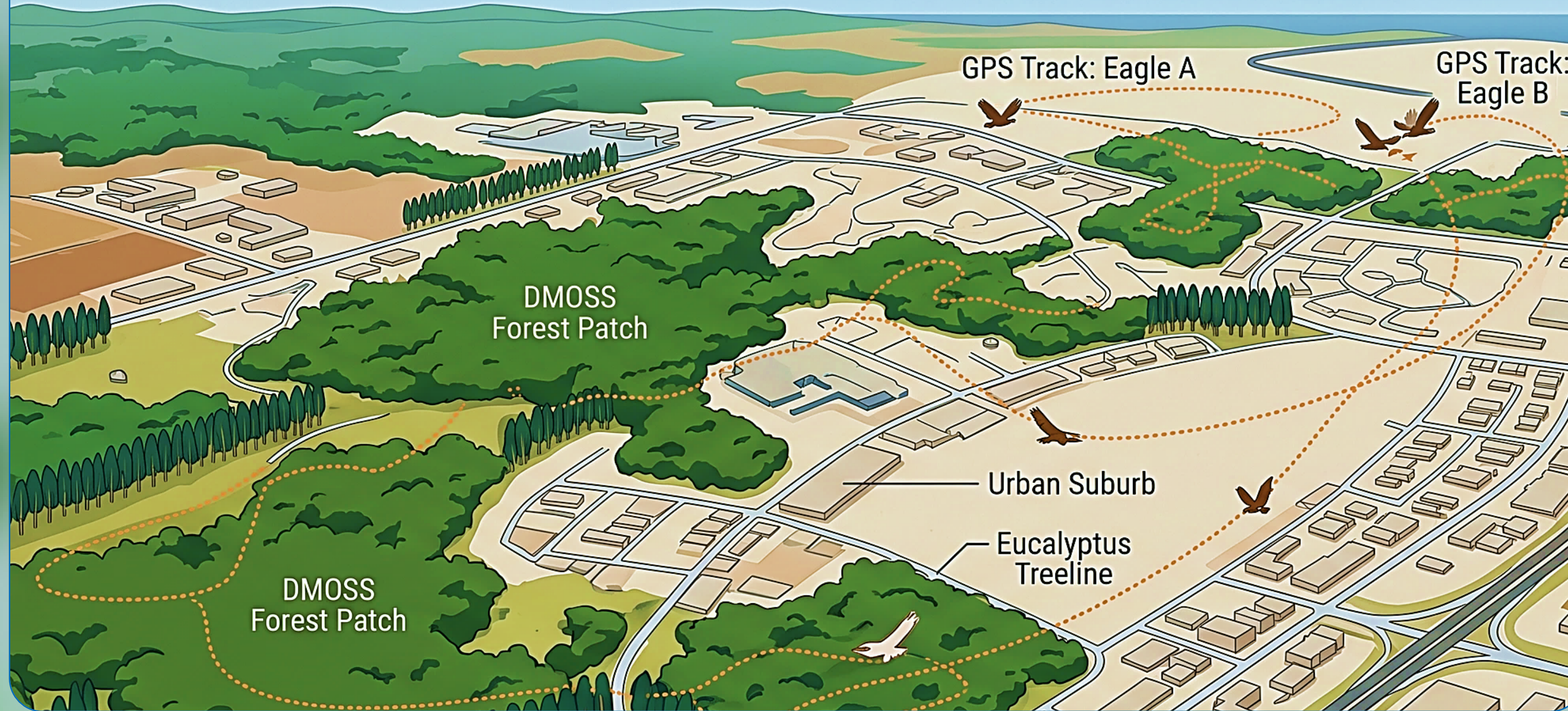
4 sec running window mean ODBA per ACC burst

Methods.

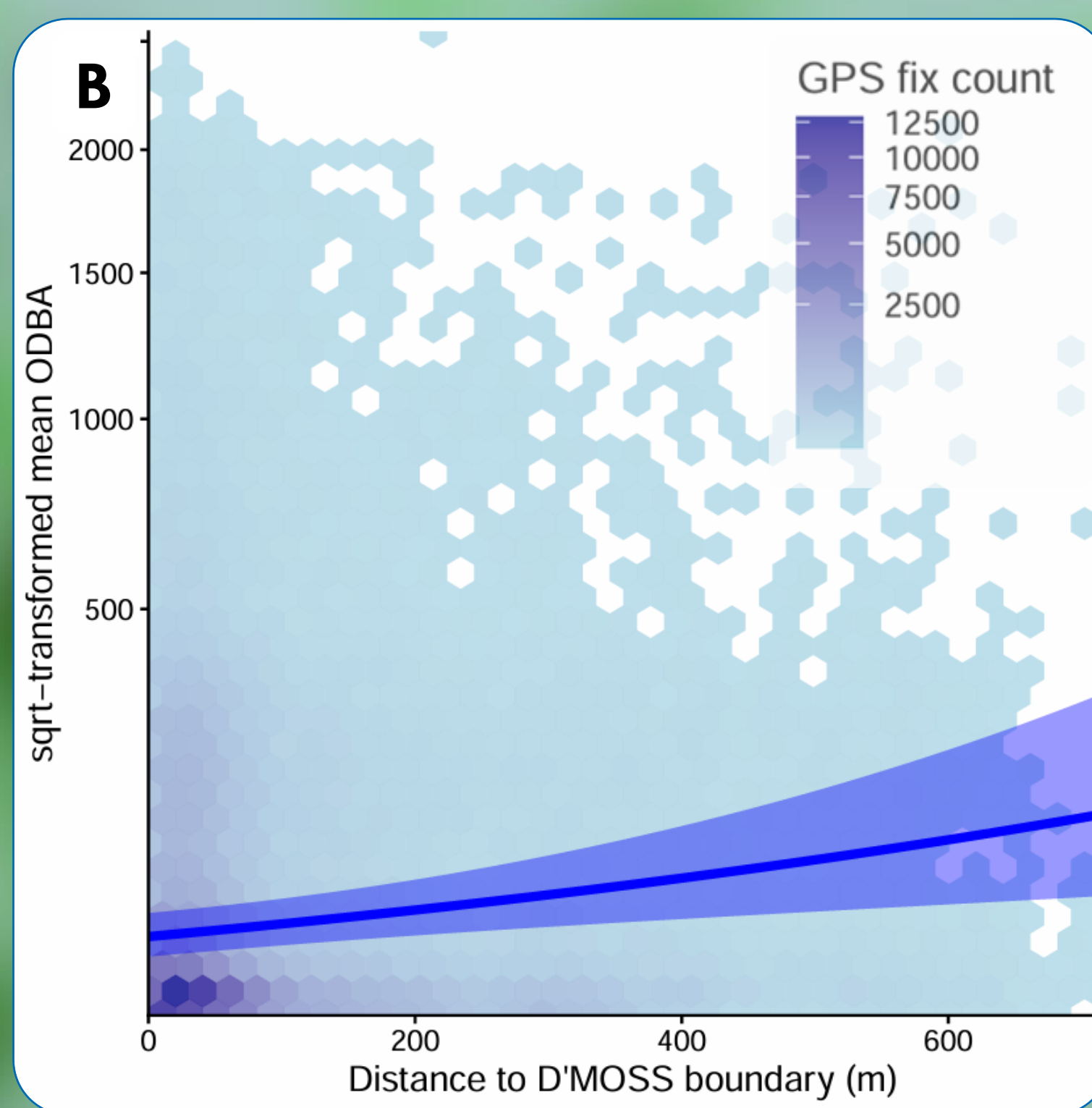
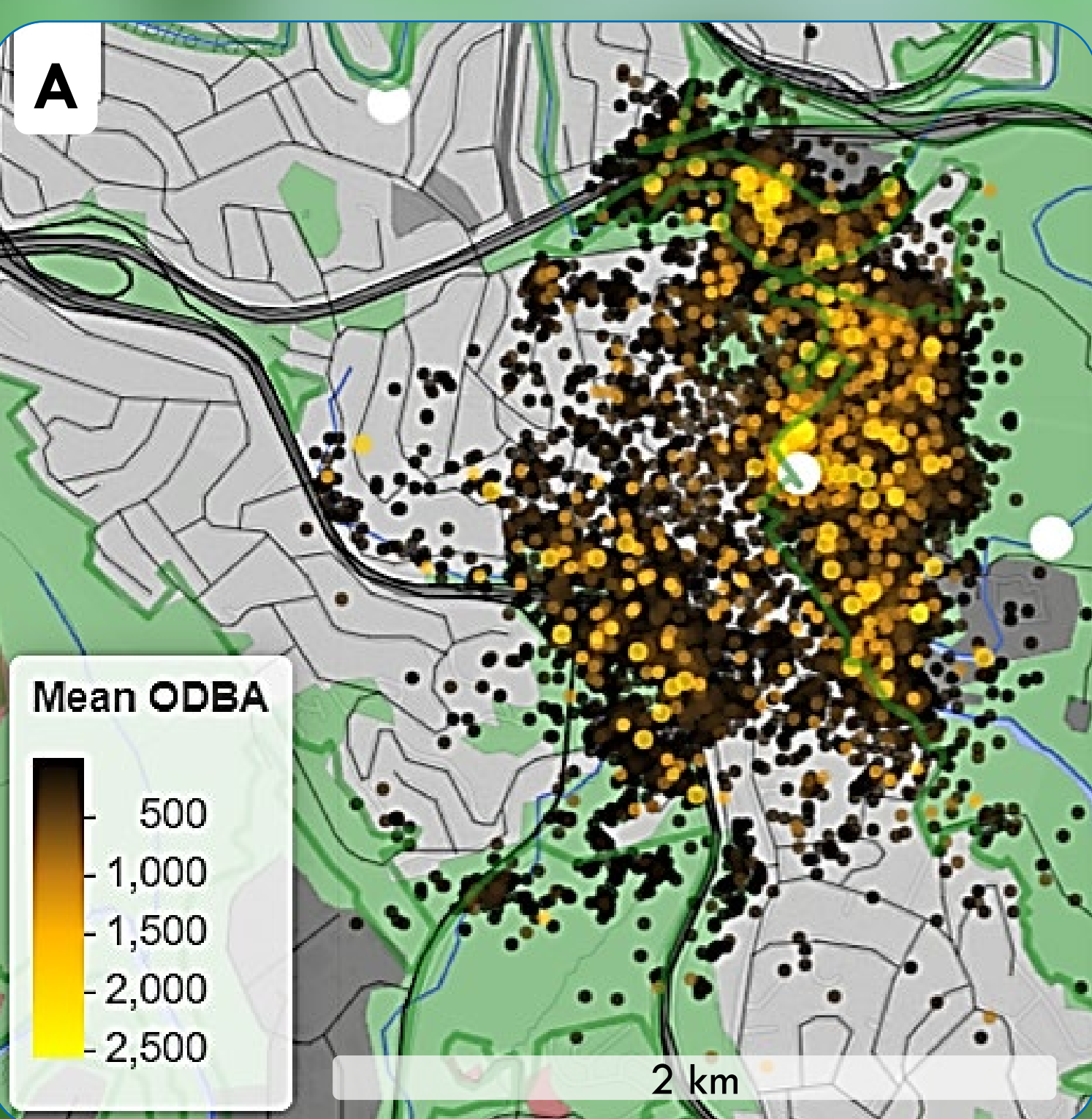
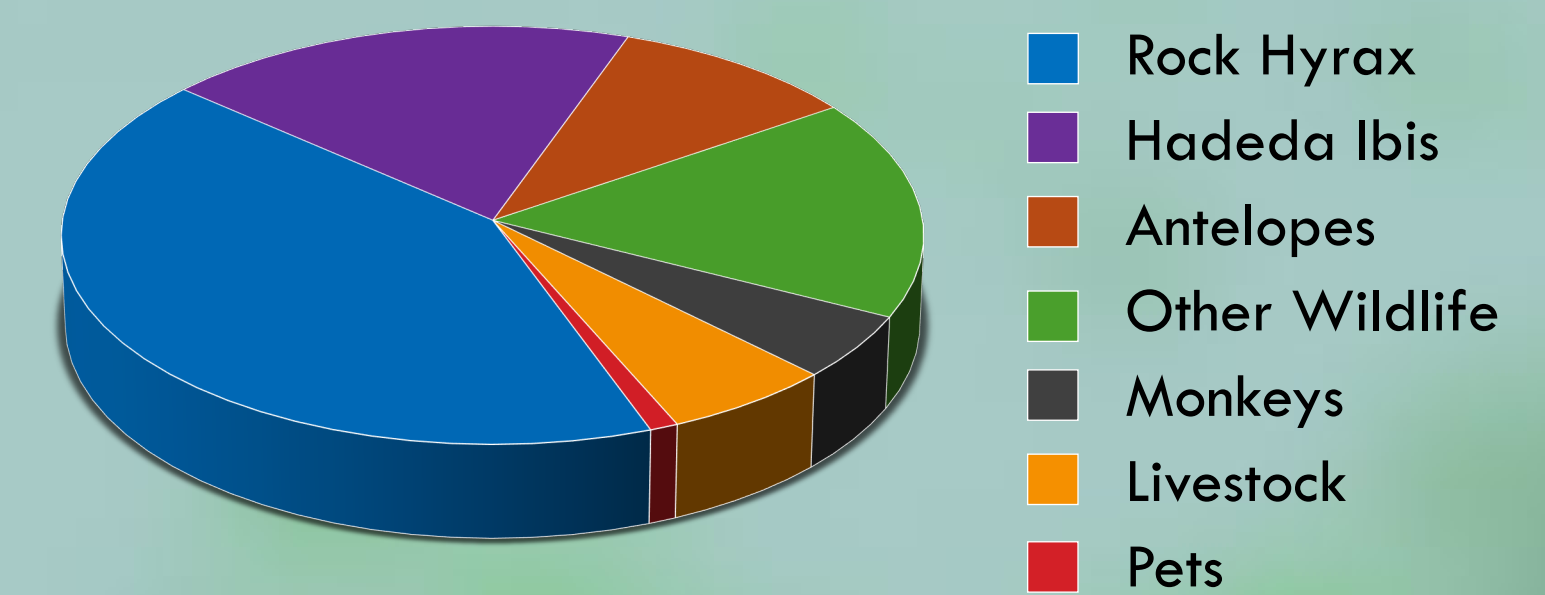
- High-resolution GPS + triaxial accelerometry (ACC) on adults.
- Resource Selection Functions to quantify habitat selection across the urban–natural gradient.
- Overall Dynamic Body Acceleration (ODBA) as a proxy for energy expenditure in different habitat types.

Background. Urban expansion is reshaping ecosystems worldwide. Among raptors, urban tolerance is typically restricted to small-bodied, generalist species. The African Crowned Eagle – a large, powerful forest specialist – is a notable exception. Despite being considered vulnerable in South Africa and commonly persecuted, Crowned Eagles reach higher densities within the city than in surrounding natural habitats. Durban may act as an urban refuge: abundant eucalyptus trees provide nest sites, and an assemblage of city-dwelling prey sustains the population.

Durban Metropolitan Open Space System (DMOSS)



Urban Prey



Results of 5 breeding adults. **A** Mean ODBA within the home range of one male (white circles = active nests). **B** Individuals expend more energy (ODBA) in transformed habitats – particularly further away from DMOSS boundaries – while forest patches act as energetic refuges. Elevated energy expenditure may signal hunting activity or behavioural responses to human disturbance.

IMPLICATIONS FOR BIODIVERSITY MONITORING

Movement-derived indicators are interpretable as biodiversity-relevant traits:

- 1 Energy expenditure as a new monitoring currency** by pairing GPS tracking with ACC to map energetic landscapes
- 2 Protect green space networks as a functional threshold** where behaviour shifts from foraging effort to disturbance avoidance
- 3 Pinpoint physiologically costly urban features** for targeted mitigation
- 4 Behavioural plasticity as a measurable indicator of urban pressure** like shifts in breeding frequency, prey switching, or activity budgets
- 5 Conservation physiology bridges individual performance and urban planning** as a mechanistic link between environmental change and population viability

References. McPherson et al (2016) *Landscape and Urban Planning* 146: 43-50. McPherson et al (2016) *Urban Ecosystems* 19: 383-396. McPherson et al (2019) *Journal of Raptor Research* 53: 180-188. McPherson et al (2021) *Frontiers in Ecology and Evolution* 9. Muller et al 2020 *The Condor* 122.

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Take-Home Message.

Crowned eagles reach higher densities inside Durban's urban green network than in surrounding natural habitats – yet they pay an energetic cost when navigating transformed landscapes. Movement-derived metrics expose hidden ecological dynamics that conventional biodiversity assessments miss.