**The Effects of Forest Edges on Dung Beetle Communities in a Tropical Montane Forest**

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**Living On The Edge**

Land use has been implicated as the largest global driver of biodiversity loss, largely due to associated habitat loss and fragmentation. The resulting production of habitat edges has pervasive impacts on the distribution and persistence of invertebrates. Land use change is of particular concern in African tropical montane forests as populations are increasing dramatically throughout these areas. Therefore, this study focuses on the impacts of livestock and fire on forest edges around a unique Afrotropical forest in Nigeria.

**Diversity & Abundance Distributions**

Total abundance of dung beetles will be measured per trap at each distance from the edge. Additionally, species diversity and richness will be measured across the edge gradient. This will give an indication of the impact of edge effects and the interactions with matrix/edge condition on the composition of dung beetle communities. This data can then be used to analyse correlations with ecosystem function.

**Study Site & Design**

The effects of anthropogenically created edges on dung beetle community structure has, thus far, not been investigated across a continuous edge gradient. This presents an important gap in our knowledge of the potential effects of surrounding land use on the intensification of edge effects and resulting impacts on dung beetle communities. Dung Beetle communities were sampled at forest edges, both protected (A) and unprotected (B) from intensive livestock grazing in a severely fragmented montane forest landscape surrounding the Ngel Nyki forest reserve in Nigeria.

Using pig dung baited pitfall traps, dung beetles were sampled at distances of 100, 200, 400, 600, 1500, 3000, 5000, and 6000 metres from the forest edge. Traps were placed along a transect to maintain independence.

- **Trait-Dependent Responses**
  - The extinction proneness of a species can often be determined by their traits (response traits). Dung beetles have been shown to exhibit trait-dependent responses to anthropogenic disturbance, but there is still no evidence of such responses across habitat edge gradients. Furthermore, anthropogenic disturbance may impact the ecosystem functions carried out by dung beetles (effect traits).
  - By analysing trait-dependent responses of dung beetles across the forest edge, we may then be able to determine possible correlations between these response and effect traits.

- **Ecosystem Function**
  - Dung beetles are extremely important as they perform major ecosystem functions by burying dung. This increases rates of decomposition and thus nutrient cycling is enhanced. Additionally, seeds within the dung are secondarily dispersed, reducing seed predation and facilitating germination. Dung removal rates were measured across the edge to test for the effects of habitat edges on ecosystem functioning.
  - Preliminary data for removal rates between protected (A) and non-protected (B) edges are shown below. Values are mean percentages of dung removed in a 5E.

- **Yet To Be Dung...**
  - Results show that dung beetle communities respond strongly to habitat edges. To what degree these responses occur will be identified as other parameters are analysed, such as species richness and species traits. The most important factor determining edge response in dung beetle community structure and ecosystem function, appears to be the degree of edge protection from livestock and fire encroachment. A major goal is to quantify these effects on secondary seed dispersal performed by dung beetles. This would provide insight into the possible ramifications of edge effects in forest maintenance and restoration through the effects of dung beetle communities. This research may potentially identify adverse correlations in community responses by comparing trait-mediated susceptibility with ecosystem functions performed by dung beetles.