

SCIENCE POLICY BRIEF

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Ecological and Socioeconomic Variables Contributing to Vulture Population Decline in Maswa Game Reserve, Serengeti-Mara Ecosystem: Implications for Evidence-based Conservation Policy

Overview

Vulture populations have declined by more than 90% globally over recent decades. Tanzania supports eight vulture species, including four classified as Critically Endangered (CR), two as Endangered (EN), one as Near Threatened (NT), and one as Least Concern (LC). Although vulture populations were relatively abundant in the 1980s, substantial declines have been recorded since the early 2000s, driven by multiple factors including habitat degradation, poisoning, and socio-cultural exploitation.

Vultures continue to play critical ecological roles through carcass disposal, disease regulation, greenhouse gas emission reduction, and maintenance of ecosystem stability. Continued population declines may therefore pose significant risks to public health, biodiversity conservation, and ecosystem functioning, highlighting the urgent need for strengthened vulture protection and conservation measures in Tanzania.

Purpose of this brief

This policy brief presents concise evidence on the drivers of vulture decline within the Serengeti-Mara landscape in Tanzania, highlighting the major ecological and socioeconomic factors influencing vulture populations.

Habitat suitability for the White-backed Vulture was modeled using the MaxEnt algorithm with a five-fold cross-validation approach to predict potentially suitable habitats. In addition, 300 households (100 households per village) from three villages surrounding the Maswa Game Reserve were interviewed to assess local community perceptions, uses, and attitudes toward vulture conservation.

Key recommendations

- Strengthen the harmonization and enforcement of existing wildlife laws and policies, including the Tanzania Vulture Conservation and Management Plan (2023–2033), to address gaps in implementation and curb the illegal trade in vulture body parts, particularly heads and feathers.
- Prioritize the protection and management of critical vulture habitats, especially open landscapes, nesting areas, and roosting sites associated with wildebeest migration corridors within the Serengeti-Mara ecosystem.
- Promote community awareness and recognition of culturally acceptable alternative plant species, such as *Biophytum crassipes*, which may serve similar traditional functions as vulture body parts. This approach, as documented by Nature Tanzania, could help reduce illegal harvesting and trade of vultures.
- Expand long-term monitoring and research programs on vulture populations to establish reliable databases on mortality, breeding success, and population trends across protected areas in Tanzania.
- Conduct year-round ecological studies to assess seasonal variation in habitat use, nesting distribution, and breeding performance, as these factors are critical for understanding population dynamics and informing adaptive conservation planning.



Photo Credit: Optato Mworio

Key findings

The modelling result showed that:

- Under current climatic conditions, highly suitable habitat for the White-backed vulture, accounts for only 2.26% of the study area, whereas 88.6% remains unsuitable (Figure 1), indicating a restricted ecological niche primarily associated with open landscapes. Precipitation during the warmest quarter (Bio_18; December - February) and slope emerged as the main environmental factors influencing habitat suitability. Under the low-emission scenario (SSP_126), the extent of highly suitable habitat is projected to remain relatively stable, increasing to 5.99% by 2060 before slightly declining to 4.17% by 2080.
- Survey results showed that vulture heads and feathers were the most sought-after body parts for cultural purposes, cited by 42.44% and 28.13% of respondents, respectively (Figure 2). While Poisoning, particularly from pesticides and locally distilled illicit alcohol ("*moonshine*"), was identified as the leading cause of vulture mortality, accounting for 56.9% of responses.
- Network analysis revealed that feathers and heads had the highest centrality values across multiple metrics, indicating that they are the most influential components within the vulture-part utilization network. Their high connectivity suggests that they serve as important cultural links across multiple community uses, including traditional medicine, arrow making, and ritual ceremonies.

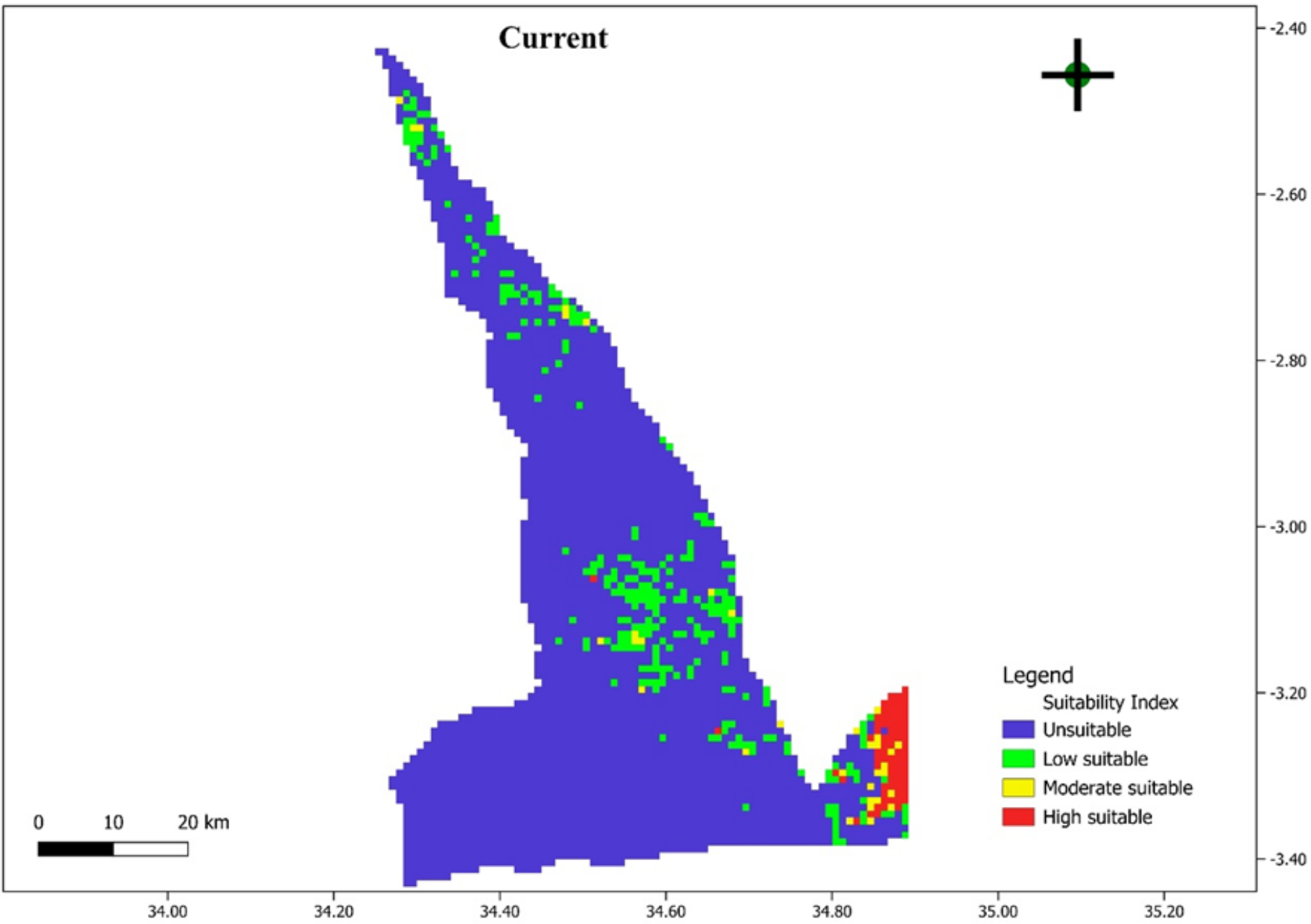


Figure 1. Current habitat suitability of the White-backed vulture in Maswa Game reserve

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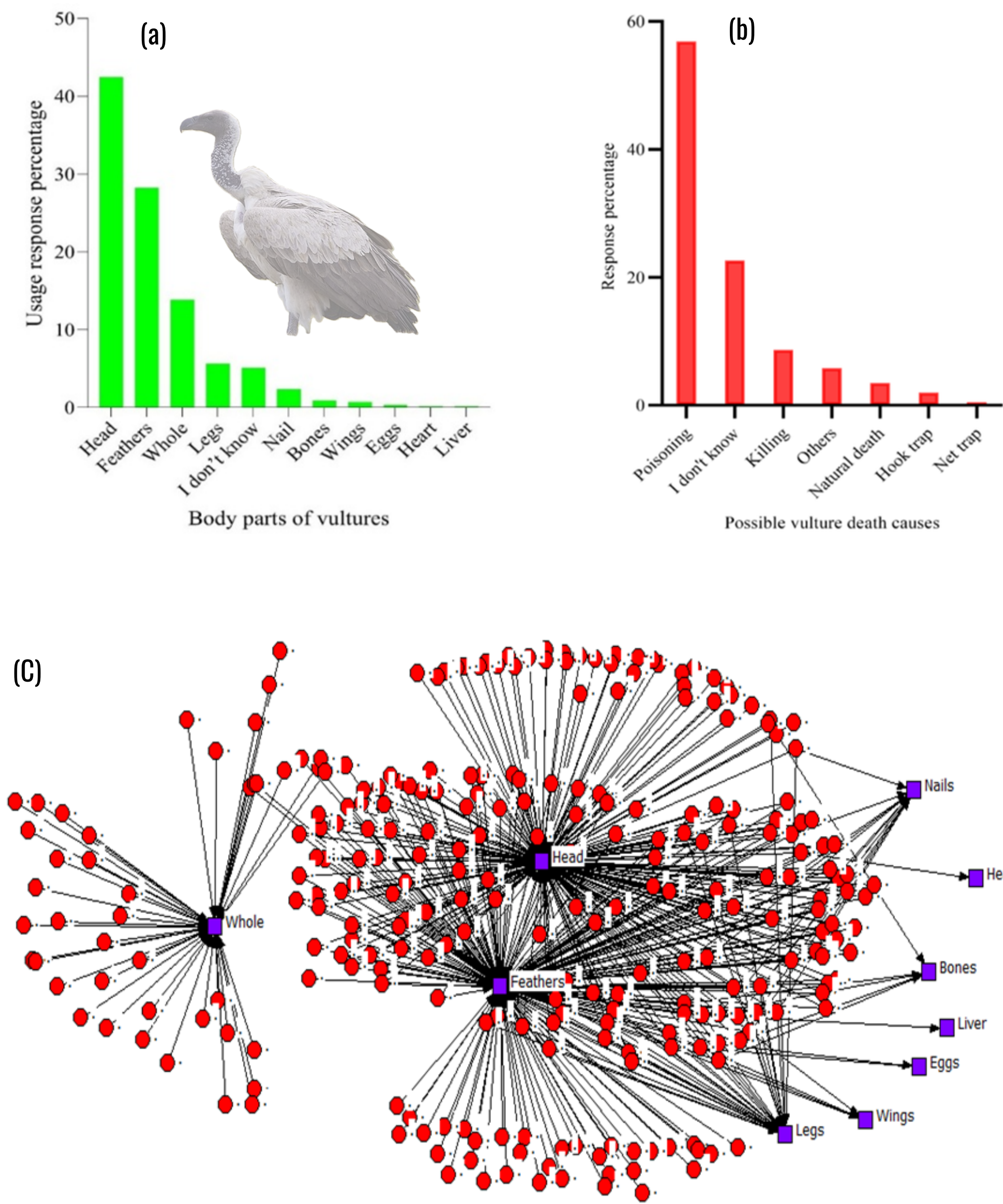
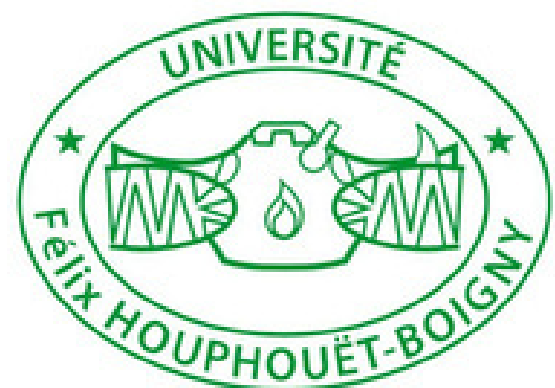


Figure 2. The percentage of response to the use of the vulture body parts (a), possible mortality causes (b) and Social Network Analysis on the uses of vulture body parts (c), within the surveyed villages - Butuli, Matala, and Bulyandulu.

Conclusion

Vulture conservation can be guided by existing framework of national laws, acts, policies, strategies, plans, and international agreements.

However, the successful conservation of vultures will require a combined approach to bridge the gap between ecological science and climate action, strong policy implementation, enforcement of the Act, and community-based interventions that addresses the cultural uses of vulture body parts and promotes sustainable alternatives to reduce exploitation.



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