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Hornbills (Bucerotidae)

the Forest" - seed dispersal (Kinnaid &')

Distribution and Occupancy of Hornbills in Western Sarawak

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- World – 57 species (Ponsawat, Kemp & Strange, 2013); P. Malaysia – 10 species; and Borneo – 8 species
- Habitat – Mixed Dipterocarp Forest, Primary Forest, Secondary Forest, Peat Swamp Forest, Kerangas, Mangrove, Beach, Riverine, Montane, and Limestone.



Ponsawat P., KEMP A. C., & STRANGE M. (2013). Hornbills of the world: A photographic guide, Grasshopper and Distribution. Per (ed) Kinnaid, M. P., & O'Brien, T. G. (2002). The ecology and conservation of Asian Hornbills: forests of the forest. University of Chicago Press.

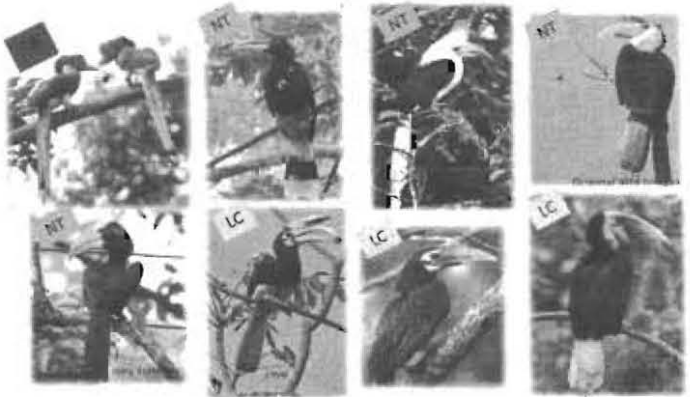
Hornbills (Bucerotidae)

- Wide home range – at least 10km of daily movement
- Indicators of forest condition and human disturbance – habitat preference of non-fragmented forest and forest with large fruiting trees for their feeding and nesting habit (Gale & Thongaree, 2006)



Gale, G. A., & Thongaree, S. (2006). Density estimates of nine hornbill species in a lowland forest site in southern Thailand. *Avian Conservation and Ecology*, 1(3):21-29.

- Monogamous (Kemp, 1995)
- Nest - natural cavity from woodpecker, bear and fungi (Ponsawat, 2017)
- Unique breeding biology
- Nest cavities
- Sealed up with female's droppings and mud, tiny slit.
- Male provides nourishment for female – Egg-laying, chicks plume



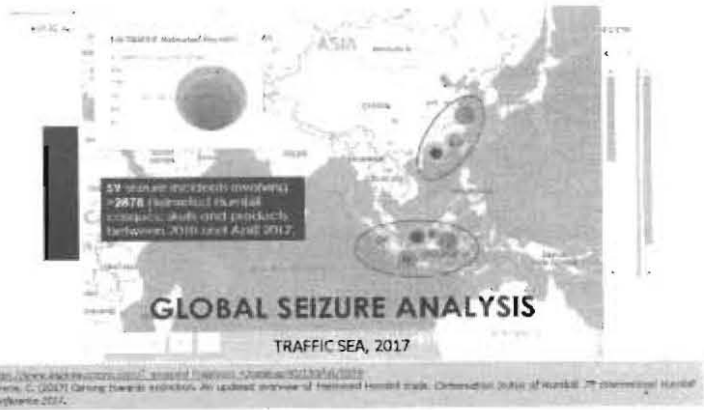
Kemp, A. (1995) The hornbills. Oxford University Press, New York.
Ponsawat, P. (2017). *Wings and Address*. 7th International Hornbill Conference 2017.

Threats

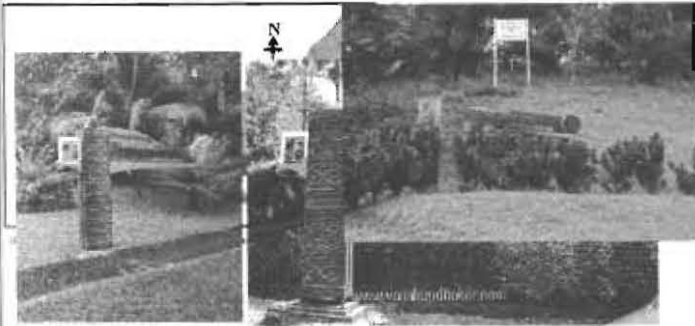


- Hunting
- Hostile and destructive practice
 - Population reduction (Amin & Ropot, 2017)

Amir, S. A., & Shugart, J. (2016). Diversity estimates of new hornbill species in a lowland forest site in western Thailand. *Conservation Genetics*, 17(1), 57-66.



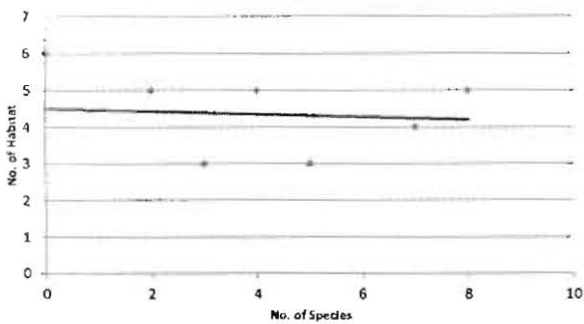
Study Area



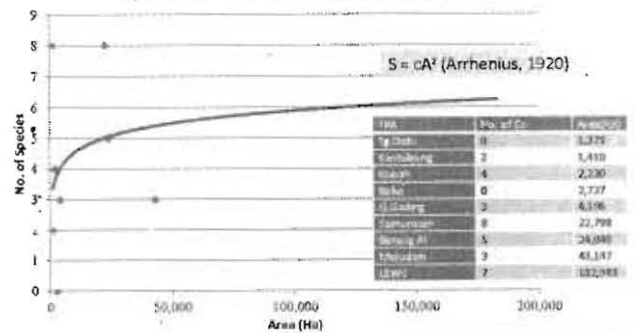
Methodology

- Data collection: 2013-2016
- Incidental and opportunistic observation
 - Opportunistic surveys – line transect sampling, patrolling and observations by staff member of Sarawak Forestry Corporation.
 - Identification – direct observations and calls.

Habitat – Species Relationship

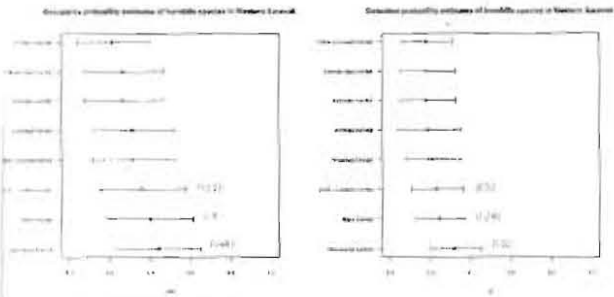


Species – Area Relationship



Arrhenius, O. (1920). Comparison of the species-area relation. *Journal of Animal Ecology*, 4, 1-5.

Bayesian Single-season Occupancy Modelling



P. S. Doherty, L. A. (2013) Applied Hierarchical Modelling in Ecology: Analysis of distribution, abundance and species richness in R and BUGS. Volume 1 and 2. Wiley-Blackwell, Academic Press.

Future Direction for Hornbill Conservation in Sarawak

- Long term conservation plan
 - Extension of protected areas
 - Forest patches connection
 - Identify nesting sites and estimate population densities in existing TPA
- Population monitoring
- Establishment of network or corridor plan.
- Predictive modelling tools – habitat availability and habitat suitability.

Priority areas that need attention

1. Setting conservation priorities based on the distribution of hornbills in the existing and proposed TPA network.
2. Species assemblage study:
 - Species-area relationship
 - Population viability analysis
3. Identify important hornbill habitats in non-protected areas of HoB (Heart of Borneo):
 - Spatial overlay of species distribution
 - Abundance estimation

Priority areas that need attention

4. Seasonality impacts on hornbill ecology:
 - Annual haze
 - Weather pattern
5. Education and awareness
6. Additional support from stakeholders

Acknowledgement

- Universiti Malaysia Sarawak
- Ministry of Higher Education
- Forest Department Sarawak
- Sarawak Forestry Corporation