

## Patterns of bird hunting in Arunachal Pradesh and implications for biodiversity conservation

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**Abstract:** We conducted a questionnaire survey to document the patterns of bird hunting among the Nyishi, Apatani and Monpa tribes of Western Arunachal Pradesh, India. A total of 157 hunters representing 57 % Nyishis, 20 % Monpas and 23 % Apatanis were interviewed to ascertain the seasonality of hunting and number of bird species hunted. Fifty three species of birds including 18 belonging to Schedule I of India's Wildlife (Protection) Act were hunted by the interviewees. Examples of Schedule I species hunted in the region are hornbills, eagles and owls. Passeriformes were hunted most (40 %) followed by Ciconiformes (19 %) and Strigiformes (9 %). These families constituted 70 % of the total species hunted. Hornbills and Galliformes are the most threatened groups in the region. Hunting is intensive during *jhum* cultivation and harvesting of the crops. However, hunting time and season vary with the species. The average rate of hunting from all major tribal groups is 6 birds hunter<sup>-1</sup> year<sup>-1</sup>. The rate of loss from the study area is 10,956 birds year<sup>-1</sup>. The implications of the hunting on biodiversity are discussed.

**Resumen:** Realizamos una investigación por medio de cuestionarios para documentar los patrones de caza de aves entre las tribus Nyishi, Apatani y Monpa del occidente de Arunachal Pradesh, India. En total, 157 cazadores que representaron 57 % Nyishis, 20 % Monpas y 23 % Apatanis fueron entrevistados con el fin de indagar la estacionalidad de la cacería y el número de especies de aves que son cazadas. Cincuenta y tres especies de aves, incluyendo 18 listadas en el Apéndice I del Acta de (Protección de) la Vida Silvestre de la India, fueron cazadas por los entrevistados. Ejemplos de especies del Apéndice I que son cazadas en la región son los cálaos, las águilas y los búhos. Las aves cazadas más intensamente fueron las Passeriformes (40 %), seguidas de las Ciconiformes (19 %) y las Strigiformes (9 %). Estas familias constituyeron 70 % del total de las especies cazadas. Los cálaos y las Galliformes son los grupos más amenazados en la región. La cacería es intensa durante el cultivo *jhum* y la cosecha de los cultivos. Sin embargo, el momento preciso y la estación de la caza variaron con la especie. La tasa promedio de caza entre todos los grupos tribales principales es de seis aves cazador<sup>-1</sup> año<sup>-1</sup>. La tasa de pérdida en el área de estudio es de 10,956 aves año<sup>-1</sup>. Se discuten las implicaciones de la caza sobre la biodiversidad.

**Resumo:** Realizámos um inquérito por questionário para documentar os padrões de caça de aves entre as tribos Nyishi, Apatani e Monpa da região ocidental de Arunachal Pradesh, na Índia. Entrevistou-se um total de 157 caçadores que representam 57 % dos Nyishis, 20 % de Monpas e 23 % Apatanis para determinar a sazonalidade da caça e do número de espécies de aves caçadas. Cinqüenta e três espécies de aves, incluindo 18 pertencentes ao Anexo I da Legislação sobre Vida Selvagem da Índia (Proteção) foram caçados pelos entrevistados. Exemplos de espécies caçadas na região e constantes do Anexo I são os calaus, águias e corujas.

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As mais caçadas foram as Passeriformes (40 %) seguido pelas Ciconiformes (19 %) e as Strigiformes (9 %). Estas famílias constituíram 70 % do total de espécies cinegéticas. Os calaus e Galliformes são os grupos mais ameaçados na região. A caça é intensa durante o cultivo jhum e a colheita das culturas. No entanto, o tempo de caça e estação variam com as espécies. A taxa média de caça de todos os principais grupos tribais é de 6 aves caçador<sup>-1</sup> ano<sup>-1</sup>. A taxa de perda para a área de estudo é 10.956 pássaros ano<sup>-1</sup>. As implicações da caça sobre a biodiversidade são discutidas.

**Key words:** Arunachal Pradesh, ethnic culture, Galliformes, hornbill, hunting, *jhum*.

Hunting of wild animals for sustenance has been the way of life for many tribal communities all over the world. Over hunting is considered the major cause for animal extinction (Diamond 1984; Diamond & Case 1986; Foster & Machilis 1996; Harcourt & Park 2003; Kerr & Currie 1995; McKinney 2001; Sala *et al.* 2000). Bush-meat hunting and its utilization has been studied in African and Neo-tropical countries extensively (Angelici *et al.* 1999; Bakarr *et al.* 2001; Barnnet 2000; Tilahun *et al.* 2012; Wilkie & Carpenter 1999). However, very few studies are available on these aspects from Asia and South-east Asia (Bennett & Rao 2002; Chutia *et al.* 2008; Rawat 2009; Solanki & Chutia 2004, 2009; Venkataraman 2009). Eastern Himalaya is one of the important global "Biodiversity Hotspots" inhabited by a large number of tribal communities who have been traditionally hunting wild animals for subsistence. However, magnitude and seasonality of hunting and its impact on biodiversity has not been documented adequately.

Arunachal Pradesh, located in Eastern Himalaya, represents one of the tribal states of India (26° 28' to 29° 30' N. and 91° 51' to 97° 30' E). The state is inhabited by as many as 26 major tribes and 110 sub-tribes having rich ethnic culture (Pandey *et al.* 2003). All the tribal communities have been traditionally practicing subsistence hunting since ages. The state forms a part of the global terrestrial biodiversity hot spots. It is believed that traditional hunting in Arunachal Pradesh was sustainable till recently as there was no trade of animal parts. Of the various groups of animals hunted for meat, birds constitute the largest proportion. In order to examine the patterns of bird hunting across three major tribal communities of Arunachal Pradesh, viz., Nyishi, Monpa and Apatani, we conducted a questionnaire survey. Results of the survey and conservation implications of such practices are discussed in this paper.

The survey area is located in the western Arunachal Pradesh and has a total of 1731 villages. Of these, 1354 belong to Nyishis, 341 to Monpas and 36 villages to Apatanis. Nyishis, Apatanis and Monpas constitute 13.44 %, 2.6 %, and 4.4 % of the total population of the state (Population Census 2001). A total of 157 hunters (57 % Nyishis, 20 % Monpas and 23 % Apatanis) were interviewed using semi-structured questionnaires (Sethi & Hilaluddin 2001; Solanki 2002). The surveys were conducted during 2002 - 2005, covering the crop plantation (April - May) and crop harvesting periods (October - December). Number of hunters interviewed from each tribal community was roughly in proportion to their population. For the identification of species hunted by the interviewees we relied on their ability to pin-point the species in their visible range as well as their confidence in pin-pointing in the pictorial guide (Ali & Ripley 1983). Doubtful species were discarded from the analysis. Off take calculation was made by analyzing the number of kills each year by individual hunter per household.

The survey reveals that nearly 10 - 15 % population in all the three communities was involved in active hunting of birds. In a period of three years (2002 - 2005) 53 species of birds were hunted in the area (Table 1). The hunted species belonged to Passeriformes (40 %), Ciconiformes (19 %), Strigiformes (9 %), Buceriformes and Piciformes (7 % each), and Galliformes, Psittaciformes and Cuculiformes (6 % each). Passeriformes, Ciconiformes and Strigiformes altogether formed 70 % of the total species hunted. Of the total species hunted, 18 fall under Schedule I, 34 under Schedule IV and 1 species in Schedule V of Wildlife (Protection) Act 1972. The major groups of birds under Schedule I are hornbills (Great Indian, Indian pied, Wreathed and Rufous necked), owls (Grass owl, Forest eagle owl, Brown wood owl), and eagles (Feather-toed

**Table 1.** Hunting intensity of birds by Nyishi, Monpa and Apatani tribes in Arunachal Pradesh, India.

Family/Group	Number of species	Hunting intensity of birds (%)		
		Nyishi	Monpa	Apatani
Ciconiformes	10 (2*)	12.2	13.8	18.0
Galliformes	3 (1*)	8.2	7.6	9.0
Psittaciformes	3 (1*)	2.0	3.0	3.0
Cuculiformes	3 (1*)	2.9	3.0	3.4
Passeriformes	21(2*)	49.0	50.0	44.7
Strigiformes	5 (1*)	9.4	10.0	8.0
Bucerotiformes	4 (2*)	8.0	7.0	7.8
Piciformes	4 (1*)	6.6	6.4	6.2

\*Number of Threatened Species.

hawk eagle, Crested hawk eagle, Bonelli's hawk eagle, Rufous bellied hawk eagle). As per IUCN Red List (2003) the hunted birds belong to Endangered (5), Vulnerable (5) and Critically Endangered (1) category. The three communities had almost similar intensity of hunting i.e., 6 birds hunter<sup>-1</sup> year<sup>-1</sup>. Hunting was more intensive during April - May when the communities have prepared *jhum* fields for cultivation and during October - December after crop harvesting. The species such as hornbills and hawks are hunted by the Apatani and the Monpa tribes inside the nest when birds are incubating the eggs or guarding the chicks. However, Nyshis restrain from hornbill hunting during breeding season due to religious taboos.

The hunting intensity, if extrapolated to entire study area, comes to 10,956 individuals of birds year<sup>-1</sup> (48 % by Nyshis, 30 % by Apatanis and 22 % by Monpas). The difference in killing of birds is due to the size of the population of the tribal groups and ethno-zoological use patterns (Solanki *et al.* 2004, 2005). Although, Monpas follow Buddhism, the religion that forbids killing of animals, the religion does not seem to have any influence on the local populations. Hornbills have already gone extinct in certain areas in Arunachal Pradesh (Solanki *et al.* 2004). Hunting of birds especially during breeding season has serious consequence as it breaks the life cycle and leads to local extinction of species.

The role of birds in seed dispersal and pollination has been well documented (Datta 1998, 2000, 2001; Pacheco & Simonetti 2000). Local extinction of such species could have negative impact on the regeneration of forests and maintenance of species diversity in primary forests. The

genetic variability of trees in the natural habitat is found more where the pollinators and seed dispersal groups of animals predominate, and their elimination reduces the variability (von Halle 2002). Thus, hunting of animals also have larger impact on animal genetic diversity and population structure of plants in the ecosystem at large and the survival of species in the long run. When any link of food chain is eliminated from the ecosystem, it will have cascading effect on ecosystem stability and functioning on which humanity depends (Brooks *et al.* 2006; Hunter & Hutchinson 1994; Pimm *et al.* 1995; Tilahun *et al.* 2012). Considering the current level of hunting pressure in the area and given the global conservation significance of Eastern Himalaya, it is high time that concerned agencies formulate appropriate strategies to prevent rapid extinction of critically endangered and vulnerable species from this region.

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## References

- Ali, S. & D. Ripley. 1983. *A Pictorial Guide to the Birds of the Indian Subcontinent*. BNHS & Oxford University Press, Delhi.
- Angelici, F. M., L. Luiselli, E. Politano & G. C. Akani. 1999. Bushmeat and mammal-fauna: A survey of the mammals traded in bushmeat markets of local people in the rainforests of south-eastern Nigeria. *Anthropzoology* **30**: 51-58.
- Bakarr, M. J., G. A. B. Da Fonseca, R. Mitterneier, A. B. Rylands & K. W. Paenenilla. 2001. *Hunting and Bushmeat Utilization in the African Rain Forest: Prospective towards a Blueprint for Conservation Action*. Applied Biodiversity. Series 2. Washington, USA.
- Barnett, R. (ed.). 2000. *Food for Thought: The Utilization of Wild Meat in Eastern and Southern Africa*. TRAFIC East. Southern Africa.
- Bennett, E. L. & M. Rao. 2002. Wild meat consumption

- in Asia tropical forest countries: Is this a glimpse of the future for Africa? pp. 39-44. In: S. Mainka & M. Trivedi (eds.) *Links between Biodiversity Conservation, Livelihoods and Food Security: The Sustainable Use of Wild Species for Meat*. Gland Switzerland, Cambridge.
- Brooks, T. M., R. A. Mittermeier, G. A. B. Da Fonseca, J. Gerlach, M. Hoffmann, J. F. Lamreux, C. G. Mittermeier, J. D. Pilgrim & A. S. L. Rodrigues. 2006. Global biodiversity conservation priorities. *Science* **313**: 58-61.
- Chutia, P., G. S. Solanki & O. P. Singh. 2008. Extraction of mammals and its impacts on biodiversity of Arunachal Pradesh. pp. 128-136. In: P. Natarajan (ed.) *Proceedings of International Conference on Biodiversity Conservation & Management*. Cochin University of Sciences & Technology, Cochin, India.
- Datta, A. 1998. Hornbill abundance in unlogged forest, selectively logged forest and a plantation in Western Arunachal Pradesh. *Oryx* **32**: 285-294.
- Datta, A. 2000. Pheasant abundance in selectively logged and unlogged forests of western Arunachal Pradesh, North-east India. *Journal of Bombay Natural History Society* **97**: 177-183.
- Datta, A. 2001. *An Ecological Study of Sympatric Hornbills and Fruiting Patterns in a Tropical Forest in Arunachal Pradesh*. Ph.D. Thesis, Saurashtra University.
- Diamond, J. M. 1984. Historic extinctions: A rosetta stone for understanding prehistoric extinction. pp. 824-862. In: P. S. Martin & R. G. Klein (eds.) *Quaternary Extinctions: A Prehistoric Revolution*. University of Arizona Press, Tucson, USA.
- Diamond, J. & T. J. Case. 1986. Overview, introductions, extinction and invasions. pp. 56-79. In: J. Diamond & T. J. Case (eds.) *Community Ecology*. New York, USA.
- Foster, D. J. & G. E. Machilis. 1996. Modeling human factors that affect the loss of biodiversity. *Conservation Biology* **10**: 1253-1263.
- Harcourt, A. H. & S. A. Park. 2003. Threatened primates experience high human densities: Adding an index of threat to the IUCN Red List criteria. *Biological Conservation* **109**: 137-149.
- Hunter, Jr., M. L. & A. Hutchinson. 1994. The virtues and shortcomings of Parochialism: Conserving of species that are locally rare, but globally common. *Conservation Biology* **8**:1163-1165.
- IUCN. 2003. *IUCN Red List of Threatened Species*. IUCN Gland, Switzerland.
- Kerr, J. T. & D. J. Currie. 1995. Effects of human activity on global extinction risk. *Conservation Biology* **9**: 1528-1538.
- McKinney, M. L. 2001. Role of human population size in raising bird and mammal threat among nations. *Animal Conservation* **4**: 45-57.
- Pacheco, L. F. & J. A. Simonetti. 2000. Genetic structure of a mimosoid tree deprived of its seed disperser, the spider monkey. *Conservation Biology* **14**:1766-1776.
- Pandey, B. B., D. K. Duarah & N. Sarkar. 2003. *Tribal Village Council of Arunachal Pradesh*. Govt. of Arunachal Pradesh Publication, Itanagar, Arunachal Pradesh.
- Population Census. 2001. *Registrar General of India*. Government of India, New Delhi.
- Pimm, S. L., G. J. Russell, J. L. Gittleman & T. M. Brooks. 1995. The future of biodiversity. *Science* **269**: 347-350.
- Rawat, G. S. 2009. Current trends in tropical biodiversity research and conservation. *Tropical Ecology* **50**: 5-6.
- Sala, O. E., F. S. Chapin, J. J. Armesto, E. Berlow, J. Bloomfield, R. Dirzo, E. Harber-Sanwald, L. F. Huenneke, R. B. Jackson, A. Kinzig, R. Leemans, D. M. Lodge, H. A. Mooney, M. Oesterheld, N. L. Prff, M. T. Sykes, B. H. Walker, M. Walker & D. H. Wall. 2000. Global biodiversity scenarios for the year 2100. *Science* **28**: 1770-1774.
- Sethi, P. & Hilaluddin. 2001. Structural financial empowerment for localized development with joint forest management: examples from Madhya Pradesh, India. *Sustainable Development* **9**: 87-102.
- Solanki, G. S. 2002. Socio-cultural and faunal diversity of Arunachal Pradesh. *Himalayan Journal Environment and Zoology* **16**: 159-170.
- Solanki, G. S. & P. Chutia. 2004. Ethno zoological and socio-cultural aspects of Monaps of Arunachal Pradesh. *Journal of Human Ecology* **15**: 251-254.
- Solanki, G. S., P. Chutia & O. P. Singh. 2004. Headgear-A cultural artifact and its impact on biodiversity in Arunachal Pradesh. *Rajiv Gandhi University Research Journal* **7**: 35-44.
- Solanki, G. S., P. Chutia & O. P. Singh. 2005. Ethnozoology of Nyishi tribe and its impact on biodiversity in Arunachal Pradesh. *Rajiv Gandhi University Research Journal* **8**: 89-100.
- Solanki, G. S. & P. Chutia. 2009. Studies on ethno-medicinal aspects and zoo-therapy in tribal communities in Arunachal Pradesh, India. *International Journal of Ecology & Environmental Science* **35**: 67-76.
- Tilahun Chekol, Afeework Bekele & M. Balakrishnan. 2012. Population density, biomass and habitat association of rodents and insectivores in Pawe area, North Western Ethiopia. *Tropical Ecology* **53**: 15-24.
- von Halle, B. O. 2002. Preliminary assessment of the environmental and socio-economic impacts of wild

- meat harvesting in South America. pp. 61-69. *In: The Sustainable Use of Wild Species for Meat*. TRAFFIC International.
- Venkataraman, K. 2009. India's Biodiversity Act 2002 and its role in conservation. *Tropical Ecology* **50**: 23-30.
- Wilkie, D. S. & J. F. Carpenter. 1999. Bushmeat hunting in the Congo Basin: an assessment of impacts and option for mitigation. *Biological Conservation* **8**: 927-955.

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