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Research Article

Wildlife exploitation: a market survey in Nagaland, North-eastern India

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Abstract

With growing human population, increased accessibility to remote forests and adoption of modern tools, hunting has become a severe global problem, particularly in Nagaland, a Northeast Indian state. While Indian wildlife laws prohibit hunting of virtually all large wild animals, in several parts of North-eastern parts of India that are dominated by indigenous tribal communities, these laws have largely been ineffective due to cultural traditions of hunting for meat, perceived medicinal and ritual value, and the community ownership of the forests. We report the quantity of wild animals sold at Tuensang town of Nagaland, based on weekly samples drawn from May 2009 to April 2010. Interviews were held with vendors on the availability of wild animals in forests belonging to them and methods used for hunting. The tribes of *Chang, Yimchunger, Khiemungan*, and *Sangtam* are involved in collection/ hunting and selling of animals in Tuensang. In addition to molluscs and amphibians, 1,870 birds (35 species) and 512 mammals (8 species) were found in the samples. We estimated that annually 13,067 birds and 3,567 mammals were sold in Tuensang market alone, which fetched about Indian Rupees (₹) 18.5 lakhs/ year. Temporal variation was observed with respect to various taxa sold; molluscs: almost all through the year; amphibians: June-August; and birds and mammals restricted to October-February. We suggest monitoring of all major markets of Nagaland to examine trends in exploitation of wild animals. However, considering the traditional dependency of people on wild resources, as well as their cultural sentiments and livelihoods, any interventions for wildlife conservation should have the involvement and support of local inhabitants.

Key words: Biodiversity Conservation, Hunting, Nagaland, North-eastern India, Tribes

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Introduction

With growing human population, increased accessibility to remote forests and adoption of modern tools, hunting has become a severe problem [1]. Local communities living in the vicinity of forests depend on wildlife for livelihood and income generation [1-7]. Hunting is practiced by indigenous tribal communities for reasons such as cultural traditions of hunting for meat, perceived medicinal value and for ritual uses. Information on hunting patterns and on the factors that drive local hunting would help propose measures to control exploitation. Market demands for wild meat have also pushed the harvest of wildlife to unsustainable levels [4, 8]. The effects of hunting by rural people have led to changes in the structure of mammal assemblages [9, 10].

North-eastern India, a part of the Indo-Myanmar faunal sub-region, is one of the 34 global biodiversity hotspots [11] and is home for about 225 tribes. Their culture and customs have an important role in understanding biodiversity conservation and management in the region [12]. Nagaland is a special category state of the Indian Union, and the Indian Constitution provides privileges such as allowing Tribal Councils of the state to try criminal and civil cases of their area and to impose fines according to customary law. Insurgency activities were common in the region for several decades, and are currently under control due to a peace agreement in 1975 between the Indian Government and local leaders.

Nagas, the local communities, are not a homogenous group, but a composite of at least 18 major tribes, which hunt animals largely for their food, medicine and ritual uses. About 93% of natural habitats (largely forests) in Nagaland are owned and managed by individuals, clans, village and district councils and other traditional community institutions; the rest is owned by the state government [13]. People of Nagaland practice slash-and-burn (*Jhum*) cultivation. The state-driven approach of declaring Protected Areas for conservation of species and habitats, where anthropogenic exploitation is prohibited or restricted, is therefore of little conservation value in the region.

The combined effects of degraded forests and excessive hunting, particularly of birds with air guns, the rapid decline in animal populations, the drying up of water resources and the declining availability of wood and wild vegetables resulted in a self-evolved change in resource use as early as the 1950s in many villages in Nagaland. The idea of Community Conservation Areas (CCA) was therefore mooted by the community. Self-imposed restrictions on hunting, extraction of timber and non-timber forest products are being practiced in several places at community level in Nagaland, including in Tuensang district. Conservation efforts initiated by local communities of Nagaland are being strengthened by Kalpaviriksh, Pune and SACON, Coimbatore, India.

In India, quantitative data on the exploitation of wild animals by local communities are scarce [14- 20**]**, and relatively few studies have examined hunting patterns in Northeast India [1, 21-25). Here, we report on the quantity and variety of wild animal meat sold in a market in Tuensang town of Nagaland based on weekly samples drawn from May 2009 to April 2010. We further discuss the implications of this exploitation on biodiversity conservation.

Methods

Study site

The present study was carried out in Tuensang daily market (Fig.1). Tuensang town (26 °28’ N 94° 83’E) is the district Headquarters of Tuensang district in eastern Nagaland. Tuensang district (2,088 sq km), with about 108 isolated villages, is characterised by high ridges, deep gorges and narrow valleys. As per

the 2001 Census of India, the population of Tuensang town was 29,772, most of them tribals. About one hundred people are non-native, who have business establishment in the town. The non-tribals do not have rights to purchase land or hunt animals in the area. The major indigenous tribes inhabiting the district are *Chang, Sangtam, Khiemungan Yimchunger, Phom* and *Sumi,* all reportedly hunter gatherers [26-28]. As in other parts of north-east India, *Jhum* or slash-and-burn cultivation is the most common agricultural practice in the district. Wild animals are sold openly in the market, as the Indian wildlife protection act is ineffective and local laws do not prohibit selling them.

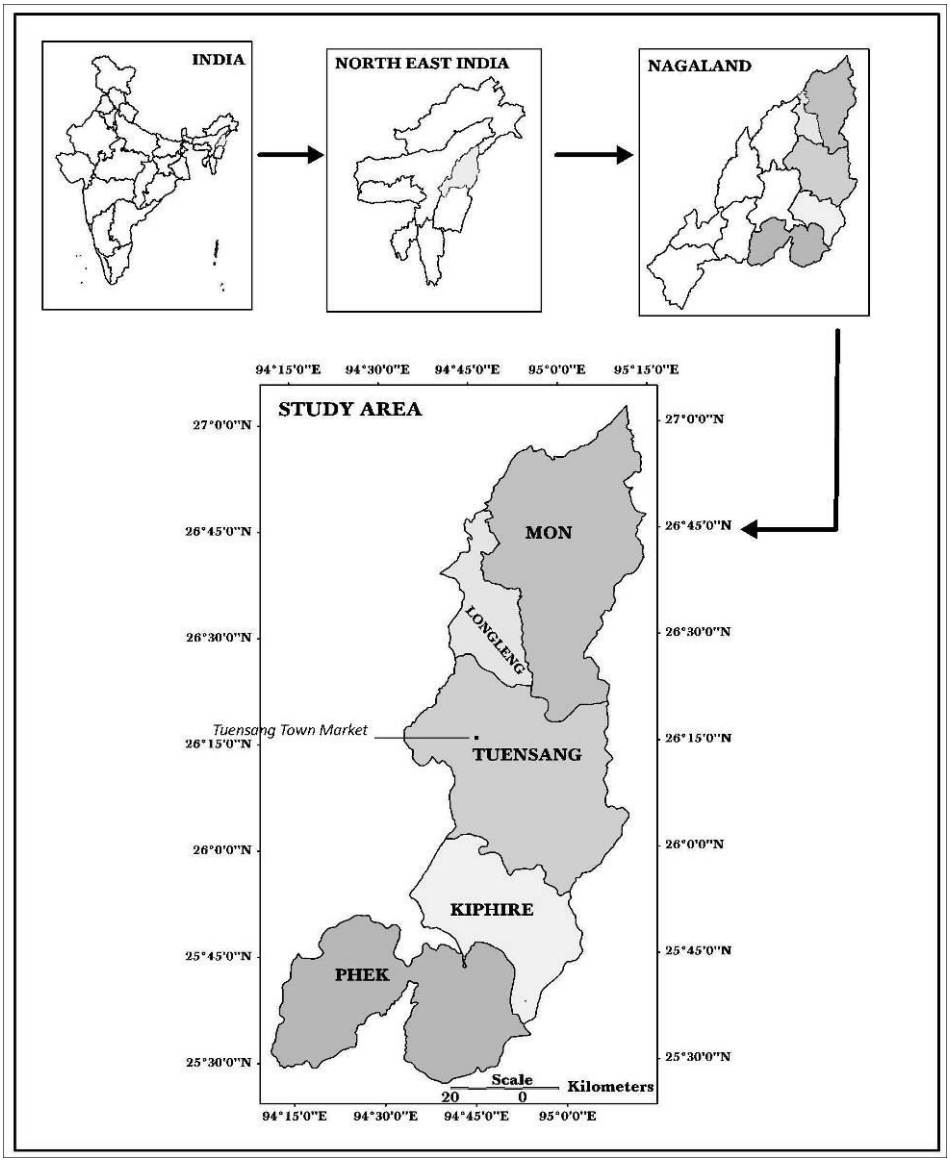

Fig. 1. Map showing eastern districts of Nagaland, India and location of Tuensang town

Data collection

We carried out surveys in Tuensang daily market once a week between 0730 and 1100 hrs (Indian Standard Time) from May 2009 to April 2010 (total = 52 surveys). Because hunted animals were brought to the market from nearby villages before 1000 hrs, the sampling was restricted to the forenoon. No fixed day was followed for sampling, to avoid bias, if any. For instance, sampling only on Sunday may overestimate the number of animals sold, as most of the people of this region consume non-vegetarian food on this day. The number of live and dead wild animals and price of each species/ taxon for sale during each survey were recorded. Digital photographs of birds and mammals were taken where identification of species on the spot was difficult. We compared the digital images with those available in books on the birds and mammals of the Indian subcontinent [29-31]. In a few cases, species identity was confirmed in consultation with experts in the field. Identification of amphibians and molluscs was restricted to broad taxonomic level. Prior to the initiation of the work, the vendors were briefed on the purpose of this work by the team, especially by C L (one of the authors of this work), who is from one of the local tribal communities of Tuensang.

One of the authors (SRK) interacted with all ten vendors selling bush meat in Tuensang market at least once during May 2009- April 2010 to determine the source of animals and their past and present status in the area. Formal interviews with structured data sheets were not carried out in source villages due to prevailing tense socio-political conditions in the eastern Nagaland during the study.

The study duration was divided into the wet season (April-September) and dry season (October- March) and we compared the number of animals sold to determine the seasonal variations, if any. Daily and annual quantities of animals sold in Tuensang market were estimated based on the average number of individuals of each taxon in the samples (52 weeks) and average number of animals recorded per day X 364 days respectively. Data on size and body weight of the animals were drawn from various websites and literatures [29 -31]. Nomenclature followed herein was of Grimmett et al, [30] and Menon [31] for birds and mammals respectively.

Results

A total of 52 visits were made to Tuensang market from May 2009 to April 2010. Only live or fresh meat of wild animals was considered for analysis; the meat of domestic animals such as domestic chickens (*Gallus gallus domesticus*), pigs (*Sus scrofa domestica*) and dogs (*Canis domesticus*) was omitted from the analysis. The vendors stated that all animals sold in the market were hunted during the previous day or night and brought to the market through local transportation from villages found within 50 sq. km of Tuensang town.

Interviews with vendors revealed that tribes such as *Chang, Yimchunger, Khiemungan*, and *Sangtam* were involved in collection/ hunting of animals and selling them in the market. Also, it was revealed that hunting was largely restricted within the forests or water bodies belonging to an individual/ community. Various hunting methods were used for collecting animals; frogs and molluscs (hand collection), bird (catapult, snares and air guns), and mammals (snares, bow and arrows, spear, shot guns and rifles). Rodents were extricated by digging them out of their burrows. The unsold animals each day were reportedly consumed by the vendors or smoked and stored for future consumption.

In total, 47 taxa belonging to mammals (8 species), birds (35 species), amphibian (2 taxa) and molluscs (2 taxa) were recorded during this study (Table 1). No reptile species was sold in the market during this

study; however, Burmese python *Python bivittatus*, water monitor lizard *Varanus salvator*, Asian brown tortoise *Manouria emys*, Mouhot's box turtle *Coura mouhotii* and Gemel's leaf turtle *Cyclemys gemeli* were consumed locally in the region (Bhupathy, personal observation). It is believed by the locals that consumption of water monitor lizard provides greater strength and longevity to humans.

Wild animals were sold in the market throughout the year, molluscs during the most months, followed by amphibians (Fig. 2). Availability of birds and mammals was restricted to October-February, i.e. colder and non-rainy months. Greater amounts of molluscs were observed during March-May, amphibians during June-August, and birds and mammals during November-January (Fig. 2).

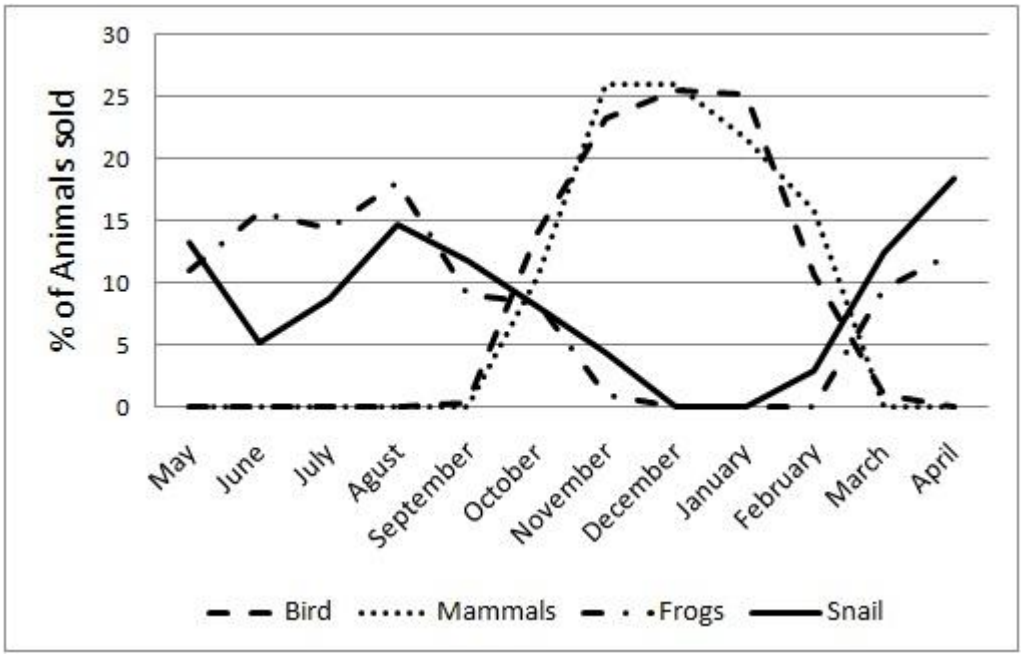

Fig. 2. Monthly variation in the abundance of various taxa of animals recorded from May 2009 to April 2010 in Tuensang market, Nagaland, Northeast India

A total of 512 mammals belonging to eight species were observed in the samples (Table 1). The Himalayan striped squirrel *Tamiops mcclellandii* (body weight = 50 g) was the most common species with 159 records, followed by house rat *Rattus* sp. (150 g; n=158) and orange-bellied Himalayan squirrel *Dremomys lokriah* (Table 3), while spotted linsang *Prionodon pardicolor* (450 g) and Himalayan palm civet *Paguma larvata* (4.3 kg) were the least common species (each contributing 11 individuals). An estimated 3,567 mammals arrived at Tuensang market annually. In total, 1,870 birds belonging to 35 species and 20 families were observed in the samples (Table 2). The bird family *Columbidae* was represented by six species followed by *Pycnontidae* (five species). The great barbet *Megalaima virens* (body weight = 243 g) accounted for the highest (264) and forest eagle-owl *Bubo nipalensis* (1.3 kg) the lowest (2) number of individuals found in the samples. Size of the birds sold in Tuensang market ranged from a small sunbird (e.g. *Aethopyga gouldiae,* 10 cm, 9 g) to a large forest eagle owl and pheasant (e.g. *Gallus gallus*, 63 cm, 1100 g). The beautiful nuthatch *Sitta formosa* (10 g), a Vulnerable species [32] was observed in the market (Appendix 1). Our estimates suggest that annually 13,067 birds arrived at Tuensang market.

Table 1. Quantity of different faunal groups sold in Tuensang market, eastern Nagaland, India during May 2009- April 2010.

Taxa	No. of Species/ Taxa	Quantity/ Number		
		In Sample	Per Day ± SD	Annual
Mammals	8	512	9.8 (± 13.72)	3567
Birds	35	1870	35.9 (± 46.64)	13067
Amphibians	2	4150	79.8 (± 71.40)	29047
Molluscs	2	136,000	2615.4 (± 2750.6)	952005

Birds and smaller mammals such as rodents were sold as individuals (piece) and frogs as lots of 3-10 animals and molluscs in bags (lots) comprising 50-100 animals. Larger mammals such as red muntjac *Muntiacus muntjak* (25 kg) were slaughtered and meat sold by weight per the buyers' choice, e.g., 1 or 2 kg. Price range of a mammal species ranged from (Indian Rupees) ₹ 20/ (house rat) to 3000/ (red muntjac). Price range at which the meat of various mammal species sold at Tuensang market is given in Table 3.

Table 2. Seasonal variation in the number of animals recorded in Tuensang market

Taxa	April-September (Wet season)	October-March (Dry season)	Total
Molluscs	98,000 (62.1)	38,000 (27.9)	136,000
Amphibians	3360 (81.0)	790 (19.0)	4150
Birds	6 (0.3)	1864 (99.7)	1870
Mammals	0	512 (100)	512

Birds were normally sold as individuals (whole bird), the price ranging from ₹ 20 to 1000/ bird (Appendix 1)**.** Taboos or particular preferences among the communities for different species or animal groups could be a reason for this disparity in the selling price of birds. For instance, locals believed that soup made out of the common hoopoo *Upupa epops* (body weight= 75 gm) cures asthma, and hence, a live bird fetched ₹ 1000/ (US $18.7). Based on the market prices of different species, the estimated annual turnover was ₹ 739,970 (US **$** 13,841) for mammals and ₹ 1,107,470 (U$ 20,755) for birds sold at Tuensang market alone. Only ten (20%) vendors sold wild animals, while others (50) sold domesticated animal meat and vegetables (both cultivated and wild). In all, a vendor earned about ₹ 300 - ₹500/ day by selling meat of wild animals in Tuensang market.

Discussion

The present study provides data on the quantity of wild meat sold at Tuensang market of Nagaland, North-eastern India. Ninety-two species and subspecies of mammals and 428 species of birds have been reported from Nagaland by the Zoological Survey of India [33]. The number of species of mammals (8) and birds (35) brought to market was low compared to the faunal diversity of the area, but is just a sample of exploitation of wildlife in the area. There are several possible reasons for this disparity: (1) that only a small quantity of hunted animals were brought to the market for sale after household consumption and/or (2) that many other species known to occur in the area have already been severely depleted. For instance, it is reported that amur falcons (*Falco amurensi*s) were sold door to door in villages near Doyang and Wokha in Nagaland, and 12,000-14,000 birds were consumed every day during October, the migratory season of the species [34,35].

Table 3. List of mammals recorded and price range in Tuensang market during May 2009- April 2010.

Family	Common Name	Species Name	Number in the sample (%)	Average Weight (kg)	IUCN Threat Category	Price (₹) animal
Cervidae	Red muntjac	*Muntiacus muntjak*	22 (4.3)	25	LC	3000.00
Viverridae	Spotted linsang	*Prionodon pardicolor*	11 (2.2)	0.45	LC	150.00
Viverridae	Himalayan palm civet	*Paguma larvata*	11 (2.2)	4.3	LC	750.00
Talpidae	Mole	*Euroscaptor* sp.	12 (2.4)	1.0	-	150.00
Sciuridae	Flying squirrel	*Petaurista* sp.	10 (2)	1.75	-	400.00
Sciuridae	Orange-bellied Himalayan squirrel	*Dremomys lokriah*	129 (25.3)	0.17	LC	100.00
Sciuridae	Himalayan striped squirrel	*Tamiops mcclellandii*	159 (31)	0.05	LC	50.00
Muridae	House rat	*Rattus* sp.	158 (31)	0.15	LC	20.00

All tribes inhabiting Tuensang district such as *Chang*, *Sangtam, Khiemungan*, *Yimchunger*, *Phom* and *Sumi* largely depend on wild animals for meat. Trophies (skulls) displayed commonly in the villages around Tuensang belong to macaque (*Macaca* sp.), hoolock gibbon (*Bunopithecus hoolok,* body weight = 6-9 kg), porcupines (*Hystrix* sp. 6-16 kg), wild boar (*Sus scrofa*, 80-100 kg), sambar (*Cervus unicolor*, 100-300 kg), muntjac (*Muntiacus muntjak*, 14-28 kg) and goral (*Naemorhedus goral,* 20-40 kg) (SACON, Unpublished data). Trophies in the houses appeared to be about 5-10 years old. Absence of several of these species in the market showed that they were rare in the natural forests of the district.

Based on animals sold in market, it appears that the people of Tuensang town consume animal products throughout the year. The population of Tuensang town during 2001 was 29,772 [36]. Decadal (2001-2011) growth of the population of Tuensang district was 5.81%, which is much lower than the National average (17.64%). Data on the impact of growth in population on the hunting and utilization of wildlife in the area are not available. The quantity of various animal taxa consumed differed seasonally (Fig. 2): birds and mammals (October-February), molluscs (March-May), amphibians (June-August). The

interaction with vendors revealed that local communities are aware of habits and habitats of these taxa. For instance, it was reported that they largely collected molluscs from drying water bodies during March-May, i.e. drier months. Amphibians are collected from breeding congregations during monsoon (June-August) in rain-fed pools, as revealed from the quantity of these taxa sold in the market (Fig. 2). Many tribal customs in India prohibit hunting of larger animals during the breeding season [37]. Most Indian birds and mammals reportedly breed prior to monsoon i.e. prior to May [29-31]. Hence, it is possible that locals do not hunt these animals during March – August 2011. It is possible that other animals such as molluscs and amphibians were readily available during these months, and populations of many resident bird species may have become very rare due to over-exploitation in the past.

Traditionally, the people of Nagaland largely depend on wild animal meat for their protein requirement. During winter, the temperature of the region dips to < 8º C and animal protein is an important and staple food for the local inhabitants. Enquiry among the vendors revealed that the number and diversity of birds and mammals brought to the market declined during the last five years. Culturally important birds such as the great hornbill *Buceros bicornis* and Blyth's tragopan *Tragopan blythii* and mammals such as goral *Nemorhaedus goral* were sold about 5-10 years ago at Tuensang market, but were not observed during this study. Animals sold in Tuensang market were smaller (Table 3) compared to the trophies found in houses. Vendors believed that these animals have been locally extirpated due to over-exploitation and massive habitat destruction. Tribes used catapults for hunting small birds and squirrels and bow and arrows for killing larger mammals a decade ago. Vendors believe that use of air guns and other sophisticated weapons became common in the last 5-10 years. They also revealed that in recent (<5) years, people have switched from consuming wild animals to domesticated animals such as chicken, pig, dog and cattle. However, data on the quantities of these were not recorded during this study.

Fig.3. Representation of wild animals sold in Tuensang market, eastern Nagaland; (a) Spotted Linsang *Prionodon pardicolor* (b) Red Muntjac *Muntiacus muntjak* (c) Kalij Pheasant *Lophura leucomelanos* (d) Beautiful Nuthatch *Sitta formosa* (e) Amphibians (f) Molluscs. Photos Credits - a,c: J.Paramanandham, b,d: S. Ramesh Kumar, e,f: P. Thirumalainathan.

Implication for conservation

The present study showed that wild animals are still being sold in open market in larger towns in Nagaland, which points to the ineffectiveness and lack of enforcement of both Indian wildlife laws and local restrictions. These failures are likely due to the community ownership of the forests [1], religious sentiments, and lifestyle of the people, who are largely hunter-gatherers [26-28]. The people of eastern Nagaland were reportedly aware of the environmental degradation and decline of animals in their forests in their area since early 1800, and had the concept of environmental conservation by local communities. For instance, records in Yongphang village in Longleng district of the sate showed that the tropical evergreen forest of Yingnyu shang was declared a Community Conservation Area (CCA) in 1842. Since the late 1990s, the number of CCAs has increased, and currently 766 of are reported [13] in five eastern districts of Nagaland, Mon, Longleng, Tuensange, Kiphere and Phek. In Tuensang district alone, 104 CCAs have been declared, several of them with concurrences (or) resolutions passed in village councils (local administrative bodies) with self-imposed bans/restrictions on hunting.

However, the present study shows that birds and mammals are still being hunted and sold in the open market. Villagers involved in CCAs are interested in conserving wildlife, but they do not have resources to protect their community forests from intruders. Improvement of economic conditions of the CCAs could provide incentives to keep the locals engaged in wildlife conservation [13, 37, 38]. Alternate livelihood options, especially poultry and piggery and awareness programmes, may help to reduce the exploitation of wild animals in the region.

The annual estimate of over 13,000 birds and 3,500 mammals arriving at Tuensang market is a sample of the level of exploitation happening in Nagaland. Apart from Tuensang, there are at least 10 other towns (district headquarters) where wild fauna are being sold. There are markets at village level as well, and we do not have data on these. We suggest monitoring of all major markets of Nagaland to determine the trend in exploitation of wild animals in the state. However, given the traditional dependency of people on wild resources, cultural sentiments and livelihoods, any interventions for wildlife conservation must have the involvement and support of local inhabitants.

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Appendix 1. Birds recorded in Tuensang market during May 2009- April 2010

Family	Common Name (size in cm)	Scientific Name	Number in the sample	IUCN Threat category	Body Weight (g)	Price (₹)
Phasianidae	Mountain bamboo partridge (32)	*Bambusicola fytchii*	53	LC	369	150
Phasianidae	Red junglefowl (66)	*Gallus gallus*	93	LC	1100	250
Phasianidae	Kalij pheasant (70)	*Lophura leucomelanos*	48	LC	1139	250
Picidae	Lesser yellownape (27)	*Picus chlorolophus*	41	LC	78	50
Megalaimidae	Great barbet (33)	*Megalaima virens*	264	LC	243	100
Megalaimidae	Golden throated barbet (33)	*Megalaima franklinii*	78	LC	75	50
Upupidae	Common hoopoe (31)	*Upupa epops*	26	LC	70	1000
Trogonidae	Red-headed trogon (35)	*Harpactes erythrocephalus*	18	LC	89	100
Cuculidae	Lesser coucal (33)	*Centropus benghalensis*	15	LC	146	100
Strigidae	Spot-bellied eagle owl (63)	*Bubo nipalensis*	2	LC	1300	350
Columbidae	Emerald dove (27)	*Chalcophaps indica*	14	LC	124	100
Columbidae	Oriental turtle dove (33)	*Streptopelia orientalis*	14	LC	170	100
Columbidae	Spotted dove (30)	*Streptopelia chinensis*	34	LC	160	100
Columbidae	Barred cuckoo dove (41)	*Macropygia unchall*	21	LC	200	100
Columbidae	Wedge-tailed green pigeon (33)	*Treron sphenura*	82	LC	140	100
Columbidae	Thick-billed green pigeon (32)	*Treron curvirostra*	49	LC	140	100
Eurylaimidae	Long tailed broadbill (27)	*Psarisomus dalhousiae*	13	LC	50	50
Corvidae	Grey treepie (42)	*Dendrocitta formosae*	13	LC	120	100
Oriolidae	Maroon oriole (28)	*Oriolus traillii*	18	LC	71	50
Monarchidae	Asian paradise flycatcher (20)	*Terpsiphone paradisi*	16	LC	20	30
Turdidae	Grey winged blackbird (37)	*Turdus boulboul*	16	LC	80	30
Muscicapidae	Verditer flycatcher (15)	*Eumyias thalassina*	32	LC	20	30
Sittidae	Beautiful nuthatch (18)	*Sitta Formosa*	5	VU	10	40
Pycnonotidae	Crested finchbill (20)	*Spizixos canifrons*	218	LC	21	30
Pycnonotidae	Striated bulbul (20)	*Pycnonotus striatus*	57	LC	30.5	30
Pycnonotidae	Red whiskered bulbul (20)	*Pycnonotus jocosus*	134	LC	32.5	30
Pycnonotidae	Red vented bulbul (20)	*Pycnonotus cafer*	43	LC	35	30
Pycnonotidae	Black bulbul (23)	*Hypsipetes leucocephalus*	148	LC	30	30
Timaliidae	Chestnut-crowned laughing thrush (28)	*Garrulax erythrocephalus*	53	LC	119.5	50
Timaliidae	Red faced liocihla (18)	*Liocichla phoenicea*	32	LC	20	20

Timaliidae	Streak-throated barwing (18)	*Actinodura waldeni*	40	LC	26	20
Timaliidae	Rusty-fronted barwing (20)	*Actinodura egertoni*	90	LC	33	20
Sylviidae	Grey-sided bush warbler (18)	*Cettia brunnifrons*	40	LC	27	20
Nectariniidae	Mrs Gould's sunbird (14)	*Aethopyga gouldiae*	40	LC	9	20
Motacillidae	Grey wagtail (17)	*Motacilla cinerea*	40	LC	17	20