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Conservation Letter

Local demand drives a bushmeat industry in a Philippine forest preserve

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Abstract

Unregulated hunting can severely affect wildlife populations, particularly in the tropics. From May to October, 2011, we documented target species, hunting techniques, and demand and sale of bushmeat from a local community located at the base of a forested National Park on an isolated mountain (over 10,000 ha) in southern Luzon, the Philippines. The prey taken by hunters (i.e., poachers) included 22 invertebrate and vertebrate species. The main prey items were fruit-eating birds, bats, civets and wild pigs, but the most sought-after prey were flying foxes. Money was the major driver of bushmeat hunting in our study area. Bushmeat was sold and consumed almost entirely by residents of the local community and nearby towns, as hunters stated that they do not have demand from regional urban markets. Localized consumption suggests that focused conservation efforts may be effective in reducing the documented hunting pressures. Fines for hunting endangered species, according to hunters, were a deterrent. Because of limited law enforcement in our study area, however, conservation efforts such as teaching local hunters to avoid endangered species or encouraging them to monitor local animal populations may be the best bottom-up approach to minimize the negative effects of hunting.

Keywords: hunting, the Philippines, conservation, bushmeat, biodiversity hotspot, Southeast Asia

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Introduction

Hunting plays a pivotal role in the lives of many cultures and communities. In many less-developed regions, hunting for bushmeat provides people with relatively inexpensive food and some income [1]. Hunting demand and needs by local communities must be carefully weighed against the impacts of hunting on wildlife populations [2]. The negative impacts of hunting and the commercial bushmeat trade are well documented in many regions in the world, such as Equatorial Africa [1, 3] and the Amazon [4], but comparatively few accounts document hunting in Southeast Asia [5]

Southeast Asia contains a large portion of the Earth's biodiversity, and one of the biologically richest countries in the region is the Philippines [6, 7]. The Philippines is an archipelago of largely oceanic islands of varied origins, and has some of the highest levels of endemism in the world for its size [7, 8]. Unfortunately, in the 20th century most of the Philippine rainforests were cleared for cultivation and conversion to plantations [9]. Less than 3% of the original primary forest remains, with the last bastions of forested habitat confined to mountains [10, 11].

Mountain habitats sustain a high proportion of Philippine species [11, 12] and are relatively well protected from clearance for cultivation above 800 m elevation. Even though the forest remains, forests are still subjected to many pressures, including wildlife hunting by local communities. There is, however, almost no information on current hunting practices and targeted species in the Philippines (except see [13]), making it impossible to assess their impacts or to design appropriate conservation responses. Here we summarize the potential impact of illegal hunting on targeted vertebrates and invertebrates in the Philippines and discuss the challenges of alleviating hunting pressure in montane forest preserves.

Methods

From May to October 2011, the lead author and three assistants documented the hunting practices of a community (~1000 residents) located at the base of a forest preserve on an isolated mountain (over 10,000 ha) in southern Luzon, the Philippines. We purposely omit the precise location and identity of the community to protect our informants from legal action or reprisal. In our study area we documented the hunting techniques used and the targeted species. Additionally, we interviewed local hunters regarding the local and regional demand and sale of bushmeat.

Data were primarily collected from field observations (by the lead author and three field assistants) taken over the six month period while conducting field surveys as part of a different study. Additionally, we regularly interviewed three hunters about the animals they recently hunted. These three hunters were local officials with strong connections to the community; they were thus well informed of hunting activity in the local forest preserve. The same three hunters also reported the animals collected by other resident hunters. All hunting in our study area is considered illegal poaching and not subsistence hunting by aboriginal groups.

Our study occurred on a mountain that is divided into variable regulatory jurisdictions. Overall, the mountain is classified as a National Park; however, one side of the mountain is regularly protected and governed under a protected-area management board, whereas our study area is not regularly patrolled by guards. As such, one half of the mountain is regularly hunted, and the other half appears to have minimal hunting activity.

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Results

The prey of the local community included 22 invertebrate and vertebrate species (Table 1). Hunting was concentrated above 900 m elevation, particularly from 900 to 1300 meters above sea level (m.a.s.l.). Some gallery forest exists at lower elevations, from 550-700 m.a.s.l., but according to hunters this forest is only used sporadically to hunt the Philippine long-tailed macaque (*Macaca fascicularis*). Hunting occurred almost daily and hunters preferred to hunt from August to October, which corresponds with the end of the wet season. We do not have sufficient data to estimate the total number of hunters per day, but we encountered numerous human trails across the mountain. On one evening in September 2011, we counted 31 hunters along a few hundred meters of trail at 950 m elevation, all hunting large bats (*Pteropus vampyrus*).

In this area, hunting is driven by both direct consumption and sale. Typically, hunters sell half of their meat and eat the other half in celebration. However, sale seems to override consumption; most hunters have regular clients that purchase their bushmeat. Prices for bushmeat were variable, ranging from 150 Pesos per flying fox (*Pteropus vampyrus* and *Desmalopex leucopterus*) to 350 Pesos/kg for wild pig (*Sus philippensis*) (42 Pesos = $1 USD; see Table 1).

The main prey items were fruit-eating birds, bats, civets and wild pigs, but according to hunters, the most sought-after prey were flying foxes (Figure 1). A large terrestrial snail (*Ryssota* sp.) was regularly collected (~120 snails in five months by two hunters; figure 1). Hymenoptera (bee and wasp) larvae were eaten. Two species of stream-dwelling frog (*Limnonectes* spp.) were also collected for consumption.

The most sought-after ground-dwelling mammal is the Philippine warty pig (*Sus philippensis*). According to the three hunters we interviewed, *S. philippensis* hunting is seasonal, likely peaking from August through early-October and then again from February to April. These time periods correspond with heavy fruiting, which occurs during the end of the rainy season (August – October) and the drier months, which allow for easier accessibility (February – April). During a three-week period in February, 2011, three hunters shot eight wild pigs (range 15 - 80 kg). One large pig killed in July, 2011 (weight 76 kg) earned the hunters ~13,000 Pesos, compared with typical daily wages of 250-350 Pesos per day.

The Philippine brown deer (*Rusa marianna*) is very rare, according to local hunters. Prior to this study, in 2010, three hunters snared a ~50 kg male deer near a stream. Half of the meat was sold while the other half was consumed by the local community in celebration. The last deer captured prior to this date, a ~40 kg male, was shot in 2005. Deer meat is sold for 375 Pesos/kg.

The most common hunting methods used were air rifles and snares, but the methods used are largely species specific. Air rifles were used for hunting birds and most mammals. Only a few hunters own high-caliber rifles, which are commonly used for hunting wild pig. Snares were often used for palm civets (*Paradoxurus hermaphroditus*) and opportunistically for larger mammals. Frogs were either speared or dove for with a snorkeling mask and caught by hand. Bat poles, which are a stick (probably a rattan) with many attached thorns, were used to swat small bats (likely *Cynopterus brachyotis*, *Ptenochirus jagori*, *Rousettus amplexicaudatus*, and *Eonycteris* spp.) in flyways. Fish nets were also hung to catch small flying bats and birds. Large-bodied bats were always hunted by spotlight and air rifle.

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Hunting blinds were constructed between 900-1300 m.a.s.l. for shooting animals. During the course of this six-month study, we counted 120 hunting blinds, predominantly constructed for hunting birds, flying foxes, and wild pigs with both air and high caliber rifles.

Table 1. The diversity of animals hunted on a montane forest preserve in Luzon, the Philippines. In total, 22 species were hunted from May to October, 2011. IUCN indicates the global conservation status for each species. Categories: EX, Extinct; EW, Extinct in the Wild; CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near threatened; LC, Least Concern; DD, Data Deficient. * indicates the species is endemic to the Philippines. Price per unit reflects the typical price a hunter would receive for each species sold to clients (omitted cells imply that the species is typically not sold). 42 Pesos ≈ $1 USD.

Common Name	Binomial	IUCN	Price per unit
Invertebrates			
wasp larvae	*NA*		
bee larvae	*NA*		
giant snail	*Ryssota (cf. ovum)*		
Vertebrates			
Amphibian			
Luzon Fanged Frog	*Limnonectes macrocephalus*	NT*	
Woodworth's Frog	*Limnonectes woodworthi*	LC*	
Reptile			
Reticulated Python	*Python reticulatus*		50 Pesos/kg
Philippine Cobra	*Naja philippinensis*	NT*	
Bird			
Red Junglefowl	*Gallus gallus*	LC	
Worcester's Buttonquail	*Turnix worcesteri*	DD	
White-eared Brown-Dove	*Phapitreron leucotis*	LC	
Flame-Breasted Fruit-Dove	*Ptilinopus marchei*	VU	
Yellow-Breasted Fruit-Dove	*Ptilinopus occipitalis*	LC*	
Philippine Cuckoo-Dove	*Macropygia tenuirostris*	LC	
Luzon Bleeding-Heart	*Gallicolumba luzonica*	NT*	
Rufous Hornbill	*Buceros hydrocorax*	NT*	
Mammal			
Long-tailed Macaque	*Macaca fascicularis*	LC	
Asian Palm Civet	*Paradoxurus hermaphroditus*	LC	150 Pesos/kg
Philippine Warty Pig	*Sus philippensis*	VU*	300 Pesos/kg
Giant Flying Fox	*Pteropus vampyrus*	NT	150 Pesos/ind.
White-winged Flying Fox	*Desmalopex leucopterus*	EN*	
Southern Luzon Giant Cloud Rat	*Phloeomys cumingi*	VU*	
Philippine Brown Deer	*Rusa marianna*	VU*	375 Pesos/kg

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Discussion

Hunting can have severe effects on wildlife populations [2], highlighting the importance of studies to document the presence and drivers of hunting in Southeast Asia, including the Philippines. The Philippines is a biologically rich country with high endemism, and hunting is suspected to be widespread [6, 14]. Recent studies show that some members of the endemic mammal fauna, such as pigs and deer, readily use second growth-forest [15]. Thus, considering that forest cutting and conversion from forest to agriculture are minimal within our study area, if these species were not hunted, their populations would likely persist [16]. Understanding hunting pressures is therefore of critical importance for biodiversity conservation and management.

Prey selection by traditional and modern hunters in tropical and subtropical Asia typically favors large-bodied animals such as wild pigs and deer [17-19]. Our results agree with other studies in that hunters prefer large-bodied game, but our findings also show that hunters opportunistically take a variety of small-bodied species. Prey selection was broad, ranging from snails to wild pigs, but species that yielded large amounts of meat and/or had high monetary value, such as wild pigs, are preferred.



Fig. 1. a) a snail midden consisting of hundreds of *Ryssota* (cf. *ovum*). Based on the condition of shells these snails were collected within several months of each other; b) two species of frog (Luzon fanged frog, (*L.macrocephalus) and Woodworth's frog (L. woodworthi)*) collected from a large stream pool via diving with snorkel mask; c) a Philippine cuckoo-dove (*M. tenuirostris)* shot with air rifle; d) a local hunter with 19 giant flying foxes (*P. vampyrus*) shot in a night of hunting at 900 m.a.s.l. Hunters hid behind a blind and shot the bats via air rifle. Flying foxes are sold for 150 Pesos per individual; e) a Asian palm civet (*P. hermaphroditus)* caught via snare and sold for 150 Pesos/kg; and f) the head of a Philippine warty pig (*S. philippensis)* shot via high caliber rifle; wild pig is sold at 350 Pesos/kg.

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As in many other developing countries, money is a major driver of the bushmeat trade in our study area [20]. Thus, improvement of local economic conditions would likely substantially decrease hunting frequency, as was observed in nearby Indonesia [18]. Most hunters take sale orders from clients locally and in nearby towns. Average wages in the local community range from 200-350 Pesos per day, so bushmeat hunting is a profitable activity, with a single wild pig potentially earning the hunter over 10,000 Pesos (wages for ~29 days). Hunting equipment is a significant investment for hunters, with the air rifle, costing approximately 20,000-30,000 Pesos, being the most commonly used method.

According to hunters, the two most sought-after bushmeat in our study area were the globally near-threatened, giant flying fox and the globally endangered white-winged flying fox (endemic to the Philippines), corroborating with other studies from Southeast Asia (e.g., see [21]). From August through October, bats are regularly hunted by hunters behind blinds. This preference likely resulted from the high abundance of bats still found throughout the study area relative to other large-bodied animals. According to hunters, bats represent a steady supply of bushmeat, as success in hunting large animals such as wild pig, is considered unreliable and sporadic. Several reports suggest that the flying fox populations are rapidly declining throughout Southeast Asia, largely due to overhunting [22-24]. In addition to habitat loss, hunting likely plays a significant role in the decline of flying fox populations throughout the Philippines [25]. Because flying foxes contribute to forest regeneration by promoting seed dispersal, reductions in their populations could potentially alter local plant communities and ecosystem functioning [26-28]. This also holds true for other seed dispersers such as palm civets, macaques, fruit-doves, and hornbills, all of which are also hunted.

Implications for conservation

Interviewed hunters recognize the protected side of the mountain as an area with abundant animal populations, but one that is inaccessible because of anti-hunting policies enforced by the protected-area management board. Such protected status may successfully limit hunting throughout the forest preserve. We believe that increased education about threatened species could encourage hunters to focus on less-threatened species [29]. In the end, fines may serve as the best method to limit hunting in the protected area [16]. Bushmeat was sold and consumed almost entirely by residents of the local community and nearby towns, as hunters stated that they do not have the opportunity to sell bushmeat to regional urban markets. This is an important consideration, because conservation actions are likely most effective at local scales [29, 30]. Even though our study area is a National Park, enforcement that minimizes overhunting of local wildlife is minimal. In fact, hunting is obviously not considered “risky,” as we observed both local officials, such as the mayor of a nearby town, and law enforcement officers actively hunting *Pteropus* bats in our study area. Thus, efforts to minimize the negative effects of hunting in this area may benefit from bottom-up conservation [30, 31)]. Convincing local barangays (towns) to regulate their own animal populations may be a successful approach in reducing potential overhunting [32]. In concert with this, education on overhunting and long-term viable bushmeat yields is required. Such efforts would be informed by better baseline data on current animal population sizes and bushmeat yields.

Hunting is undoubtedly driving species to extinction on a global scale [20, 29, 33, 34]. We document an active hunting culture driven by consumption and economic incentives, typical of many other areas throughout the tropics. Future conservation efforts in the Philippines and Southeast Asia would benefit

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from research that quantifies sustainable hunting yields in wild game species, population-level studies on hunted species, and the incentives that drive hunting pressures.

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