Biodivers Conserv (2018) 27:1031–1037
https://doi.org/10.1007/s10531-017-1450-5

COMMENTARY

The wildlife snaring crisis: an insidious and pervasive threat to biodiversity in Southeast Asia

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Received: 12 April 2017 / Revised: 30 September 2017 / Accepted: 11 October 2017 /
Published online: 14 October 2017

Abstract Southeast Asia, a region supporting more threatened species than any other comparable continental area, is in the midst of a conservation crisis. Hunting constitutes the greatest current threat to the region's threatened vertebrates and has resulted in many areas of largely intact forest losing much of their former vertebrate diversity and abundance. Though numerous hunting methods are used, capture with home-made snares is a major driver of this defaunation. Snares are cheaply constructed and easy to set but can be difficult to detect and are highly damaging to vertebrate populations due to their indiscriminate and wasteful nature. The primary response to snaring is the removal of snares by patrol teams: more than 200,000 snares were removed from just five of the region's

Communicated by David Hawksworth.

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protected areas between 2010 and 2015. However due to the low opportunity costs of replacing snares, removal alone is largely ineffective. Without the proactive search, arrest and prosecution of snare-setters, along with incentives not to hunt, snares will continue to be replaced. Legislative reform that criminalises the possession of snares, and the materials used for their construction, inside and immediately adjacent to protected areas is also required. Consistent enforcement of such legislation is essential. This must be combined with longer-term demand reduction activities aimed at changing cultural attitudes and behaviors related to the consumption of wildlife products in Southeast Asia.

Keywords Extinction crisis · Mammal conservation · Natural resource management · Poaching · Protected area

Introduction

Illegal hunting for commercial purposes represents the greatest threat to the conservation of many of the iconic species which are the focus of global conservation efforts (Ripple et al. 2014, 2015). Hunting pressure is particularly severe in Southeast Asia where it represents a significant, and often underappreciated, conservation challenge (Corlett 2007; Harrison et al. 2016; Ripple et al. 2016). In the majority of global conservation meta-analyses conducted, Southeast Asia is identified as a region in crisis: supporting more threatened species, and experiencing higher rates of forest loss, than any comparable continental area (Schipper et al. 2008; Hughes 2017a). Hunting, largely to supply ever-expanding local, regional and global markets, constitutes the greatest current threat to wild vertebrates in the region. Hunting is so pervasive and intense throughout Mainland Southeast Asia that even where areas of good quality forest remain intact, they retain only a small proportion of their former vertebrate diversity and abundance (Harrison et al. 2016).

The growth of the middle classes in Southeast Asia and their increased purchasing power, paired with the conception that wildlife products are desirable commodities that both confer status and offer health benefits, has created a seemingly insatiable demand (Nijman 2010). This, combined with improved technology and improved road access into remote areas (Hughes 2017b), has resulted in a massive increase in hunting levels throughout the region's protected and non-protected areas (Harrison et al. 2016). Consequently, extirpations of some of Asia's most iconic species, including Javan rhinoceros (*Rhinoceros sondaicus)* (Brook et al. 2014) and tiger (*Panthera tigris*) (O'Kelly et al. 2012; Johnson et al. 2016), have occurred within the region in recent years. Saola (*Pseudoryx nghetinhensis)* and large-antlered muntjac (*Muntiacus vuquangensis)*, two large mammals described from the Annamite Mountains in the 1990s, are Critically Endangered and facing imminent extinction. Moreover, other widespread terrestrial species including sambar (*Rusa unicolor)*, gaur (*Bos gaurus)*, greater hog badger (*Arctonyx collaris)*, and dhole (*Cuon alpinus)* have disappeared from many of the region's flagship protected areas. Substantial areas of forest throughout Mainland Southeast Asia are devoid of any terrestrial mammals larger than porcupines (Willcox et al. 2014; Harrison et al. 2016). We believe that capture in home-made snares is a major cause of this defaunation across much of the region.

Snares: silent killers of the forest

Snares are one of the simplest but most effective hunting techniques practiced in the tropics and home-made wire or cable snares are the predominant form of hunting across large areas of Southeast Asia (Wilkinson 2016; O'Kelly et al. 2017a; Table 1). The equipment involved is affordable and widely available, and snares can trap and maim a wide range of mammal, bird, and reptile species—ranging in size from Asian elephants *Elephas maximus* to partridges, rodents, and tortoises (Fig. 1). Furthermore, snares, and the hunters using-them, may be more difficult to detect and apprehend than other forms of hunting (e.g. gun-hunting, hunting-dogs). Despite the threat snares pose to Southeast Asian biodiversity, few studies have been published on the impacts and reach of snaring in the region (see Harrison et al. 2016; O'Kelly et al. 2017a). Though no published studies exist from Asia, evidence from Africa shows that snare losses to scavengers and decomposition result in the wastage of up to a quarter of total captures (Noss 1998). This is also an important animal welfare problem; up to one-third of animals escape with injury and unknown subsequent fates (Lindsey et al. 2011) and others need permanent care in wildlife rescue centers (Gray et al. 2017a).

Some snares are set by local people whilst engaged in other forest activities, and snares also are used around fields to prevent crop-raiding (Scotson et al. 2014). The impact of this kind of 'ad-hoc' snaring is likely to be comparatively low however, and we contend that the vast majority of snares set across Southeast Asia are part of much larger-scale commercially-orientated approaches to hunting that have arisen primarily to cater to the immense and increasing demand for wild meat and other wildlife products throughout the region. Wild meat consumption, and the medicinal use of wildlife products, are common throughout mainland Southeast Asia and it has likely always been the case that wild

Table 1 Numbers of snares removed annually from selected Southeast Asian protected areas between 2010 and 2015

Protected area and latitude/longitude		Number of snares removed by law enforcement patrols					
		2010	2011	2012	2013	2014	2015
Southern Cardamom National Park, Cambodia[a]	11.4°N 103.5°E	14,364	12,129	18,701	13,474	22,835	27,714
Hue/Quang Nam Saola Reserves, Vietnam[b]	16.1°N 107.5°E	n/a	10,429	12,168	12,490	17,025	23,183
Srepok/Phnom Prich Wildlife Sanctuaries, Cambodia[b]	12.8°N 106.9°E	22	89	126	304	711	3,101
Seima Wildlife Sanctuary, Cambodia[c]	12.4°N 107.4°E	1202	1344	480	499	806	749
Nam Et–Phou Louey National Protected Area, Laos[c]	20.5°N 103.6°E	82	251	101	21	154	535

While these figures provide a lower bound for the number of snares being set each year, they are highly biased as indicators of trend

[a]Wildlife Alliance

[b]World Wildlife Fund Greater Mekong

[c]Wildlife Conservation Society

Fig. 1 Threatened species caught in snares in Southeast Asia. Clockwise from top left: Asian elephant *Elephas maximus*, Cambodia ©WCS-Cambodia; Asiatic black bear *Ursus thibetanus*, Laos ©L. Scotson/Free The Bears; stump-tailed macaque *Macaca arctoides*, Laos ©C. Coudrat/Anoulak; hog badger *Arctonyx collaris*, Cambodia ©Wildlife Alliance

products were seen as a delicacy or as having special curative powers (Nijman 2010). Increasingly, however, the use and consumption of wild products is viewed as indication of status and wealth (Shairp et al. 2016). This is particularly apparent in urban centers throughout the region and these practices are no longer solely reserved for the privileged parts of society (Sandalj et al. 2016). Legal wildlife farming in the region, particularly in China, Indonesia, and Vietnam (Brooks et al. 2010), renders it easy to launder wild caught animals and exacerbates the challenges associated with enforcement in addition to legitimizing the consumption of wildlife products. Leaving aside the ethical and enforcement issues associated with wildlife farms, studies show a consistent consumer preference for wild, as opposed to farmed, meat (Drury 2009).

An expanding road network throughout Southeast Asia, including infrastructure associated with hydropower and mining operations, means few areas of forest are $>$ 1 day walk from vehicle access (Laurance et al. 2014; Hughes 2017b). Consequently, very few areas are immune from snaring pressure and virtually no locations within the range of many Threatened or regionally endemic species, such as saola and Owston's civet (*Chrotogale owstoni)*, are effectively protected from snaring. The primary response to this phenomenon is the removal of snares by patrol teams, which is a relatively easy, non-controversial and politically expedient activity. Between 2010 and 2015 almost 200,000 snares were removed from just five protected areas in Cambodia, Lao PDR, and Vietnam (Table 1). Despite this substantial investment of effort tens of thousands of snares continue to be removed annually. Controlled experiments suggest that the probability of a patrol detecting individual snares on a single trip is under 30% (O'Kelly et al. 2017b), although certain varieties may be easier to find. Given this low detectability and the low opportunity cost of setting snares, we contend that snare removal—by itself—is largely ineffective as a deterrent.

Solutions for the Southeast Asia snaring crisis

The ongoing snaring crisis in Asian forests can be combated in several ways. First by making it more difficult to poach wildlife utilizing methods from the field of criminology such as situational crime prevention, community-based, problem-oriented, and intelligence-led policing that have been used and evaluated in more traditional criminological settings (Gibbs et al. 2010). Second by increasing the efficiency of patrolling utilizing adaptive management and analysis tools such as SMART (Spatial Monitoring and Reporting Tool) that has resulted in increased efficiency of law enforcement as indicated by improved efforts of ranger teams and reduced poaching (Hotte et al. 2016), and ultimately increases in populations of wildlife species that are the targets for poaching (Duangchantrasiri et al. 2015). Third, by incentivizing local people not to hunt and to report when outsiders are seen hunting, (Steinmetz et al. 2014) Fourth, the strengthening of the legal frameworks to give greater protection for wildlife from poaching and trafficking, along with specific legislative reform that criminalizes the possession of snares, and the materials used for their construction (Gray et al. 2017b) within a buffer distance of all reserves. Such reforms may need to include 'stop-and-search' powers and a mandate for enforcement teams to arrest and prosecute on suspicion of intent to snare (including carrying materials for snare construction).

We therefore urge law enforcement agencies and other relevant government bodies to treat hunting with snares as a serious crime, which is taking a devastating toll on the region's wildlife, and to act accordingly. Increased awareness raising of the serious impacts of snares and of wildlife crime in general, especially for the judiciary and prosecution, is also needed (Akella and Cannon 2004), along with strong penalties for snaring offences to increase the deterrent effect. This is especially needed in countries with less mature functioning networks of protected areas and wildlife legislation (e.g. Cambodia, Indonesia, and Lao PDR and Vietnam). For example in Cambodia species protection legislation (the Forestry Law) is outdated with many IUCN Threatened species, including fishing cat *Prionailurus viverrinus*, binturong *Arctictis binturong* and sambar, listed as 'common' with negligible penalties for their hunting and trade (Gray et al. 2017a). In addition only a small proportion of the country's 42 Protected Areas are zoned making implementation of the Protected Area law, which in theory prohibits access to areas zoned as critical for biodiversity, difficult (Souter et al. 2016). In contrast the Wildlife Protection Act of India proscribes strong penalties for the hunting of all wild species and strictly regulates all human activities within protected areas.

Political will is also critical and in some instances the judiciary system may need to be strengthened to facilitate the successful conviction of perpetrators of wildlife snaring. Securing political support for such legislative reform may be difficult where snaring is perceived to be a legitimate livelihood activity for rural communities, yet the combined effect of snaring with other methods of hunting should not be underestimated. It should be emphasized in these cases that the scale and intensity of commercial poaching leads to severely depleted forest ecosystems and thereby negatively impacts the livelihoods of rural forest-dependent communities (Milner-Gulland and Bennett 2003).

We maintain that snaring in Southeast Asia is primarily a commercially-orientated activity facilitated by 'middlemen', who purchase the catch, and in some cases place orders and supply equipment (authors pers. obs.). Although organized and criminal in nature, much of the trade is local in scale with products moving from forested areas to nearby urban centers. This indicates that the majority of trade is not being orchestrated by the

international criminal syndicates implicated in the trafficking of high value products such as rhino horn and elephant ivory. Tackling this trade will thus require consistent and effective law enforcement interventions at landscape and national levels rather than focusing on a few major international traffickers. Improved enforcement effort is necessary at all points along the trade chain, targeting not only snarers and other poachers but also traffickers and end consumers. In parallel with improved law enforcement effective behavior change campaigns to reduce the demand for wildlife meat, and thus the incentives for commercial snaring operations, must be initiated. However, examples of demonstrably successful initiatives remain rare in the context of wildlife consumption and further work is required. Without such work the specter of "empty forests" will become progressively manifest across Southeast Asia and conservation efforts to protect the region's iconic species and biodiversity will be in vain.

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