Investigations into the illegal wildlife trade in central Lao PDR

Report by J. Schweikhard, K. Kasper, C.L. Ebert, M. Lehmann, P. Erbe and T. Ziegler

Tropical ecosystems are at high risk of mass extinctions, holding the largest numbers of species on earth. In addition to other anthropogenic factors, illegal wildlife trade is a major threat to local populations (Bennett and Robinson, 2000). Wildlife remains one of the most important food resources in many rural areas of Lao People's Democratic Republic (Lao PDR) (Butler, 2009). Specimens of numerous species are sold at local markets, but a comprehensive understanding of the human impact on nature conservation of such consumption remains insufficient.

This study provides a trade assessment using market surveys of terrestrial vertebrates being offered for sale in Khammouane Province, in central Lao PDR, where the Hin Nam No National Protected Area (HNN NPA) is located. This protected area was submitted by the Lao National Commission for UNESCO for inscription on the UNESCO World Heritage List and is currently on the Tentative List (UNESCO WHC, 2018). As documentation of illegal wildlife activities within and around the area is one of the requirements for inclusion in the World Heritage List, wildlife trade surveys were performed both during the dry season (October to November 2017) and rainy season (June to July 2018), to document seasonal trade activities and explore potential differences across the different seasons.

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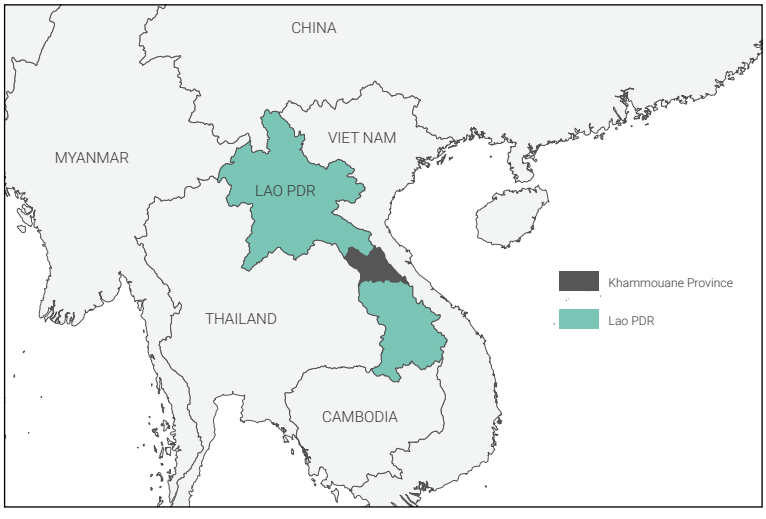
▲ **Typical market in Khammouane Province, Lao PDR, with a sign indicating that illegal wildlife trade is punishable by law.**

Introduction

Located in tropical South-east Asia, the Indo-Burma Biodiversity Hotspot, which includes Lao PDR, is one of the most biologically important regions of the planet (Tordoff *et al.,* 2012). Currently, it is suggested that this biodiversity richness will soon reach human-induced extinction rates at least five times higher than in the recent past (Johnson *et al.,* 2017). In these times of human population growth, rising demands and globalisation (FAO, 2009), the illegal wildlife trade is considered the critical issue in the interface between biodiversity conservation and sustainable development (UN Secretary-General, 2016). Rural villagers in developing countries are the most affected by this issue (Robinson *et al.,* 2018). Some wild animal populations are depleting faster than they could ever regenerate (IUCN Red List, 2014).

In Lao PDR the majority of inhabitants live in rural areas (Silverstein *et al.,* 2018) and are highly dependent on wildlife (Johnson *et al.,* 2005) both as an important food resource (Butler, 2009; Singh, 2008) and for medicine (Lüthi, 2012; Johnson *et al.,* 2005). Therefore numerous terrestrial vertebrate species are sold at local markets, regardless of their international or domestic conservation status. To date, few studies have been conducted on species population assessments in the country, and while other provinces have been examined (Foppes *et al.,* 2001; Suzuki *et al.,* 2015), the last survey in Khammouane Province took



▼ **Fig. 1. Map of mainland South-east Asia, and the Indo-Burma Biodiversity Hotspot.**

Taxon	Common name	Scientific name	CITES	IUCN	Nat.	No.S	Ind.
MAMMALIA							
Artiodactyla	Southern Red Muntjac	*Muntiacus muntjak*	-	LC	M	2	2
Carnivora	Sun Bear	*Helarctos malayanus*	I	VU	P	1	1
	Asiatic Black Bear	*Ursus thibetanus*	I	VU	P	2	2
	Smooth-coated Otter	*Lutrogale perspicillata*	II	VU	P	1	1
	Large-toothed Ferret-Badger	*Melogale personata*	-	LC	M	1	1
	Common Palm Civet	*Paradoxurus hermaphroditus*	-	LC	M	4	5
	Leopard Cat	*Prionailurus bengalensis*	II	LC	-	4	5
Chiroptera	Greater Short-nosed Fruit Bat	*Cynopterus sphinx*	-	LC	M	1	5
	Dawn Bat	*Eonycteris spelaea*	-	LC	M	2	32
	Leaf-nosed Bat	*Hipposideros* sp.			M	1	10
Lagomorpha	Burmese Hare	*Lepus peguensis*	-	LC	M	1	1
Pholidota	Pangolin	*Manis* sp.	I	**CR**	P	2	5
Primates	Bengal Slow Loris	*Nycticebus bengalensis*	I	VU	P	3	3
	Red-shanked Douc Langur	*Pygathrix nemaeus*	I	EN	P	1	1
Proboscidea	Asian Elephant	*Elephas maximus*	I	EN	P	1	1
Rodentia	Asiatic Brush-tailed Porcupine	*Atherurus macrourus*	-	LC	M	2	2
	Malayan Porcupine	*Hystrix brachyura*	-	LC	M	2	2
	Laotian Rock Rat	*Laonastes aenigmamus*	-	LC	P	2	3
	Indian Giant Flying Squirrel	*Petaurista philippensis*	-	LC	P	1	2
	Black Giant Squirrel	*Ratufa bicolor*	II	NT	M	7	7
	Indo-Malayan Bamboo Rat	*Rhizomys sumatrensis*	-	LC	M	1	1
Scandentia	Northern Treeshrew	*Tupaia belangeri*	II	LC	-	2	3
AVES							
Columbiformes	Eastern Spotted Dove	*Spilopelia chinensis*	-	LC	M	3	10
Cuculiformes	Greater Coucal	*Centropus sinensis*	-	NE	P	2	12
Passeriformes	Common Myna	*Acridotheres tristis*	-	LC	M	2	2
Strigiformes	Buffy Fish-owl	*Ketupa ketupu*	II	LC	M	1	1
REPTILIA							
Squamata	Chinese Water Dragon	*Physignathus cocincinus*	-	NE	M	3	10
Sauria	Clouded Monitor	*Varanus nebulosus*	I	NE	M	4	5
	Common Water Monitor	*Varanus salvator*	-	LC	M	4	4
Squamata	Cobra	*Naja* sp.	II	DD	M	1	1
Serpentes	King Cobra	*Ophiophagus hannah*	II	VU	P	3	15
Chelonians	Giant Asian Pond Turtle	*Heosemys grandis*	II	VU	-	3	3
(Testudines)	Mekong Snail-eating Turtle	*Malayemys subtrijuga*	II	VU	M	14	78
	Wattle-necked Softshell Turtle	*Palea steindachneri*	III	EN	-	1	1

Table 1. Overview of species/genera at risk and their conservation status according to CITES, the IUCN Red List and the Lao Protection List. Key: Not Evaluated (NE); Data Deficient (DD); Least Concern (LC); Near Threatened (NT); Vulnerable (VU); Endangered (EN) and Critically Endangered (**CR**). - = not listed; Prohibition Category 1 [P] and Management Category 2 [M] sorted by taxonomic classes and orders. CITES Appendices I; II; III. Nat. = National Conservation Status; No.S. = number of sightings; Ind. = individuals.

place almost two decades ago (Nooren and Claridge, 2001) and needs re-assessing to provide an overview of the current situation and to facilitate strategic planning of future conservation efforts.

To this end, this study provides a topical market analysis in Khammouane Province (Fig. 1), within the framework of four bachelor theses and comprised investigation of 15 trade centres during both the dry and rainy seasons in 2017 and 2018, respectively, to provide an assessment at different times of the year.

Methods

The authors conducted 66 surveys at 15 trade centres in Khammouane Province that were offering wild-sourced terrestrial vertebrates. These took place during October and November 2017 (C.L. Ebert and M. Lehmann) and June and July 2018 (K. Kasper and J. Schweikhard) during the dry and rainy seasons, respectively, allowing for an overview of the trade in these species at different times of the year. Each market was visited at least twice

but wildlife being offered for sale at roadsides was also documented. Species were identified on site or subsequently from photographs taken by the researchers. The regulatory and conservation status of the species was assessed internationally according to CITES, the IUCN Red List of Threatened Species™ and the national wildlife protection list.

Descriptive statistical evaluations were carried out in R environment for statistical computing (R Core Team, 2017). The libraries—rcompanion (Mangiafico, 2018)—were used to summarise datasets and "ggplot2" (Wickham, 2016) for the depiction of data distribution. In cases where only small numbers of individuals were recorded, Fisher's exact test was used with a level of significance at $p<0.05$ to detect differences between seasons. P-values were then adjusted using the Holm method to correct the family-wise error rate, the probability of making one or more false discoveries, from multiple considerations of hypotheses (Holm, 1979).

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Market stall in Khammouane Province, with live Clouded Monitor *Varanus nebulosus* and freshly killed squirrels and a rat.

Legislation

The *Lao Wildlife and Aquatic Law* (LWAL) (No. 7, 2007) applies to wildlife species that are divided into three categories: those considered to be at risk of extinction and of high value, which are listed in the Prohibition Category 1 [P] and their use prohibited without permission; Management Category 2 species [M] are managed and include those of national economic, social and environmental interest and important to livelihoods, and their use is controlled. Species listed in Categories 1 and 2 are included in Decree No. 81/PM (2008). Category 3 [C] species (listed in Decree No. 70/PM (2008)) include those that can reproduce widely in nature and that are considered to be important for socio-economic development; their use is permitted provided such use does not adversely affect populations in the wild. According to Prime Minister Order No. 05 on *Strengthening Strictness of the Management and Inspection of Prohibited Wild Fauna and Flora*, issued on 8 May 2018 and after much of this survey was completed, enforcement concerning wildlife issues shall be tightened, specifically in terms of trapping (affecting species listed in Categories P and M of the LWAL) and trade, and the export of species protected in Lao PDR and those covered by CITES is prohibited (Thongloun Sisoulith, 2018). A new Penal Code No. 26/NA 17 May 2017 (effective 17 October 2018) broadens and increases penalties associated with wildlife violations.

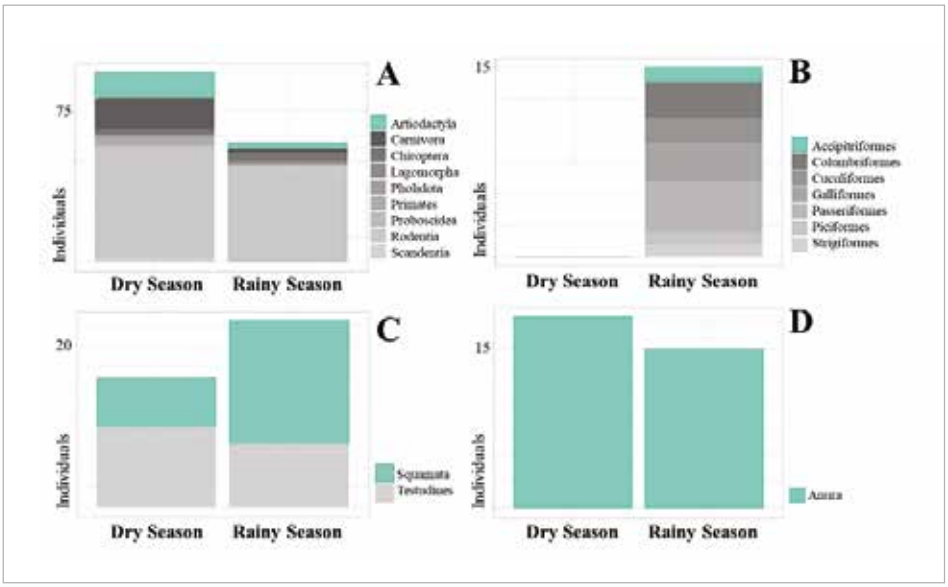

Fig. 2. Relative amounts of individuals observed (Y-axis) with stacked orders indicated.
The findings of the dry season (October to November 2017) and rainy season (June to July 2018) are compared (X-axis). There are significant differences in reptiles (frequencies of Squamata (Fisher's exact test, $p=5.99\times10^{-4}$)) and mammals (Fisher's exact test, $p=7.57\times10^{-3}$). As birds were not a focus in the first phase of the study, comparative data are lacking for all seasons. **A** Mammalia **B** Aves **C** Reptilia **D** Amphibia.

Results

A total of 3,276 individuals was recorded during the course of the surveys (12.3% mammals, 1.2% birds, 4.3% reptiles and 82.2% amphibians). Out of 66 species (38 mammals, seven birds, nine reptiles, 12 amphibians) that were identified to species level, 24.6% were considered at risk internationally (CITES Appendices I-III or at least categorised as Near Threatened by the IUCN Red List of Threatened Species™) and 38.5% are listed on the national LWAL. None of the amphibian species was considered at risk. An overview of documented species at risk is recorded in Table 1.

A comparison of individuals of four taxonomic classes offered in the dry and rainy seasons is illustrated in Fig. 2. As birds were not a focus in the first phase of the study, comparative data is lacking for all seasons. Amphibians observed were only represented by the order Anura (frogs), while reptiles consisted of various lizards, snakes and chelonians (testudines). There were significant seasonal differences in mammal (A, Fisher's exact test, $p=7.57x10^{-3}$) and reptile findings (C, in frequencies of Squamata (snakes and lizards), Fisher's exact test, $p=5.99x10^{-4}$).

◄ **Clouded Monitors *Varanus nebulosus***

It was apparent that larger quantities of mammals and amphibians were traded during the dry season. By contrast, greater numbers of reptiles were documented in the rainy season.

Discussion

The study confirms findings documented over recent decades (Nijman, 2010) that trade in numerous vertebrate species continues in Lao PDR, and includes some which are vulnerable and protected. The trade is not limited to certain periods but continues year-round. As observed by Johnson *et al.,* (2010), it appeared that hunting frequencies vary due to seasonal differences in agricultural labour, such as the planting or harvesting of rice.

Hunting down the body size

Snares were stated to be the most commonly used trap in the survey area as they are the predominant hunting method in South-east Asia (Gray *et al*., 2017). With multiple sales taking place each day, a shop owner described the most lucrative period to be during the main trapping season between November and December. Given the relatively small number of inhabitants of the village her shop was located in, and the large number of snares sold, a high level of engagement in trapping amongst the villagers must be assumed.

Due to the shape and size of the snares encountered during the surveys, they appeared to be suited to smaller-bodied animals. In this study, smaller terrestrial vertebrates such as Rodentia and Anura species were identified to be the most commonly traded species. These animals increasingly become victims of a phenomenon that was first observed 15 years ago in similar environments in Thailand: "hunting down the body size" (Tungittiplakorn and Dearden, 2002). They described how the demand for wildlife does not exclude any animal group. When it comes to choice, larger vertebrates are preferred as they are the most profitable both in trade terms and for their nutritional values. However, when larger animals become scarce, the focus shifts to the smaller, more abundant species (Ripple *et al*., 2016; Ripple *et al*., 2019; Bennett *et al.,* 2002). Therefore, overhunting over longer periods also leads to a decline in populations of smaller vertebrates that can even result in local extinctions (Wikramanayake *et al.,* 1998).

The fact that the majority of specimens recorded during these surveys comprised smaller animals could be a clear indicator that populations of larger animals have already declined to a large extent or are at least difficult to obtain. Studies in South-west China have already demonstrated a correlation between hunting preference for larger-bodied vertebrates, e.g. boars and muntjacs, and population declines, as well as species endangerment (Chang *et al.,* 2017). In light of this phenomenon, the conservation status of certain species might require revision.

Global connection

In addition to consumption of wild meat and wildlife-based products within Lao PDR, the increasing demand from neighbouring countries and an international market aggravate the issue. So far, Lao PDR remains at a trade-off between human development and conservation needs. During the Viet Nam War in the late

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◄ Clockwise, from top: market stalls selling freshly killed rats, disembowelled dried frogs, and slugs; Red-shanked Douc Langur *Pygathrix nemaeus*, Boualapha district; and Mekong Snail-eating Turtles *Malayemys subtrijuga*, all at locations in Khammouane Province.

20th century, Lao PDR suffered severe bombardments, forcing people to sustain themselves with wild food resources. With a dysfunctional economy that could not ensure a reliable food source (Duckworth *et al.,* 1999), the illegal use of wildlife was, and continues to be, high. With trade in many species taking place regardless of their conservation status or national orders in place to regulate such practices, the prospects for protecting the country's rich diversity of wildlife from unsustainable trade are poor.

At present, the large amount of steady trade activity provides evidence that measures in place to prevent illegal wildlife trade remain widely ineffective. Further attempts to regulate the trade also entail risks. Any trade bans could mean not just the loss of control in monitoring and preventing population declines but also of trade shifts. The prosecution of wildlife crimes alone in a broad context of trade drivers and frame conditions is likely to drive the trade underground.

Over the course of these studies, neighbouring China and Viet Nam were mentioned frequently as driving forces of the wildlife trade (see also Environmental Investigation Agency, 2015). This might be the reason why certain markets have developed as major trading points. The most active markets for wildlife were usually located in close proximity to a major road network. These provide the main transport route between Thailand, Lao PDR and Viet Nam, and play a pivotal role in facilitating the trade within South-east Asia.

Based on the literature, trade links to neighbouring countries are already apparent. The Lao Government itself has revealed that most wildlife trade is driven by foreign demand (Prime Minister's Office, 2005). Nooren and Claridge (2001) refer to Thailand, Viet Nam and China in this context. They also report exports with annual wholesale values of USD11.8 million being smuggled to China. With its booming economy, China has become the world's fastest growing market for wildlife (Butler, 2009). The increasing demand for wildlife requires strong border controls. Although this survey has been conducted exclusively within Khammouane Province, it is likely to be representative of the entire country and the South-east Asian region as a whole. With high levels of wildlife remaining and the country's position as a critical trading centre, Lao PDR is obligated to address more rigorously the issue of illegal wildlife trade.

If efforts to prevent illegal wildlife trade are to have any success, a more strategic and holistic approach is needed, together with improved dissemination of information about wildlife laws and more rigorous law enforcement.

Recommendations

Prosecution alone is an inadequate approach to combat wildlife crime and unlikely to lead to long-term success. As trade in wildlife has deep roots in society, social sciences must be integrated into the corresponding conservation efforts. It is important to understand why humans behave in certain ways regarding the environment and to recognise that wildlife contributes to the maintenance of food security and is essential in providing incomes, especially for rural populations. The authors endorse two key strategies to address these problems, namely policy and public awareness, including behaviour change communication (TRAFFIC, 2016; Singh, 2010). There are ways to combine the conservation of biodiversity and people's need for a sustainable income. Eco-tourism can take the form of community-based projects, provide job opportunities and promote and support an understanding that wildlife is more valuable alive. For instance, former hunters with excellent knowledge of wildlife habitats are suited to professions as wildlife tour guides. A similar approach in the northern Lao Nam Et-Phou Louey National Protected Area has already been established successfully and has created a link between wildlife protection and the wellbeing of local people (Butler, 2009).

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Laotian Rock Rat *Laonastes aenigmamus* at a market in Ban-kok, Khammouane Province.

The dissemination of comprehensible information about the legal status of trapping and the long-term consequences of overhunting needs improvement. Recognising people's personal interest in preserved ecosystems, rather than solely punishing them with fines and incarceration, might lead to better results.

Approval of the application for UNESCO World Heritage Site status will certainly provide the HNN NPA with greater motivation to improve conservation efforts. Such an upgrade is supposed to give the NPA a new and international identity and will help to generate further funds for wildlife protection activities. It could further ensure economic benefits, e.g., from ecotourism.

Further details of the surveys under discussion, including a socio-economic assessment of this study involving considerations of consumer behaviour and livelihood needs driving personal engagement in poaching are currently being analysed and will be published in due course.

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Body of a cobra *Naja* sp., Khammouane Province.

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