Global Ecology and Conservation 27 (2021) e01552

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: www.elsevier.com/locate/gecco

An analysis of the illegal bear trade in India

Lalita Gomez[a,b], Belinda Wright[c], Chris R. Shepherd[a,*], Tito Joseph[c]

[a] Monitor Conservation Research Society, British Columbia, Canada
[b] Oxford Wildlife Trade Research Group, Oxford Brookes University, UK
[c] Wildlife Protection Society of India, S-25 Panchsheel Park, New Delhi 110017, India

ARTICLE INFO

Article history:
Received 5 January 2021
Accepted 18 March 2021

Keywords:
Asiatic black bear
Bear bile
Gall bladder
Illegal wildlife trade
India
Sloth bear

ABSTRACT

Throughout the range of bears in Asia, a combination of threats - loss of suitable habitat, increasing human conflict, illegal wildlife trade - are pushing bear populations towards extinction. But studies in Asia are showing that indiscriminate poaching and illegal trade are increasingly becoming the main driver of species extinctions. Here we examine seizure data and poaching incidents involving India's bear species from 2009 to 2019 to assess the extent illegal wildlife trade is impacting bear populations in the country. The Wildlife Protection Society of India (WPSI) systematically collects data on poaching and seizures of protected species which is collated, categorised and stored in WPSI's database on wildlife crime. Using this data, we assessed bear species impacted by trade, mapped out important trade and poaching hubs, and trade dynamics involving bears in India. Seizure data indicated the exploitation of Asiatic black bears for traditional medicine use while sloth bears were coveted for their skins. Poaching incidents predominantly involved sloth bears and steadily increased over the study period. However, it is unclear whether this is a result of targeted hunting of bears for trade, a threat possibly exacerbated by declining bear species elsewhere in Asia where demand still persists for bear gall bladder and parts; or in response to growing levels of human-bear conflict which is on the rise in India due to loss of suitable habitat and increasing human encroachment into forested areas. This study shows that despite being a strictly protected species in India, there is still a threat to bears from illegal trade. Greater effort is needed to protect bear habitat and reduce retaliatory killing of bears which impedes conservation efforts to reduce the illegal exploitation of bears for trade. Enforcement capacity and resources also need to be improved and must encompass intelligence-led investigations and cross-border cooperation between enforcement agencies to target buyers and traders. The trade in bears and their parts should be consistently monitored on a national scale to support effective law enforcement interventions and conservation initiatives to reduce the levels of poaching of bears in India.

1. Introduction

Widespread poaching for illegal trade has been described as a major driver in the decline of bear populations throughout Asia (Shepherd and Nijman, 2007; Foley et al., 2011; Burgess et al., 2014; Lee et al., 2015; Willcox et al., 2016; Nijman et al., 2017;

* Correspondence to: Box 200, Big Lake Ranch, BC V0L 1G0, Canada.
E-mail address: chris.shepherd@mcrsociety.org (C.R. Shepherd).

https://doi.org/10.1016/j.gecco.2021.e01552
2351-9894/

Or et al., 2017; Crudge et al., 2018; Gomez and Shepherd, 2018). Bears are in high demand as they are hunted for their gall bladders and bones used in traditional medicine; meat and paws that serve the exotic food industry; claws, teeth, skin and skull coveted as trophies; and cubs kept as pets or supplied to bear bile extracting facilities (Foley et al., 2011; Burgess et al., 2014; Livingstone et al., 2018; Gomez and Shepherd, 2019). Apart from the giant panda *Ailuropoda melanoleuca*, all bear species found in Asia are at high risk from illegal trade. Three of these species, the Asiatic black bear *Ursus thibetanus*, sun bear *Helarctos malayanus* and sloth bear *Melursus ursinus* are currently listed as Vulnerable on the IUCN Red List of Threatened Species with populations considered to be in decline across their range (Garshelis and Steinmetz, 2016; Scotson et al., 2017; Dharaiya et al., 2020), while the brown bear *Ursus arctos* is listed as Least Concern with populations considered to be stable for the most part (McLellan et al., 2017).

The poaching and exploitation of wildlife in India for illegal trade is considerable and widespread (WWF, 2014). Seizures of live animals and parts are reported daily throughout the country involving a long list of species including deer, elephants, leopards, mongoose, pangolins, tortoises and freshwater turtles, tigers, rhinos, seahorses, snakes and monitor lizards (WWF, 2014; Arun, 2019; Badola et al., 2019; Chatterjee, 2019; UNEP, 2019; Wong and Krishnasamy, 2019). Bears are no exception (Sethy and Chauhan, 2011; Burgess et al., 2014; Gupta et al., 2007; Sathyakumar et al., 2012; Zaugg and Suri, 2019). India is home to four of the world's eight bear species, the Asiatic black bear, sun bear, sloth bear and the Himalayan brown bear *Ursus arctosisa bellinus* (Fig. 1).

The main threat to bears in India is habitat loss, degradation and fragmentation due to rapid development throughout the country. This is exacerbated by retaliatory killings due to human-bear conflict and targeted hunting of bears to supply a black-market trade in their parts coveted as trophies or for traditional medicine, and their meat consumed in some parts of India (Sethy and Chauhan, 2011; Sathyakumar et al., 2012). Bear cubs, predominantly sloth bears, are also captured to be trained as dancing/performing bears. In the mid-1990s, it was estimated that there were more than 1200 performing bears on the streets of India. Sloth bears have been exploited and traded for this use for hundreds of years, although it has decreased as a threat in recent years (D'Cruze et al., 2011; Wildlife Protection Society of India, unpublished data).

A survey of bear parts in trade in the state of Arunachal Pradesh between 2007 and 2009 revealed open sale of carcasses, skulls, canines, paws, claws, skins, gall bladders and derivatives (Sethy and Chauhan, 2011). During an analysis of seizure data involving bears across Asia between 2000 and 2011, India reported 23 seizure incidents that involved live bears and gall bladders (Burgess et al., 2014). There have also been reports of international trafficking of bear gall bladders from India into Japan as far back as 1981 as well as into Singapore and Taiwan (Mills and Servheen, 1991), China and Myanmar (Sethy and Chauhan, 2011) and Nepal (Burgess et al., 2014). In 2012, a National Bear Conservation and Welfare Action Plan was developed to address State specific needs for the conservation of all four bear species in India covering a 5-year period (Sathyakumar et al., 2012). The aim of the Plan was to ensure stable status of all bear species through enhanced protection of bears from illegal trade, mitigation of bear-human conflicts, habitat management, increased research and monitoring, enhanced capacity development, increased awareness and education on bears, and stronger policy and legislation.

Yet, a recent arrest of a notorious wildlife poacher in October 2019 exemplified that the illegal trade of bears in India is still a persistent threat to bear populations (Zaugg and Suri, 2019). However, the extent of the illegal trade in bears in India remains poorly documented as do the results of efforts made to counter this trade. In this study we attempt to address this knowledge gap through an analysis of seizure and poaching data in an effort to understand the impact of illegal trade on wild bear populations and identify/prioritise enforcement and conservation efforts to end the illegal exploitation of bear species in India.

2. Protection status

Wildlife protection in India falls under the Indian Wild Life (Protection) Act 1972, which has been amended several times i.e. 1991, 2002, 2003 and 2006 to include new species, higher penalties, stronger protection for tigers, among other things.

All four bear species found in India are protected. The sun bear and sloth bear are listed in Schedule I of the Act, Asiatic black bear in Part II of Schedule II, while the brown bear is listed in both Schedule I and Part II of Schedule II (likely due to an error). Nevertheless, the same regulations apply to both Schedules with respect to penalties and fines. Listing on both/either Schedules essentially prohibits hunting, killing, unlicensed possession, unlicensed transport, and any mode of transfer, apart from inheritance, of the listed species or products thereof, i.e. trophies, meat, animal articles, etc. Domestic and international trade or commerce, in these species and their derivatives is therefore prohibited. Schedule I and II listed species can only be hunted in very special circumstances. With Schedule I species this is only authorised by the Chief Wildlife Warden if they are a threat to human life or are diseased/disabled beyond recovery. The same applies to Schedule II species with the addition that hunting may also be allowed by the Chief Wildlife Warden or an authorised officer if the animal poses a threat to property such as standing crops. Permits can also be issued by the Chief Wildlife Warden to hunt (hunt is defined to include any capture) bears for the purpose of education, scientific research or scientific management (without killing animals). However, for these permits, prior Central Government approval is required for Schedule I species and State Government approval is required for Schedule II species. Offences related to wildlife listed in Schedule I and Part II of Schedule II are punishable with imprisonment between a minimum of 3 years and a maximum of 7 years as well as a fine of no less than INR10K (USD140). In the case of a second of subsequent offences, the imprisonment term remains the same but the fine increases to a minimum of INR25K (USD349).

Captive breeding of bears is only allowed if it is conducted by recognised zoos as per the rules that apply to them. It is theoretically possible for a private individual to legally own/possess a bear if a declaration was made and ownership certificate obtained when the species were first listed in the Schedules (1986 for Himalayan brown bear and sloth bear, 1980 for sun bear

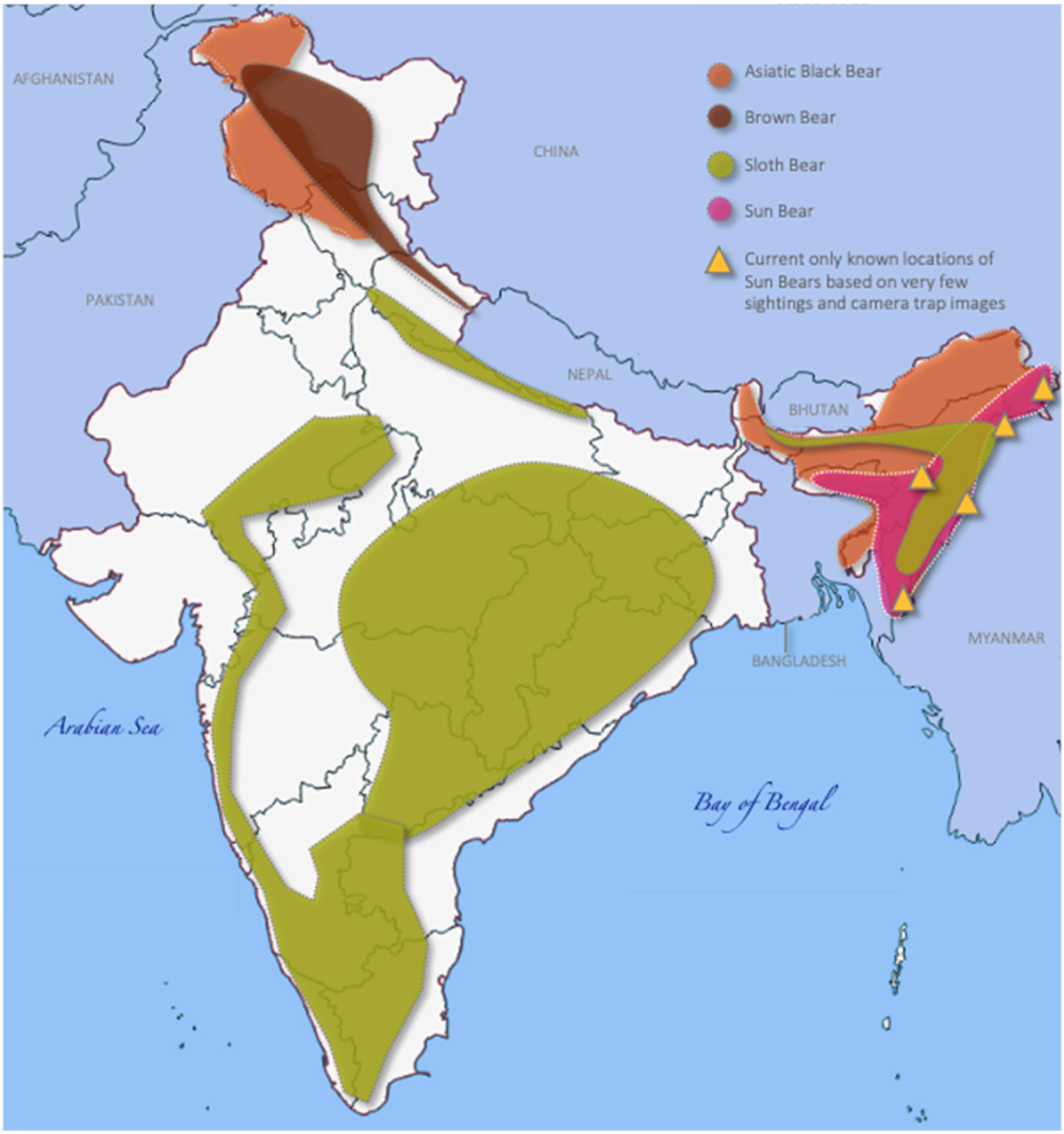

Fig. 1. Approximate distribution range of the Asiatic black bear, brown bear, sloth bear and sun bear in India based on IUCN Red List of Threatened Species (Dharaiya et al. 2020; Garshelis and Steinmetz, 2016; McLellan et al., 2017; Scotson et al., 2017) and unpublished data from Wildlife Protection Society of India (WPSI).

and Himalayan black bear) or during a subsequent immunity period granted in 2003. However, any offspring born to such a bear cannot be declared and legalised. Hence, captive breeding of bears by private individuals is effectively illegal.

India is also a Party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) which regulates international trade of wildlife. The Asiatic black bear, sun bear and the sloth bear are listed in Appendix I of CITES, and as such international commercial trade in these bears, their parts or derivatives is completely prohibited; while the brown bear (barring populations in Bhutan, China, Mexico and Mongolia) is listed in Appendix II allowing for regulated international commercial trade provided it is permitted by national CITES management authorities. That said, no international commercial trade to or from India in Himalayan brown bears is permitted by the Indian Import/Export Policy in line with the Wild Life (Protection) Act, 1972, except for the trade of animals between recognised zoos.

3. Methods

Seizure and poaching incidents involving bears in India for the period 2009–2019 were collated and analysed. A seizure is defined as an incident involving the arrests of individuals and/or confiscation of live bears or their parts (e.g. claws, skins, paws, gall bladder) illegally in their possession. A poaching incident is when a bear is found dead either in traps, or electrocuted, or killed by other anthropogenic means, with or without body parts removed. The Wildlife Protection Society of India (WPSI) systematically collects data on poaching and seizures of protected species which is collated, categorised and stored in WPSI's database on wildlife crime. Primary information is from a network of field-staff, local NGOs and concerned citizens. WPSI also liaises with enforcement agencies, including the Forest Department, Police and Customs, to collect or verify information on wildlife crime. Information is also obtained from sources such as newspapers and other media, both local and regional, which is verified with the relevant agencies before entry into the database. Wherever possible, documents relating to incidents are obtained. A large amount of information has also been acquired by WPSI as part of wildlife trade studies conducted with state governments in India and the Right to Information Act 2005 has been used to elicit information about incidents of crime. We also requested seizure data from the Indian CITES Management Authority, but there was no response.

Using this data, we mapped out important trade hubs and centres where trade exists. We have estimated a minimum number of bears recorded in trade from commodities seized, by either counting whole or near-whole specimens seized (e.g. live animals, skins, carcasses), or by tallying quantities of body parts seized (e.g. gall bladders, claws, teeth, paws) that form one whole individual per seizure record. In terms of tallying body parts, each bear (regardless of species) is assumed to have four paws, one gall bladder, 20 claws and 40 teeth (or four canines if this is specifically mentioned). For example, a seizure of an adult skull and skin would be counted as one, as these could potentially have been derived from the same individual and similarly a seizure of two paws, 20 teeth and five gall bladders would be counted as a minimum of five individuals. Where quantities of seized commodities were not provided, we estimated at minimum that one bear was involved. We have quantified the volumes of bears seized from the trade over a set period to determine if there are any trends in trade.

Due to inherent biases in the way seizure data are reported, given varying levels of law enforcement, reporting and recording practices between the various states in India, language biases, etc., this dataset is interpreted with caution. Reported incidents are likely to represent only a fraction of the illegal trade and so under-estimate the full extent of poaching and illegal trade (Nijman 2015; Burgess et al., 2014).

4. Results

Between 2009 and 2019, there were a reported 149 incidents involving the poaching and seizure of bears in India amounting to a minimum of 264 bears. This encompassed 73 poaching incidents representing an estimated 82 bears, and 76 seizure incidents representing an estimated 182 bears. The number of incidents involving bears since 2009 appears to be on the rise in India, largely attributed to rising number of poaching cases. The highest number of incidents were reported in 2017 (n = 22), followed by 2018 (n = 20) and 2019 and 2016 (n = 17 respectively) (Fig. 2).

At least two species of bears were identified in these incidents, Asiatic black bear and sloth bear, equally represented in reported incidents (Table 1). That said, the majority of poaching incidents involved the sloth bear (n = 97%) which amounted to 80 bears, while with seizures, slightly more than half of incidents were of Asiatic black bears (n = 55.3%), which represented about 70% of the estimated number of bears based on commodities seized.

Various types of bear commodities were seized and included live bears and their parts (bones, claws, gall bladder, meat, paws, skin, skull and teeth) (Table 2). Gall bladder was the most frequent and abundant bear part seized (n = 42 incidents; 129 gall bladders), the majority of which were reportedly Asiatic black bear. For sloth bears, the most frequent bear part seized were skins (n = 11 incidents; 12 skins) followed by live bears (n = 8 incidents; 26 individuals) and claws (n = 6 incidents; 27 claws). Of the 26 live bears seized, 20 were cubs.

The seizure of bear gall bladders has been relatively constant throughout the study period, although quantities peaked quite substantially in 2017 (Fig. 3). Similarly, while seized in small quantities, the seizure of skins has also been relatively constant throughout the study period. There appears to be a reduction in the seizure of live bears. Incidents involving the poaching of bears increased over the study period.

Incidents involving the poaching and seizure of bears and their parts occurred throughout the country encompassing 78 districts within 19 states (Fig. 4). Most incidents were reported in the states of Uttarakhand (24%) and Madhya Pradesh (23%), followed by Chhattisgarh (12%) and Maharashtra (7%). Uttarakhand had the highest number of reported seizures which were primarily bear gall bladders (n = 33 seizures, 63 gall bladders), although the number of seizures here decreased over the study period. Assam with only four reported incidents was second, after Uttarakhand, in terms of estimated number of bears involved (n = 45 bears) largely attributed to the seizure of 42 gall bladders followed by three skins and a skull. Madhya Pradesh and Chhattisgarh had the highest number of reported poaching incidents (n = 29 incidents, 33 bears; 16 incidents, 20 bears respectively) and appears to have increased over the study period.

5. Discussion

Asian bear species are declining across their range (Dharaiya et al. 2020; Garshelis and Steinmetz, 2016; McLellan et al., 2017; Scotson et al., 2017). While this is largely attributed to habitat loss, destruction and fragmentation, bears are also

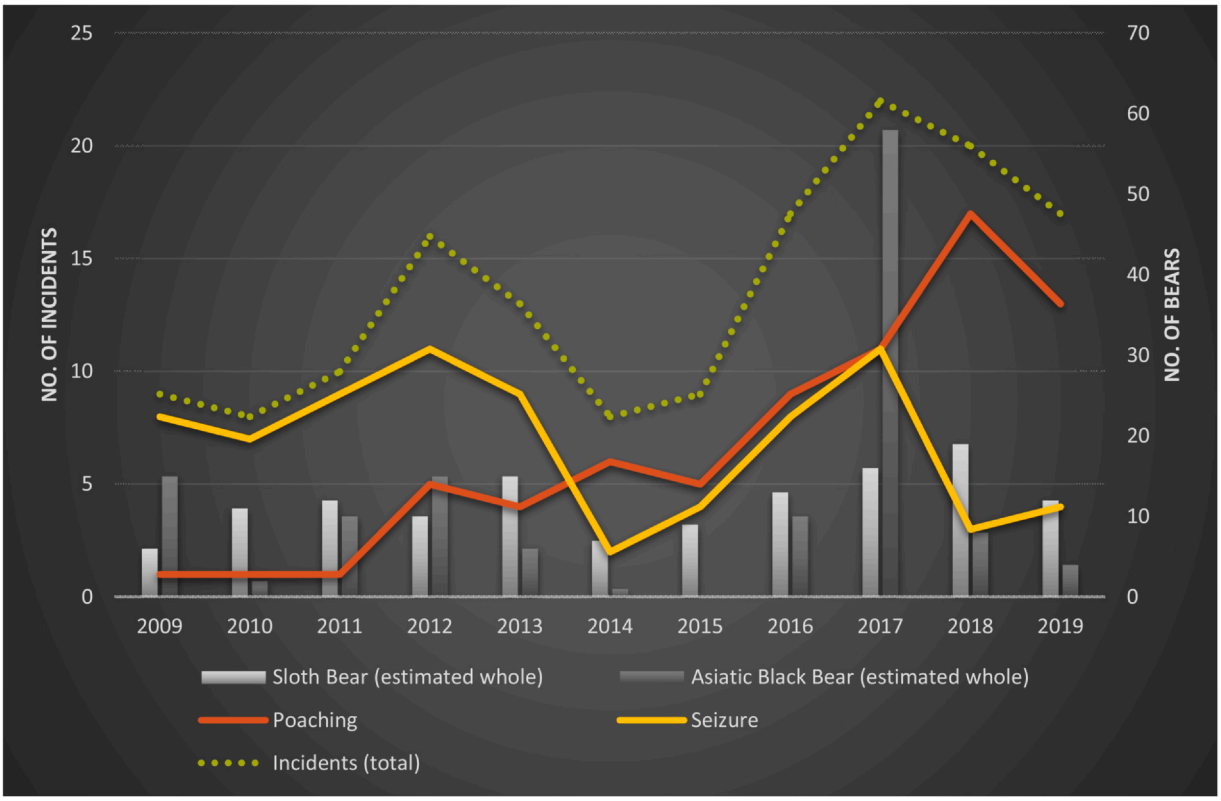

Fig. 2. The total number of incidents involving the illegal exploitation of bears in India reported from 2009 to 2019 with a breakdown of the type of incidents reported (i.e. seizures or poaching), bear species and the estimated number of bears represented in these incidents combined per year.

Table 1
Bear species reported in poaching and seizure incidents in India from 2009 to 2019 with minimum estimated number of bears involved.

Species	Poaching		Seizure		Total (Bears)
	Incidents (#)	# of Bears (Est.)	Incidents (#)	# of Bears (Est.)	
Asiatic black bear	2	2	42	127	129
Sloth bear	71	80	34	55	135
Total	73	82	76	182	264

Table 2
The various types of bear commodities seized in India from 2009 to 2019 including the species of bear, the number of times each commodity was seized and quantities. Note: the data represented here does not include poaching which amounted to 73 incidents and 82 bears (sloth bear = 80, Asiatic black bear = 2).

Commodity seized	Asiatic black bear		Sloth bear	
	Seizures (#)	Quantity	Seizures (#)	Quantity
Bone	–	–	1	2
Canine	–	–	2	2
Claws	–	–	6	27
Fat (kg)	–	–	1	2
Gall bladder	38	123	4	6
Hair	–	–	2	Unknown
Jaws	–	–	1	Unknown
Legs	–	–	1	Unknown
Live	–	–	8	26
Meat (kg)	–	–	3	26
Paws	–	–	3	5
Skin	3	3	11	12
Skull	2	2	–	–

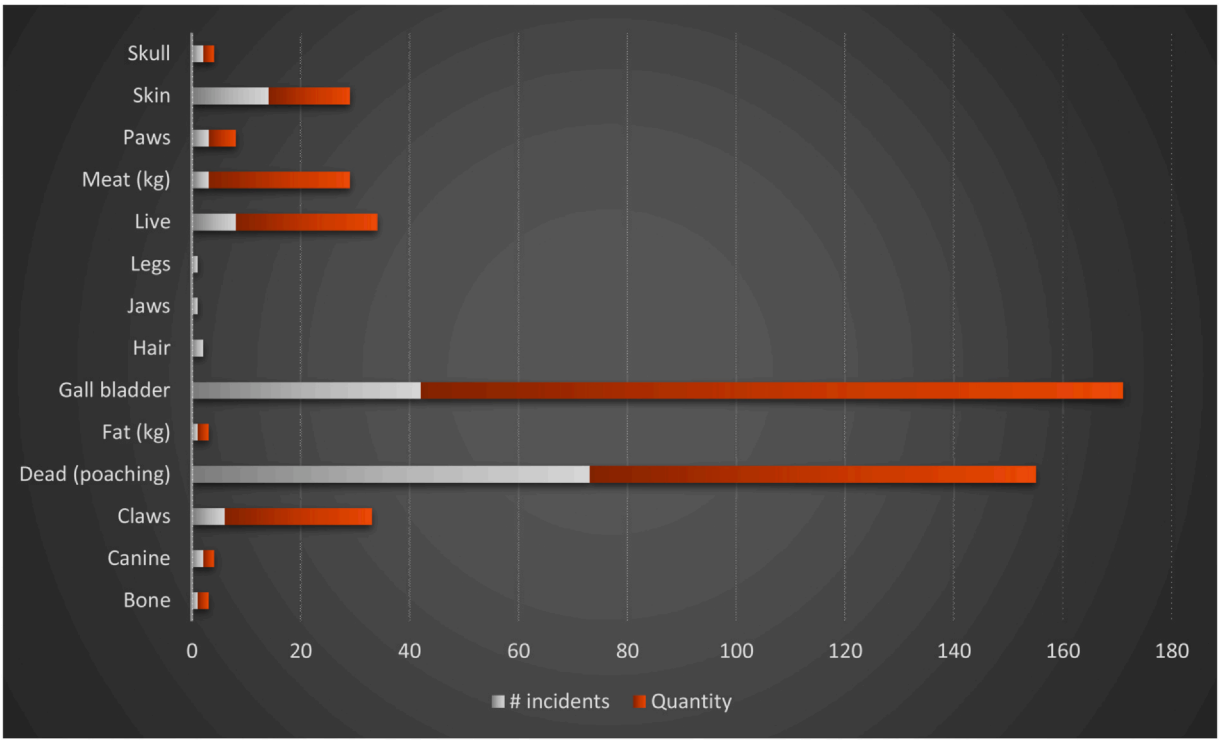

Fig. 3. Incidents involving poaching of bears (labelled 'dead') as well as seizure of live bears and bear parts (bone, canines, claws, gall bladders, paws, skin and skull) reported in India from 2009 to 2019. Note that quantities of bear meat and fat seized are provided in unit of kg; and although bear hair, jaws and legs were seized in one incident, quantities were not reported.

persistently targeted for the illicit trade in their parts prized as talismans and trophies, gall bladders for traditional medicine, meat and paws for consumption and live for use as pets, performance animals, replacement stock in bear farms, and more. Seizure data obtained for this study indicates that there is an ongoing illegal trade of bears in India that appears to be targeted at two species, the Asiatic black bear and the sloth bear. This is not surprising considering that of all the four species of bears found in India, these two are the most common and widespread. That said, both species are at risk of extinction having been assessed as Vulnerable by the IUCN Red List of Threatened Species, with populations in decline across their range due to habitat loss, increasing human conflict and illegal exploitation for trade (Garshelis and Steinmetz, 2016; Dharaiya et al., 2020).

Analysis of seizure data revealed that bears are predominantly being trafficked for traditional medicine use (based on the high frequency and abundance of gall bladders seized) and, to a lesser extent, trophies (based on seizures of claws and skins). This is further supported by the decreasing number of seizures involving live bears over the study period. Past studies indicate that live bears, mostly cubs, are primarily harvested to be trained as dancing/performing bears in India, a practice that was made illegal in 1998 and has since been, to a large extent, eradicated (D'Cruze et al., 2011). Far more Asiatic black bear parts were seized in comparison to sloth bears, revealing that Asiatic black bears are predominantly targeted for their gall bladders. This is the case across Asia in Asiatic black bear range states (Feng et al., 2009; Kikuchi, 2010; Livingstone and Shepherd, 2014), as this species produces especially high levels of tauroursodeoxycholic acid, a compound prized in traditional Chinese medicine (TCM) and considered rare in other bear species (Crudge et al., 2019). It is also the reason more Asiatic black bears are found in bear bile extracting facilities than any other bear species. Seizures involving sloth bears were primarily of skins (~33% of seizures involving sloth bears) suggesting they are coveted more as trophies. Nevertheless, the gall bladders of sloth bears were also seized in four incidents indicating they are not exempt from being exploited for traditional medicine. Live sloth bears (mostly cubs) were seized in the first half of the study period (2009–2015) and it is assumed these were destined for the pet/performing trade. While the seizure incidents analysed offer insufficient detail on the end destinations of product seized (i.e. local or international markets), we do know that bear parts are in high demand in East Asia and Southeast Asia mostly for traditional medicine and trophies (Shepherd, 2007; Foley et al., 2011; Burgess et al., 2014; Gomez, 2019). The highest number of bear seizures in this study was reported in Uttarakhand (n = 33 seizures) the majority of which were of gall bladders. This is unsurprising considering Uttarakhand shares a long and porous border with Nepal, a known trade route through which gall bladders (and other wildlife products e.g. big cat skins) reach China. In at least one seizure incident, two Bhutanese nationals were arrested with bear gall bladders in West Bengal that were likely being smuggled to China through Bhutan.

Aside from seizures, there was a steady rise in poaching incidents, predominantly involving sloth bears, in India over the study period. In poaching incidents, the bears were found dead in traps, electrocuted, or killed by other means by poachers, with body parts (i.e. canines, claws, gall bladder, paws, etc) usually removed. The removal of body parts suggests that there is a

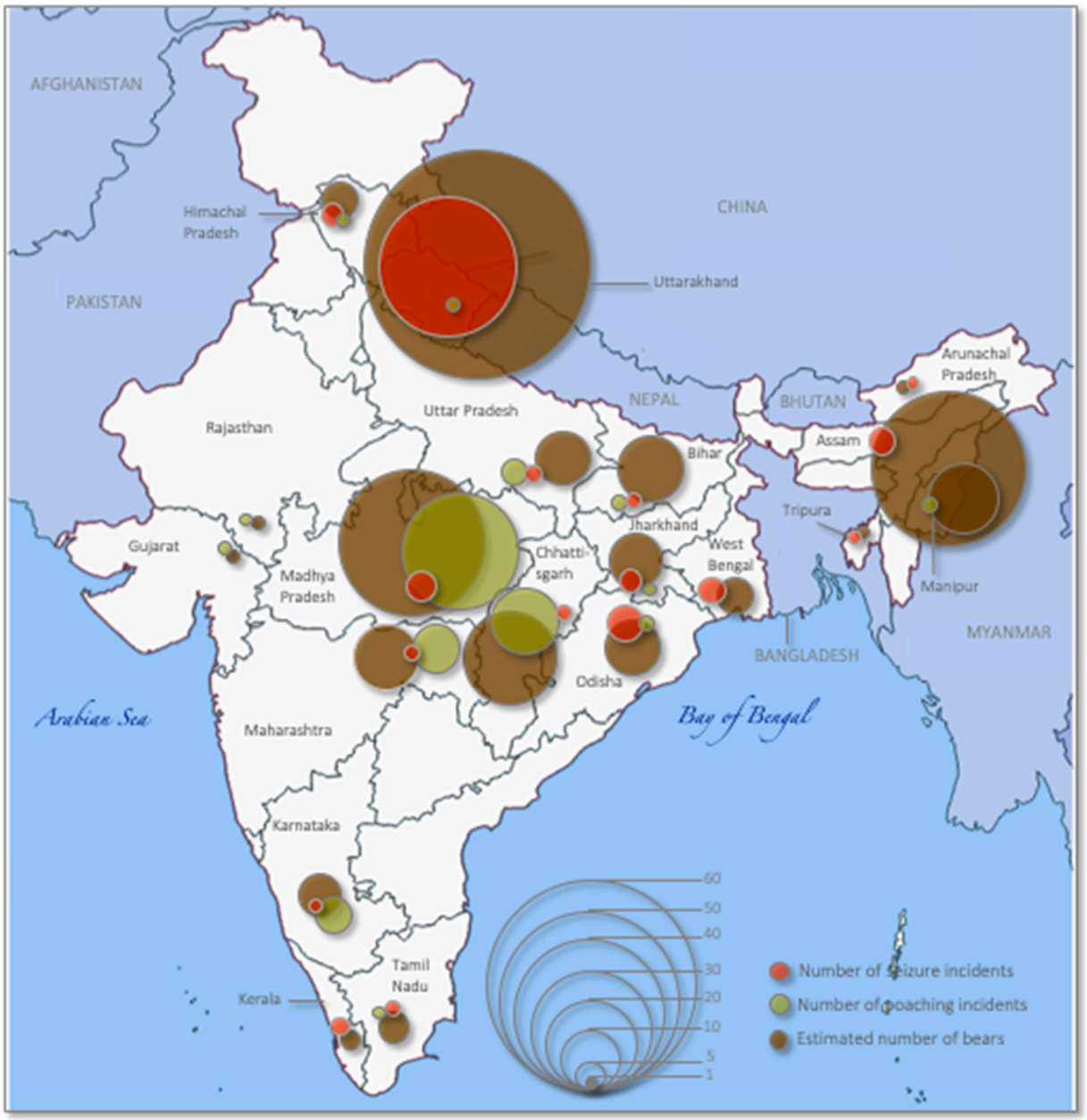

Fig. 4. Bear seizure and poaching hotspots in India based on incidents analysed for the period 2009–2019. A total of 149 incidents were obtained; 73 poaching incidents and 77 seizure incidents which was estimated to amount to 264 bears. The location of each incident has been grouped by States in India.

demand and trade in such commodities, although again, it remains unclear whether this feeds a local demand and/or international market. It is also unclear whether the rise in poaching incidents is targeted hunting of bears for trade or retaliatory killing of bears. Incidents of poaching were reported mainly in Madhya Pradesh and Chhattisgarh which have good populations of sloth bears (WPSI, unpublished data). There has been growing levels of human-bear conflict in India due to loss of suitable habitat and increasing human encroachment into forested areas (Debata et al., 2016; Garcia et al., 2016); and it is suspected that this conflict may be resulting in rising poaching levels. Sloth bears are perceived as a significant threat as conflict cases cause serious human injury or death that has adverse impacts on a family's livelihood. Retaliatory killing of bears has grown as a result - from 2009 to 2019, at least 112 bears were found dead due to human conflict where bears were killed by villagers using guns, poisoning, electrocution, burning and stoning or culled by Forest Officials or Police as they posed a danger to the public (Wildlife Protection Society of India, unpublished data). This figure also includes a few unnatural deaths due to road and train accidents and accidental electrocution (Wildlife Protection Society of India, unpublished data). This considering, the root cause of killing a sloth bear is generally considered to be in retaliation rather than trade although parts may be removed opportunistically as

trophies or traded for extra income. That said, it is also possible that wildlife poachers are exploiting conflict situations to procure bear parts for trade as exemplified by the number of seizures in this study. Just last year (2019), a wildlife trader was arrested in India for hunting sloth bears for their gall bladders and parts, and other wildlife (e.g. tigers) that he reportedly supplied to international smuggling syndicates in China and Southeast Asia for nearly a decade (Zaugg and Suri, 2019). In China, research has shown that the poaching of bears is linked more significantly with trade in their valuable parts in comparison to human-bear conflict (Liu et al., 2010). The fact is, bear gall bladder is a highly valued commodity in the traditional medicine industry, with China and Viet Nam the main drivers of demand. This demand has been the reported cause for bear declines in Cambodia, Lao PDR, Myanmar and Viet Nam (Scotson, 2012; Crudge et al., 2016, 2019; Nijman et al., 2017). Moreover, it is not uncommon for wildlife traders/poachers to adapt to depleting population in one country by targeting areas/countries where populations are still abundant e.g. India. A case in point is the international trafficking of pangolins for traditional medicine and wild meat that is highly sought after in China and Viet Nam. When pangolin populations were depleted in East Asia, a greater increase in the poaching of pangolins from Southeast Asia was noted, particularly Indonesia and Malaysia (Semiadi et al., 2009; Challender, 2011). As populations started dwindling in the Southeast Asian region, there was a notable shift in the trafficking of pangolins from South Asia (e.g. India, Nepal) and Africa (Challender et al., 2016; Gomez et al., 2016; Heinrich et al., 2016) to meet demand.

This study shows that despite being a strictly protected species in India, there is still a threat to bears from illegal trade. Clearly, enforcement capacity and resources need to be improved in relation to crimes involving bears. Between 2009 and 2019, 287 individuals were investigated in relation to bear trade, of which only 20 were convicted. While there have been some arrests, these have been confined to local poachers and mid-level traders, and there has been little effort dedicated to intelligence gathering or sustained investigation on actual buyers, end consumers, illegal cross-border trade, and the higher levels of the poaching and trafficking syndicate(s). For high profile species like tigers and more recently pangolins, there appears to be greater effort, but perhaps growing levels of human-bear conflict has rendered bears a considerable threat rather than in need of conservation attention. Throughout the range of bears in Asia, a combination of threats - loss of suitable habitat, increasing human conflict, illegal wildlife trade - are pushing bear populations towards extinction. But studies in Asia are showing that indiscriminate poaching and illegal trade are becoming the main driver of species extinctions, more so than deforestation (Brodie et al., 2015; Harrison et al., 2016; Gray et al., 2018; Symes et al., 2018; Voigt et al., 2018; Tilker et al., 2019). As such, while critical bear habitats must be preserved, greater efforts are also needed to reduce human-bear conflict and the threat of the illegal trade. Given the number of reported poaching and seizure incidents in India, enforcement efforts must be enhanced to include intelligence-led investigations and cross-border cooperation between enforcement agencies to target buyers and traders. Government authorities and conservation organisations should continue monitoring the trade in bear parts on a national scale, with findings analysed on a regular basis to support action-oriented strategies and effective law enforcement interventions. We also recommend research be carried out to better identify the end destinations of the parts and derivatives sourced from India's bears. Once clarified, targeted strategies should be developed and implemented to reduce consumption and demand and ultimately reduce levels of poaching of bears in India.

Declaration of Competing Interest

There is no conflict of interest.

Acknowledgements

We thank Avinash Basker for his invaluable advice on India's wildlife laws, Sunish Kumar for assistance in extracting the data and Loretta Shepherd for her improvements on an earlier draft of this paper. We also owe much appreciation to Karine Hauser and Anna Hauser for their generous funds that make our work on bear conservation possible.

References

Arun, T., 2019. Red Sand Boa Worth $71,000 Seized, One Person Arrested. International Business Times. ⟨https://www.ibtimes.com/red-sand-boa-worth-71000-seized-one-person-arrested-2860081⟩. (Accessed 11 November 2019).

Badola, S., Choudhary, A.N., Chhabra, D.B., 2019. Tortoises and Freshwater Turtles in illegal trade in India (2019). TRAFFIC India.

Brodie, J.F., Giordano, A.J., Zipkin, E.F., Bernard, H., Mohd-Azlan, J., Ambu, L., 2015. Correlation and persistence of hunting and logging impacts on tropical rainforest mammals. Conserv. Biol. 29 (1), 110–121.

Burgess, E.A., Stoner, S.S., Foley, K.E. 2014. Bring to bear: an analysis of seizures across Asia (2000–2011). TRAFFIC, Petaling Jaya, Selangor, Malaysia.

Challender, D., 2011. Asian pangolins: increasing affluence driving hunting pressure. TRAFFIC Bull. 23 (3), 92–93.

Challender, D., Baille, J., Waterman, C., Pietersen, D., Nash, H., Wicker, L., Parker, K., Thomson, P., Nguyen, T.V., Hywood, L., Shepherd, C.R., 2016. On scaling up pangolin conservation. TRAFFIC Bull. 28 (1), 19–21.

Chatterjee, B., 2019. 650 mongooses killed for 29,166 fur paint brushes seized across Maharashtra: WCCB. Hindustan Times Online: ⟨https://www.hindustantimes.com/mumbai-news/650-mongooses-killed-for-29–166-fur-paint-brushes-seized-across-maharashtra-wccb/story-xG8MRq4BTfvNxjp2uGHIeN.html⟩. (Accessed 11 November 2019).

Crudge, B., O'Connor, D., Hunt, M., Davis, E.O., Browne-Nunez, C., 2016. Groundwork for effective conservation education: an example of in situ and ex situ collaboration in South East Asia. Int. Zoo Yearb. 50, 1–15.

Crudge, B., Nguyen, T., Cao, T., 2018. The challenges and conservation implications of bear bile farming in Viet Nam. Oryx 1–8.

Crudge, B., Lees, C., Hunt, M., Steinmetz, R., Fredriksson, G., Garshelis, D. (Eds.), 2019. Sun bears: global status review and conservation action plan, 2019–2028. IUCN SSC Bear Specialist Group/IUCN SSC Conservation Planning Specialist Group/Free the Bears/TRAFFIC.

D'Cruze, N., Sarma, U.K., Mookerjee, A., Singh, B., Louis, J., Mahapatra, R.P., Jaiswal, V.P., Roy, T.K., Kumari, I., Menon, V., 2011. Dancing bears in India: a sloth bear status report. Ursus 22 (2), 99–105.
Debata, S., Swain, K.K., Sahu, H.K., Palei, H.S., 2016. Human-sloth bear conflict in human dominated landscape of northern Odisha, India. Ursus 27 (2), 90–98.
Dharaiya, N., Bargali, H.S., Sharp, T., 2020. Melursus ursinus. The IUCN Red List of Threatened Species 2016: e.T13143A45033815. http://dx.doi.org/10.2305/IUCN.UK.2016–3.RLTS.T13143A45033815.en. (Downloaded 08 November 2019).
Feng, Y., Siu, K., Wang, N., Ng, K., Tsao, S., Nagamatsu, T., Tong, Y., 2009. Bear bile: dilemma of traditional medicinal use and animal protection. J. Ethnobiol. Ethnomed. 5, 2.
Foley, K.E., Stengel C.J., Shepherd. C.R., 2011. Pills, powders, vials and flakes: The bear bile trade in Asia. TRAFFIC, Petaling Jaya, Selangor, Malaysia.
Garcia, K.C., Joshi, H.M., Dharaiya, N., 2016. Assessment of human-sloth bear conflicts in North Gujarat, India. Ursus 27 (1), 5–10.
Garshelis, D., Steinmetz, R., 2016. Ursus thibetanus (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T22824A114252336. http://dx.doi.org/10.2305/IUCN.UK.2016–3.RLTS.T22824A45034242.en. (Downloaded 08 November 2019].
Gomez, L., Shepherd, C.R., 2018. Trade in bears in Lao PDR with observations from market surveys and seizure data. Glob. Ecol. Conserv. 15 (2018), e00415.
Gomez, L., Shepherd, C.R., 2019. Bearly on the radar – an analysis of seizures of bears in Indonesia. Eur. J. Wildl. Res. 65 (6), 89. https://doi.org/10.1007/s10344-019-1323-1
Gomez, L., Leupen, B.T.C., Tian, K.H., 2016. The trade of African pangolins to Asia: a brief case study of pangolin shipments from Nigeria. TRAFFIC Bull. 28 (1), 3–5.
Gomez, L., 2019. An update on the bear bile trade in Peninsular Malaysia. TRAFFIC Southeast Asia, Petaling Jaya, Malaysia.
Gray, T.N.E., Hughes, A.C., Laurance, W.F., Long, B., Lynam, A.J., O'Kelly, H., Ripple, W.J., Seng, T., Scotson, L., Wilkinson, N.M., 2018. The wildlife snaring crisis: an insidious and pervasive threat to biodiversity in Southeast Asia. Biodivers. Conserv. 27, 1031–1037.
Gupta, B.K., Singh, R., Satyanarayan, K., Seshamani, G., 2007. Trade in bears and their parts in India: threats to conservation of bears. In: Williamson, D. (Ed)., Proceedings of the Fourth International Symposium on the Trade in Bear Parts. TRAFFIC East Asia-Japan.
Harrison, R.D., Sreekar, R., Brodie, J.F., Brook, S., Luskin, M., O'Kelly, H., Rao, M., Scheffers, B., Velho, N., 2016. Impacts of hunting on tropical forests in Southeast Asia. Conserv. Biol. 30, 972–981.
Heinrich, S., Wittmann, T.A., Prowse, T.A.A., Ross, J.V., Delean, S., Shepherd, C.R., Cassey, P., 2016. Where did all the pangolins go? International CITES trade in pangolin species. Glob. Ecol. Conserv. 8, 241–253.
Kikuchi, R., 2010. Captive bears in human-animal welfare conflict: a case study of bile extraction on Asia's bear farms. J. Agric. Environ. Ethics 25, 55–77. https://doi.org/10.1007/s10806-010-9290-2
Lee, S.L., Burgess, E.A., Chng, S.C.L., 2015. Hard to bear: an assessment of trade in bear bile and gall bladder in Malaysia. TRAFFIC. Petaling Jaya, Selangor, Malaysia.
Liu, F., McShea, W.J., Garshelis, D.L., Zhu, X., Wang, D., Shao, L., 2010. Human-wildlife conflicts influence attitudes but not necessarily behaviours: factors driving the poaching of bears in China. Biol. Conserv. 144 (2011), 538–547.
Livingstone, E., Gomez, L., Bouhuys, J., 2018. A review of bear farming and bear trade in Lao People's Democratic Republic. Glob. Ecol. Conserv. 13, e00380.
Livingstone, E., Shepherd, C.R., 2014. Bear farms in Lao PDR expand illegally and fail to conserve wild bears. Fauna & Flora International, Oryx, 1–9.
McLellan, B.N., Proctor, M.F., Huber, D., Michel, S., 2017. Ursus arctos (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2017: e.T41688A121229971. http://dx.doi.org/10.2305/IUCN.UK.2017–3.RLTS.T41688A121229971.en. [Downloaded 08 November 2019].
Mills, J.A., Servheen, C., 1991. The Asian Trade in Bears and Bear Parts. World Wildlife Fund, Inc., USA.
Nijman, V., 2015. Pangolin seizure data reported in the Indonesian media. TRAFFIC Bull. 27 (2), 44–46.
Nijman, V., Oo, H., Shwe, N.M., 2017. Assessing the illegal bear trade in Myanmar through conversations with poachers: topology, perceptions and trade links to China. Human Dimensions of Wildlife. http://dx.doi.org/10.1080/10871209.2017.1263768.
Or, O.C., Gomez, L., Lau, C.F., 2017. Recent reports of sun bear seizures and poaching in Malaysia. International Bear News, Summer 2017, vol. 26, no. 2.
Sathyakumar, S., Kaul, R., Ashraf, N.V.K., Mookerjee, A., Menon, V., 2012. National Bear Conservation and Welfare Action Plan. Ministry of Environment and Forests, Wildlife Institute of India and Wildlife Trust of India.
Scotson, L., 2012. Status of Asiatic Black Bears and Sun Bears in Xe Pian National Protected Area, Lao PDR. International Bear News, February 2012, vol. 21, no. 1.
Scotson, L., Fredriksson, G., Augeri, D., Cheah, C., Ngoprasert, D., Wai-Ming, W., 2017. Helarctos malayanus (errata version published in 2018). The IUCN Red List of Threatened Species 2017: e.T9760A123798233. http://dx.doi.org/10.2305/IUCN.UK.2017–3.RLTS.T9760A45033547.en. (Downloaded on 08 November 2019).
Semiadi, G., Darnaedi, D., Arief, A.J., 2009. Sunda Pangolin Manis javanica conservation in Indonesia: status and problems. In: Pantel, S., Chin, S.Y. (Eds). Proceedings of the Workshop on Trade and Conservation of Pangolins Native to South and Southeast Asia: 30 June–2 July 2008, Singapore Zoo. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia.
Sethy, J., Chauhan, N.P.S., 2011. Use and trade of bear body parts: impact and conservation in Arunachal Pradesh State of India. Int. J. Bioresour. Stress Manag. 2 (4), 409–415 2011.
Shepherd, C.R., Nijman, V., 2007. The trade in bear parts from Myanmar: an illustration of the ineffectiveness of enforcement of international wildlife trade regulations. Biodivers. Conserv. 17, 35–42.
Shepherd, C.R., 2007. Bear trade in Southeast Asia: the status of protection for Southeast Asia's bears. In: Williamson, D. (Ed)., Proceedings of the Fourth International Symposium on the Trade in Bear Parts. TRAFFIC East Asia-Japan.
Symes, W.S., Edwards, D.P., Miettinen, J., Rheindt, F.E., Roman, C., 2018. Combined impacts of deforestation and wildlife trade on tropical biodiversity are severely underestimated. Nat. Commun. 9, 4052. https://doi.org/10.1038/s41467-018-06579-2
Tilker, A., Abrams, J.F., Mohamed, A., Nguyen, A., Wong, S.T., Sollmann, R., Niedballa, J., Bhagwat, T., Gray, T.N.E., Rawson, B.M., Guegan, F., Kissing, J., Wegmann, M., Wilting, A., 2019. Habitat degradation and indiscriminate hunting differentially impact faunal communities in the Southeast Asian tropical biodiversity hotspot. Commun. Biol. 2, 396. https://doi.org/10.1038/s42003-019-0640-y
UNEP, 2019. Spotlight on India's soaring wildlife crime. ⟨https://www.unenvironment.org/news-and-stories/story/spotlight-indias-soaring-wildlife-crime⟩. Accessed 11 November 2019.
Voigt, M., Wich, S.A., Ancrenaz, M., Meijaard, E., Abram, N., Banes, G.L., Campbell-Smith, G., d'Arcy, L., Delgado, R.A., Erman, A., Gaveau, D., Goosens, B., Heinicke, S., Houghton, M., Husson, S.J., Leiman, A., Llano, S., Makinuddin, N., Marshall, A., Meididit, A., Miettinen, J., Musnanda R., Mundry, Nardiyono, Nurcahyo, A., Odom, K., Panda, A., Prasetyo, D., Priadjati, A., Purnomo, Rafiastanto, A., Russon, A.E., Santika, T., Sihite, J., Spehar, S., Struebig, M., Sulbaran-Romero, E., Tiiu, A., Wells, J., Wilson, K.A., Kuhl, H.S., 2018. Global demand for natural resources eliminated more than 100,000 Bornean Orangutans. Curr. Biol. 28, 761–769.
Willcox, D., Minh, N.D.T., Gomez, L., 2016. An assessment of trade in bear bile and gall bladder in Viet Nam. TRAFFIC, Petaling Jaya, Selangor, Malaysia.
Wong, R., Krishnasamy, K., 2019. Skin and Bones Unresolved: An Analysis of Tiger Seizures from 2000–2018. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia.
WWF, 2014. Illegal Wildlife Trade in India (Special Issue). ⟨http://awsassets.wwfindia.org/downloads/traffic_panda_8_oct.pdf⟩. Accessed 8 November 2019.
Zaugg, J., Suri, M., 2019. Poacher manhunt exposes murky world of Indian wildlife trafficking, where bear bile is big business. CNN Online: ⟨https://edition.cnn.com/2019/10/25/asia/bear-bile-trafficking-intl-hnk/index.html⟩. Accessed 8 November 2019.