Original Research Article

Monitoring illegal trade in snow leopards: 2003−2014

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ABSTRACT

Illegal trade in snow leopards (*Panthera uncia*) has been identified as one of the major threats to long-term survival of the species in the wild. To quantify severity of the threats to dwindling snow leopard population, we examined market and questionnaire surveys, and information from the published and unpublished literature on illegal trade and poaching of snow leopards. We collected information from 11 of the 12 snow leopard range counties in central and southern Asia, barring Kazakhstan, and reported 439 snow leopards (88 records) in illegal trade during 2003−2014, which represents a loss of approximately 8.4%−10.9% snow leopard population (assuming mid-point population of 5240 to minimum population of 4000 individuals) in a period of 12 years. Our data suggested a 61% decadal increase in snow leopard trade during 2003−2012 compared with 1993−2002, while taking the note of significant strengthening of wildlife enforcement and crime control network in the decades of 2000s and 2010s. We found 50% prosecution rate of snow leopard crimes resulting in only 20% conviction rate globally. Many limitations e.g., secretive nature of illegal trade, ill developed enforcement mechanism, poor and passive documentation of snow leopards' seizures, restricted us to reflect actual trend of snow leopards' illegal trade. Even on a conservative scale the present situation is alarming and may detrimental to snow leopard conservation. We propose an effective networking of enforcement efforts and coordination among the law enforcement agencies, efficient collection of data and data management, and sharing of intelligence in snow leopard range countries, could be useful in curbing illegal trade in snow leopards in central and southern Asia.

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1. Introduction

The snow leopard (*Panthera uncia*) categorized as Vulnerable on the International Union for Conservation of Nature (IUCN) Red List (McCarthy et al., 2017), is a large feline in high altitude ecosystems of central and southern Asia across 12 range countries (Fig. 1). The species like other large predators is intrinsically rare, and even though it inhabits a large geographical range (~1.6 million km^2), and its global population is estimated at 7463−7980 (McCarthy et al., 2016). However, the population estimates for snow leopard are not robust and based mainly on expert knowledge and approximations due to extremely rugged terrains, remoteness of the snow leopard habitats and lack of large scale support for monitoring (McCarthy et al., 2016). Snow leopard, a cross boundary species is an indicator species, which makes cascading effects on different

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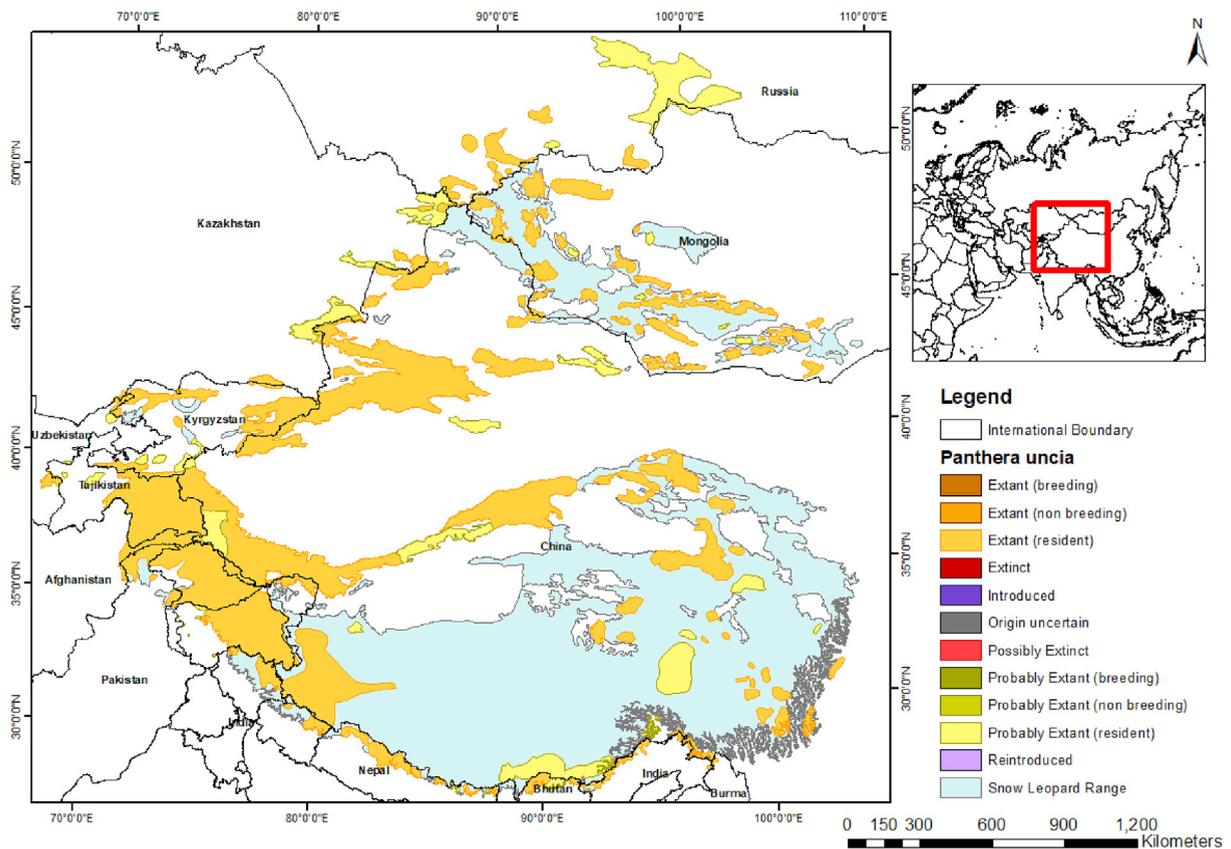
Fig. 1. Global distribution range of snow leopard in central and south Asia (Courtesy: IUCN Red List Version 3; McCarthy et al. 2017). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

trophic levels in thriving the health and functioning of the high-altitude ecosystems in central and southern Asia (Snow leopard Working Secretariat, 2013). For many decades, snow leopards have been menaced by the illegal trade related hunting for their valuable pelts and other body parts (Theile, 2003; Maheshwari and Niraj, 2016). According to Heptner and Sludskii (1972), approximately 1000 skins of snow leopard were estimated in illegal wildlife trade per year globally during early 1900s. Therefore, in 1975, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) included snow leopard in Appendix I, which is the list of most highly protected species banning the species' trade. However, despite the CITES initiative, illegal hunting of snow leopards has persisted in most of its ranges. Motives for such killings varied over commercial interest to retaliatory killings to protect livestock, notwithstanding, it is likely that the animal or its parts will ultimately enter trade (Theile, 2003). However, a lack of adequate information constrain quantifying the extent of threat to snow leopard conservation due to illegal trade.

2. Materials and methods

2.1. Study area

Currently, snow leopard is on the highest priority of several international treaties, conventions and national laws and legislations. Similar to CITES, Convention on the Conservation of Migratory Species of Wild Animals (CMS, 2002) has included the snow leopard in Appendix I to the Convention since 1985. At the national levels, hunting and trade of snow leopards is prohibited in all 12-range counties; however, the implementation and enforcement of the anti-illegal trade and anti-poaching laws varies, and is not always effective. In addition, global efforts have also been initiated for the conservation of the snow leopard across the 12 range countries (i.e., the Global Snow Leopard and Ecosystem Protection Program [GSLEP] and National Snow Leopard and Ecosystem Protection Priorities [NSLEP; Snow Leopard Working Secretariat, 2013]). The GSLEP is a join initiative of 12-range countries aiming at strengthening conservation of snow leopard and the valuable high mountain ecosystems and landscapes. The GSLEP was formed based on 12 individual NSLEPs. In 2013, 12 snow leopard range countries and partners signed the Bishkek Declaration in Bishkek, Kyrgyzstan and agreed to the goal of the GSLEP for the seven years through 2020 and identified 20 snow leopard landscapes (Snow Leopard Working Secretariat, 2013) or in short − "Secure 20

by 2020" (www.globalsnowleopard.org). Initial findings from the present study were presented by (Maheshwari and von Meibom, 2016).

2.2. Literature search and market surveys

We followed Li and Lu (2014) for the systematic literature search, which included collating information on snow leopard illegal trade from published and unpublished sources (e.g., published scientific articles, newsletters, research reports, survey reports from the range countries, and the reputable national newspapers). From October 2013 to March 2015, we looked up combination of key words such as snow leopard illegal trade (Chinese "雪豹非法交易", Russian "снеЖная леопардная незаконная торговля") snow leopard poaching (Chinese "雪豹偷猎", Russian "браконьерство в снеЖноМ барсе"), snow leopard seizures (Chinese "雪豹缉获", Russian "изъятия снеЖного барса"), snow leopard skin for sale (Chinese "雪豹皮待售", Russian "снеЖная леопардная коЖа для продаЖи") and scientific name of snow leopard in Google, Baidu (Chinese web search engine) and TRAFFIC News Letters from central and south Asian countries and collected all snow leopard related poaching and trade reports from 2003 to 2014. Along with number of snow leopards, body parts, year, location of trade or poaching, we also recorded prosecution and conviction rate (if available) in each case. Prosecution rate indicates seizure cases ending successfully in trial, whereas conviction rate indicates seizure cases that ended in convictions and other penalties. In addition, we systematically searched the bibliography and news archive of the Snow Leopard Network (www.snowleopardnetowrk.org) for gathering information. Along with the survey, we also conducted limited market surveys in the animal fur markets of Kabul, Mazar-E-Sharif and Heart in Afghanistan in September 2014 (Maheshwari et al., 2016) and in Bishkek, Kyrgyzstan in October 2013. We selected these markets for surveys based on published and unpublished reports and also the fact that large sections of the markets specialize in fur and leather garments. We surveyed all the shops and interacted with the sellers. The exercise indicated trading of snow leopard parts and derivatives and looked for snow leopard skins and garments made of snow leopard skins in the markets. We also circulated questionnaires among various stakeholders (e.g., scientists, researchers, enforcement officials, non-governmental organizations, policy makers) to collect information on snow leopard illegal trade in different range countries (Appendix 1). We received a range of snow leopards trade observations from 2000 to 2014. Some respondents provided snow leopard trade or poaching in a range of numbers. For example, if a researcher reported an observation of 5−10 snow leopards offered for sale in 10 years, we assumed that five snow leopards were in trade or poached in a decade. Thus, the observations were made to estimate minimum number of snow leopards in trade (Li and Lu, 2014). Initial findings (Maheshwari and von Meibom, 2016) have been revalidated with the information received as responses on the questionnaires and published literature by cross examining with the database from the literature research to avoid duplications of trade records.

Based on the overall data, we maintained a database (the time and location of the trade or poaching, wherever available, and the number of snow leopard parts (carcasses/pelts/bones). The number and type of items (e.g., skin, head, skull, canines, claws, bones) if the parts or derivatives of the snow leopard were converted into garments or other products (e.g., coats, hat, rugs, wall hanging) were recorded factually. We checked the sources of information and removed the duplications of records after ascertaining reported published information, a recorded seizure or a market observation. We included such information in our database, which we considered a record. A 'record' constituted one snow leopard when a single seizure event was recorded or more than one snow leopards, when the market observation involved multiple animals.

3. Results

3.1. Snow leopard illegal trade

We obtained data in 11 of 12 snow leopard range countries. During 2003, 2014, we computed a 62 records of a minimum of 337 snow leopards in trade through literature search, while an additional 26 records of a minimum 102 snow leopards were recorded through questionnaires and market surveys. In total, we recorded presence of 439 snow leopards (88 records) in trade during 2003 and 2014 (Table 1) or an average of almost 36 individuals/year.

Of these 88 records, 42 (47.7%) were reported as seizures by enforcement agencies, however, these accounted for 156 (35.5%, n = 439) snow leopards detected in trade. In contrast, individual observations accounted for 38 records (43.1%, n = 88) of records, which represented 279 (63.4%, n = 439) of snow leopards in trade. China (50.6%) and Afghanistan (30%) together contributed 80.6% of the recorded volume of snow leopards in trade between 2003 and 2014.

Skins of snow leopard were the most frequently observed body parts in trade. Out of 88 records, 60 (68.1%) were of skins alone, whereas 12 records had bones, skull or skeletons with skins. We did not find any records of bones being traded in isolation of pelts. Two records were of live snow leopards smuggled each from the Afghanistan-Pakistan Border and the Tajikistan-Afghanistan border of the Pamir region (Gorno-Badakhshan). We recorded three instances of snow leopard skins being converted to products (i.e., rugs, fur-coat). We also recorded two records of whole bodies of snow leopards that were observed for sale in China and approximately 70 snow leopard claws offered for sale in the Xinjiang province of China. Furthermore, two live-trapped snow leopards were reported in the questionnaire from Tajikistan, which were taken alive to Dushanbe in 2014, died subsequently.

Table 1
Minimum number of snow leopards in trade across twelve range countries.

Snow leopard range country	Literature search: n = 334 (2003−2014)	Questionnaire surveys: n = 147 (2003−2014)	Total [a]
Afghanistan	119	13	132
Bhutan	7	0	7
China	164	58	222
India	7	0	7
Kyrgyzstan	1	3	4
Mongolia	21	4	25
Nepal	3	2	5
Pakistan	0	11	11
Russia	15	0	15
Tajikistan	0	6	6
Uzbekistan	0	5	5
Total	337	102	439

[a] Excluding 8 snow leopards (7 cases) outside the snow leopard natural range.

3.2. Legal proceedings for snow leopard trade

Of the 88 records, 40 were registered and qualified for legal proceedings within and outside the snow leopard natural range. Within the snow leopard range countries, we found 100% prosecution rate in India (6/6 cases), Nepal and Russia (1/1 case) followed by Mongolia (50%; 3/6 cases), Kyrgyzstan (50%; 1/2 cases), and China (47%; 17/36). Eight cases in China were convicted for imprisonment and penalties, whereas Afghanistan had lowest prosecution rate of 6.7% (1/15 cases).

3.3. Records of trade outside the snow leopard natural geographical range

We obtained seven records (accounting for eight snow leopards) outside the snow leopard natural range during 2003−2014. Australia, Dubai, Georgia, Netherlands, the UK and the US accounted for one record each and two snow leopard skins were observed on sale in Myanmar. Based on available information, countries outside snow leopard's natural range do not appear to be a significant market.

4. Discussion

4.1. Snow leopard poaching

Overall, there are three stressors working on the poaching of snow leopard: (i) commercial hunting pertaining to poaching and trade (Theile, 2003; Maheshwari and Niraj, 2016), (ii) retaliatory killing due to livestock predation by snow leopards (Oli et al., 1994; Mishra, 1997; Jackson and Wangchuk, 2004) and (iii) opportunistic killing (Paltsyn et al., 2012). Importantly, altogether all three poaching types may cause potentially serious decline of snow leopard population. There is a likelihood of a link between commercial hunting and retaliatory killing (i.e., if snow leopards are being killed for retaliation but may be later sold for monetary benefits; Maheshwari, unpublished data), which can accelerate losses.

Keeping in view secretive nature and poor detection rate, our data indicate that illegal trade remains one of the major threats to snow leopard throughout its range. Based on present analysis, 447 individuals are the minimum number of snow leopards recorded in trade between 2003 and 2014. The data gathering process was systematic, however, no information could be obtained from Kazakhstan.

4.2. Sentencing and conviction for snow leopard trade

The United Nations Office on Drugs and Crime (UNODC, 2016) advocated that seizures are not the only evidence of wildlife crime, the seizure data should be supplemented with other criminal justice data, including information derived from arrests, prosecutions, and convictions. Hunting and trade of snow leopard is prohibited by national laws in all 12 range countries (Dexel, 2002; Theile, 2003; Maheshwari and Niraj, 2016), however, we found 50% prosecution rate of snow leopard crimes resulting in only 20% convictions in the cases, where convictions and sentencing were awarded. Many prosecution efforts failed, as collecting evidences in remote location would be difficult. We conclude that data obtained during this study will likely present only a portion of the actual poaching and trade levels due to various reasons (UNODC, 2016). Nevertheless, considering all the above factors, a loss of approximately 8% snow leopard population in a decade due to illegal trade could be a serious threat to the overall population. A constant monitoring of the market using active intelligence would be important. Legislative and policy support with allocation of more resources to snow leopard protection would be a significant step. The low prosecution and conviction rates could be serious impediment in the anti-poaching and anti-illegal trade strategies in protecting the snow leopard. High financial rewards and low risk of detection of the crime create an incentive to commit further crimes, and hence, there is a need at all levels of the judiciary to use the full range of prescribed punishment and

penalties in crimes related to snow leopard. We further state that there is an overall decline of presence of snow leopard skins (fur, coats and other products) in the exotic and fashion leather industry in recent years possibly as a result of greater awareness about snow leopard conservation and in general on conservation of global biodiversity. However, we do not eliminate the possibilities of snow leopard trade occurring under cover.

4.3. Conservation implications

One of the important notes for future studies could be to quantify the range-wide total loss of snow leopards due to retaliatory killing. Looking at retaliatory killing in conjunction with trade affected cases will certainly multiply the total number of snow leopards lost on a given time scale.

In recent years, there has been a growing international interest and attention to snow leopard conservation across the globe, and particularly in entire Asia's high mountain regions. The Bishkek declaration, 2013 clearly stated that '*Take firm action to stop poaching and illegal trade of Snow Leopards and other wildlife by adopting comprehensive legislation, strengthening national law-enforcement systems, enhancing national, sub regional, regional and international collaboration and developing effective mechanisms to eliminate the illegal demand for Snow Leopard and other wildlife products*' (Snow leopard Working Secretariat, 2013). Therefore, it is indeed important to flag the illegal trade issues to curb poaching and trade in snow leopards, enhance cross-border cooperation and facilitate sharing data and information on snow leopard illegal trade. Investigations related to snow leopard crimes remain orthodox with hardly any applications of newer tools, e.g., forensics and DNA barcoding. Professional management of snow leopard related crime investigation with use of advanced forensics and DNA based techniques could help three aspects-confirming the species from the specimens seized, locating the geographical region from which the specimens were derived, and assessing the impact of the loss to the local population. A comprehensive strategy to mitigate the poaching element of snow leopard conservation at the landscape level or the global level will have development of DNA and wildlife forensics as significant tools to enhance the snow leopard conservation. Creating a sound reference library and standardisation of investigative protocols could be important first steps to achieve the global objective. Similarly, a systematic demand reduction campaign for the snow leopard products in the regions known for high demands could be an important strategy to save the species from poaching and illegal trade.

Author contributions statement

AM and SKN designed the study. AM compiled and analysed that data and carried out the market surveys. AM and SKN contributed critically to the drafts and gave final approval for publication.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.gecco.2018.e00387.

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