

TRAFFIC

the wildlife trade monitoring network

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AN ASSESSMENT OF TRADE, MORTALITIES
AND ANTHROPOGENIC THREATS FACING

LIONS IN TANZANIA AND MOZAMBIQUE

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TRAFFIC REPORT

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EXECUTIVE SUMMARY

THE UNREGULATED AND ILLICIT TRADE OF WILDLIFE PRODUCTS AND DERIVATIVES POSES A SIGNIFICANT THREAT TO THE LONG-TERM VIABILITY OF TAXA SUCH AS WHITE RHINOCEROS *CERATOTHERIUM SIMUM*, AFRICAN ELEPHANTS *LOXODONTA AFRICANA*, AND THE AFRICAN LION *PANTHERA LEO*.

In recent years, several studies have highlighted concerns about an emerging and increasing trade in African Lion parts and derivatives both domestically within African countries, and internationally to Asian markets. However, the extent and impact of this trade on lion populations in Africa remains undocumented across most of their range. African Lion numbers are in decline primarily due to anthropogenic influences such as retaliatory killing by humans, depletion of their prey-base due to the bushmeat trade, habitat loss and conversion, and poorly regulated trophy hunting. Understanding the additional impact of trade on wild lion populations is critical for current and future conservation of the species.



African Lion numbers are in decline primarily due to anthropogenic influences

In this study, TRAFFIC aimed to provide a greater understanding of the impact of harvest and trade on wild lion populations in two countries that have been identified as potential countries of concern, Tanzania and Mozambique. The report followed a non-detriment finding outline and utilised information on threats, biological characteristics, national status, management and monitoring, as well as data gathered from

TRAFFIC's Wildlife Trade and Information System (WITIS); grey and published scientific literature; interviews with wildlife authorities and organisations, professional hunters, local community members; and trade data collected from government institutions and customs authorities. Aspects of trade which were investigated and reported on include: the perceived trade of lion parts both domestically and internationally; the extent and scale of both domestic and international trade in lion parts and derivatives, either sourced from legally or illegally harvested lions; the geographic extent of the illegal trade; and the location of potential poaching and trade "hotspots" within both countries (Tanzania and Mozambique). The data gathered were then used to deduce the potential impacts of harvest and trade on the current lion populations within each country.

In Tanzania, the results illustrate that the majority of lion parts and derivatives are used and traded locally and have, most likely, been acquired for traditional use through historic and present-day retaliatory killings. Distinct within-country regional differences existed with regards to lion product use. Skin, tail and fat were the

preferred products used in northern Tanzania, whilst central Tanzania had a preference for fat followed by claws and skin. In southern Tanzania fat was used widely. Poaching data for Tanzania were severely deficient and likely grossly underestimated. While the figures on domestic, regional, and international trade recorded in this study only represent a portion of the documented lion mortalities, a disparity exists between the declines predicted by the International Union for Conservation of Nature (IUCN) and the Tanzania Wildlife Research Institute (TAWIRI). These findings suggest that either the full extent of trade is not being detected or anthropogenic lion mortalities (i.e. poaching, retaliatory killings) are not being adequately reported.

In Mozambique, the data indicate that targeted poaching and suspected poaching incidences are high (74% and 48% of anthropogenic lion mortalities in Niassa and Limpopo National Park respectively) with evidence of domestic, regional, and international trade of lion parts and derivatives. Slight regional differences existed within-country with regards to lion product use. Claws, teeth and skin were the preferred products used in northern Mozambique, whilst communities in southern Mozambique showed a preference for fat followed by skin and claws. Considering the local decline in lion populations (Niassa and Limpopo National Park), their relatively low abundance in the country, and the significant number of targeted poaching events within core lion ranges, the current impact of both domestic and international trade in lion parts and derivatives on wild populations in Mozambique was found to be high and detrimental to Mozambique's lion populations and species persistence. If these

events continue on the current trajectory, Mozambique's wild lion populations will become increasingly threatened.

Teeth and claws were the most common, internationally traded lion commodity from both Tanzania and Mozambique. The most common destinations for these lion parts were Asian countries, specifically Viet Nam. It is plausible that the ease with which lion teeth and claws can be collected and concealed makes the trade of these products less risky to move and transport regionally and internationally. This finding suggests a new modus operandi for lion poaching.

Levels of poaching and trade differ between Tanzania and Mozambique. In Mozambique targeted poaching for parts is substantial, involving mainly claws, teeth and skin with evidence of trading towns in northern Mozambique. Products used domestically and internationally correspond with parts that are targeted during poaching events, indicating a potential international demand driving illegal local harvesting. These targeted poaching incidences are a threat to Mozambique's lion population. Results suggest that Tanzania's lion trade is predominantly domestic and regional. Lion product use for traditional purposes is widespread and interviews suggest that the source of products is from current and historic retaliatory killings. Retaliatory killings make up the vast majority of anthropogenic lion mortalities and are having a marked negative impact on population numbers. There is also qualitative evidence for targeted poaching incidences which may be occurring in the Ruaha-Rungwa region, however empirical data are lacking.



teeth and claws

are the most commonly traded lion products internationally

asian countries

are the most common international destination for lion parts sourced in both countries



RECOMMENDATIONS:

BASED ON THE FINDINGS OF THIS STUDY, THE CRITICAL RECOMMENDATIONS FOR

TANZANIA ARE:

GENERAL

To address the substantial numbers of retaliatory killings that are likely to be occurring across Tanzania, more monitoring agencies are needed in key lion areas such as the Selous region. These agencies could include NGOs, tourism companies or government staff to assist with monitoring of lions and collaborate and support communities to reduce human-lion conflict.

The Tanzania Government should amend the current hunting regulations to prohibit any lion hunts where lions are younger than the six-year minimum age restriction.

The Tanzania Government should adjust trophy hunting fees to charge hunting operators per lion hunt and refrain from charging a yearly fee regardless of offtake.

TANZANIA WILDLIFE RESEARCH INSTITUTE

TAWIRI needs to develop an updated Conservation Action Plan specific to the African Lion in Tanzania. The updated Action Plan should have a specific focus on updating current lion population estimates to ensure that regular lion surveys and monitoring programmes are implemented across the country.

The Tanzania Government should strengthen management of protected areas (PAs) with specific emphasis on vacant hunting blocks where management is compromised and consider pursuing Public-Private Partnerships for PA management in areas where no support or management exists.

The activities that have been achieved in the current Carnivore Action Plan (TAWIRI, 2009) need to be consolidated by TAWIRI and the existing activities updated, paying attention to ensure that all activities are accountable, timely, and conducted regularly.

Border control and customs officers at all ports (i.e. sea, land, air) need to improve detection measures to ensure that all illegal trade is uncovered and information is gathered on trafficking routes and commodities in demand. The relevant agencies (TAWA and the Tanzania Customs Authority) need to allocate additional resources towards staff training in detection and screening techniques and technologies, while institutional collaboration needs to be improved to ensure that seizure data are accurately stored and accessible to those needing to access them.

TANZANIA WILDLIFE MANAGEMENT AUTHORITY

TAWA should facilitate workshops and meetings within wildlife authorities, relevant conservation organisations and communities to boost awareness of the threat of lion poaching and trade.

TAWA should develop a country-wide database for compiling and storing data on lion poaching incidents.

TAWA should identify key wildlife authorities in areas recognised as potential trade/poaching "hotspots" such as the Ruaha-Rungwa region and the Ruvuma landscape and assist law enforcement and anti-poaching efforts in these areas to ensure that lion mortalities are reduced.

Law enforcement agencies should collaborate with wildlife authorities and make full use of wildlife legislation to prosecute criminals. Tanzania should rate its success in countering illegal wildlife trade by the number of successful prosecutions, in addition to the detection of lion parts and derivatives at ports of entry and exit.

Relevant enforcement agencies such as TAWA need to strengthen work on anti-trafficking and investigations related to the illegal wildlife trade.

TANZANIA GOVERNMENT

CUSTOMS AND LAW ENFORCEMENT

CRITICAL RECOMMENDATIONS FOR MOZAMBIQUE ARE:

It is a necessity that Administração Nacional das Áreas de Conservação “National Administration for Conservation Areas” (ANAC) improves regional lion management by providing support for research and programmes which promote lion conservation, reduce human-lion conflict, conserve lion habitats and prey base, increase law enforcement and reduce illegal trade and strengthen community programmes.

ANAC should provide a progress report on activities (and their implementation) listed in the 2016 Conservation Strategy and Action Plan for the African Lion. Subsequent to this progress report, activities in the Action Plan should be consolidated and realistic and achievable goals set for lion conservation and management.

Although ANAC has a formal national trophy hunting regulation, we encourage the Mozambique government to increase monitoring of legal hunting to ensure that legal lion harvest is sustainable throughout the country.

ANAC should facilitate workshops and meetings to increase collaboration between different conservation organisations and wildlife authorities. These workshops could be used as a platform to strategise and devise methods and steps to reduce and mitigate lion poaching and trade.

Areas which have been identified as potential trade/poaching “hotspots” require further investigation and immediate action. ANAC needs to identify and provide support to key wildlife authorities in areas such as the Ruvuma landscape, Limpopo National Park and Niassa Special Reserve to help increase levels of law enforcement and anti-poaching to ensure that lion trade is reduced. Covert investigations should be undertaken to examine and understand the extent of trade in lion parts and derivatives, trade routes, and the actors involved in these areas.

Border control and customs officers at all ports (i.e. sea, land, air) need to improve detection measures to ensure that all illegal trade is being uncovered and information is gathered on trafficking routes and commodities in demand. The national government should allocate additional resources to training staff in detection and screening techniques and technologies. Increased institutional collaboration between the Mozambique Customs Authority and ANAC is needed to ensure that seizure data are accurately stored and accessible to those needing to access them.

Law enforcement agencies should collaborate with wildlife authorities and make full use of wildlife legislation to prosecute criminals. Mozambique should rate its success in countering illegal wildlife trade by the number of successful prosecutions, in addition to the detection of lion parts and derivatives at ports of entry and exit.

Increased support and resources are needed for tackling illegal wildlife trade in Mozambique. ANAC should co-ordinate with organisations such as the PAMS foundation and Wildlife Crime Prevention (WCP) to support investigations and anti-trafficking measures.

The management of protected areas (PAs) should be strengthened by ANAC, with specific emphasis on vacant hunting blocks where management is compromised. ANAC should consider pursuing Public-Private Partnerships for PA management in areas where no support or management exists.

INTRODUCTION

THE AFRICAN LION *PANTHERA LEO* WAS ONCE WIDELY DISTRIBUTED ACROSS THE AFRICAN CONTINENT WITH AN ESTIMATED POPULATION OF 450,000 IN THE 1940S. TODAY THE TOTAL LION POPULATION, APPROXIMATELY 20,000 INDIVIDUALS, OCCUPIES A FRACTION OF ITS FORMER RANGE AND POPULATIONS ONLY PERSIST IN AREAS THAT ARE INTENSELY MANAGED (BAUER *ET AL.*, 2015; BAUER *ET AL.*, 2016).

The species is listed as Vulnerable on the Red List of the International Union for Conservation of Nature (IUCN) and in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).





Lions are apex predators and play a central role in maintaining a functioning ecosystem at all trophic levels. The removal of lions or declines in population numbers in an ecosystem often results in “predator-mediated trophic cascades”, where other wildlife is negatively affected by the absence of large carnivores (Green et al., 2018; Everatt et al., 2019a). Their occupancy at the highest trophic levels, large spatial requirements, and their relatively low numbers compared to prey species also makes lions excellent ecological indicators of disturbances and ecosystem functionality for large protected area networks (PANS) (Ripple et al., 2014; Watson et al., 2014).

African Lion numbers are in decline across most of their range except in a few southern Africa countries, namely Botswana, Namibia, South Africa, and Zimbabwe (Bauer et al., 2015). These declines are primarily due to anthropogenic influences such as retaliatory killing by humans in response to livestock or human deaths (Ikanda and Packer, 2008), depletion of their prey base due to the bushmeat trade (Lindsey et al., 2013b), habitat loss and conversion (Riggio et al., 2013), and poorly regulated trophy hunting (Packer et al., 2009; Packer et al., 2011). In recent years, a new threat has also emerged: the trade in lion parts and derivatives (IUCN 2006a,b, Bauer et al., 2016).

Several studies have highlighted concerns about the emerging and increasing trade in African Lion bones and derivatives both domestically within African countries, and internationally to Asian markets (Williams et al., 2015; Williams et al., 2017). The African Lion bone trade has complex drivers, spanning multiple countries with a diverse array of cultures. Much of this trade has been attributed to traditional medicine practices in Africa and Asia (Bauer et al., 2016). Across the African continent, lion parts such as claws, skin, bones, teeth and fat are often used in traditional ceremonies and rituals, medicines, and decorations (Williams et al., 2017), spurring a now illegal domestic trade. South Africa (as a major legal exporter of lion bones) had seen an increase in the international legal export of lion bones and skeletons to East and Southeast Asia (2017: 800 skeletons; 2018: 1,500 skeletons), although the trade was ruled unlawful and frozen by a court order in 2019 (Venter, 2019). These lion bones were reportedly being used as

substitutes in tiger wine or “bone strengthening wine”; a knock-on effect seemingly related to the heightened protection of tigers in the early to mid-2000s (Williams et al., 2015).

While the impact of this trade in lion parts and derivatives is negligible for South African wild lion populations, the impact on other populations outside of South Africa is largely undocumented and unknown (Williams et al., 2015). Numerous seizures of illegal lion body parts across various African countries where wild populations exist, along with increased reports of lion poaching incidences, suggest that these trades may pose a significant threat to several populations across Africa (2004–2014 data from UNEP-WCMC in Funston et al., 2016). Those populations thought to be most at risk are in East Africa, where lion populations have decreased by almost 60% in the past two decades (Bauer et al., 2016).

In 2015, Williams et al., (2017) undertook a pan-African questionnaire and literature survey to investigate the domestic and international trade and consumption of lion body parts across current and former African Lion range states. During this study, lion experts were consulted to assess traditional medicinal practices (in Africa and Asia), as well as perceived international and domestic trade and use of lion parts and derivatives. Findings from the surveys suggested that while the impact of international trade on wild populations may be high, it remained mostly undocumented. As a result, the domestic trade of lion parts was perceived to pose a more significant impact on wild lion populations than the international trade. To monitor the potential impacts further, 17 countries of concern were identified. These countries included Mozambique and Tanzania. Tanzania is a lion stronghold, containing more than 40% of the African Lion population (Riggio et al., 2013). Historically, lions were widespread in Tanzania (Mesochina et al., 2010). Today they are still widely distributed in relatively large numbers, but some populations are decreasing and becoming increasingly fragmented. Some 37% of Tanzania’s surface area is designated for protection of biodiversity in mostly unfenced reserves; however, trophy hunting occurs in 86% of this entire protected area network (Brink et al., 2016).

Mozambique is a country with a complicated history, ravaged by civil war spanning many decades (1977–1992). During these times as well as post-war, poverty was high, wildlife poaching was rife, and many wildlife populations were decimated (Bouley et al., 2018). Since then, conservation efforts have increased, and many organisations are working to restore conservation areas with species that were once omnipresent (Bouley et al., 2018). Due to this complex history, lions are facing both direct and indirect pressures during their

recovery. Mozambique's National Parks and protected areas are unfenced and often have communities living within the parks' boundaries where large areas are used to cultivate crops, graze cattle, and gather food (Everatt et al., 2019a). Bushmeat poaching of ungulates is also widespread across these protected areas, and in some areas of Mozambique, lions are targeted for their body parts (Everatt et al., 2015; Everatt et al., 2019b), or persecuted for livestock depredation.

OBJECTIVES OF THIS STUDY:

In this report, TRAFFIC investigated the extent of trade and harvest of lions in Tanzania and Mozambique. Interviews and consultations were conducted to investigate the presence, extent, and scale of domestic and international trade and harvest in both countries, specific considerations are listed to the right.

The report has been structured to provide a multi-factorial analysis based on the non-detriment finding (NDF) format of Rosser and Haywood (2002). As reliable data are patchy, TRAFFIC's aim was to use information on threats, biological characteristics, national status, management, monitoring, and the impact of legal, illegal, and unregulated harvest and trade to produce an assessment of the impact of these activities and associated parameters on the wild lion populations of Tanzania and Mozambique.

- 1. The perceived trade of lion parts, both domestically and internationally.**
- 2. The extent and scale of the domestic trade in lion parts and derivatives.**
- 3. The extent and scale of the international trade of lion parts and derivatives, either sourced from legally or illegally harvested lions.**
- 4. The geographic extent of the illegal trade and harvest of lions within Tanzania and Mozambique and the location of potential poaching and trade "hotspots".**

ACRONYMS AND ABBREVIATIONS

ANAC	Administração Nacional das Áreas de Conservação “National Administration for Conservation Areas” (Mozambique)
CDV	Canine Distemper Virus
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
HLC	Human-lion conflict
IUCN	International Union for Conservation of Nature
NCP	Niassa Carnivore Project
NDF	Non-Detriment Finding
NGO	Non-Governmental Organisation
PAC	Problem Animal Control
PANS	Protected Area Networks
SANBI	South African National Biodiversity Institute
SSC	Species Survival Commission
TANAPA	Tanzania National Parks Authority
TAWA	Tanzania Wildlife Management Authority
TAWIRI	Tanzania Wildlife Research Institute
WCS	Wildlife Conservation Society
WD	Wildlife Division of the Ministry of Natural Resources and Tourism
WiTIS	Wildlife Trade and Information System
WMA	Wildlife Management Area
UNCAC	United Nations Convention against Corruption
UNODC	United Nations Office on Drugs and Crime



LITERATURE REVIEW



GENERAL

BIOLOGICAL CHARACTERISTICS OF LIONS

HABITAT AND ECOLOGICAL ADAPTABILITY

Lions commonly inhabit savannah habitats across the African continent (Riggio *et al.*, 2013); however, lions are not limited to a particular habitat and can adapt to survive in a variety of different landscapes and ecosystems, including semi-arid to arid environments (Bauer *et al.*, 2016). Some lion populations have also been known to occur in the savanna-forest biomes of Gabon and Congo (Henschel, 2009). Ecological adaptability refers to the degree to which a species can adapt (i.e. habitat, diet, etc.). When compared to other mammalian carnivores,

lions can be considered as generalists as they are not restricted to one habitat or prey species (Government Gazette No. 41393, 2018). While hunting success is dependent on habitat types, for example, longer grass (Funston *et al.*, 2001) or increased cover (Hopcroft *et al.*, 2005), lions do have the ability to adjust their hunting strategies to hunt in new habitats. Lions can readily adapt and recover from various disturbances (Trinkle *et al.*, 2017), for example, population bottlenecks and disease (Packer *et al.*, 1991).

DISPERSAL EFFICIENCY

Lions are the most social species of the Felidae family, living in fission-fusion family groups called prides (Kotze *et al.*, 2018). Related females tend to stay in their prides for their entire life, while male offspring will leave their natal prides and go in search of their own prides when they are about four years old (Trinkle *et al.*, 2017). As such, lions have large spatial requirements with vast home ranges and territories spanning hundreds of square kilometres (Macdonald and Sillero-Zubiri, 2002; Stolton and Dudley, 2019). Overall, lions are not considered good dispersers. In many cases, these dispersal events result in male lions entering high-risk environments outside of protected areas (Trinkle *et al.*, 2017).

From a genetic viewpoint, the ability to disperse between populations is a crucial factor in retaining the genetic viability of populations at a landscape level by decreasing the likelihood of inbreeding and disease (Cushman *et al.*, 2018).

To maintain dispersal pathways, it is essential to maintain habitat connectivity through protected areas and corridors (Cushman *et al.*, 2015). Many factors will influence the dispersal efficiency of lion populations; these include protected area size, the availability of wildlife corridors, as well as human-wildlife conflict (Cushman *et al.*, 2018). Space is a rare commodity in most African countries, with wildlife and humans often competing for space and resources. What space is available is often fragmented and transformed (Macdonald and Sillero-Zubiri, 2002). Cushman *et al.* (2018), suggest that “many existing protected areas are too small to support large populations and are therefore unlikely to be viable in the long term.” These small, protected areas promote isolated populations that have no means of dispersal and may ultimately cause reduced reproductive rates (due to inbreeding), and increased vulnerability to disease (Kissui and Packer, 2004).



lions are long-lived

often living longer than 12 years in the wild

social cats

they live in fission-fusion family groups, females tend to stick with one pride for a lifetime

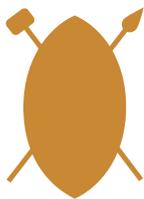
LIFE HISTORY

Lions are long-lived, with males and females often living longer than 12 years of age in the wild (Packer et al., 1988). Generally, lionesses give birth to between 1–4 cubs (Packer and Pusey, 1995) with a gestation period of approximately 110 days (Rudnai, 1973). Cubs are weaned

after 6–8 months (Packer and Pusey, 1983). Conception can take place from two years of age (Rudnai, 1973) with intervals between litters averaging two to three years. As a result, lions are considered to have a low reproductive rate and are sensitive to over-utilisation.



Young Maasai men and boys are often responsible for protecting cattle from predators and herding their cattle to appropriate food and water sources



Ala-mayo
a traditional
Maasai culture
that included a rite
of passage where
young men would
hunt and kill a lion

INTERACTION WITH HUMANS

Lions thrive within protected area networks where human interactions are limited. However, threats such as habitat loss, disturbances, and conversion of wilderness areas are all having a negative effect on lion ranges across Africa (Riggio *et al.*, 2013). These culminating threats often lead to lion populations becoming susceptible to fragmentation across their landscapes which in turn means that populations often display a metapopulation structure. Dolrenry *et al.* (2014) state that these metapopulations are

“distinct populations within a wider landscape with limited migration between them.” Thus, in addition to trade impacts, lions are susceptible to these fragmentation disturbances. Reduced or fragmented habitat often results in increases in human-lion interactions and livestock encounters. In these complex landscapes of coexistence, humans are having a detrimental effect on lion population numbers and are contributing towards their decline both directly and indirectly (Oriol-Cotterilletal *et al.*, 2015; Suraci *et al.*, 2019).

MAJOR THREATS

DIRECT THREATS FACED BY LIONS EXCLUDING REGULATED HARVEST

TARGETED POACHING

Traditional medicine and commercial use of lion parts are driving an unsustainable trade in lion parts and derivatives across Africa (Williams *et al.*, 2015). In some areas, lions are falling victim to targeted poaching for parts (Mesochina *et al.*, 2010; Everatt *et al.*, 2019b) and this, along with other significant threats facing lion populations, is adding to population declines in most African countries.

RITUAL/ CULTURAL KILLING

In Africa, several cultures have strong traditional links with the lion. In the Maasai culture, for example, it is a tradition for young men to hunt and kill a lion as a rite of passage to adulthood (Ikanda and Packer, 2008; Mesochina *et al.*, 2010). These hunts are traditionally referred to as “Ala-mayo.” This form of lion hunting was banned in the 1970s (Ikanda and Packer, 2008); however, many people believe it still occurs in secret. According to the literature and also reported during interviews carried out for this study, lion products collected are the tail, paws, and mane (Mesochina *et al.*, 2010). These products are used in the celebrations, following which the tail and paws are discarded (Mesochina *et al.*, 2010). Traditional lion hunting also occurs in other local pastoral tribal groups, but it is not well documented.

RETALIATORY KILLING

In areas where humans and wildlife co-exist, carnivores such as the African Lion are often killed in retaliation for predation on domestic livestock (Kissui, 2008). In East Africa, for example, in the Maasai culture, family wealth is measured in cattle numbers, and thus depredation is often a cause of conflict (Ikanda and Packer, 2008).

In most cases retaliatory killings will happen in areas adjacent to protected areas where lions occur in large numbers (Bauer *et al.*, 2016; Eustace *et al.*, 2019). With human population numbers on the rise, it is easy to see why there is an increase in human-wildlife conflict as humans and wildlife compete for space and resources.

ROADKILL

In some areas, national highways cut through National Parks and reserves. On these national roads, people are negligent and do not obey the speed limits.

This leads to numerous unnecessary deaths due to animals being hit by vehicles. In countries where protected areas are often unfenced and major roads intercept protected areas, incidents of roadkill are a common occurrence (Kioko *et al.*, 2015).

retaliatory killings for predation on domestic livestock are common in areas where lions and humans co-exist



commercial use and traditional medicine are driving an unsustainable trade in lion parts and derivatives across Africa

UNREGULATED TROPHY HUNTING

Sport hunting is a multifaceted practice in those African countries that still allow it. On the one hand, hunting blocks conserve vast amounts of land for wildlife, which under different circumstances may have been used for agriculture and grazing (Brink *et al.*, 2016). The hunting blocks may also provide economic benefits to neighbouring communities (Brink *et al.*, 2016). However, there are also many negative facets of trophy hunting. When lions are hunted

for sport, it is the mature males that are targeted (six years and older). In social cats such as lions, this can create a situation of abnormal male replacement that can lead to high levels of infanticide (Packer *et al.*, 2009; Lindsey *et al.*, 2012). Unmanaged or unregulated trophy hunting can lead to unsustainable offtake which can have a negative impact on lion densities (Lindsey *et al.*, 2012; Brink *et al.*, 2016).

PROBLEM ANIMAL CONTROL (PAC)

Lions are prone to conflict with humans, whether it be killing livestock or in some cases, people. Problem Animal Control (PAC) is a measure used to mitigate this conflict (Mesochina *et al.*, 2010). When human-lion conflicts (HLC) occur, wildlife authorities, village game scouts, or game officers are called out to assess the damage caused by the lions and if deemed necessary, remove the individual. PAC can be challenging to implement as the lions may have already moved out of the area by the time the wildlife authorities arrive (Mesochina

et al., 2010). In many cases, only the livestock carcasses are discovered and reported, or in other cases, if lions are encountered, they are chased away. In many incidences where villages are isolated, and wildlife authorities lack the human resources to send a representative out to assess the situation, these “problem” lions face persecution and are often killed or injured by villagers themselves (retaliatory/revenge killings). According to Mesochina *et al.* (2010), PAC is a viable option if it is implemented correctly.

DISEASES

Diseases such as bovine tuberculosis and canine distemper are a threat to lion populations (Mesochina *et al.*, 2010). Canine distemper virus (CDV) is a severe and often fatal disease (Myers *et al.*, 1997). Outbreaks have been recorded in Ngorongoro Crater, Tanzania as well as in the Serengeti ecosystem (Kissui and Packer 2004). The Ngorongoro Crater lion population is isolated due to geographic barriers making this population more susceptible to inbreeding and diseases such as CDV (Kissui and Packer, 2004; Mesochina *et al.*, 2010). Increasing human populations, and thus domestic dogs (the supposed reservoir for CDV in northern Tanzania), around the crater are creating the perfect environment for CDV to be transferred to the isolated crater lions (Kissui and Packer, 2004; Mesochina *et al.*, 2010). This relatively

small population does not fare as well with disease outbreaks when compared to larger, less isolated populations like the Serengeti lions (Kissui and Packer, 2004; Mesochina *et al.*, 2010).

Lions are also susceptible to bovine tuberculosis, a disease which is closely linked to bovine species such as cattle and buffalo (Michel *et al.*, 2006). Buffalo is one of the top prey for lions and therefore this disease can spread to lion prides after lions consume infected buffalo meat from herds which have a prevalence of bovine tuberculosis (Michel *et al.*, 2006). When bovine tuberculosis is present in a pride it can have many adverse effects, one of which is reduced breeding success (Michel *et al.*, 2006).



Part of a team conducting the lion census in Tsavo East National Park, Kenya



A vet tries to save young male lion, poisoned after eating a poisoned carcass poisoned by local cattle herders

INDIRECT THREATS FACED BY LIONS EXCLUDING REGULATED HARVEST

PREY-BASE DEPLETION

The illegal bushmeat trade occurs in many countries across Africa (Lindsey et al., 2013b). Bushmeat has become an essential source of protein and income generation for countless people living in rural areas (Lindsey et al., 2013b). Wildlife was first targeted in areas where there was little protection. However, as areas surrounding protected areas become over-utilised, protected areas are becoming negatively affected by unsustainable bushmeat poaching (Lindsey et al., 2013b). There is a delicate balance in the predator-prey ecosystem relationship. The illegal bushmeat

trade is considered a significant factor which adversely affects this predator-prey interaction due to excessive hunting of certain ungulate species (Lindsey et al., 2013b). This can, in turn, have drastic consequences for predator species that also rely on these prey populations (Macdonald and Sillero-Zubiri, 2002). In Mozambique, human population numbers are high, thus causing competition for the same “prey” resource. In future, over-utilisation of prey species will reduce their abundance and, in turn, lion numbers if this relationship is not managed (Bauer et al., 2015).

HABITAT LOSS DUE TO HUMAN ENCROACHMENT

One of the main threats to lion conservation is the issue of habitat loss and conversion of natural habitats to support growing human populations (Ripple et al., 2014; Watson et al., 2014).

Lions do not cope well in human-modified landscapes or areas with high human density. With an increasing human population comes

an intensification of the resources needed to sustain more people. These resources could be in the form of grazing land for cattle or fields for cultivation, both of which transform and fragment natural habitats (Ripple et al., 2014). For protected areas that are unfenced, encroachment into these natural areas is a common occurrence. Packer et al. (2011) found high human populations around wildlife



bushmeat

depletes prey for lions but is an essential source of protein/income for rural communities

areas in Tanzania and concurrent declines in prey species (herbivores). Thus, people and carnivores are competing for the same limited space and resources, which makes lions

extremely susceptible to persecution due to increased contact and possible conflict with livestock (Ripple *et al.*, 2014).

INDISCRIMINATE KILLING (SNARING/GIN TRAPS)

Lions are often the indirect casualty of poaching traps used to capture or kill wildlife for bushmeat.

In particular, wire snares and gin traps pose a significant threat to lions (Mesochina *et al.*, 2010, Figure 1). This method of poaching is indiscriminate, and even if a lion manages to

break free, the snare often remains attached to its victim and can cause fatal injuries if left untreated. Gin traps are still the preferred method of poaching in many areas in Mozambique. Lions caught in gin traps often lose their paws but have been known to recover and live on three legs.

gin traps are the preferred method of poaching lions in many areas of Mozambique

FIGURE 1

A lion that lost its paw and died due to a gin trap



NATIONAL STATUS OF LION POPULATIONS

TANZANIA: ABUNDANCE, DISTRIBUTION, AND POPULATION TRENDS

Tanzania is a lion stronghold, containing more than 40% of the African Lion population (Riggio *et al.*, 2013). Using population data provided by TAWIRI, seven broad lion ranges were identified across Tanzania (Table 1; Figure 2). The majority of their distributions occur within Tanzania's protected area network, which covers approximately 37% of the landscape (Figure 2).

Population strongholds with estimates greater than 1,000 include Selous, Ruaha-Moyowosi-Ugalla-Rukwa-Katavi, and the Maasailand populations, the Selous population being the largest (Figure 2). The latest population estimates place the current national population at approximately 13,818 lions (Table 1).

FIGURE 2

African Lion *Panthera leo* distribution across the United Republic of Tanzania. Lion population data provided by the Tanzania Wildlife Research Institute (TAWIRI) and the IUCN SSC Cat Specialist Group, 2018. Lion population distributions (brown, labelled 1–7) and population estimates (1–7) are summarised in Table 1. Data source for lion distribution: *Panthera* and WCS 2016.

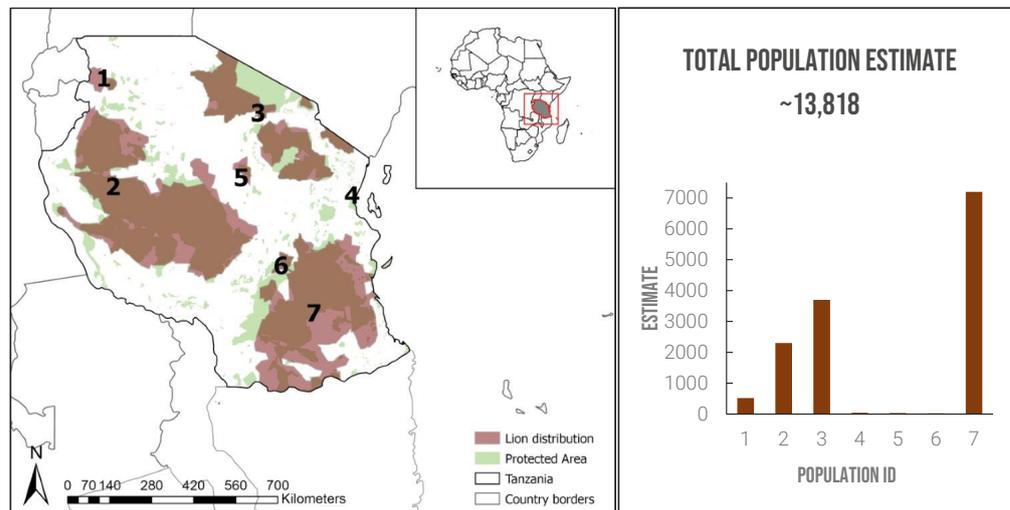


TABLE 1

Tanzania African Lion *Panthera leo* population estimates

ID	LION AREA	POPULATION SIZE	STATUS	YEAR OF SURVEY	SOURCE/REFERENCE
1	North-western Tanzania	520	unknown	2010	TAWIRI, 2016b
2	Ruaha, Moyowosi, Ugalla, Rukwa-Katavi,	2,300	unknown	2010	TAWIRI, 2016b
3	Maasailand	3,700	declining	2015	TAWIRI, 2016b
4	Saadani	40	unknown	unknown	D. Guthrie pers. comm.
5	Swaga Swaga	33	unknown	2010	Mésochina <i>et al.</i> , 2010
6	Udzungu	25	unknown	2010	Mésochina <i>et al.</i> , 2010
7	Selous Ecosystem	7,200	stable	2015	TAWIRI, 2016b
TOTAL		13,818			

MOZAMBIQUE: ABUNDANCE, DISTRIBUTION, AND POPULATION TRENDS

According to the IUCN Species Survival Commission (SSC) Cat Specialist Group, (2018), there are five lion populations distributed across Mozambique (Table 2; Figure 3). These populations are clustered in southern Mozambique (Limpopo National Park/Banhine National Park), central Mozambique (Gorongosa, surrounding Coutadas and Tete province) as well as northern Mozambique (Niassa and surrounding Hunting Blocks). Niassa Special Reserve has the highest population of lions with between 800–1,000 individuals (Niassa Carnivore Project, 2018), followed by central Mozambique (including Tete province) ~290 individuals (Jacobson *et al.*, 2013; Bouley *et al.*, 2018). Southern Mozambique has the smallest

population of lions (~ 34 individuals) which occur within Limpopo National Park (Everatt *et al.*, 2014). Limpopo National Park forms part of the Greater Limpopo Transfrontier Park (GLTP); a more extensive ecosystem which also includes Kruger National Park, Banhine, Zinave, and Gonarezhou National Parks. As a result, population numbers will likely fluctuate over seasons and years as lions move between these protected areas. Niassa Special Reserve is considered a stronghold for lions, with several older reports estimating stable or increasing populations (Lindsay *et al.*, 2012; Riggio *et al.*, 2013). However, recent annual report results show a declining lion population (Niassa Carnivore Project, 2018).

FIGURE 3

African Lion *Panthera leo* distribution across Mozambique. Lion population data are taken from IUCN SSC Cat Specialist Group, 2018. Lion population distributions (brown, labelled 8–12) and population estimates (8–12) are summarised in Table 2. Data source for lion distribution: *Panthera* and WCS 2016.

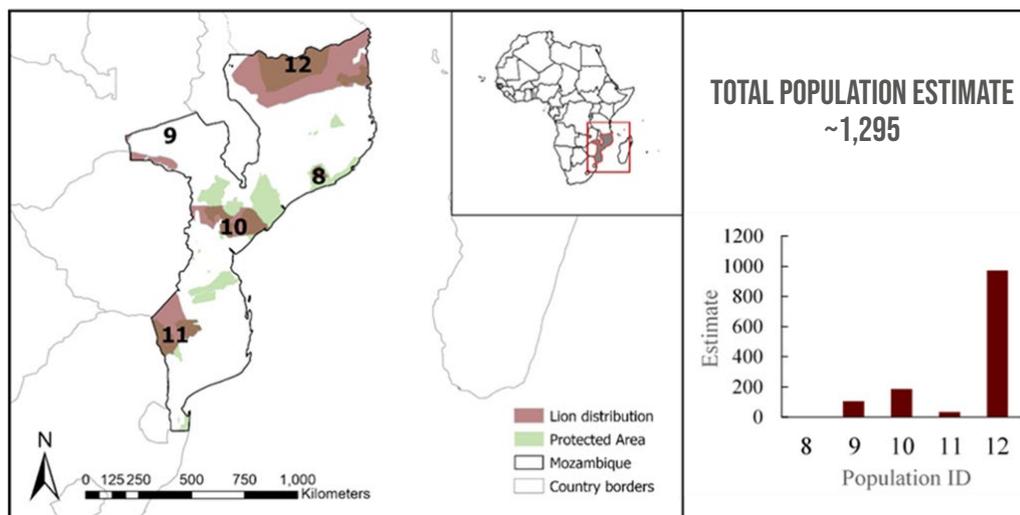


TABLE 2

Mozambique African Lion *Panthera leo* population estimates (IUCN SSC Cat Specialist Group 2018).

ID	LION AREA	2005 POPULATION NUMBERS	2018 POPULATION NUMBERS	SOURCE/REFERENCE
8	Gile	30	0	Lindsay <i>et al.</i> , 2017
9	Tchuma Tchato	no data	185	Jacobson <i>et al.</i> , 2013
10	Gorongosa/Marromeu	174	104	Bouley <i>et al.</i> , 2018
11	Limpopo National Park	no data	34	Everatt <i>et al.</i> , 2014
12	Niassa Special Reserve	1,025	972	Begg <i>et al.</i> , 2017
TOTAL		1,229	1,295	



Searching for lions as part of a national census in Kenya

MANAGEMENT PLANS

TANZANIA

LIONS ARE REPORTEDLY ACTIVELY MANAGED IN MOST AREAS OF TANZANIA. IN 2009, A CARNIVORE ACTION PLAN, WHICH WAS A COMBINED PLAN FOR LEOPARDS AND LIONS, WAS DEVELOPED BY TAWIRI (TAWIRI, 2009).

TAWIRI has implemented this Action Plan and over the years has undertaken monitoring and surveys across Tanzania. **TAWIRI (2016a) outlined five implementation activities for lions which the Management Authority are undertaking:**

1. **Management:** a status assessment was conducted (Mesochina *et al.*, 2010); population monitoring of “key” lion populations (Selous, Serengeti, Ngorongoro and Tarangire); and surveys of lion “hotspots” (Selous, Rungwa and Maasai Steppe and West Kilimanjaro).
2. **Mitigation:** identify research priorities and projects in conjunction with non-governmental organisations (NGOs) to address the central issue of human-lion conflict in pastoralist communities to equip communities with new techniques to protect their livestock and improve husbandry practices.
3. **Socio-economics:** many communities are living close to wildlife, especially those near National Parks. Some 25% of fees received from professional hunting goes back to the District Councils. Tanzania National Parks Authority (TANAPA) has implemented community programmes that uplift local

communities, and hunting companies and photographic tourism are also supporting rural communities.

4. **Policy and land-use:** the ongoing establishment of Wildlife Management Areas (WMAs).
5. **Trade:** Hunting Regulations have been amended and updated (newest version 2015) to promote a sustainable harvest. The Wildlife Division has developed a monitoring programme and harvest rate for lion hunting

Additionally, the Wildlife Division worked with the International Foundation for Wildlife Management (IGF Foundation) and this collaboration resulted in the Conservation Lion Status report which was published in 2010 by Pascal Mesochina *et al.*, as well as a monitoring system for lion hunting and an ageing system and restrictions for these hunts from 2011–2018. The programme is overseen by TAWA. Currently, the Carnivore Action Plan (TAWIRI, 2009) is the only plan in use; however, the Wildlife Division (funding dependent) would like to update the Carnivore Action Plan and develop a plan specific to *Panthera leo*.

MOZAMBIQUE

IN 2009 A CONSERVATION LION STATUS REPORT FOR MOZAMBIQUE WAS PUBLISHED (CHARDONNET ET AL., 2009). THIS REPORT IS A GUIDING DOCUMENT FOR THE CONSERVATION STATUS OF LIONS IN MOZAMBIQUE AND OUTLINES LION RANGES, HISTORICAL AND CURRENT ABUNDANCE, THREATS, HUMAN-LION CONFLICT AND LION HUNTING IN MOZAMBIQUE.

This document is not an Action Plan, and as such, it has no implementation or actionable activities for lion conservation, monitoring and research in Mozambique.

In 2010, the first Conservation Strategy and Action Plan for the African Lion (*Panthera l. leo*) were published for Mozambique (Fusari *et al.*, 2010). In 2016, the Administração Nacional das Áreas de Conservação (“National Administration for Conservation Areas”) (ANAC) developed a revised document, the National Action Plan for Conservation of the African Lion (*Panthera leo leo*) in Mozambique (ANAC, 2016). These Action Plans are comprehensive documents which outline the status of lions in Mozambique as well as the threats, gaps and constraints

facing lion management and conservation. The 2016 revised Action Plan contains specific, actionable activities for lion management within Mozambique. These activities fall under six broad objectives namely, 1) Management; 2) Mitigation; 3) Socio-economics; 4) Policy and land-use; 5) Politics, and 6) Trade. Each of these objectives has specific targets and activities associated with it, as well as timelines for completion/implementation of each activity.

However, the Action Plan also notes several knowledge gaps for each of the six objectives listed above. The most important of these from the 2010 and 2016 Action Plans and relevant to this report are summarised below:

1. **Lack of regular monitoring** of lion status and threats.
2. **Unknown levels of retaliatory killing** (especially in the south of Mozambique).
3. **Lack of understanding of cultural and anthropological** matters related to lions.
4. **Weak law enforcement** when violating the use of natural resources.
5. **Indiscriminate killing of lions** for PAC.
6. **Lack of appropriate knowledge** and awareness of the existing legal framework.
7. **Lack of recognition of the conservation value** and importance of lions.
8. **Local communities are often not aware of the full economic value** of natural resources.
9. **Lack of incentives** for lion conservation.
10. **There is a general shortage of both human and financial resources** for the management of wildlife, including lions.



TROPHY HUNTING HARVEST

THE AFRICAN LION IS LISTED AS VULNERABLE ON THE IUCN RED LIST™ AND IN APPENDIX II OF CITES. ACCORDING TO CITES, INTERNATIONAL TRADE IN SPECIMENS OF APPENDIX II SPECIES MAY BE AUTHORISED BY THE GRANTING OF AN EXPORT PERMIT OR RE-EXPORT CERTIFICATE.

No import permit is necessary under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met; above all, that trade will not be detrimental to the survival of the species in the wild. Note that, aside from trophy hunting, other types of

harvest (for instance, Problem Animal Control) do take place in Tanzania and Mozambique, especially if lions have killed humans. However, this type of harvest is conducted by the relevant wildlife authorities in each country (i.e. ANAC in Mozambique and Wildlife Department/TAWA in Tanzania) and not by professional sport hunters (Mesochina *et al.*, 2010). PAC is not used as a method of population control.

TANZANIA

hunting blocks are allocated via a closed tender process, and according to regulations, sport hunting is allowed in designated wildlife areas

Tanzania has extensive landscapes that have been set aside for wildlife and *Biodiversity Conservation* (~37%), including National Parks, Game Reserves, Game Control Areas, Wildlife Management Areas, or Open Areas (Mesochina *et al.*, 2010; Brink *et al.*, 2016). Tanzania also has the largest population of lions when compared to other African countries (Packer *et al.*, 2011; Riggio *et al.*, 2013). Hunting blocks are allocated via a closed tender process (Lindsey *et al.*, 2013a), and according to regulations, sport hunting is allowed in designated wildlife

areas (Game Reserves, Game Controlled Areas, Open Areas, Wildlife Management Areas), except National Parks and the Ngorongoro Conservation Area. Hunting companies are leased land (hunting blocks) by the government, with a lease length of five years and are each issued with a species-specific quota per hunting block and season (Lindsey *et al.*, 2013a; Brink *et al.*, 2016). Lion hunts are only issued to clients who purchase a 21-day safari (Packer *et al.*, 2011).

Only wild lions are harvested in Tanzania. In terms of sport hunting, Tanzania is at the top of the list of trophy hunting destinations, especially for species such as lion and leopard (Packer *et al.*, 2011; Brink *et al.*, 2016). Trophy hunting brings in a substantial (~USD424/km²)² amount of revenue for the country (Lindsey *et al.*, 2012). Lindsey *et al.*, (2012) conducted a study to assess the financial impact which lion trophy hunting had across five countries (Tanzania, Mozambique, Namibia, Zambia, and Zimbabwe). The authors concluded that the

gross income received from trophy hunting (per km²) was highest in Tanzania, Zimbabwe, and Namibia. The ability to harvest lions is financially significant, and lion quotas are available in most hunting areas in Tanzania. According to Lindsey *et al.*, (2013a), an amount equal to 40% of the total quota fees are paid by hunting operators to government, regardless of whether lion hunts are successful. Thus, the practice of sport/ trophy hunting in Tanzania is beneficial to the economy in terms of annual income.

40% of the quota fees are paid by hunting operators in Tanzania to the government

HUNTING QUOTAS

Sport hunting was previously managed by the Wildlife Division of the Ministry of Natural Resources and Tourism (Wildlife Division). Currently, the newly formed Tanzanian Wildlife Management Authority (TAWA) manages permitting, and quota numbers. TAWA issues species-specific quotas per hunting company per annum (Brink *et al.*, 2016). The hunting companies can then choose how many of these quotas they would like to sell to clients in the form of specific hunting packages.

Annual quotas are set by the Quota Allocation Advisory Committee, which consists of selected experts from TAWIRI, the University of Dar es Salaam, Sokoine University of Agriculture, University of Dodoma, the College of African Wildlife Management, and the Wildlife Division (TAWIRI, 2016a). These quota numbers are

based on surveys and reports (where available), as well as recommendations from hunting operators and staff from the Wildlife Division (Lindsey *et al.*, 2013a). According to TAWIRI, (2016a), population estimates, research work and field personnel are also consulted when setting the annual quota number. This quota system is in place so that TAWA can monitor the harvests for each hunting operator. Hunting operators are required to notify TAWA of the number of lions harvested per hunting season, which is verified by local wildlife officials who are present on hunts. The government imposes a harvest threshold of approximately 200 lions annually. This is based on the best available scientific advice which underpins a harvest of 1 lion/1000 km² for the Selous-Nyerere ecosystem and 0.5 lions/1000 km² for other ecosystems (Packer *et al.*, 2011).

MONITORING AND REPORTING

Tanzania has strict hunting regulations which were last updated in 2015 (Wildlife Conservation (Tourist Hunting) Regulation, 2015). Guidelines and reporting measures are in place to ensure that harvests are sustainable (Benyr *et al.*, 2017). According to the NDF published by TAWIRI, (2016a), Tanzania follows an adaptive management strategy for trophy hunting so new issues can be addressed and regulations can be revised continuously. Strict hunting regulations are followed (Wildlife Conservation (Tourist Hunting) Regulation, 2015; TAWIRI, 2016a), which include application procedures, hunting restrictions (e.g. age restrictions), management and supervision of hunters, and outlines

offences and penalties (Wildlife Conservation (Tourist Hunting) Regulation, 2015; TAWIRI, 2016a). No opportunistic lion harvests are permitted in Tanzania. According to The Wildlife Conservation Tourist Hunting Regulations (2015), a Wildlife Officer or certified village Game Scout is required to be present during every hunt, provided the hunting block is under the management of an Authorised Association. After a hunt is completed, whether successful or unsuccessful, a Safari return form must be completed and pictures, measurements and samples for DNA analysis must be collected and these, along with the skull, must be delivered to the management department (Benyr *et al.*,

2017). The skulls are then aged by the TAWA as well as experts from TAWIRI and the results are stored in a database (Benyr *et al.*, 2017). These skulls are then catalogued and stored as “blind” samples with no details of hunting company or client attached to each skull (Benyr *et al.*, 2017).

Further verification of these “blind” skulls is carried out by lion experts (Benyr *et al.*, 2017). The relevant CITES export permits will only be issued if the age of the skulls has been verified, and the correct paperwork has been submitted (Benyr *et al.*, 2017).

AGEING PROTOCOLS

Hunting operators and clients may only hunt male lions that are six years or older; this is the minimum age for Tanzania (Lindsey *et al.*, 2013a; Wildlife Conservation (Tourist Hunting) Regulation, 2015). The use of age-based hunting systems is required to ensure the sustainable harvest of lions (Miller *et al.*, 2016; Begg *et al.*, 2017). Section 27 (1) of the Wildlife Conservation (Tourist Hunting) Regulations, (2015) states that if hunting operators are found to be contravening these regulations, fines are prescribed, as well as confiscations

of trophies in some cases. Hunting operators who hunt lions in the 4–5 age class may still export these trophies; however, operators will incur fines (Benyr *et al.*, 2017). Any males hunted which are below four years of age may result in the professional hunter’s licence being cancelled and no export of these trophies is allowed (Benyr *et al.*, 2017). To age lions correctly, professional hunters use indices such as mane development, the colouration of the nose and assessment of the lion’s teeth (White and Belant, 2016; Benyr *et al.*, 2017).



MOZAMBIQUE

SPORT HUNTING IS CONDUCTED IN DESIGNATED HUNTING BLOCKS AND WILDLIFE CONCESSIONS KNOWN AS COUTADAS. MOZAMBIQUE HUNTING BLOCKS ARE SET ASIDE USING A CLOSED TENDER PROCESS AND ARE TYPICALLY LEASED FOR TEN OR MORE YEARS (LINDSEY ET AL., 2013A).

Only wild lions are harvested in Mozambique. Trophy hunting can bring in significant revenue (~USD130/km²), especially when key species such as lions are permitted to be hunted (Lindsey et al., 2012). Lindsey et al. (2012) concluded that the gross income received from trophy hunting (per km²) was low in Mozambique when compared to countries such as Tanzania, Namibia, and Zimbabwe. However, the ability to harvest lions is still financially valuable, and lion quotas are available in most hunting areas in Mozambique.

Trophy hunting is not permitted in National Parks and Reserves, and so occurs predominately in hunting blocks surrounding Niassa Special Reserve, Coutadas (Game Reserves) in central Mozambique, as well as Community Based Management Areas and Game Ranches (Chardonnet et al., 2009). According to Lindsey

et al. (2013a), hunting occurs on about 120,932 km² and the percentage of lion range where lions are hunted is approximately 11% to 13%. In Mozambique, sport hunting occurs in protected areas with strong tenure (Coutadas, Hunting Blocks, Community Community Based Management Areas, Game Ranches). These areas are either privately managed and leased by safari outfitters/professional hunters or run by the local communities. Most of the sport hunting of lions in Mozambique is located within the buffer zone of Niassa Special Reserve in northern Mozambique. This area has the largest population of lions in Mozambique (~1,000 individuals) (Lindsey et al., 2012; Begg et al., 2017). According to Begg et al. (2017), not all Niassa hunting concessions are active all year round due to several factors such as the number of quotas issued, and changes in concession ownerships and leases.

HUNTING QUOTAS

ANAC is responsible for issuing species-specific hunting quotas per Coutada (hunting block), per annum. Quotas are set based on the following information: lion surveys, research reports, human-lion conflict incidences, historical surveys, government and operator opinions (Lindsey et al., 2013a). Quotas are increased in areas where there is a substantial amount of human-lion conflict; however, this is reportedly not an effective criterion as these data could be misreported and false, which could lead to the incorrect distribution of quotas within Mozambique (Lindsey et al., 2013a).

The main concerns expressed about the hunting quotas as identified in the 2010 (Fusari et al., 2010) and 2016 (ANAC, 2016) National Action Plans for African Lion, are that the hunting quotas in most cases are issued without any scientific basis and consequently seem to be too high (nationally 50 lions in 2007, 111 in 2008, 60 in 2009, 54 in 2016, 49 in 2017, and 54 in 2018).

hunting quotas

are set according to lion surveys, research reports, and human-lion conflict

MONITORING AND REPORTING

In the Niassa Hunting Blocks, strict monitoring and hunting regulations are applied (Miguel, 2013). A points system has been devised, which rewards hunting operators who only hunt lions that are older than six years (Begg *et al.*, 2017). In Coutadas in central Mozambique it is a requirement that an official observer be present during every hunt, and a hunting return form

needs to be submitted following every hunt (Lindsey *et al.*, 2013a).

The main shortcomings regarding monitoring of sport hunting in Mozambique, identified in the 2010 and 2016 National Action Plans for African Lion are:

1. **A lack of information** and control of illegal hunting for money and trophies.
2. **A lack of monitoring of trophies** and under-aged killing in sport hunting.
3. **Sport hunting is conducted in most concession areas without reliable information** on the status of the lion population.
4. **Hunting permits are often issued to kill problem lions** without any control of the resulting hunting trophy and when and how the hunting occurs.

AGEING PROTOCOLS

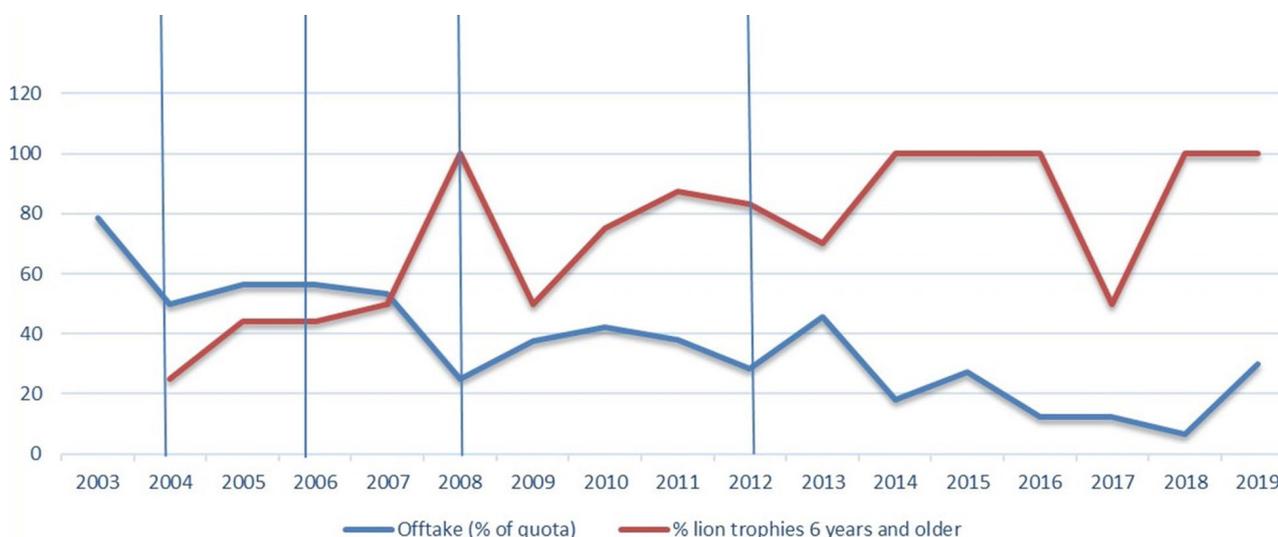
Niassa has had success in the implementation and monitoring of an “age-based hunting system” where hunters are rewarded on a points system for complying with a six-year minimum age restriction for lion hunts (Begg *et al.*, 2017). This system is working to reduce excessive and unsustainable lion hunting in the Niassa area (Figure 4). According to Begg *et al.* (2017), the goal of the system is threefold: (1) to adjust annual quotas for each hunting area based on the number of suitably aged lions hunted as trophies (as a proxy of population size), (2) to

discourage the harvest of underage lions and encourage the harvest of old lions and (3) to improve monitoring of trophy harvests.

Overall, Niassa has hunting regulations and reporting measures which are in place to ensure that harvests are sustainable (Miguel, 2013). Although trophy hunting age restrictions are in place for lions in Mozambique (Boletim da Republica de Mocambique Series 203, 2017), trophy hunting management is inconsistent in areas outside Niassa.

FIGURE 4

Legal lion offtakes in Niassa and the age of lion trophies between 2003–2019. Data Source: Niassa Carnivore Project (C. Begg, in litt. to K. Mole, May 2020).





METHODOLOGY



TO DETERMINE WHETHER TRADE IN LIONS IS SUSTAINABLE, IT IS NECESSARY TO UNDERSTAND AT A MINIMUM THE EXTENT OF LEGAL AND ILLEGAL HARVEST,

the volume of domestic and international trade, population abundance, seizures and mortalities from National Parks, Game Reserves, or Protected Areas. Qualitative data from interviews are useful to determine the drivers and effects of harvest on a population (Rosser and Haywood, 2002).

In this project, a combination of quantitative and qualitative methods was used to

investigate the presence, extent and scale of domestic and international trade and harvest in lions for both Mozambique and Tanzania. It included interviews with wildlife authorities and professionals, communities surrounding National Parks and Protected Areas; consultations with CITES and customs authorities; and a review of relevant scientific, grey literature and government legislation and related documents.

‘INTERVIEWS WITH WILDLIFE PROFESSIONALS

Interviews with key wildlife authorities and professionals were conducted to investigate the reported extent of domestic and international trade of lion products. These interviews included individuals within government, wildlife professionals (i.e. wildlife authorities, conservation organisations, NGOs, as well as professional hunting operators). Participation in interviews was voluntary. Ethical clearance for the interview and interview process for the study was obtained through the University of Witwatersrand (WITS; Clearance no. 2019/08/49/O).

Interviews were conducted using an online questionnaire or in person. Questions were structured to cover the following topics: awareness of lion poaching within and around wilderness areas; awareness of trade in lion parts and derivatives; the use and destination of traded lion products; lion mortalities and poaching events; and the legal harvest of lions. If available, empirical data were acquired from respondents.

Answers obtained from the interviews and questionnaires were analysed to determine:

1. **the threat of poaching to wildlife in each country;**
 2. **if wildlife authorities/organisations were aware of the trade in lion bones, parts and derivatives in their respective countries, and the actual extent of this trade**
 3. **if authorities/organisations were aware of lion mortalities in their wilderness areas,**
 4. **if lion mortalities were linked to the trade,**
 5. **the possible origin of lion products; and lastly,**
 6. **the uses of lion products, both reported and actual use (traditional use by communities).**
-



Young Maasai men from a village in the Ngorongoro Conservation Area, Tanzania

COMMUNITY INTERVIEWS

Community interviews focused on conflict with lions, illegal harvesting of lions and wildlife, the use of lion parts and products at present and in the past, and the potential sources of lion parts. Interviews with community members were done in person with people living in and around lion ranges to investigate the extent of lion trade and use of lion products amongst local community members.



interview questions helped to better understand the human-wildlife conflict within communities

The interview process made use of semi-structured, open-ended questions that were flexible and adaptable depending on the participant. The use of open-ended questions is advantageous because it allows participants to express their opinions without being guided towards a particular answer.

Community interviews were conducted with the permission of the district councils. Using historical information about areas with human-lion interactions, the district council, in conjunction with a local TRAFFIC consultant, selected appropriate communities for interviewing. In each village, it was attempted to conduct interviews with five different village members (this ranged from village chiefs and elders to council members and cattle carers). Where possible, TRAFFIC staff and consultants conducted interviews individually; however, if people were more comfortable in a group setting, then a focus group method was adopted. If, and where possible, interviews were conducted by a consultant in the interviewees' home language.

DATA COLLECTION FROM GOVERNMENT WILDLIFE MANAGEMENT AUTHORITIES

Data from lion trophy hunting registers, PAC, poaching, retaliatory killings and natural mortalities were collected from experts in the field and relevant wildlife authorities, including TAWA, TANAPA, TAWIRI, ANAC, and through interviews with NGOs. These data were used to assess the extent of legal and illegal lion mortalities in Tanzania and Mozambique, as well as the potential source of lion products. Locations and the number of lion mortalities were analysed to investigate potential hotspot

regions of illegal lion harvest activities. The data were further assessed to investigate the theoretical scale of trade and demand for certain lion body parts. CITES authorities in Tanzania were consulted to compare the lion mortalities and legal harvest data against CITES export permits and to investigate whether there are discrepancies between what is officially reported for export versus what is recorded on the CITES Trade Database. CITES data (2000–2018, CITES Trade Database) on the export and

import of lion products to and from Tanzania and Mozambique were sourced from the CITES Trade Database and assessed to investigate the extent of legal lion products that are exported and imported annually by various countries.

Lastly, TAWA, ANAC, and the Mozambique Customs Authority were consulted to collect lion seizure data from the relevant countries. The data were entered into the TRAFFIC Wildlife Trade and Information System (WiTIS) database and mapped to detect the potential trade routes. Data were checked and scrutinised to ensure that duplicates were eliminated.

CALCULATIONS USED TO DETERMINE IF TRADE WAS DETRIMENTAL

Numerous data sources were utilised to determine whether trade was detrimental to African Lion populations in Tanzania and Mozambique. Data on anthropogenic lion mortalities (i.e. trophy hunting, poaching, retaliatory killings, Problem Animal Control and road kills) were used to calculate within-country regional declines and annual lion mortalities as a percentage of the total lion population estimates (TAWIRI, 2016b; IUCN SSC Cat Specialist Group, 2018, Niassa Carnivore Project, 2018).

Trade data on seizures were downloaded from TRAFFIC's WiTIS database and used to determine the volume of lion parts and derivatives in trade, as well as the demand for specific commodities. Specific lion body parts were summed and converted into "whole animal" equivalents. For this, TRAFFIC used lion parts that could accurately be equated to a whole animal without the risk of duplication, such as, claws (18 claws equates to 1 lion), whole-body carcasses, complete skins, and skulls. Data were analysed to ensure that each case was only counted once. If multiple parts were seized, for example, if the skin was seized with claws, either the skin or claws was used to get an equivalent estimate of the number of lions as it is assumed that the parts came from the same lion. Teeth, bones, skin pieces and fat were not used as estimates, as without morphological examination, it was not known how many of these parts would equate to one lion.

Tanzania's regional anthropogenic lion mortality data were incomplete, and thus existing data

A comprehensive database of seizure incidents, using existing records and new records collected from TAWA and the Mozambique Customs Authority involving lions since 2000 was compiled and spatially mapped using TradeMapper.

The term "parts and derivatives" has been used throughout this report. "Parts" refers to lion parts which are identifiable, for example skulls, bones, teeth, claws, and skin. "Derivatives" refers to lion products which are unidentifiable, for example, urine and fat.

were combined as far as possible with interview responses to supplement data and improve regional representation. Lion population estimates in Tanzania were obtained from TAWIRI, (2016b) and some data from the IUCN SSC Cat Specialist Group report (2018). Growth rate³ projections were obtained from Bauer *et al.*, (2015). In terms of these projections a growth rate³ of one (1) represents a stable lion population, <1 a declining population, and >1 an increasing population.

For Tanzania, using population estimates from TAWIRI, (2016b) as a starting point, estimated annual lion mortalities gathered from anthropogenic lion mortalities (TAWA & TAWIRI) and trade data (WiTIS & TAWA) were used to illustrate the decline in the lion population from 2010 to 2019. Data were plotted on a graph to compare the IUCN population estimates, the Bauer *et al.* (2015) growth rate, and the estimated population decline using the TAWIRI population estimate. Available annual lion mortality data were subtracted from the TAWIRI population estimate.

For Mozambique, data from Niassa were used as a proxy for Mozambique's total lion population as these represent the largest lion population and the most complete data set. Survey data were provided by the Niassa Carnivore Project for 2005, 2008, 2012, 2015 and 2018. Survey data are assumed to be inclusive of births and deaths. Survey data were plotted against trade data obtained from WiTIS and the Mozambican Customs Authority.



TANZANIA

TANZANIA RESULTS

THE RESULTS OF THE STUDY ARE OUTLINED IN FIVE SECTIONS, NAMELY: 1) INTERVIEWS WITH WILDLIFE PROFESSIONALS; 2) COMMUNITY INTERVIEWS; 3) WILDLIFE AUTHORITY DATA; 4) CITES TRADE DATA; AND 5) SEIZURE DATA.

INTERVIEWS WITH WILDLIFE PROFESSIONALS

A total of 40 interviews were conducted with wildlife professionals, which included 17 interviews with wildlife authorities (Protected Area Management staff, wildlife conservation organisations), and 23 interviews with professional hunters. Out of a total of 40 respondents, the majority thought that poaching was a moderate threat to wildlife in Tanzania (Figure 5). Fifteen respondents (37%) were aware of the trade in lion bones, parts and derivatives. Just over half of the respondents were aware of poaching or retaliatory killings that took place in their wilderness area; however, very few (14%) believed that these lion mortalities were linked to trade in lion

parts or products (Figure 5). Most interview respondents believed that lion products were being used and traded domestically (47%) rather than internationally. The origin of traded lion products was believed to be from both retaliatory (35% of respondents) and poached lions (39% of respondents, Figure 5).

When examining the respective categories of reported use or reasons why certain lion parts are used (Figure 6), the respondents indicated that most lion parts are used for traditional African medicine. Parts such as teeth and claws were mostly used as curios, status symbols and decorations.

FIGURE 5

Summary of answers (% of respondents) by wildlife professionals in Tanzania to six key questions related to lion harvest and trade.

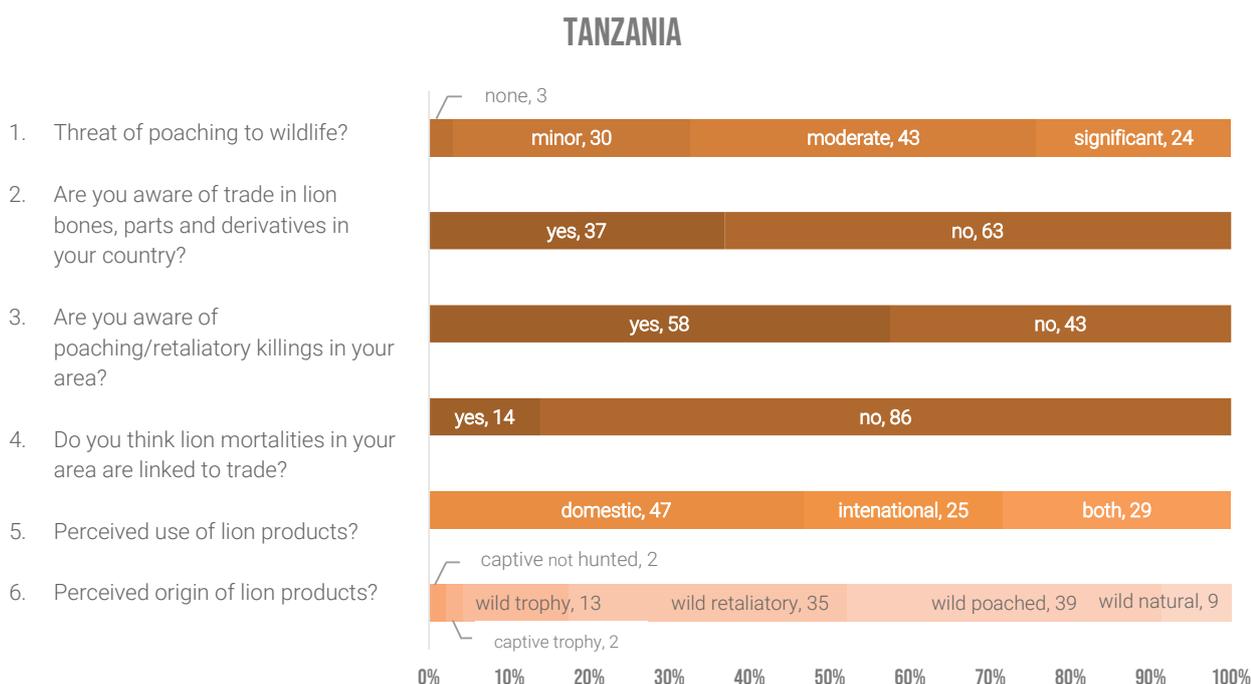


FIGURE 6

Respondents' opinions regarding the reported use of lion products in Tanzania. "Percentage" represents the percentage of the total number of responses by all respondents per category.

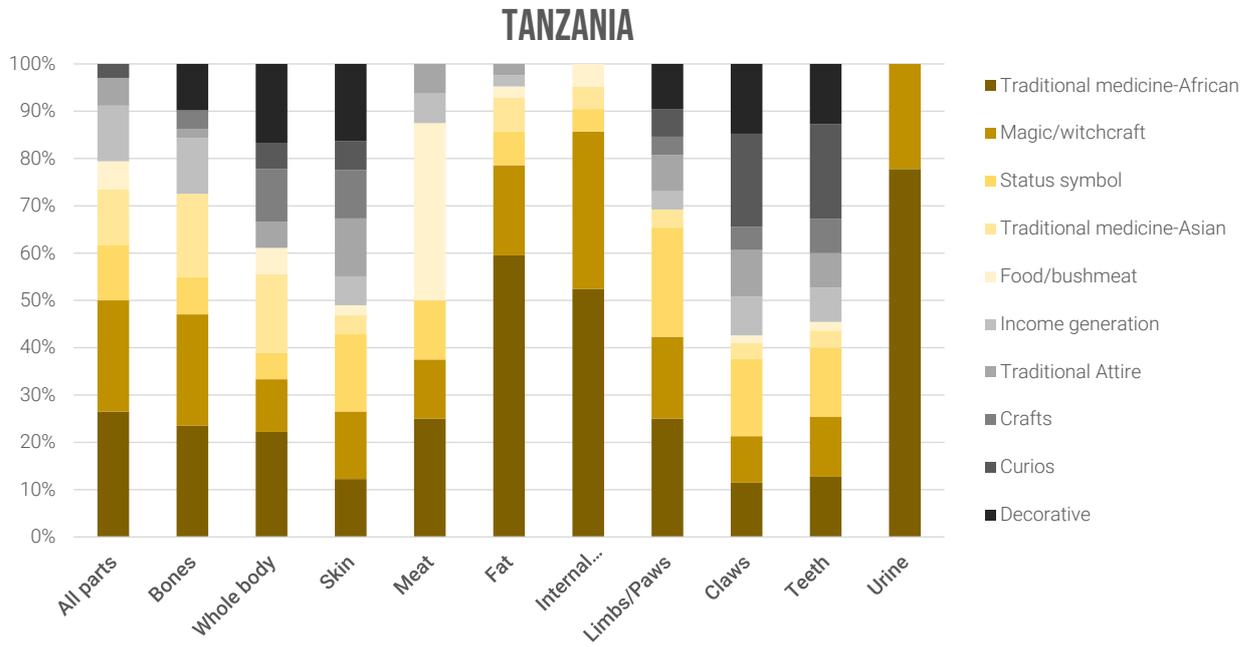
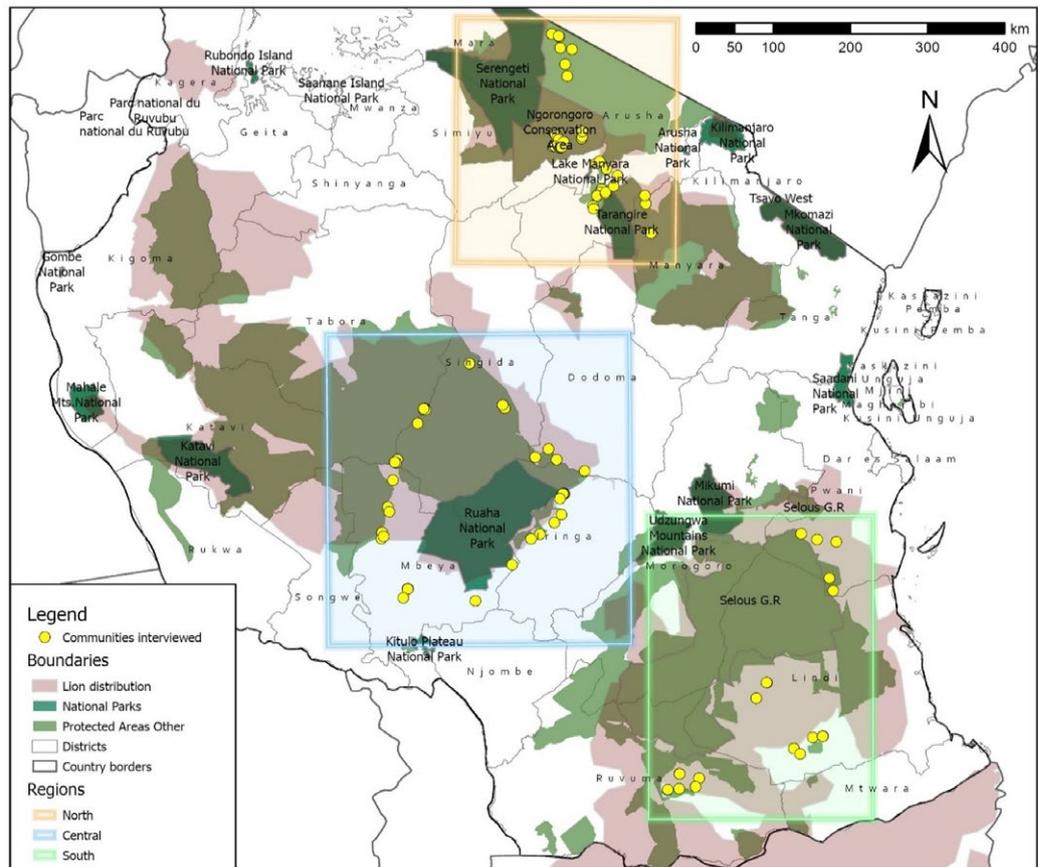


FIGURE 7

Map illustrating the location of community surveys conducted in 2019–2020 in the United Republic of Tanzania in relation to protected areas, lion population distribution and region. Protected area data: IUCN, UNEP-WCMC, 2020. Lion distribution data: Panthera and WCS, 2016.





COMMUNITY INTERVIEWS

A total of 326 community members were interviewed across Tanzania. These interviews took place in 77 communities⁴ located within three regions defined by significant lion populations and an abundance of Protected Areas (Table 3). The majority of villages (58%)

were located within known lion population ranges (Figure 7), with only ten villages located >10 km outside of lion ranges (maximum distance of 50 km). Approximately 49% of the villages were located inside Protected Area boundaries (Table 3).

326
community
members were
interviewed
across Tanzania

TABLE 3

Summary of the total number of interviews and communities where interviews were conducted by region across the United Republic of Tanzania

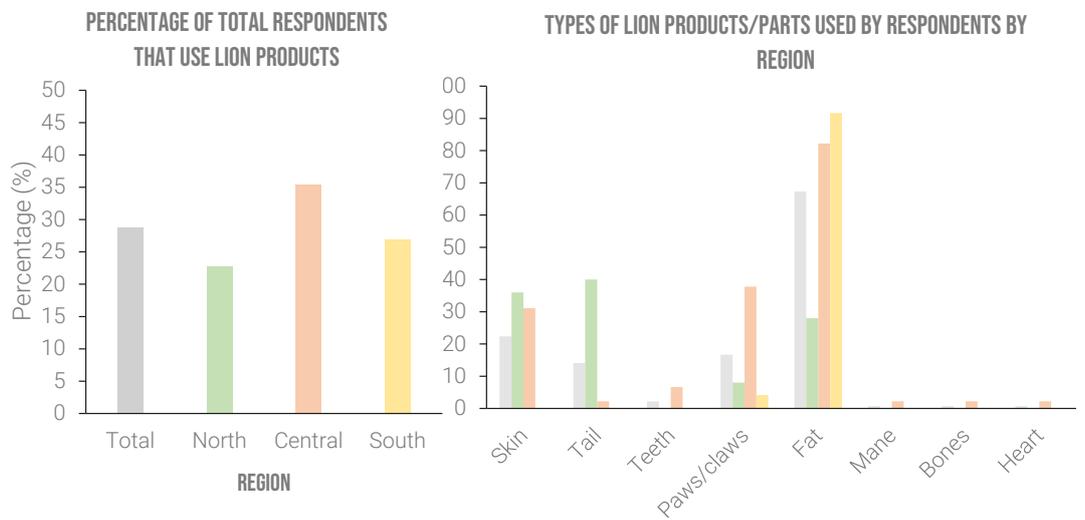
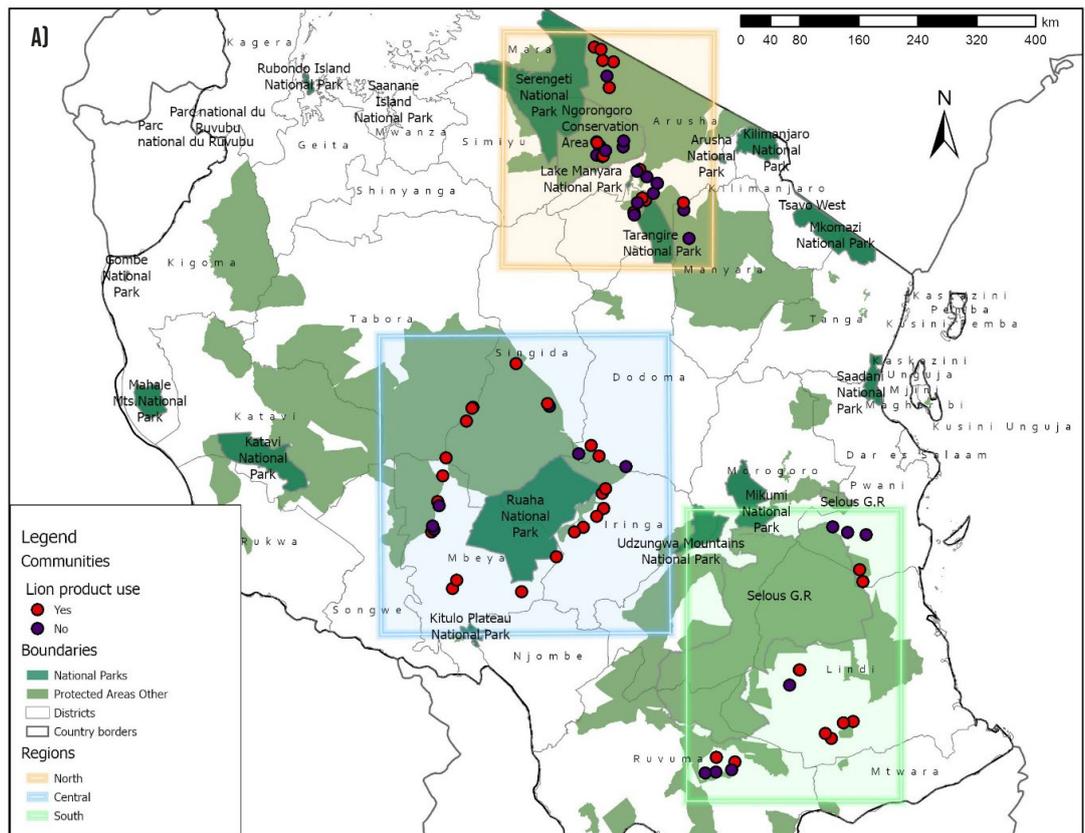
REGION IN TANZANIA	NUMBER OF COMMUNITY MEMBERS INTERVIEWED	NUMBER OF COMMUNITIES WHERE INTERVIEWS TOOK PLACE	NUMBER VILLAGES WITHIN KNOWN LION RANGES	NUMBER VILLAGES WITHIN A PROTECTED AREA
North	110	33	18 (55%)	28 (84%)
Central	127	27	15 (56%)	8 (27%)
South	89	17	12 (71%)	2 (12%)
TOTAL COUNTRY	326	77	45 [58%]	38 [49%]

38%
of community
respondents use
or have used
wildlife products

Approximately 38% of community respondents stated that they use or have used wildlife products. The most used wildlife products mentioned were elephant dung, lion products, ungulate species, and monitor lizards. Approximately 29% of respondents (n=326) admitted to using lion products either in the

past or currently (Figure 8b). While the number of respondents that used lion products was relatively low, lion product use was recorded in 60% of the communities surveyed (Table 3). Regionally, 77% of communities within the central region had respondents that used or currently use lion products (Table 4).

FIGURE 8
Lion product use. a) Map illustrating the location of community villages that admitted to lion product use; b) Percentage of total community respondents that admitted to lion product use by region; c) Types of lion products/parts used by respondents by region as a percentage of those that use lion products.



Overall, fat was the most common lion product used by respondents, with 67% admitting to using lion fat (Figure 8c). Other products used included: skin (22%), paws/claws (17%), and tails (14%). Interestingly, regional differences also existed in the types of lion products that were used (Figure 8). In northern regions (Serengeti, Ngorongoro Crater, Tarangire, Manyara), there was a preference for skin, tail and fat. In contrast, common products used in the central region (Ruaha-Rungwa) included: skin, claws/paws and fat. In the southern region (Selous), fat was used by more than 90% of respondents who used lion products with very few respondents admitting to using other lion products (Figure 8).

While almost all communities interviewed had experienced conflict with lions (96%), more than half (55%) had respondents that knew of members of their community who had killed a lion in retaliation for conflict or livestock depredation (Table 4).

In comparison, 31% of communities had respondents that stated they were aware of lion poaching incidences within or near their villages. Most of these responses came from communities in the central and southern regions (Table 4).



55%
of communities
had respondents
who knew
someone who
had killed a lion
in retaliation
for conflict
or livestock
depredation

TABLE 3

Summary of community interview responses relating to the percentage of communities (n=77) that have experienced conflict with lions, have had retaliatory killings of lions taking place, and are aware of potential poaching taking place within or around their communities. Numbers in brackets represent the actual number of communities.

REGION (N = NUMBER OF VILLAGES)	% OF COMMUNITIES THAT HAVE EXPERIENCED CONFLICT WITH LIONS	% OF COMMUNITIES WHICH HAVE EXPERIENCED RETALIATORY KILLINGS	% OF COMMUNITIES THAT ARE AWARE OF POACHING WITHIN OR AROUND THEIR VILLAGE.	% OF COMMUNITIES THAT USE LION PRODUCTS
North (n= 33)	90.9 (n=30)	36.4 (n=12)	12.1 (n=4)	45.5 (n=15)
Central (n=27)	100.0 (n=27)	66.7 (n=18)	37.0 (n=10)	77.8 (n=21)
South (n=17)	100.0 (n=17)	76.5 (n=13)	58.8 (n=10)	58.8 (n=10)
TOTAL (N=77)	96.1 (N=74)	55.8 (N=43)	31.2 (N=24)	59.7 (N=46)

LION MORTALITY DATA

Data on anthropogenic lion mortalities were gathered from TAWA, TANAPA and TAWIRI, and from personal communications with wildlife authorities to investigate the extent of legal and illegal harvest of lions in Tanzania as well as the potential source of lion products. Data included deaths due to PAC, retaliatory killings, poaching, trophy hunting, and roadkill.

Data analysis revealed that the highest cause of lion mortality in Tanzania is due to retaliatory killings (including poisoning and spearing). In five years alone (2015–2019), retaliatory killings contributed to 52 (22%) recorded mortalities (Table 5). Of the 212 retaliatory killings, only five (2.4%) were noted to have had lion parts removed. Parts removed included legs, skin, tail, teeth, and claws. The majority

of retaliatory killings recorded took place in the northern districts of Tanzania, particularly around Ngorogoro, Manyara, Tarangire, and the Serengeti (Figure 9). Data on poached lions suggest that poaching is low in Tanzania. However, it must be noted that this dataset is deficient as there is no lion mortality data available for the Ruaha-Rungwa area.

Hunting data were acquired from TAWA and TAWIRI. In the past seven years (2013–2019), permits were requested by various hunting companies to hunt a total of 265 lions. Of those, 262 lions were recorded as being successfully hunted (i.e. killed) (Table 5). Data show that the number of hunts being permitted has decreased in recent years (Table 5).

FIGURE 9

Recorded locations and number of African Lion *Panthera leo* mortality incidences as a result of retaliatory killings and poaching. Data source: TAWA and TANAPA.

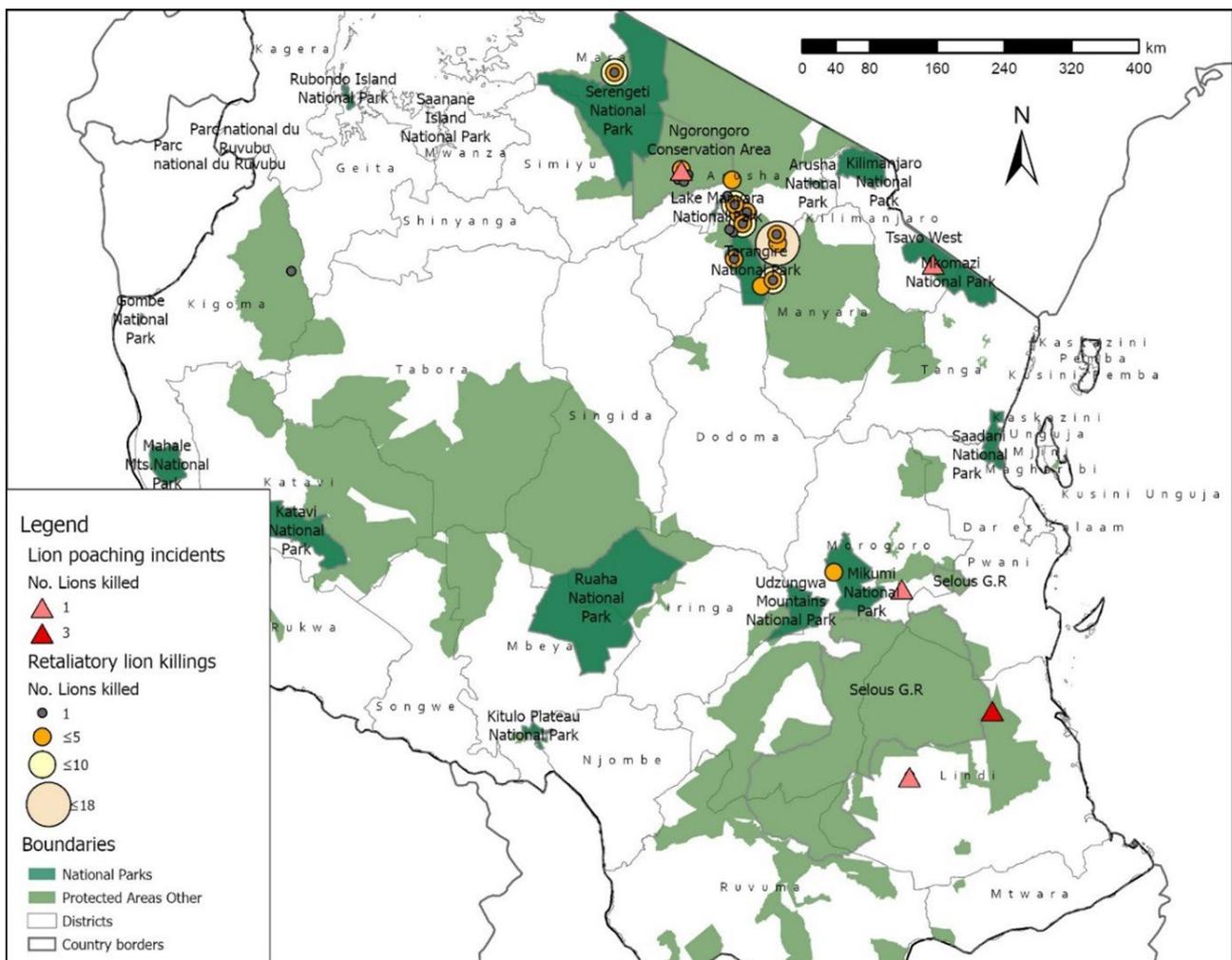


TABLE 5

Summary of African Lion *Panthera leo* mortalities due to anthropogenic mortalities (Problem Animal Control (PAC), Poaching, Retaliatory killings, Roadkill and Trophy Hunting). Data source: TAWA, TANAPA, TAWIRI.

*Trophy Hunting data years represented by the year of the second half of the financial year, for example hunting data recorded under 2013 are data recorded for the 2012/2013 financial year. nd = no data available/incomplete records

YEAR	PAC	POACHING	RETALIATORY KILLINGS	ROADKILL	TROPHY HUNTING*	TOTAL MORTALITIES
2006	10		12		278	300
2007	9				176	185
2008	10		16	1	105	132
2009	nd		45		120	165
2010	nd		21	2	nd	23
2011	nd		27		nd	27
2012	nd		13		nd	13
2013	1		15	1	52	69
2014	2		11	2	56	71
2015	1		21		44	66
2016	1		6	1	41	49
2017	5	5	17		19	46
2018	2		1	1	27	31
2019	1	2	7	1	34	45
TOTAL	42	7	212	9	952	1222

CITES TRADE DATA

2,515 lion parts were reported as imports by destination countries between 2000-2018

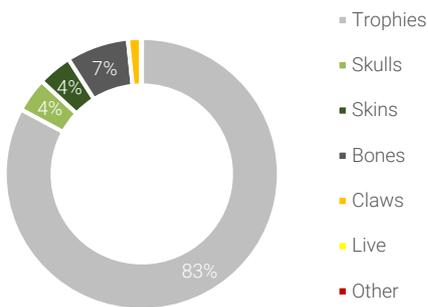
In total, 2,515 lion parts (excluding 2,494 lion "Specimens"⁵ intended for scientific use) were reported as imports by destination countries. Export data show that only 1,940 lion parts were recorded as exports by Tanzania (excluding 719 "Specimens" intended for scientific use). Commonly, reported exporter quantities and reported importer quantities do not match up

due to differences in the way countries record lion parts, year of record being incorrect, or countries failing to submit their reports. Regardless of these discrepancies, both exports and imports have shown a steady decline in quantity in the past two decades, with trophies making up 83% and 80% of imports and exports respectively (Figure 10).

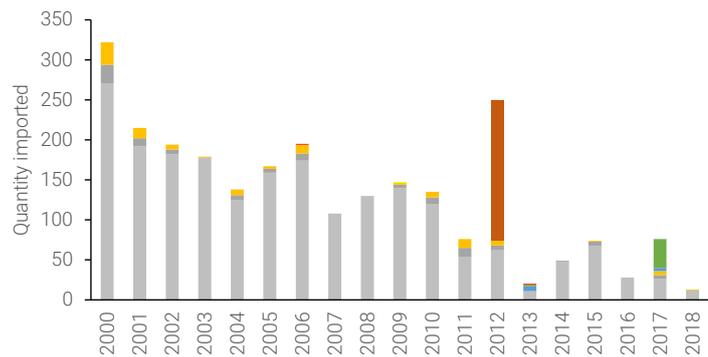
FIGURE 10

CITES data on the legal trade of lion products imported and exported to and from Tanzania. a) Percentage of total parts imported from Tanzania reported by destination countries and b) Quantity imported per year of lion parts originating from Tanzania between 2000–2018 as reported by destination countries. c) Percentage of total parts reported as exported by Tanzania and d) Quantity reported as exports per year of lion parts by Tanzania between 2000–2018. Data source: CITES Trade Database.

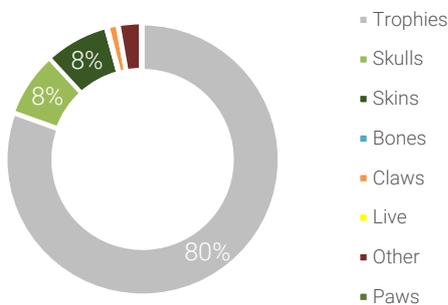
A) PERCENTAGE OF PARTS IMPORTED BY DESTINATION COUNTRIES 2000-2018



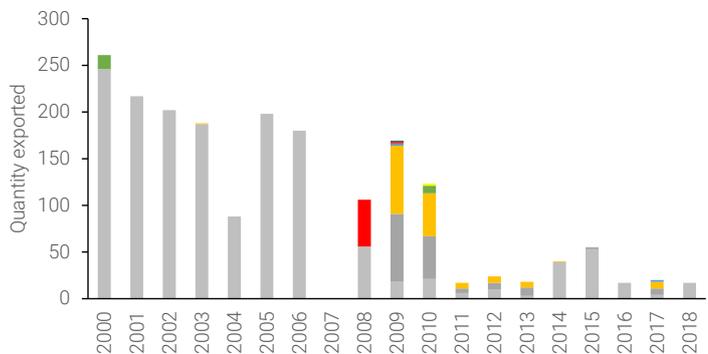
B) QUANTITY OF PARTS IMPORTED BY DESTINATION COUNTRIES



C) PERCENTAGE OF PARTS EXPORTED BY TANZANIA 2000-2018



D) QUANTITY OF PARTS EXPORTED BY TANZANIA

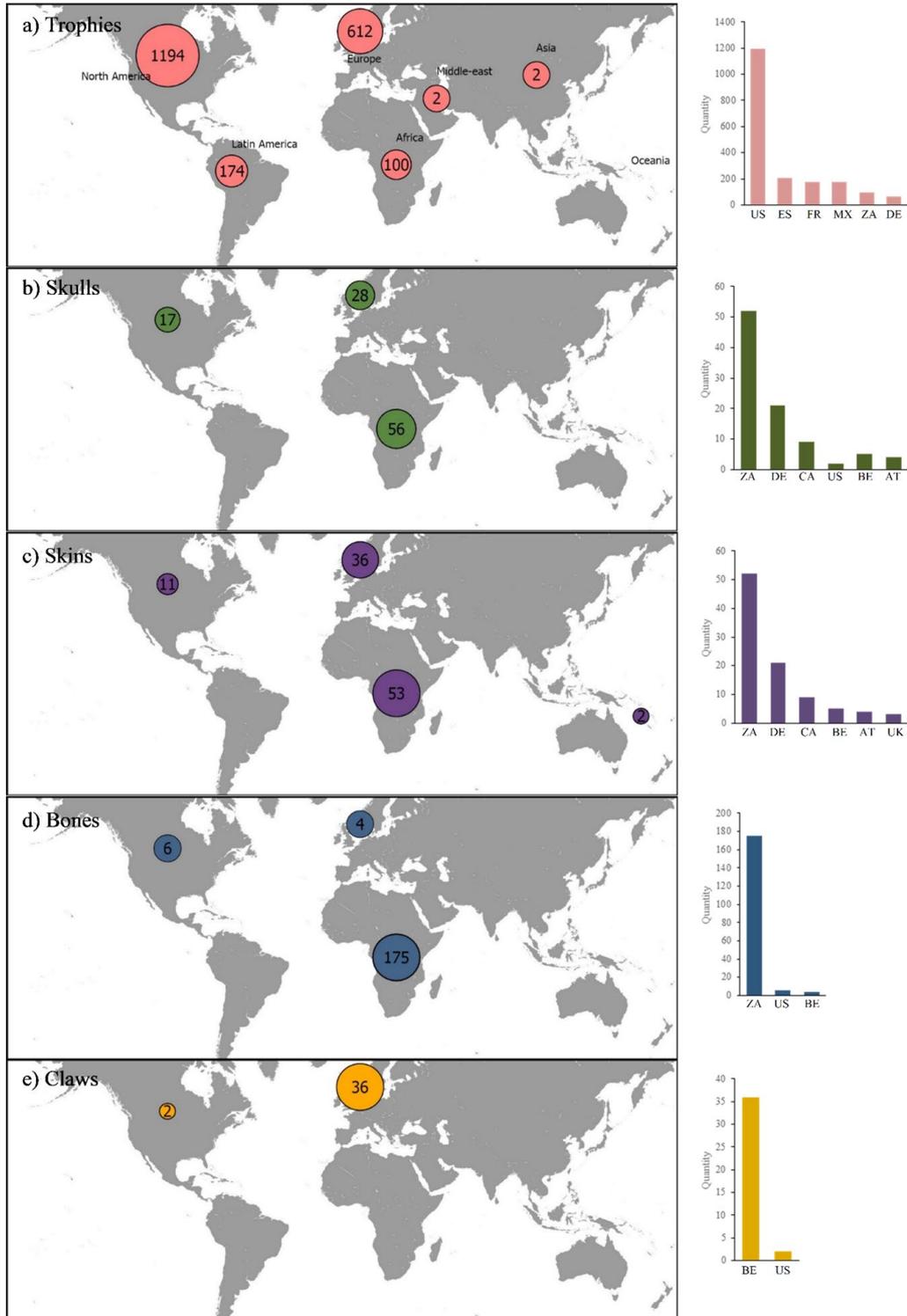


The largest importers of legal lion trophies were based in North America and Europe, with the United States being the highest (Figure 11).

Overall, South Africa was the second-largest importer of lion parts; in particular, lion bones, skulls and skins.

FIGURE 11

Quantity of legal lion products reported as imports by destination regions and countries for a) trophies, b) skulls, c) skins, d) bones, e) claws. AT-Austria, BE-Belgium, CA-Canada, DE-Germany, ES-Spain, UK-United Kingdom, US-United States, ZA-South Africa. Data source: CITES Trade Database.





SEIZURE DATA



since 2010
57 international and domestic seizures of lion products have been reported, all originating from Tanzania

Data were collected and extracted from the WiTIS database. These data represented seizures recorded between 2010–2019 and were used to investigate the extent of the illegal trade of lion products internationally.

Since 2010 there have been a total of 57 international and domestic seizures of lion products. The seizures consisted of 1,555 lion products, the vast majority of which were lion claws (1,197; Table 6, Figure 12). Of the 57 seizures, 17 (30%) were parts intended for international destinations. The most common products seized in these instances were claws and teeth with few or no records of other lion parts or derivatives being seized internationally (Table 6).

The majority of seized parts and derivatives (88% of all claws and 78% of all teeth) were destined for Viet Nam via air direct to Asia; however, some shipments were found to transit through Europe and the Middle-East (Figure 12).

The majority of individuals apprehended with lion products were Tanzanian nationals, followed by Chinese and Vietnamese (Table 7). Although Tanzanian nationals were the most apprehended nationality, Vietnamese nationals were caught with the largest quantities of lion parts and derivatives.

TABLE 6

Summary of the quantity of seized lion products originating in Tanzania and destined for undeclared and declared international destinations. Types of bones were not described in the raw data.

UNDECLARED DESTINATION/DOMESTIC: SEIZURES = 40										
COUNTRY OF SEIZURE	CARCASS	SKIN	SKULL	SKIN - PIECES	BONE	CLAW	TEETH	FAT	OTHER	TOTAL
Tanzania (domestic seizures)	11	23	1	7	1	103	38		1	185
DECLARED DESTINATIONS: SEIZURES = 17										
COUNTRY OF SEIZURE	CARCASS	SKIN	SKULL	SKIN - PIECES	BONE	CLAW	TEETH	FAT	OTHER	TOTAL
China						37	21			58
India						33	2			35
Kenya						30	28			58
United Arab Emirates						5	4			9
Viet Nam					22	989	199			1,210
Total products in international seizures					22	1,094	254			1,370
Total products in seizures (international and domestic)	11	23	1	7	23	1,197	292	0	1	1,555
Total estimated "whole" lion equivalents*	11	19	1	na	na	67	na	na	na	98

*Estimated equivalent number of lions was calculated using seized lion products which could be measured (i.e. 1 skull=1 lion). Data were analysed to ensure that each case was only counted once. If multiple parts were seized, for example, if the skin was seized with claws either the skin or claws (18 claws per lion) was used to get an equivalent estimate of the number of lions as it is assumed that the parts came from the same lion. Teeth, bones and skin pieces were not used as estimates as without morphological examination, it was not known how many of these parts would equate to one lion.

TABLE 7

Summary of the nationality of people apprehended for the possession, trade, or transport of lion products. Numbers and commodities in brackets represent the number of seized products.

NATIONALITIES OF ARRESTED OFFENDERS					
NUMBER OF CASES/INCIDENCES	CHINESE	VIETNAMESE	TANZANIAN	INDIAN	UNKNOWN
57	12 (26 teeth, 60 claws)	5 (194 teeth, 919 claws, 22 bones)	69 (38 teeth, 103 claws, 30 skin and pieces, 1 bone, 11 carcasses)	4 (2 teeth, 33 claws)	11

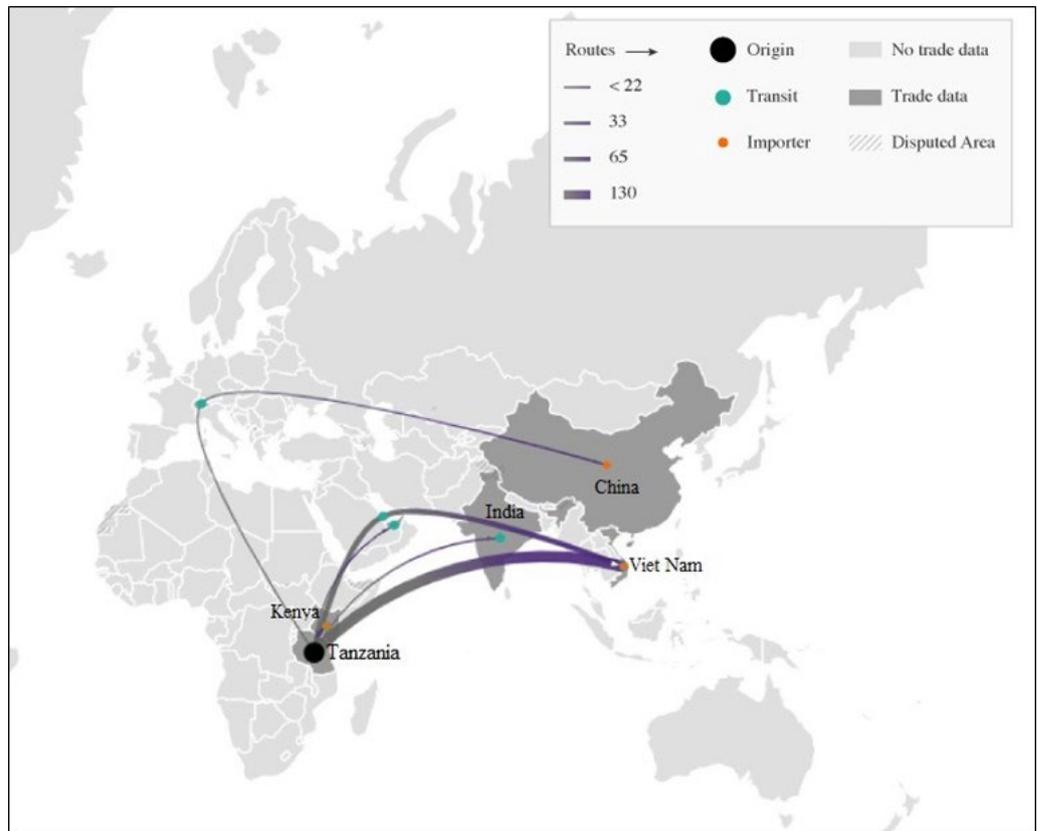
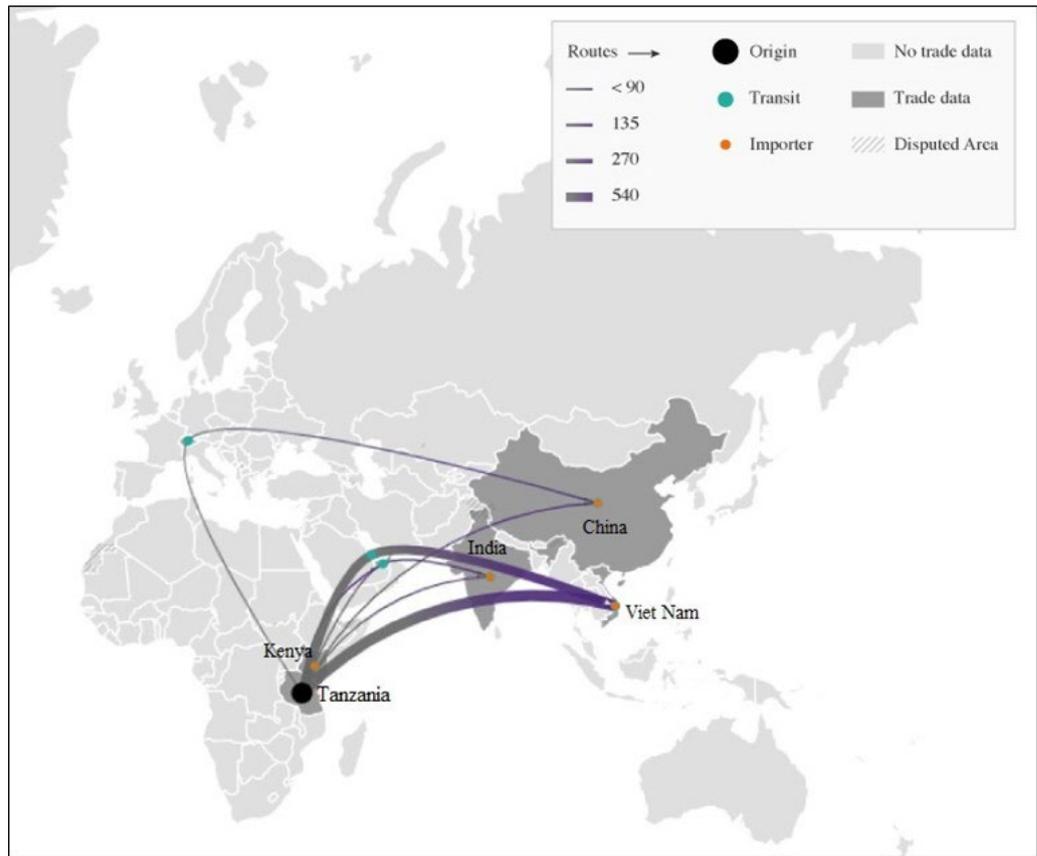


FIGURE 12
 Known trafficking routes for (top) claws and (bottom) teeth originating from Tanzania during the period 2010–2019. Thicker lines represent higher volumes of parts being transported between countries.
 Data source: WiTIS database.

OVERALL IMPACT ON TANZANIA'S LION POPULATION

During the period 2006–2019, lion deaths due to poaching (18) and retaliatory killings (1,046) collectively represent ~7.7 % of the current lion population (Table 9).

Lion products seized by authorities in Tanzania or destination countries between 2010 and 2019 were estimated to be equivalent to 98 lions (Table 10) thus representing ~1% of the lion population.

TABLE 8

2005 and 2018 population estimate and growth rate of the East Africa lion population in general and Tanzania in particular. Data source: IUCN SSC Cat Specialist Group, 2018 and Bauer et al., 2015.

POPULATION ESTIMATES	
2005 IUCN Tanzania population estimate	15,900
2018 IUCN Tanzania population estimate	9,872
Growth rate East Africa	$\lambda = 0.99 \pm 0.14$

TABLE 9

Summary table of anthropogenic lion mortalities for northern, central, and southern Tanzania, and conversion of these mortality data into annual average lion mortalities.

Numbers in bold have been extrapolated from available data. Source: Tanzania Wildlife Management Authority (TAWA), Tanzania National Parks Authority (TANAPA) and Tanzania Wildlife Research Institute (TAWIRI).

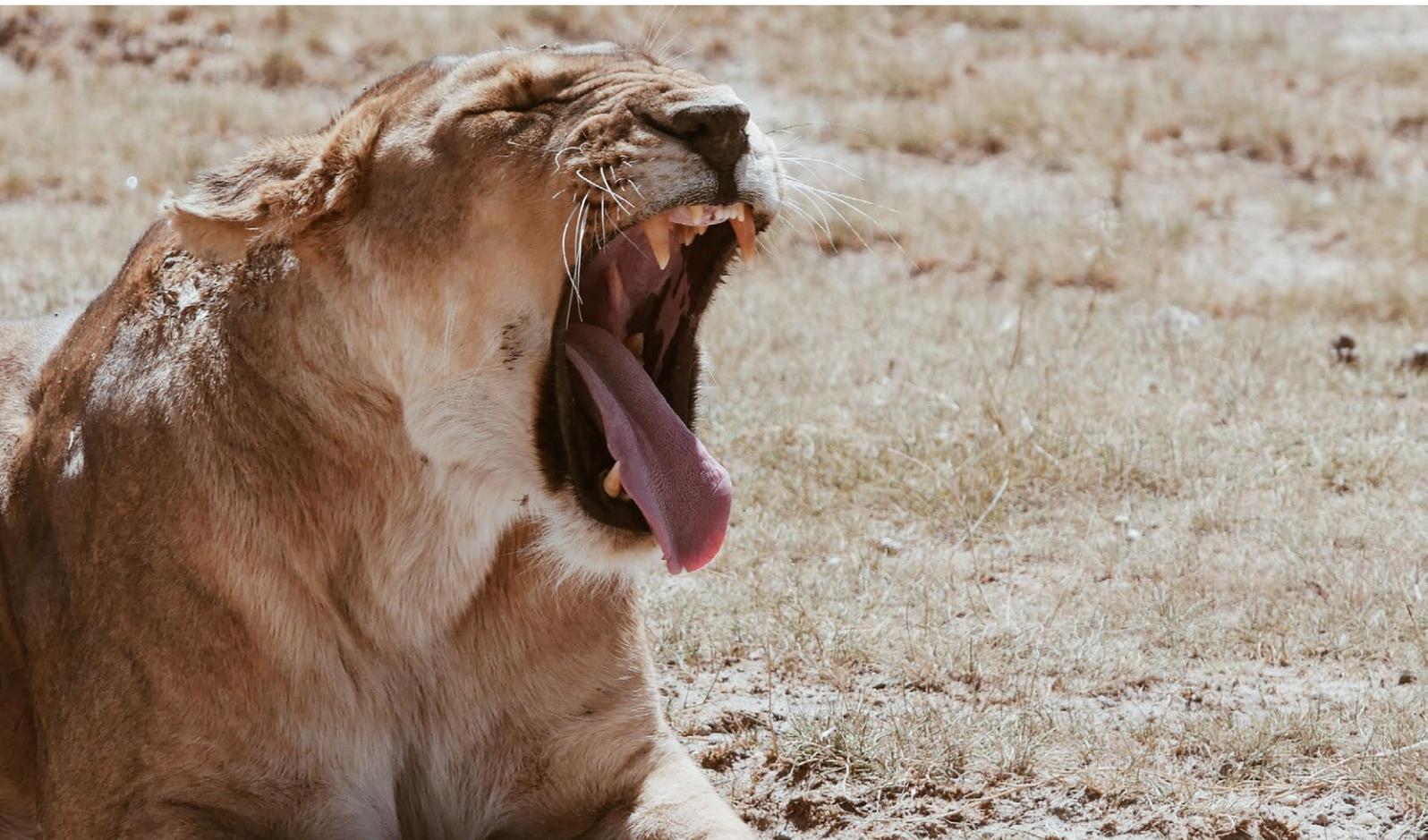
REPORTED LION MORTALITIES (2006–2019)				
	NORTH	CENTRAL	SOUTH	TOTAL
Trophy hunting				952
Retaliatory	212	388	446	1,046
Poaching	2	6	10	18
PAC				42
Roadkill				9
Total				2,067
ANNUAL AVERAGE LION MORTALITIES				159

TABLE 10

Trade data collected from seizures of lion products during the period 2010–2019 and conversion of trade data into annual average lion mortalities.

Data in italics in brackets represents the portion of the total trade data which were provided by TAWA. The National Zoological Gardens, Pretoria provided an average weight for lion claws (10.127 g), this weight was used to convert kg of claws into “whole” lion numbers. Source; Tanzania Wildlife Management Authority (TAWA), WITIS database.

TRADE DATA (2010-2019)				
	TOTAL INTERNATIONAL	TOTAL DOMESTIC	TOTAL (INTERNATIONAL AND DOMESTIC)	TOTAL ESTIMATED NUMBER OF “WHOLE” LION EQUIVALENTS
Carcass		11	11	11
Skin		23	23 (4)	19
Skull		1	1	1
Skin - Pieces		7	7 (4)	na
Bone	22		22 (22)	na
Claw (18 claws = 1 lion)	1,094	3	1,197 (574)	67
Teeth	254	38	292 (136)	na
Fat			0	na
Other		1	1 (1)	na
Total				98
ANNUAL AVERAGE LION MORTALITIES				11



According to Bauer *et al.*, (2015), lion populations are declining in East Africa.⁶ The most recent population estimates suggest that Selous is the only stable lion population in Tanzania, with other main lion ecosystems either in decline or having unknown population statuses (Table 1). Consolidated lion mortalities for the period 2006–2019 amounted to 2,165 (Table 9, Table 10). Converted to annual mortalities⁷, this amounts to 170 animals per annum or ~1.2% of the total current lion population.

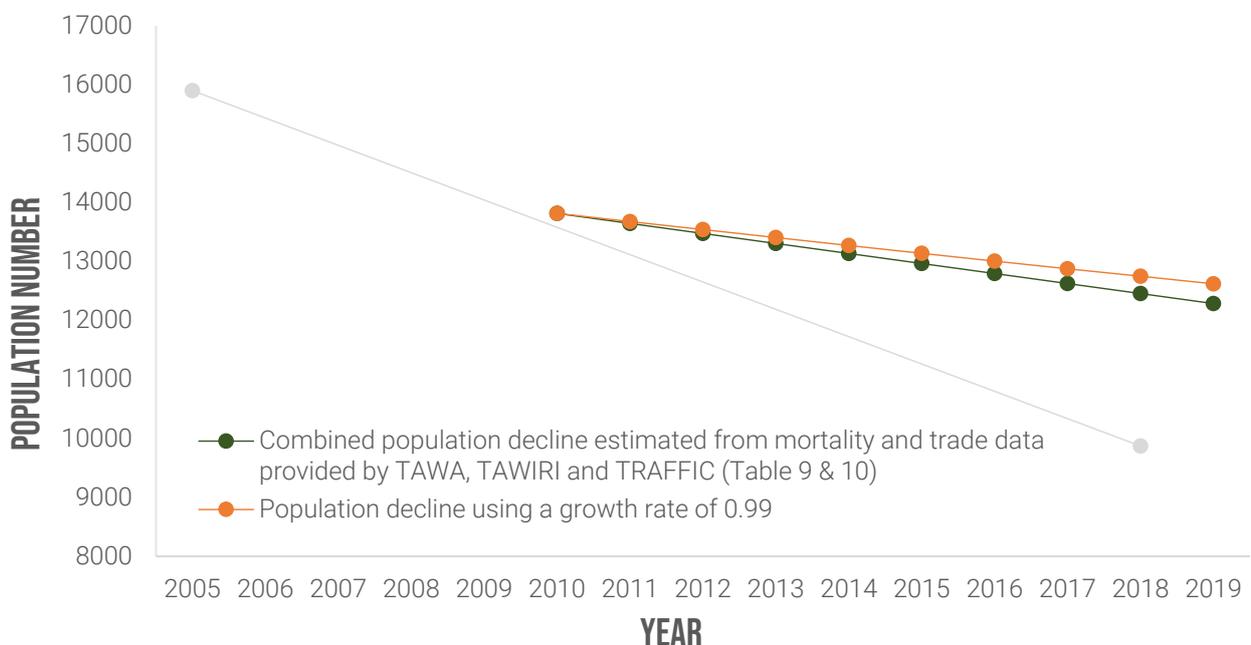
Using the TAWIRI population estimate of 13,818 (Table 1) as a starting point and the Bauer *et al.* (2015) population growth rate of 0.99, the estimated population in 2019 was 12,623 lions

(Figure 13). Using the same starting point, subtracting the animals involved in mortality and trade data cases collected by TRAFFIC, TAWA and WiTIS resulted in an estimated population of 12,288 in 2019, which is 2.7% less than the modelled growth rate decline (Figure 13). Worryingly, these estimates are in stark contrast to those published by IUCN (15,900 in 2005 and 9,872 in 2018; IUCN SSC Cat Specialist Group, 2018). These findings suggest that either the IUCN estimates are inaccurate, or the full extent of trade is not being detected and anthropogenic lion mortalities (i.e. poaching, retaliatory killings) are not being adequately reported.

alarming discrepancies exist between IUCN and TAWIRI population estimates

FIGURE 13

*Lion population decline using data from TAWIRI, TAWA, WiTIS, IUCN (IUCN SSC Cat Specialist Group, 2018) and a simulation of decline using the East Africa lion growth rate of 0.99 (Bauer *et al.*, 2015). This graph represents a summary of Tables 1, 8, 9 and 10.*





Ngorongoro crater, Tanzania

DISCUSSION AND **CONCLUSIONS**

MANAGEMENT

LIONS ARE ACTIVELY MANAGED IN TANZANIA. ALTHOUGH THE CARNIVORE ACTION PLAN (TAWIRI, 2009) IS OUTDATED, IMPORTANT ACTIVITIES AND MEASURES ARE BEING IMPLEMENTED TO ENSURE THAT TANZANIA'S LION POPULATIONS ARE BEING CONSERVED.

One implementation gap which was identified was the lack of recent regional population survey estimates (IUCN SSC Cat Specialist Group, 2018). Regular monitoring and surveys can provide valuable population data, assist

in predicting population trends and identify threatened populations. Without these frequent population surveys, it is difficult to counteract threats or manage populations as baseline data are deficient.

MONITORING OF TROPHY HUNTING

The hunting quota and management of the trophy hunting industry follow a formal but adaptive management approach. Tanzania has the management framework necessary for proper regulation. This framework consists of a suitable reporting and monitoring system which includes age restrictions on hunts (≥6 years), 21 day safari packages and robust reporting after hunts. Annual quota numbers are also in place to prevent overharvest of the species.

These quota numbers are adaptive and have decreased in recent years due to continued under-utilisation of the total quota amount (TAWIRI, 2016a). However, some shortfalls in the framework do exist. Firstly, although a six-year age limit is in place, trophies within the four to five-age category can still be exported with the payment of a fine⁸ (Wildlife Conservation (Tourist Hunting) Regulation, 2015). This leniency means that harvesting of males under six-years is accommodated if older males cannot be located. Secondly, a mandatory fee of 40% of the fixed quota is charged to all hunting operators regardless of whether lion hunts are successful. These fees may encourage hunting operators to be more “flexible” with age limits when choosing lions to harvest as they have already “paid” to harvest a specific quota of lions regardless of what is available on their hunting blocks (USFWS, 2015). Both these shortfalls may have social and ecological repercussions for lion populations (Loveridge *et al.*, 2016; Begg *et al.*, 2017) and are likely to encourage overharvest and non-adherence to science-based age restrictions (Lindsey *et al.*, 2013a).

In hunting blocks, there is a strong incentive for species and habitat conservation. It is in the hunting operators’ best interests to ensure

POPULATION STATUS

Riggio *et al.* (2013) identified 10 lion strongholds throughout Africa, three of which are located in Tanzania (Ruaha-Rungwa, Selous and Serengeti-Mara). The data presented above indicate that overall Tanzania’s lion population declined from 2010 (Figure 13). Two of Tanzania’s identified lion strongholds (Ruaha-

that land is well managed and that wildlife populations, especially carnivores, persist. Tanzania’s hunting areas cover one-third of Tanzania’s land and are very important in terms of ecosystems and wildlife populations that persist within them (TAWIRI, 2016a). With growing human populations and land conversion from wilderness areas to human-use areas such as farming or pastoralism (Riggio *et al.*, 2013), protected areas that have been gazetted as hunting areas must remain as such to conserve biodiversity. With low annual lion harvests and Tanzania’s current adaptive management approach, the findings in this report suggest that trophy hunting alone is not detrimental to African Lion population numbers. These findings align with the Non-Detriment Findings (NDFs) published by TAWIRI in 2016a, which focused on the safari hunting industry in Tanzania. In this NDF, TAWIRI concluded the following: “Safari hunting provides a net benefit to the species, it does not pose a threat to the species, and it is not a detriment to the survival of the species. Regulated safari hunting of lion in Tanzania enhances the survival of the species. Lion is neither endangered nor threatened in Tanzania.”

It is imperative to note that although the hunting management framework is adequate at a country level, Figure 13 illustrates that the overall lion population is declining under pressure of what Macdonald *et al.* (2017), term “additive” mortalities. This concept strongly supports the notion that in Tanzania excessive undocumented human-induced lion mortalities such as poaching, retaliatory killings, PAC and roadkill are “additive” to trophy hunting impacts and tipping the lion population into a negative growth rate.

Rungwa, Selous) have been identified as at risk of being negatively impacted by potential illicit activities such as poaching and “false” retaliatory killings. Immediate management interventions, especially monitoring of illicit activities, may help to arrest the current decline in the lion population.



4-5 year trophies

can still be exported with the payment of a fine

a 40% fixed quota is charged to hunting operators regardless of a hunt’s success

DOCUMENTED TRADE AND LION MORTALITIES

Overall, the data suggest that the primary source of lion products originates from lions killed in retaliation for livestock depredation. Most communities had experienced conflict with lions, and more than half had respondents that knew of members of their community who had killed a lion in retaliation for conflict or livestock depredation. Tanzania has a compensation scheme which came into effect in 2016 where communities or individuals are compensated when carnivores kill livestock (The Wildlife Conservation (Dangerous Animals Damage Consolation) Regulations, 2011). If a lion is killed in retaliation, only the lion's skin along with the teeth and claws are required to be taken to the nearest district game office by officials or community members and put into storage for record as government trophies. It is illegal to be in possession of the above-mentioned parts without written authorisation from the Director of Wildlife. It is unknown what happens with the rest of the lion carcass, but it is assumed that community members will collect certain parts for personal use. This approach is unfortunately not well managed and, in some cases, or some remote areas, skins, teeth and claws are not taken to district offices resulting in missed records of retaliatory killings.

Furthermore, this approach leaves an opportunity for illegal harvesting to take place in the disguise of "false" retaliatory killings. One community member south of Ruaha National Park (Central) was asked if he was aware of any lion poaching occurring in his village or surrounding villages, to which he replied: "Yes they pretend that the lion wanted to kill cows and then they kill it." In these cases, lion deaths are reported as retaliatory killings although the primary motivation was to collect lion parts. These unreported retaliatory killings could account for some of the undocumented mortalities that are not reflected in official data. Domestic use of lion products from retaliatory killings is a concerning activity throughout Tanzania. Although the data are deficient from some areas (i.e. Ruaha-Rungwa and Selous), examining the percentages of respondents engaged in retaliatory killings and using lion products, and extrapolating suggests that the central (Ruaha-Rungwa) and southern regions (Selous area) appear to have a higher level of

unsustainable lion product use and killings. Distinct within-country regional differences exist with regards to lion product use. Skin, tail and fat were the preferred products used in northern Tanzania, whilst central Tanzania had a preference for fat followed by claws and skin. In southern Tanzania fat was used widely. It is also clear from the data gathered in northern Mozambique that there is potential cross-border trade occurring from Tanzania at "weak" spots in the Ruvuma landscape, as Tanzanian nationals (traders) were recorded in the Niassa area in search of lion products (Niassa Carnivore Project data).

The authors of this report believe that estimates of lion deaths due to retaliatory killing, poaching, incidental by-catch and prey-base depletion are grossly underestimated due to under-reporting. Another potential source of lion products may be from targeted lion poaching. Although data on lion poaching are deficient, responses from community interviews suggest that lion poaching does exist. Approximately one-third of communities had members that were aware of lion poaching taking place within their community or surrounds, the majority of these communities were located in the south (59%) and central (37%) regions of Tanzania.

The number of seizures which took place internationally (17 seizures resulting in 1,370 seized lion products) was lower than those seized domestically (40 seizures resulting in 185 seized lion products), however the number of actual lion products seized internationally was much higher than domestic lion product seizures. Seizure data gathered from customs authorities revealed that the highest levels of trade were in teeth and claws with Asia, specifically Viet Nam, identified as the final destination for the vast majority of these products. Lion parts seized by authorities in Tanzania or destination countries between 2010 and 2019 were estimated to be equivalent to 98 lions. The preference for teeth and claws in Asia concurs with Williams *et al.* (2017), who also found that skin, teeth, claws and bones are the lion commodities most in demand across the African continent. It is plausible that the ease with which lion teeth and claws can be collected and concealed makes the trade of

killed in retaliation
for livestock depredation is the primary source of lion products found in trade

these products less risky to move and transport regionally and internationally. This preference for smaller less conspicuous products is similar to criminal syndicates involved in the illegal trade of rhinoceros horn, who manufacture products to transport, such as rhinoceros horn beads, bracelets or ground-down rhinoceros horn (powder form), all to increase the smuggling efficiency of rhinoceros products and prevent detection at airports (Moneron *et al.*, 2017).

There is a disparity between IUCN's reported lion population estimates (15,900 animals in 2005 and 9,872 in 2018), and estimates provided by TAWIRI (13,818 between 2010 and 2015). These different population estimates are concerning as the population may not be as well managed as previously thought with higher levels of illegal trade and mortality than previously estimated.

disparity
between IUCN's
reported lion
population
estimates and
estimates
provided by
TAWIRI



CONCLUSIONS

ASSESSMENT FOR AFRICAN LION IN TANZANIA

In conclusion, the majority of products traded domestically likely originate from past and present retaliatory killings that take place around Protected Areas where humans and wildlife co-exist. Disparity between population estimates and their associated declines have

led to concerns about the potential trade in lion products and mortalities that existing monitoring systems are not detecting. Some examples of such trade gaps include the following:

1. **Regional differences in lion product use within Tanzania**, specifically in the central and southern regions, where products perceived to be of value for international trade and Asian medicine are being used and possibly traded;
2. **The disparity between officially reported poaching events** versus the anecdotal poaching/retaliatory killing incidents that communities report in their areas; and
3. **Despite a low level of international trade and low level of reported poaching incidents**, significant quantities of claws and teeth destined for Southeast Asia appear to suggest higher poaching rates than officially recorded.

Using TAWIRI's population estimate the documented decline of Tanzania's lion population was calculated to be ~15% in the 10 years (2010–2019). It is evident from the results of this report that the population is declining

faster than the predicted negative growth rate of 0.99 (Figure 13). There are several possible reasons for the disconnect, including the following:

1. **Population surveys** are inherently difficult to conduct and may represent an under- or over-count, with data which are often imprecise and the level of accuracy of population counts largely unknown (IUCN SSC Cat Specialist Group, 2018).
2. **Key activities in the TAWA management plan (section 2.3)**, such as population monitoring and surveys, may not have been conducted as rigorously or regularly as required, thus resulting in underestimates of population, poaching and anthropogenic mortality levels. As lion trade is only one of several factors leading to their decline (~1%⁹ of the population decline can be attributed to trade), and this impact only represents a small portion of the overall decline, it is assumed that either not all trade is being detected or anthropogenic lion mortalities (i.e. poaching, retaliatory killings) are higher than currently reported. Under-reporting of lion mortalities and the lack of current population data are key issues when trying to assess the status of Tanzania's lion populations.
3. **High export quantities of trophies** and other lion parts during earlier years (2000–2011) could be another reason for the decline in lion populations; however, this would require further investigation to determine if overharvesting was occurring during this period.

In conclusion, it appears that the limited documented trade (~1%), in combination with lion mortalities recorded in Table 9 and Table 10 are the main contributors to the decline in lion populations in Tanzania. However, there is also concern that the Tanzania lion population is declining at a faster rate than the negative growth rate predicted. Coupled with low reproductive rates and the lion's susceptibility to anthropogenic pressures (e.g. prey-base depletion, habitat loss and indiscriminate killing), this means that lion populations may not be as resilient to coping with these

compounding negative threats as they would be in an undisturbed environment. It is evident that to protect Tanzania's lion population additional resources need to be allocated to implement management plan activities, especially those associated with monitoring and surveys, as well as preventing livestock depredation and associated retaliatory killings. Areas which have been identified as potential trade/poaching "hotspots" (Ruaha-Rungwa region and the Ruvuma landscape) require further investigation and immediate action.

RECOMMENDATIONS

TRAFFIC MAKES THE FOLLOWING RECOMMENDATIONS:

GENERAL

To address the substantial numbers of retaliatory killings that are likely to be occurring across Tanzania, more monitoring agencies are needed in key lion areas such as the Selous region. These agencies could include NGOs, tourism companies or government staff to assist with monitoring of lions and collaborate and support communities to reduce human-lion conflict.

TANZANIA WILDLIFE RESEARCH INSTITUTE

TAWIRI needs to develop an updated Conservation Action Plan specific to the African Lion in Tanzania. The updated Action Plan should have a specific focus on updating current lion population estimates to ensure that regular lion surveys and monitoring programmes are implemented across the country.

TANZANIA WILDLIFE MANAGEMENT AUTHORITY

The activities that have been achieved in the current Carnivore Action Plan (TAWIRI, 2009) need to be consolidated by TAWIRI and the existing activities updated, paying attention to ensure that all activities are accountable, timely, and conducted regularly.

TAWA should facilitate workshops and meetings within wildlife authorities, relevant conservation organisations and communities to boost awareness of the threat of lion poaching and trade.

TAWA should develop a country-wide database for compiling and storing data on lion poaching incidents.

TAWA should identify key wildlife authorities in areas recognised as potential trade/poaching “hotspots” such as the Ruaha-Rungwa region and the Ruvuma landscape and assist law enforcement and anti-poaching efforts in these areas to ensure that lion mortalities are reduced.

Relevant enforcement agencies such as TAWA need to strengthen work on anti-trafficking and investigations related to the illegal wildlife trade.

The Tanzania Government should amend the current hunting regulations to prohibit any lion hunts where lions are younger than the six-year minimum age restriction.

The Tanzania Government should adjust trophy hunting fees to charge hunting operators per lion hunt and refrain from charging a yearly fee regardless of offtake.

The Tanzania Government should strengthen management of protected areas (PAs) with specific emphasis on vacant hunting blocks where management is compromised and consider pursuing Public-Private Partnerships for PA management in areas where no support or management exists.

TANZANIA GOVERNMENT

CUSTOMS AND LAW ENFORCEMENT

Border control and customs officers at all ports (i.e. sea, land, air) need to improve detection measures to ensure that all illegal trade is uncovered and information is gathered on trafficking routes and commodities in demand. The relevant agencies (TAWA and the Tanzania Customs Authority) need to allocate additional resources towards staff training in detection and screening techniques and technologies, while institutional collaboration needs to be improved to ensure that seizure data are accurately stored and accessible to those needing to access them.

Law enforcement agencies should collaborate with wildlife authorities and make full use of wildlife legislation to prosecute criminals. Tanzania should rate its success in countering illegal wildlife trade by the number of successful prosecutions, in addition to the detection of lion parts and derivatives at ports of entry and exit.



MOZAMBIQUE RESULTS

INTERVIEWS WITH WILDLIFE PROFESSIONALS

A total of 27 interviews were conducted with wildlife professionals, including 20 with wildlife authorities (National Park staff, wildlife conservation organisations), and seven with professional hunters.

Of the 27 respondents, 23 (85%) thought that poaching was a significant threat to wildlife in Mozambique (Figure 14) with 19 (70%) aware of the trade in lion bones, parts and derivatives and almost all respondents aware of poaching or retaliatory killings that took place in their wilderness area. Some 14 (52%) believed that these lion mortalities were linked to trade in lion parts or products (Figure 14) and a similar

number (15, 57%) believed that lion products were being used both domestically and internationally. The majority of respondents (16, 58%) considered that the most likely source of lion products would be from wild poached lions (Figure 14).

Respondents indicated that the majority of lion parts are used for traditional African medicine. Parts such as teeth and claws were mostly used as curios, status symbols and decorations. Other categories which ranked high in reported use were parts used for magic/witchcraft,¹⁰ income generation, and Asian medicines (Figure 15).

FIGURE 14

Summary of answers (% of respondents) by wildlife professionals in Mozambique to six key questions related to lion harvest and trade.

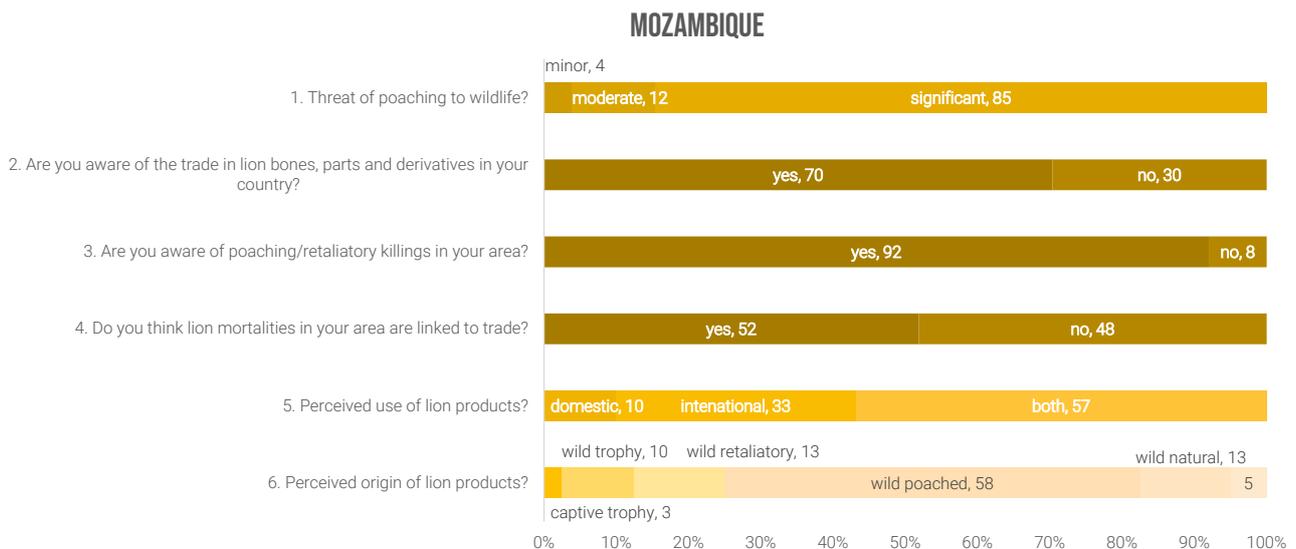
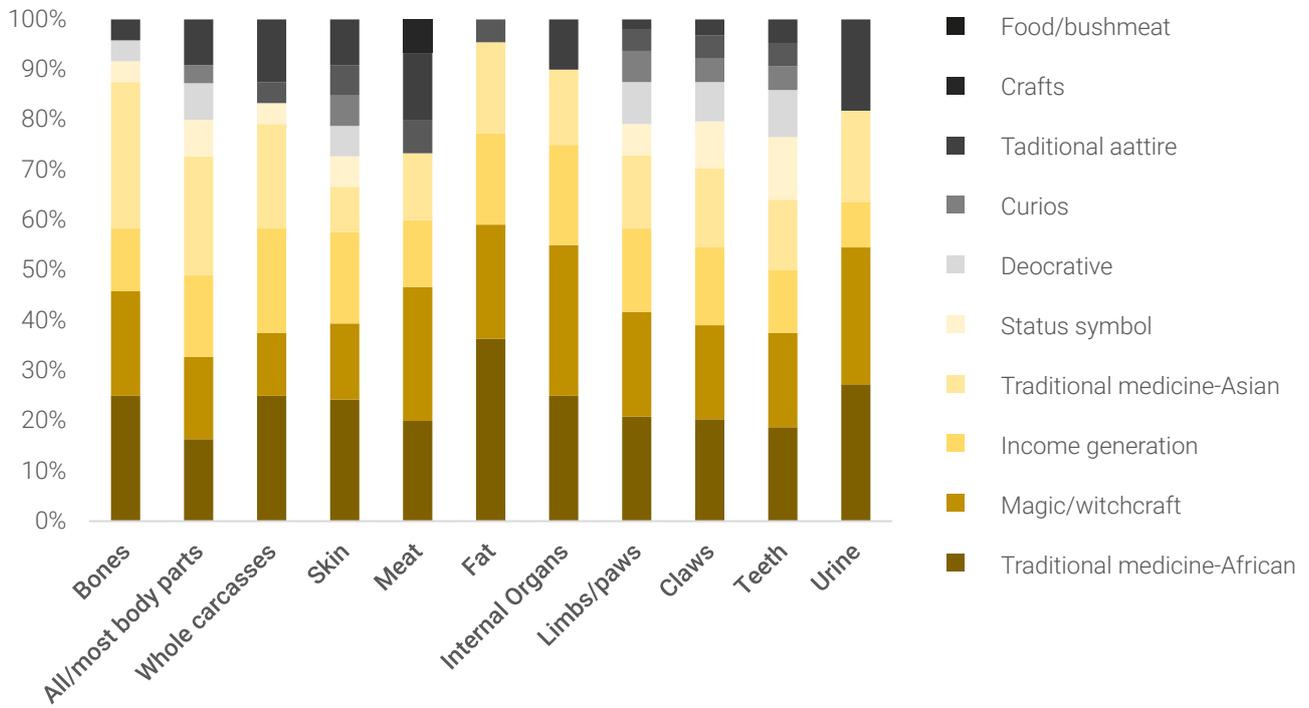


FIGURE 15

Respondents' opinions regarding the reported use of lion products in Mozambique. "Percentage" represents the percentage of the total number of responses by all respondents per category.



101
community
members were
interviewed within
30 communitiies

COMMUNITY INTERVIEWS

A total of 101 community members were interviewed within 30 communities and villages across Mozambique (Figure 16, Table 11). The interviews took place within two separate regions (northern and southern) defined by significant lion populations and abundance of protected areas. No interviews took place

in the central region of Mozambique due to security concerns that blocked researchers from accessing interview sites. The majority of villages (25, 83%) were located within known lion population ranges (Figure 16), and within protected areas (17, 57%, Table 11).



FIGURE 16

Map illustrating the location of community surveys that were conducted in 2019–2020 in Mozambique in relation to protected areas, lion population distribution and region. Protected area data: IUCN, UNEP-WCMC, 2020. Lion distribution data: Panthera and WCS, 2016

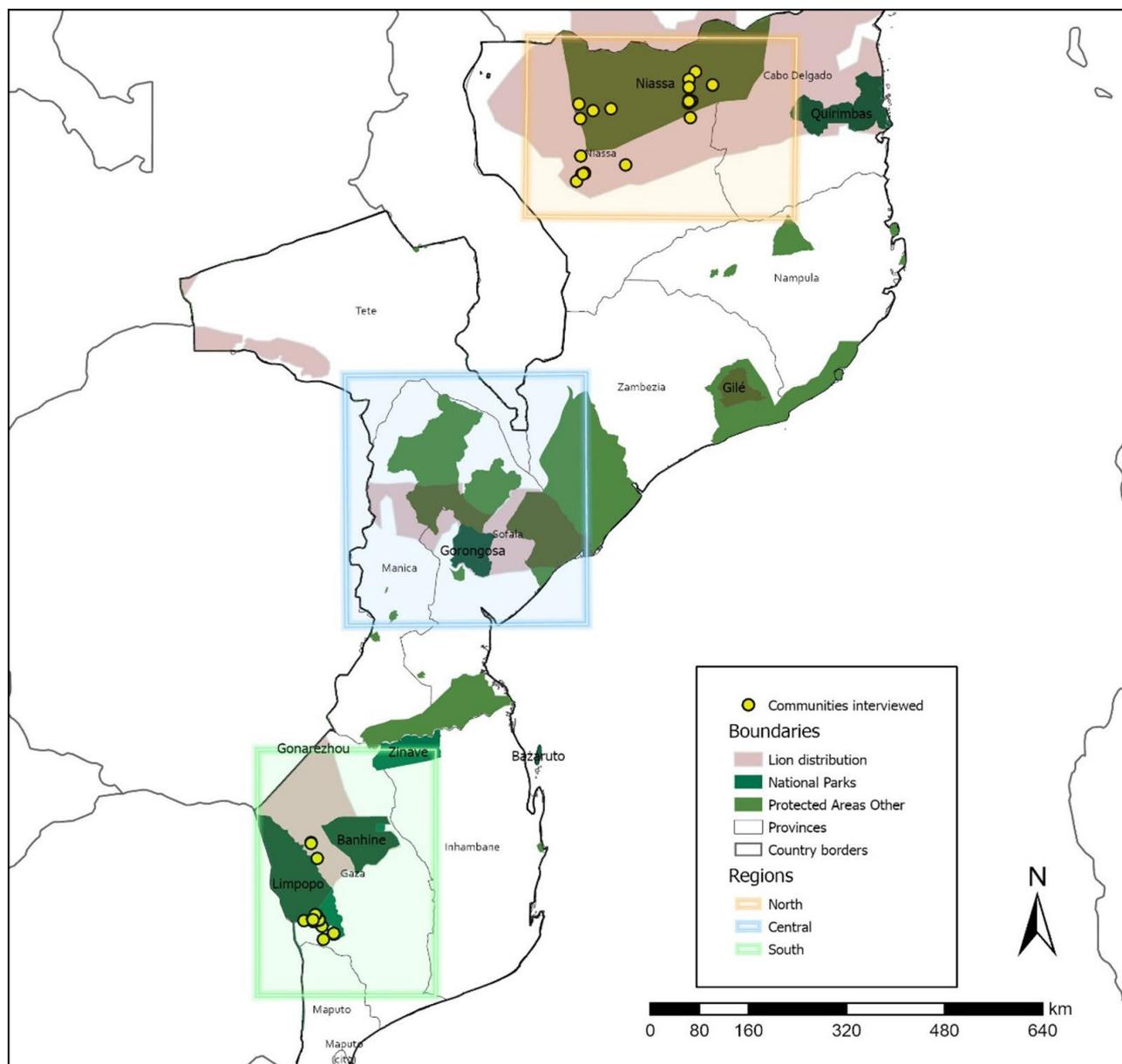


TABLE 11

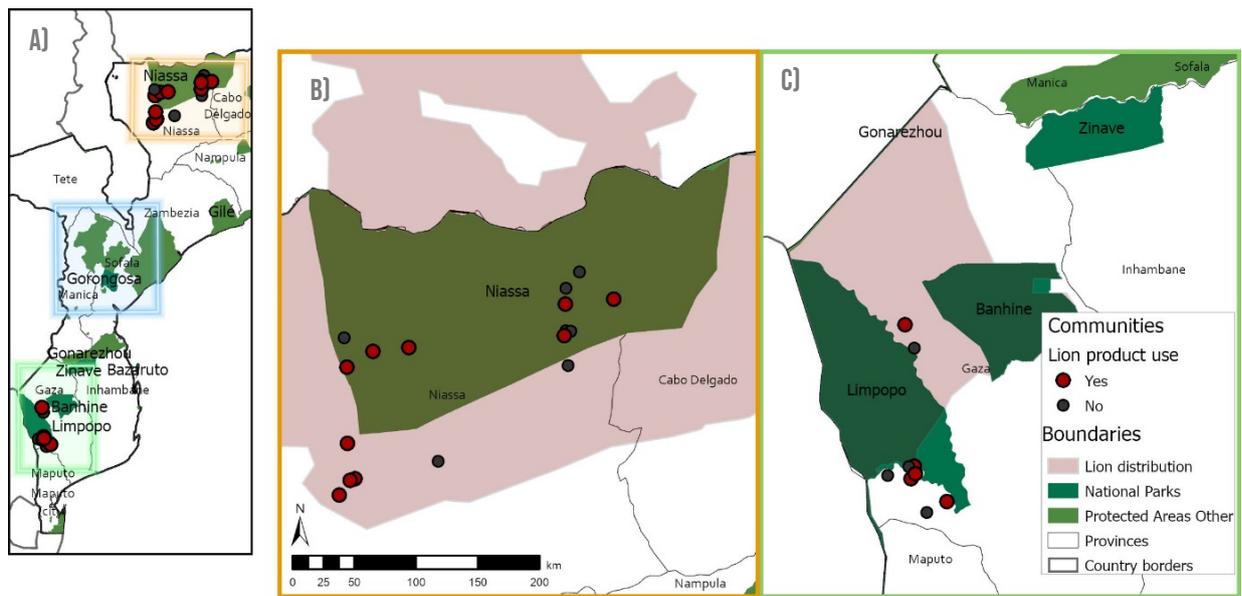
Summary of the total number of interviews and community villages where interviews were conducted by region across Mozambique.

REGION IN MOZAMBIQUE	NUMBER OF COMMUNITY MEMBERS INTERVIEWED	NUMBER OF COMMUNITIES WHERE INTERVIEWS TOOK PLACE	NUMBER VILLAGES WITHIN KNOWN LION RANGES	NUMBER VILLAGES WITHIN A PROTECTED AREA
northern	70	21	21 (100%)	15 (71%)
southern	31	9	4 (44%)	2 (22%)
TOTAL COUNTRY	101	30	25 (83%)	17 (57%)

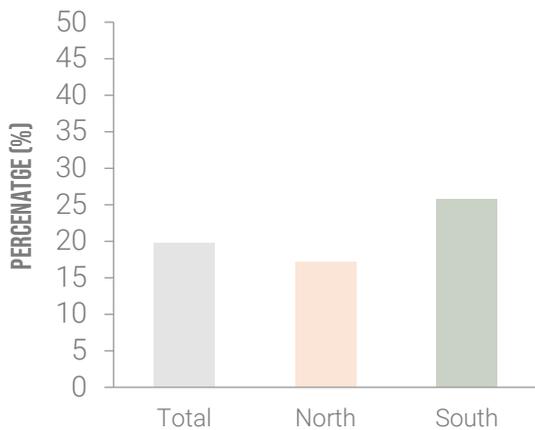
Approximately 23% of community respondents stated that they use or have used wildlife products, of which elephant dung was the most used product. Less than a quarter of respondents admitted to using lion products (20% of respondents, n=101, Figure 17).

The most common lion product used by community members was lion paws/claws, reported by 40% of respondents (Figure 17). Other products used by respondents included:

skin (35%), and fat (35%). Surprisingly, “lion throat” was reported (25%) as a commonly used item throughout the country. Interestingly, regional differences in lion product usage were identified (Figure 17). In the northern region (Niassa and surrounds), there was a preference for paws and/or claws, followed by skin and teeth. In contrast, the most common lion product used in the southern region (Limpopo National Park and surrounds) was lion fat.



D) PERCENTAGE OF TOTAL RESPONDENTS THAT USE LION PRODUCTS



E) TYPES OF LION PRODUCTS USED BY RESPONDENTS BY REGION

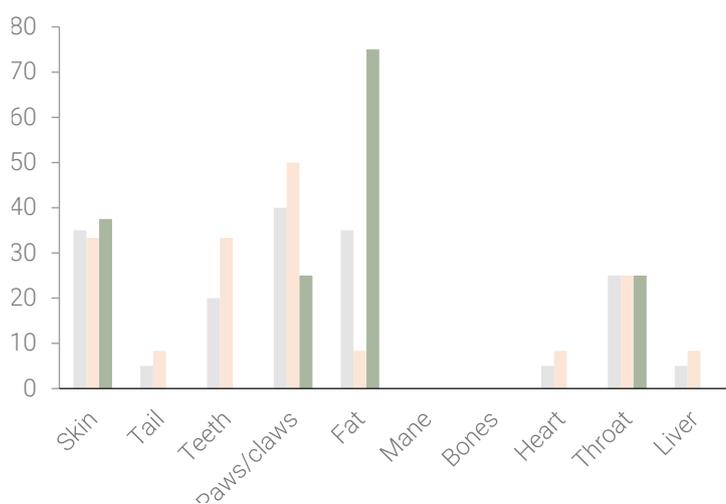


FIGURE 17

Lion product use. a) Country map illustrating the location of community villages that admitted to lion product use; b) Map of community villages that admitted to lion product use in Niassa Special Reserve (northern) and, c) around Limpopo National Park (southern) d) Types of lion products/parts used by respondents by region as a percentage of those that use lion products. No community interviews were conducted in the central region of Mozambique.

TABLE 12

Summary of interview responses relating to the percentage of communities (n=30) that have experienced conflict with lions, have had retaliatory killings of lions taking place, and were aware of potential poaching taking place within or around their communities. Numbers in brackets represent the actual number of communities.

REGION (N = NUMBER OF VILLAGES)	% OF COMMUNITIES THAT HAVE EXPERIENCED CONFLICT WITH LIONS	% OF COMMUNITIES WHICH HAVE EXPERIENCED RETALIATORY KILLINGS	% OF COMMUNITIES THAT ARE AWARE OF POACHING WITHIN OR AROUND THEIR VILLAGE.	% OF COMMUNITIES THAT USE LION PRODUCTS
northern (n=21)	33 (n=7)	19 (n=4)	57 (n=12)	48 (n=10)
southern (n=9)	78 (n=7)	33 (n=3)	10 (n=1)	56 (n=5)
TOTAL (N=30)	47 (n=14)	23 (n=7)	43 (n=13)	50 (n=15)

Almost half (~43%) of all communities interviewed had experienced conflict with lions, of which most incidents occurred in the southern region. A few northern communities admitted to knowledge of retaliatory killings of lions, most likely a reflection of the low presence

of livestock in the northern region as a result of Tsetse Flies. Knowledge of poaching incidences was more prevalent in the northern region (57%), in comparison to the southern region (10%), where very few respondents were aware of lion poaching within or near their villages (Table 12).

LION MORTALITY DATA

Data on anthropogenic lion mortalities were gathered from published sources and wildlife professionals to understand the uses and legal and illegal harvest of lions in Mozambique. Sources included Limpopo National Park (southern region; K. Everatt, in litt. to K. Mole, December 2019), the Niassa Carnivore Project (northern region; C. Begg, in litt. to K. Mole, February 2020) and Holly Rosier (in litt. with K. Mole, October 2019) in the central region. Data included deaths due to PAC, retaliatory killings, poaching, professional hunting, and roadkill.

In the northern region, there were a total of 129 lion deaths due to legal and illegal hunting between 2013–2019 (Figure 18b). Of these mortalities, 96 (74%) were due to poaching or suspected poaching (Figure 18). Incidents of poaching were also significant in the southern region, where in the nine years (2011–2019), poaching and suspected poaching represented 37 (49%) of all 76 anthropogenic lion mortalities (Figure 18c). Of these mortalities, 24 (65%) were targeted poisoning events, and in most cases,

data from both regions showed that paws and heads were removed from carcasses. Lion trophy hunting data were only obtained from the northern region of Mozambique for concessions in and around Niassa Special Reserve. These data record that from 2013 to 2018, 32 lions were hunted for sport at an average rate of 4–5 lions per annum, representing 32 (about 25%) of total lion mortalities in the region (Figure 18b).

There was a high number of retaliatory killings recorded in the southern region (Figure 18c). In comparison, there was a lack of recorded retaliatory killings in the northern region. Differences are likely a reflection of the low number of conflict incidences reported in the northern region, which is possibly due to low numbers of livestock owing to the presence of Tsetse Flies. For example, in the four years (2016–2019), there were only 17 incidences reported of lion conflict with domestic animals in the region (C. Begg, in litt. to K. Mole, February 2020).



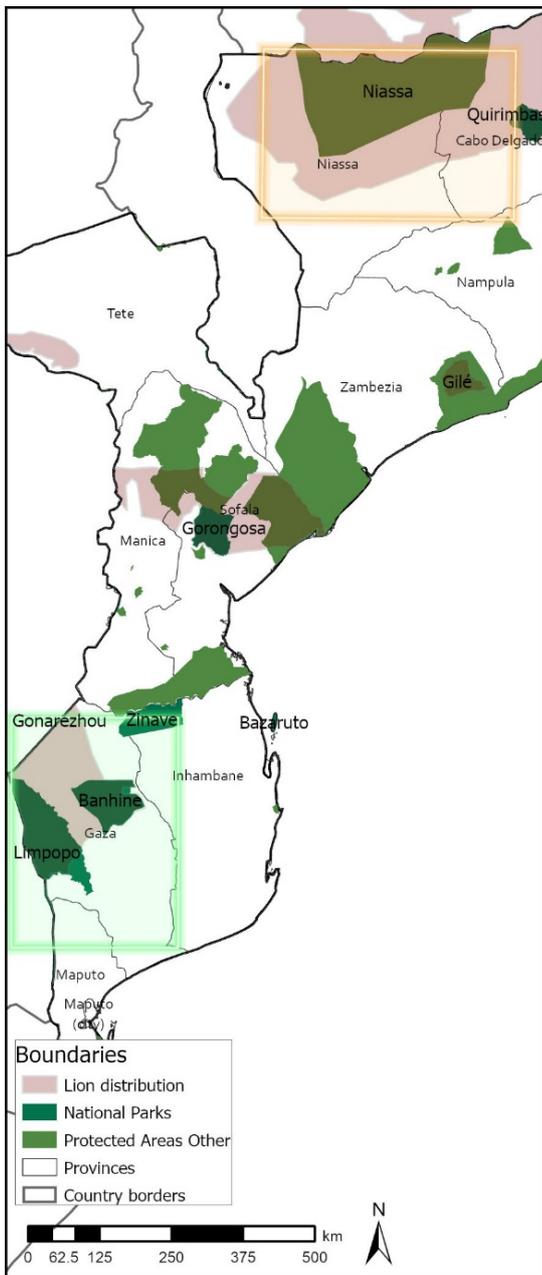
74% of mortalities in the northern region were due to poaching or suspected poaching

Central Mozambique has a small lion population of roughly ~290 lions within Gorongosa National Park and the surrounding Coutadas. While a few illegal lion mortalities have been recorded (H. Rosier, in litt. to K. Mole, October 2019),

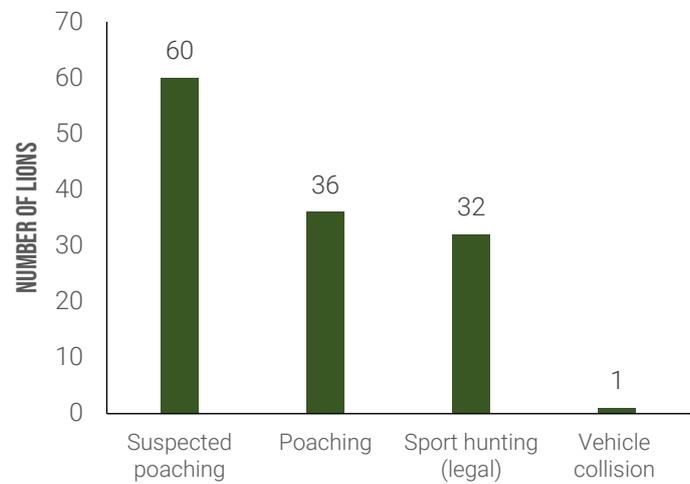
most of these cases are due to “accidental” death from gin traps placed to catch bushmeat. Interestingly, data from this area indicate that lions killed by gin traps did not have their body parts removed.

FIGURE 18

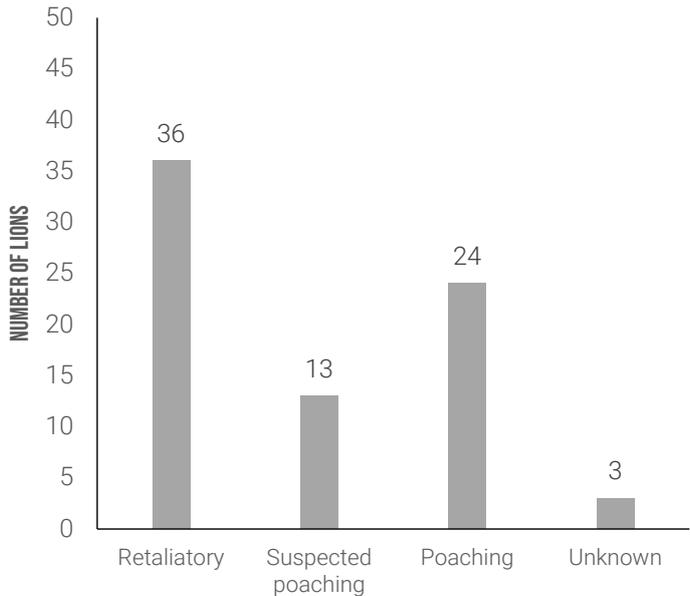
African Lion *Panthera leo* mortality data for the a) northern and b) southern regions of Mozambique. Data source: Niassa Carnivore Project (North) Everatt et al., 2019b (South).



a NORTHERN REGION LION MORTALITIES 2013-2018



b SOUTHERN REGION LION MORTALITIES 2011-2018



CITES TRADE DATA

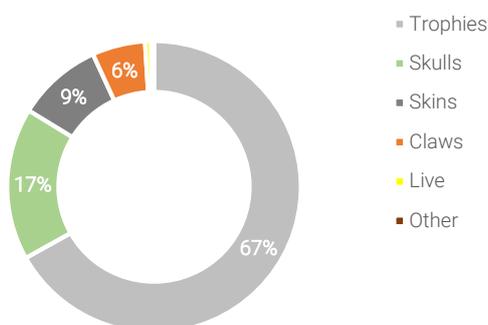
There was a discrepancy between the number of parts reported as imports by destination countries and quantities recorded as exports by Mozambique (Figure 19). In total, 774 lion parts were reported as imports by destination countries, including two shipments in 2000 and 2001 comprising 466 teeth.¹¹ By comparison, there were no recorded exports of teeth between 2000–2019. The majority of the remaining 308 parts comprised hunting trophies (Figure 19a). Exports reported by Mozambique totalled 524 parts with trophies being the main export (Figure 19c). It appears that the discrepancies between imports and

exports are likely as a result of skulls and skins being recorded separately for exports, while for imports, they are recorded together as trophies (Figure 19). Over time, both exports and imports were similar in scale, however, in 2017 there was a spike in claw import data which was not reflected in Mozambique's export data (Figure 19b). The majority of trophies were imported by Europe, North America and southern Africa, with the United States having the largest volume of trophies (Figure 20a). For skulls, skins, teeth and claws, South Africa was the largest importer (Figure 20).

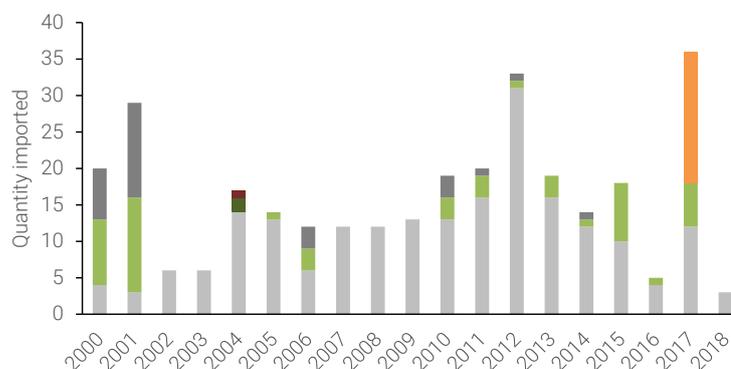
FIGURE 19

CITES data on the legal trade of lion products imported and exported to and from Mozambique. a) Percentage of imported lion parts reported by destination countries and b) Quantity of lion parts imported per year originating from Mozambique between 2000–2018 c) Percentage of exported lion parts from Mozambique (origin country) and d) Quantity of lion parts exported per year from Mozambique between 2000–2018. Import data exclude two imports of teeth that took place in 2000 and 2001 of 201 and 265 teeth, respectively. Data source: CITES Trade Database.

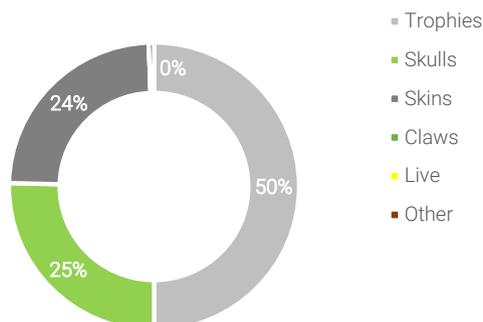
a) Percentage of parts imported by destination countries 2000-2018



b) Quantity of parts imported by destination countries



c) Percentage of parts exported by Mozambique 2000-2018



d) Quantity of parts exported by Mozambique

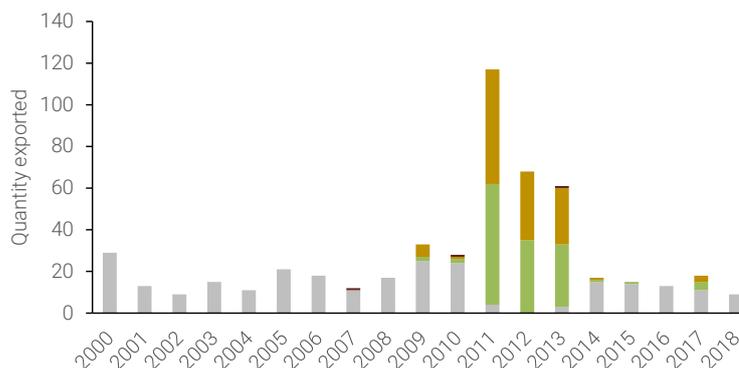
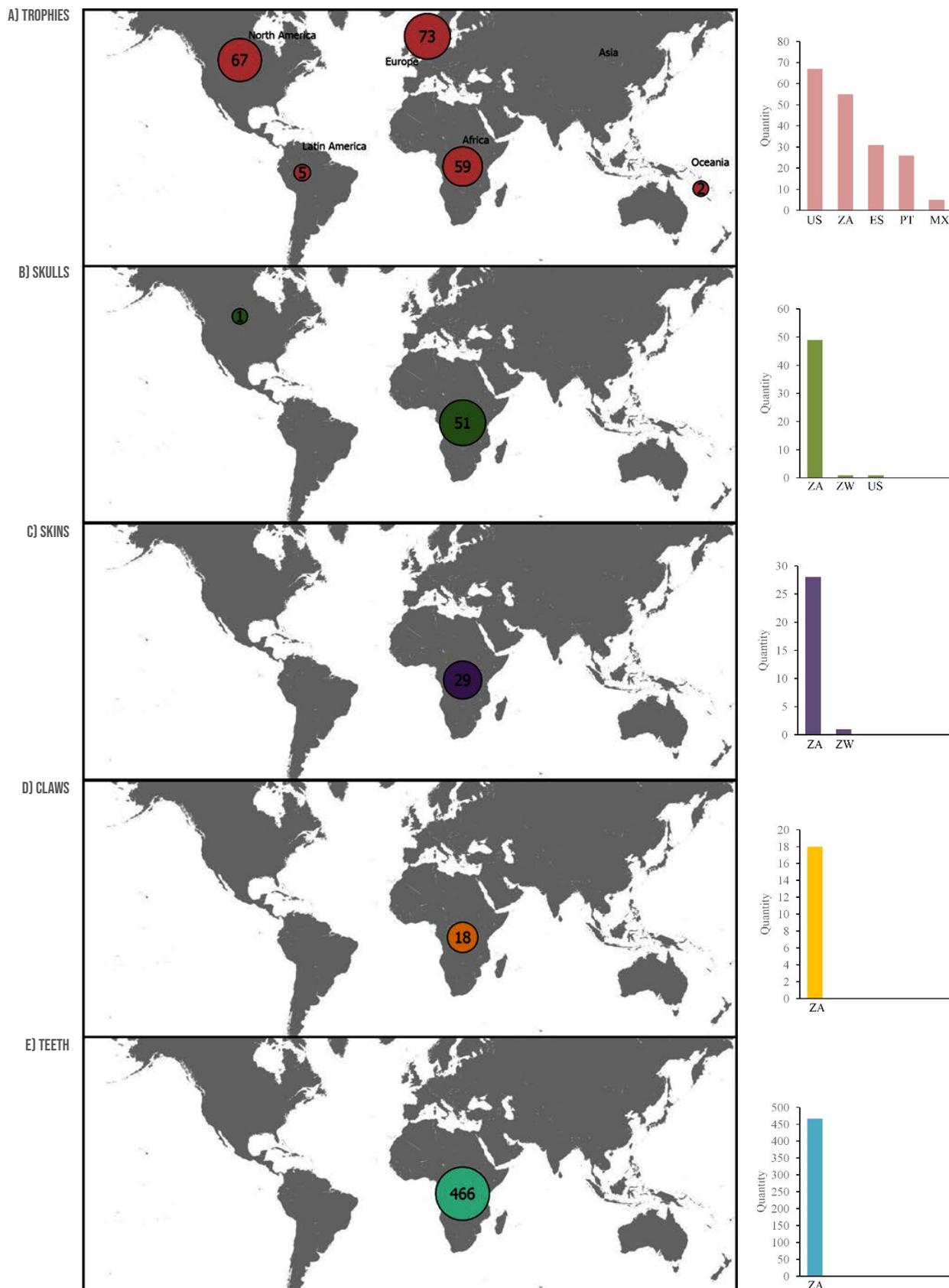


FIGURE 20

Quantity of legal lion products imported by region and country reported by destination countries for a) trophies, b) skulls, c) skins, d) claws, e) teeth. The reported teeth imports took place in 2000 and 2001 to South Africa. ES-Spain, MX-Mexico, PT-Portugal, US-United States, ZA-South Africa, ZW-Zimbabwe. Data source: CITES Trade Database.



SEIZURE DATA

Data were collected and extracted from the WiTIS database. These data represented seizures recorded between 2010–2019 and were used to investigate the extent of the illegal trade of lion products internationally.

Since 2010 there have been a total of 18 seizures of lion products made both internationally and domestically involving Mozambique. The seizures consisted of 684 individual parts, the vast majority of which comprised lion teeth (386) and claws (272+8.6 kg). Of the 18 seizures, nine (50%) were intended for international destinations. The only parts seized

in these instances were claws and teeth (Table 13, Figure 22).

Most seizures were destined, using mainly air transport, for Viet Nam (Table 13). Only two seizures were reported as a direct trade of products between Viet Nam and Mozambique. All other seizures included transit countries, such as Ethiopia, Kenya, Qatar, and South Africa (Figure 21). The predominant nationalities apprehended with lion products were Vietnamese, Chinese, and Mozambican nationals (Table 14).

18 seizures of lion products have been made internationally since 2010

TABLE 13

Summary of the quantity of seized lion products from Mozambique with undeclared and declared destinations. Types of bones were not described in the raw data.

*Estimated equivalent number of lions was calculated using seized lion products which could be measured (i.e. 1 skull=1 lion). Data were analysed to ensure that each case was only counted once. If multiple parts were seized, for example, if the skin was seized with claws either the skin or claws (18 claws per lion) was used to get an equivalent estimate of the number of lions as it is assumed that the parts came from the same lion. The teeth, bones and skin pieces were not used for estimates as it was uncertain how many of these parts would equate to one lion. The National Zoological Gardens, Pretoria provided an average weight for individual lion claws (10.127 g), this weight was used to convert kg of claws into “whole” lion numbers.

UNDECLARED DESTINATION/DOMESTIC: SEIZURES = 9								
COUNTRY OF SEIZURE	CARCASS	LIVE LION	BONE	SKULL	CLAWS	PAWS	TEETH	TOTAL
Mozambique	5	6	1	2	71 + 2.6 kg	12	239	336
DECLARED DESTINATIONS: SEIZURES = 9								
COUNTRY OF SEIZURE	CARCASS	LIVE LION	BONE	SKULL	CLAWS	PAWS	TEETH	TOTAL
China							6	6
Hong Kong Special Administrative Region					2			2
Kenya					6 kg			
Viet Nam					199		141	340
Total international					201		147	348
Total (international and domestic)	5	6	1	2	272+8.6 kg	12	386	684+8.6 kg
Total estimated “whole” lion equivalents*	5			2	15+47	1		70

FIGURE 21

Known trafficking routes for a) claws and b) teeth originating from Mozambique during the period 1996, 2013–2017. Thicker lines represent higher volumes of parts being transported between countries. Data source: WiTIS database.

Numbers and commodities in brackets represent the number of seized products.



TABLE 14

Summary of the nationality of people apprehended for the possession, trade, or transport of lion products.

NATIONALITIES OF ARRESTED OFFENDERS				
NUMBER OF CASES/INCIDENCES	CHINESE	VIETNAMESE	MOZAMBICAN	UNKNOWN
19	5 (2 claws)	6 (190 teeth, 213 claws)	4 (190 teeth, 65 claws, 2 skulls)	11



FIGURES 22

a) 72 lion claws and 42 lion teeth (collected and placed in a black bag) were found hidden inside the sole of a shoe (b) which was placed inside a suitcase. These products were seized by customs officials at Maputo Airport, Mozambique. The intended destination for these products was Viet Nam.

OVERALL IMPACT ON MOZAMBIQUE’S LION POPULATION

In the absence of comprehensive population and mortality data for Mozambique, Niassa, which has Mozambique’s largest lion population and most complete dataset, was used to represent the changing status of Mozambique’s overall lion population.

During the period 2011–2019, a total of 202 mortalities due to sport hunting, retaliatory killings, roadkill, suspected poaching, and

poaching incidences were recorded (Table 15). In addition, the number of parts and derivatives seized and converted into “whole” animal equivalents during the period 2013 to 2017 amounted to approximately 70 lions (Table 16). Thus, during the period 2011–2019, a total of 272 lion mortalities were recorded¹², which equates to an average annual mortality of 45 lions (Table 15, Table 16).



202 mortalities due to sport hunting, retaliatory killings, roadkill and poaching were recorded

TABLE 15

Summary table reporting on causes of lion mortalities for northern and southern Mozambique, and conversion of these mortality data into annual average lion mortalities. Source: Niassa Carnivore Project (C. Begg, in litt. to K. Mole, February 2020) and Limpopo National Park (K. Everatt, in litt. to K. Mole, December 2019).

Source: Niassa Carnivore Project (C. Begg, in litt. to K. Mole, February 2020) and Limpopo National Park (K. Everatt, in litt. to K. Mole, December 2019). No data available for the central region, which includes a known lion population in Gorongosa National Park.

REPORTED LION MORTALITIES BY NORTHERN (NIASSA NP) AND SOUTHERN (LIMPOPO NP) REGIONS. NIASSA (2013–2019) AND LIMPOPO NATIONAL PARK (2011–2019)			
	NORTHERN (2013 TO 2019 – 7 YEARS)	SOUTHERN (2011 TO 2019 – 9 YEARS)	TOTAL
Trophy hunting	32		
Retaliatory		36	
Poaching and suspected poaching	96	37	
PAC			
Roadkill	1		
Total	129	73	202
ANNUAL AVERAGE LION MORTALITIES	22	9	31

TABLE 16

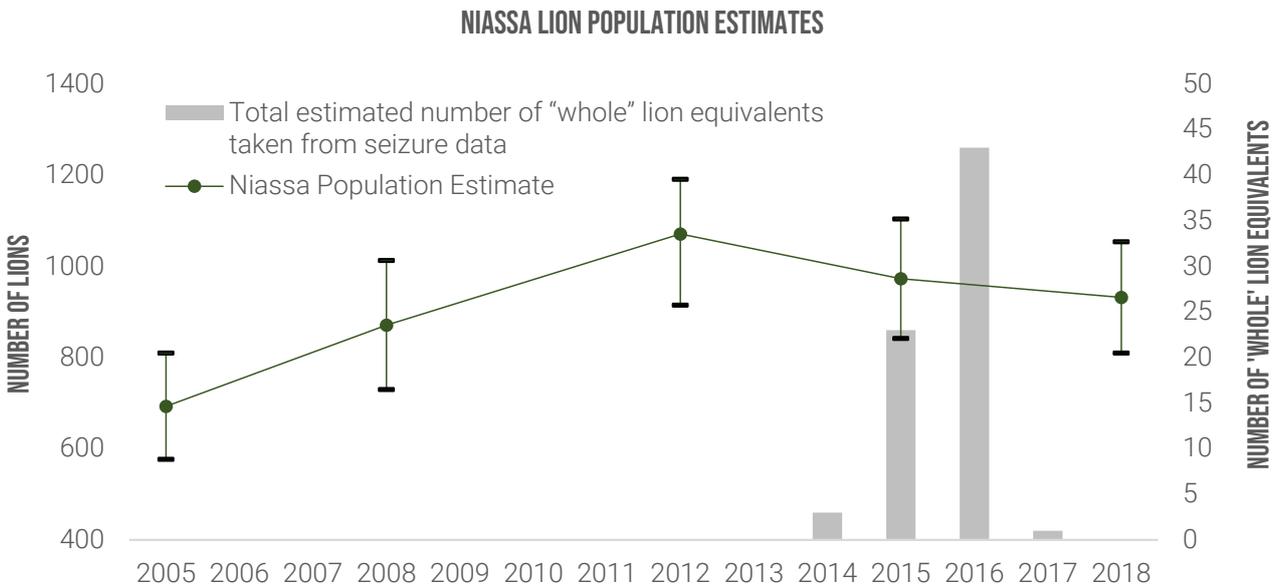
Trade data collected from seizures of lion products during the period 1996, 2013–2017 and conversion of trade data into annual average lion mortalities.

Data in italics in brackets represent the portion of the total trade data which were provided by the Mozambique Customs Authority. The National Zoological Gardens, Pretoria provided an average weight for lion claws (10.127 g), this weight was used to convert kg of claws into lion numbers. Source: WiTIS database.

TRADE DATA (1996, 2013-2017)				
	TOTAL INTERNATIONAL	TOTAL DOMESTIC	TOTAL (INTERNATIONAL AND DOMESTIC)	TOTAL ESTIMATED NUMBER OF "WHOLE" LION EQUIVALENTS
Carcass		5	5	5
Live lion		6	6	na
Bone		1	1	na
Skull		2	2	2
Claws (18 claws = 1 lion)	201+6kg	71+2.6kg	272+8.6 kg (183)	15+47
Paws			12	1
Teeth	147	243	390 (120)	na
Total				70
ANNUAL AVERAGE LION MORTALITIES				14

FIGURE 23

Niassa lion population estimates based on survey data (green line). The secondary axis (bar graph) represents the total estimated number of "whole" lion equivalents extracted from trade data for Mozambique. Data source: Niassa Carnivore Project, 2018; WiTIS database.



From Figure 23 it appears that the Niassa population is declining. Trade data converted into “whole” lion equivalents indicates that international trade in lion parts and derivatives has been increasing since 2014 with a peak in 2016, followed by a drop in 2017. It is important to note that there is no way to link trade data to population declines as there is uncertainty over the origin of traded lion parts. Nevertheless, it is interesting that the trade peak coincides with the gradual decline of Niassa’s lion numbers, raising the possibility that the decline could be due to the negative effect of mortalities caused by legal and illegal killing of lions that ultimately end up in the domestic and/or regional trade.

The interviews undertaken during this study and Niassa Carnivore Project (NCP) data support the notion that domestic, regional and international trade in lions exists in Mozambique. NCP data records indicate that traders from Malawi,

Tanzania, and South Africa visit Niassa in search of lion products and certain towns (e.g. Lichinga, Mecula, and Pemba) were also highlighted as trade “hotspots” where traders were reportedly either selling or seeking lion products. Community interviews conducted near Mapai on the eastern boundary of Limpopo National Park revealed that a South African national had stopped in their village and enquired where he could find lion products.

The NCP data revealed three cases (2017–2019) of killed lions that had their head and paws removed; it is also apparent that skin is being traded in this region. As monitoring of lion mortalities in Mozambique is inadequate, and therefore precise mortality data are not generally available, the findings suggest that lion mortalities are grossly underreported and have a more serious negative impact on lion populations than is currently apparent.



Lion skin from an individual killed in a retaliatory event collected and stored by the Chunya District Council in Tanzania (south of Ruaha National Park).



DISCUSSION

MANAGEMENT

THE 2010 AND 2016 ACTION PLANS (FUSARI *ET AL.*, 2010; ANAC, 2016) PROVIDE MEANINGFUL GUIDELINES FOR THE MANAGEMENT OF LIONS IN MOZAMBIQUE.

However, no update has been given on the status of activities while many aspects highlighting concerns about management, politics, socio-economics, land-use and trade are identical in the two Action Plans, despite the six-year gap. Thus, it appears that inadequate progress has been made and implementation

gaps remain in the current formal management system. This view is supported by C. Begg, (in litt. to K. Mole, March 2020), who observed that although these Action Plans are meant to be guiding documents, there has been little effort to implement and co-ordinate activities and/or outcomes.

MONITORING OF TROPHY HUNTING

Inconsistent monitoring of trophy hunts and insufficient enforcement are two of the issues at play in the management of the Mozambique trophy hunting system although in Niassa's hunting blocks, where most trophy hunting occurs, strict monitoring and hunting regulation documents have been developed (Miguel, 2013) and an age-based points system is enforced and encouraged (Begg *et al.*, 2017). Although no Wildlife Officer/Game Scouts are present during Niassa hunts, hunting operators co-operate and enforce the Niassa hunting regulations as they all form part of the greater Niassa Reserve area (C. Begg, in litt. to K. Mole, May 2020). Despite the requirement for the presence of a Wildlife Officer/Game Scout and the issuance of a hunting return form during lion hunts in central Mozambique's Coutadas (Lindsey *et al.*, 2013a), it is not clear to what degree these are enforced. Both the 2010 and 2016 Action Plans (Fusari *et al.*, 2010; ANAC, 2016) raised concern about the scientific basis of the quota system and that they had consequently been set too high. Confidence in the quota system is further undermined by the lack of transparency

surrounding the exact quota, which could not be established in this study, despite numerous attempts to obtain this information from ANAC. The findings suggest that the legal harvest (i.e. trophy hunting) is not detrimental to lion populations as measures are in place in areas where the highest lion numbers occur. However, mortalities due to legal hunting may be adding additional pressure to a population which is already in decline.

Although trophy hunting regulations do exist for Mozambique, field based trophy hunting management is uneven across country. Despite this, we recognise that trophy hunting is well managed and adequate measures are in place in areas where the highest lion numbers occur (i.e. areas surrounding Niassa Special Reserve). Mortalities due to unregulated killings as explained in the results section appear to be the main reason for the overall decline of Mozambique's lion population.



trophy hunts are inconsistently monitored and enforced, with exception to areas surrounding Niassa Special Reserve

POPULATION STATUS

According to actual survey data, Niassa's lion population is declining, raising concerns about the population's long-term viability. Although lion numbers in Limpopo National Park are small (34 individuals; Everatt *et al.*, 2014), the population is in decline and negatively impacted by known targeted poaching incidences and anthropogenic pressures such as prey base depletion due to bushmeat poaching (Everatt *et al.*, 2019b). The Gorongosa-Marromeu Lion Conservation Unit has the potential to become

a lion population stronghold and lion population numbers are increasing in this area. However, Gorongosa National Park and surrounds face anthropogenic pressures in the form of steel gin traps and wire snares which negatively affect lion population numbers (Bouley *et al.*, 2018). Overall, Mozambique's lion population is not stable and is being negatively affected by human induced threats, including targeted poaching for parts, prey-base depletion, habitat loss and indiscriminate killing.

DOCUMENTED TRADE AND POACHING

This study's findings support the notion that an illegal domestic, regional and international lion trade exists in Mozambique. There is evidence of targeted poaching for parts occurring in core lion populations in northern and southern Mozambique. Regional trade was recorded in the towns of Pemba, Lichinga, and Mecula in northern Mozambique, and Mapai in southern Mozambique. Similarly, this finding is reflected by Nelson, who stated that "lion teeth and claws

are being trafficked through Pemba" (Nelson, 2020). Slight within-country regional differences exist with regards to lion product use. Claws, teeth and skin were the preferred products used in northern Mozambique, whilst communities in southern Mozambique showed a preference for fat followed by skin and claws.

Seizure data gathered from customs authorities across the country revealed that the largest

volumes of parts trafficked were teeth and claws destined for Asia, specifically with Viet Nam as the final destination. The number of seized parts and derivatives destined for an international market was higher than those seized for domestic use, in particular claws. The ease with which lion teeth and claws can be collected and concealed could potentially make the trade and transport of these products less risky and thus attractive to traffickers. This modus operandi is also evident in the trade of rhinoceros horn, which is often converted into less conspicuous, smaller items such as beads, bracelets or powder in order to avoid detection (Moneron *et al.*, 2017). The timing of the lion trade in Mozambique also seems to

be overlapping with a spate of lion poaching incidences in South Africa that occurred at the end of 2019, where mainly semi-captive animals were poached for their teeth and claws (Appendix 1).

The low levels of lion mortality monitoring and known incidences of targeted poaching of lions for their parts, together with the results from community interviews, suggest it is likely that documented trade is an underestimate of poaching and trade levels occurring in Mozambique. These factors may also be an indication of the underlying illicit trade in lion parts and derivatives in Mozambique.

CONCLUSIONS

ASSESSMENT FOR AFRICAN LION IN MOZAMBIQUE

Mozambique's lion mortalities and associated trade are unsustainable when comparing available mortality data to the current low, declining population. Most products traded domestically, regionally, and internationally

likely originate from targeted poaching in core lion populations in the country. Possible reasons for the declining lion population in Mozambique include:

1. **No implementation of the activities outlined in the 2010 and 2016 Action Plans** and poor law enforcement and reduced institutional collaboration in key lion areas across Mozambique.
2. **Lion trade and the associated known targeted poaching for parts is perhaps the most pertinent threat leading to local lion population declines.** However, as the number of lions in this trade totals ~1% of the documented decline, it is proposed that either not all trade is being detected or anthropogenic lion mortalities (i.e. poaching, retaliatory killings) are higher than currently reported.
3. **Trophy hunting regulations are in place however,** monitoring and reporting differ in rigour from one area to the next, with the most robust regulations and monitoring found in Niassa (Miguel, 2013).

The data show that since 2011, 20%¹³ of total lion mortalities can be attributed to both domestic and international trade in lion parts and derivatives. Considering the local decline in key lion populations (Everatt *et al.*, 2019b, C. Begg, in litt. to K. Mole, March 2020), their relatively low abundance in the country, low reproductive rates, and the significant number of targeted poaching events within core lion ranges (74% and 48% of anthropogenic lion mortalities in Niassa and Limpopo National Parks respectively), there is cause for concern. The results suggest that

human-lion interactions are the main cause of population declines in Mozambique. In particular, their sensitivity to anthropogenic pressures (e.g. prey-base depletion, habitat loss and indiscriminate killing) and negative growth rates in core lion populations (Niassa Special Reserve and Limpopo National Park) means that current lion mortalities and trade in lion parts and derivatives in Mozambique appear to be under-reported (C. Begg, in litt. to K. Mole, May 2020), unsustainable, and detrimental to the survival of Mozambique's lion populations.

CRITICAL RECOMMENDATIONS FOR MOZAMBIQUE ARE:

It is a necessity that Administração Nacional das Áreas de Conservação “National Administration for Conservation Areas” (ANAC) improves regional lion management by providing support for research and programmes which promote lion conservation, reduce human-lion conflict, conserve lion habitats and prey base, increase law enforcement and reduce illegal trade and strengthen community programmes.

ANAC should provide a progress report on activities (and their implementation) listed in the 2016 Conservation Strategy and Action Plan for the African Lion. Subsequent to this progress report, activities in the Action Plan should be consolidated and realistic and achievable goals set for lion conservation and management.

Although ANAC has a formal national trophy hunting regulation, we encourage the Mozambique government to increase monitoring of legal hunting to ensure that legal lion harvest is sustainable throughout the country.

ANAC should facilitate workshops and meetings to increase collaboration between different conservation organisations and wildlife authorities. These workshops could be used as a platform to strategise and devise methods and steps to reduce and mitigate lion poaching and trade.

Areas which have been identified as potential trade/poaching “hotspots” require further investigation and immediate action. ANAC needs to identify and provide support to key wildlife authorities in areas such as the Ruvuma landscape, Limpopo National Park and Niassa Special Reserve to help increase levels of law enforcement and anti-poaching to ensure that lion trade is reduced. Covert investigations should be undertaken to examine and understand the extent of trade in lion parts and derivatives, trade routes, and the actors involved in these areas.

Border control and customs officers at all ports (i.e. sea, land, air) need to improve detection measures to ensure that all illegal trade is being uncovered and information is gathered on trafficking routes and commodities in demand. The national government should allocate additional resources to training staff in detection and screening techniques and technologies. Increased institutional collaboration between the Mozambique Customs Authority and ANAC is needed to ensure that seizure data are accurately stored and accessible to those needing to access them.

Law enforcement agencies should collaborate with wildlife authorities and make full use of wildlife legislation to prosecute criminals. Mozambique should rate its success in countering illegal wildlife trade by the number of successful prosecutions, in addition to the detection of lion parts and derivatives at ports of entry and exit.

Increased support and resources are needed for tackling illegal wildlife trade in Mozambique. ANAC should co-ordinate with organisations such as the PAMS foundation and Wildlife Crime Prevention (WCP) to support investigations and anti-trafficking measures.

The management of protected areas (PAs) should be strengthened by ANAC, with specific emphasis on vacant hunting blocks where management is compromised. ANAC should consider pursuing Public-Private Partnerships for PA management in areas where no support or management exists.

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ENDNOTES

⁵ Taxonomy from IUCN Redlist site (<https://www.iucnredlist.org/species/15951/115130419#taxonomy>).

² Gross earnings (USD/km²) from trophy hunting with lions on quota. Projected income from trophy hunting was used to calculate income per km² in each hunting area, followed by a mean for each country.

³ Bauer *et al.*, 2015 used Bayesian state spaced models to estimate growth rate- λ for each population.

⁴ One community is equal to one village.

⁵ Parts exported and imported as "Specimens" were parts and derivatives collected for scientific purposes (Purpose code "S" (Scientific)). These were mentioned but not assessed as it is unclear what parts and derivatives are included in the term "Specimen".

⁶ East African lion populations include Mbirikani, Ol Pejeta, Serengeti, Ngorongoro Crater, Nairobi, Matambwe, Luangwa, Queen Elizabeth, Tarangire, Laikipia, Maasai Mara, Taita, Murchison, and Katavi.

⁷ On the assumption that none of the parts from reported mortalities were subsequently seized in illegal trade.

⁸ Extracted from section 27 (2) of the Wildlife Conservation (Tourist Hunting) Regulations (2015). Any Professional hunter who guides a Client to hunt any animal in contravention of regulation 26 (5) and sub-regulation (1) commits an offence and is liable on conviction: (a) to a fine of US Dollars Two Thousand Five Hundred or imprisonment for a term not less than six months for the first time of commission of an offence; (b) to a fine of US Dollars five thousand or imprisonment for a term not less than one year for the second time of commission of an offence; and (c) to a fine of US Dollars ten thousand or imprisonment for a term not less than one year and cancellation of the Professional Hunters' license for the third time of commission of an offence.

⁹ Illegal trade equated to 98 lion mortalities from 2010 to 2019 (Table 10), this number was then divided by the current TAWIRI population estimate and converted to a percentage. $98/13818 \times 100 = 0.7\%$ rounded up to 1%.

¹⁰ Terminology follows that used in Williams *et al.* (2017). The term witchcraft can be categorised as "African zootherapeutic practices" which include traditional medicine, magic, "witchcraft" and rituals.

¹¹ Parts exported and imported as "Specimens" were parts and derivatives collected for scientific purposes (Purpose code "S" (Scientific)). These were mentioned but not assessed because it is unclear what parts and derivatives are included in the term "Specimen".

¹² On the assumption that none of the parts from reported mortalities were subsequently seized in illegal trade.

¹³ On the assumption that none of the parts from reported mortalities were subsequently seized in illegal trade.

APPENDIX I

LIST OF INCIDENCES FROM 2019 AND 2020 WHERE PAWS AND TEETH (I.E. JAWS) WERE REMOVED FROM CAPTIVE LIONS IN SOUTH AFRICA.

LOCATION OF INCIDENT	NUMBER OF LIONS POACHED	METHOD	PARTS TAKEN	MEDIA ARTICLE LINK
Chameleon Village Lion Park in Hartbeespoort	4 (2xmales, 2xfemales)	Poisoned chicken carcass	Paws (claws) and Jaws (teeth)	https://www.sapeople.com/2019/11/08/four-lions-cruelly-poached-at-lion-park-in-hartbeespoort-south-africa/
Rietvlei Nature Reserve	4 (2xmales, 2xfemales)	Poisoned meat	Paws (claws) and Jaws (teeth)	https://www.dailymail.co.uk/news/article-7625063/Pride-lions-killed-poachers-chopped-body-parts-South-Africa.html
Sunward Ranch, Limpopo	5 (1xmales, 4xfemale)	Poisoned chicken carcass	Paws (claws) and Jaws (teeth)	https://www.dailymail.co.uk/news/article-7714343/Poachers-butcher-South-African-lion-pride-month-parts-used-magic-potions.html
30km north of Brits (Beeskraal)	5 (2xmales, 1xfemale, 2xcubs)	Poisoned meat	Paws (claws) and Jaws (teeth)	https://twitter.com/AdamHartScience/status/1172245458514776066
Predators Rock Bush Lodge in North West province	16 (2xmales, 6xfemales, 8xcubs)	Poisoned chicken carcass	Paws (claws) and Jaws (teeth) removed from adults	https://www.sapeople.com/2020/01/04/8-lions-plus-cubs-killed-by-poachers-at-lodge-in-rustenburg-south-africa/

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