



WORKING PAPER

The Economics of Captive Predator Breeding in South Africa

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Glossary of Terms

Canned hunting	The unethical hunting of predominantly captive-origin lions (though not necessarily limited to this) under conditions that preclude ‘fair chase’ due to mental (human habituation) and physical constraints (relatively small enclosures that offer no chance of escape), or some degree of both.
Captive bred lions	Lions bred in conditions of captivity for the sole purpose of being commercially exploited through a range of ‘sectors’ within the captive lion industry. Managers actively manipulate all vital rates and demographics. Some are bred with minimal human imprinting (‘ranching’) and hunted in larger enclosures than their hand-reared counterparts. Others are used for cub petting activities, or what South African Predator Association (SAPA) calls ‘working’ or ‘tourism’ lions. In petting, the cubs are exploited either at the breeding facility or sold from breeding farms to the petting facilities. Some facilities rent cubs from breeders and return them once they have fulfilled their purpose. Once cubs are too old to pet, they are either sold to hunting facilities (some of which are directly linked to the petting facilities) or become ‘walking’ lions, where tourists can walk with lions, before being sold either directly into the bone trade or to the canned hunting industry. Because of the large stock of intensive-bred lions, and the declining demand for canned hunting, many lions are being slaughtered directly for the sale of their skeletons into the bone trade.
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international treaty ratified by more than 180 member countries, the purpose of which is to ensure that listed species are not subject to over-exploitation for international trade. Species listed on CITES Appendix I are ‘threatened with extinction’ and are or may be affected by trade; they, or their parts, cannot be traded internationally for commercial purposes. Species listed on Appendix II are not necessarily threatened with extinction but may

become so unless trade is subject to strict regulation to avoid utilization incompatible with their survival. The African lion is listed on CITES Appendix II with an annotation that prohibits trade in bones, bone pieces, bone products, claws, skeletons, skulls and teeth removed from the wild lions and traded for commercial purposes; however, the annotation allows South Africa to establish an annual export quota for these items from lions at captive breeding operations.

- Conservation value** A genuine contribution to species conservation in the wild. For a captive-bred lion to have conservation value, for instance, it must be i) genetically uncompromised, ii) able to socialise and survive under wild conditions, and iii) have had zero human habituation, as human-habituated lions lose their fear of people. No evidence yet exists that captive-bred lions have conservation value.
- Consumptive use** The exploitation of an animal for consumptive purposes. Cub petting, for instance, is a form of ‘consumptive use’ tourism, as is walking with lions (regardless of the fact that some ‘walking lions’ are less human-habituated than others). Trophy hunting, similarly, is a form of ‘consumptive use’, as is the sale of lion skeletons into the predator bone trade. The antimony of consumptive use is non-consumptive use. For instance, photographic tourism – taking pictures of wild lions in their natural habitats – or game viewing in the wild.
- Fair chase** A set of conditions under which an animal being hunted has a genuinely fair chance to evade its hunter for extended periods and on multiple occasions. Essentially, under these conditions, a kill is not guaranteed, even if the hunt lasts for weeks.
- Game farming** The practice of breeding wild animals for sale to, for example, tourist lodges or hunting ranches. Game ranching does not necessarily involve breeding, but stock would be acquired from game farms.
- Intensive breeding** The process of breeding to maximise reproductive capacity and increase reproduction rates, or to promote traits such as mane colour and cape size. It has no conservation value.

South African Predator Association (SAPA) The industry body that exists ‘to co-ordinate and promote the interests of its members with a view to establishing and maintaining a healthy and profitable predator breeding and hunting industry in congruence with national and international conservation principles and current national and provincial legislation.’¹

Sustainable use The concept that animals can be harvested as long as the relevant population’s maximum sustainable yield is not exceeded. In other words, the exploitation of animals for commercial gain is not viewed as necessarily problematic, provided that over-exploitation is avoided. While in principle the idea informs wildlife management just about everywhere, it has also become a smokescreen behind which controversial decisions are rationalised, based on a narrow reading of section 24 of South Africa’s constitution at the expense of broader biodiversity preservation commitments made in the same section. Also referred to as the “wildlife economy” or “green economy”.

Wild managed lions Wild lions managed (to limit population growth and maintain genetic diversity) on small fenced areas or reserves typically less than 1000km² in size. The National Lion Biodiversity Management Plan (BMP) of 2015 estimates that there are about 800 lions on over 45 small, fenced reserves in South Africa. The conservation value of these lions has been questioned because of the fragmentation of landscapes and resultant isolation of populations from each other that affects genetic health.

Wild lions Lions that completely fulfil their role as apex predators in biodiversity processes. They exist only in formally proclaimed national parks and game reserves.

¹ This definition is from the body’s own website: <http://www.sapredators.co.za>, accessed 17 August 2018.

Executive Summary

In July 2018, without public consultation or scientific substantiation, South Africa's Department of Environmental Affairs (DEA) raised its annual lion skeleton export quota to 1,500, up from 800 the year before. These skeletons are supplied by the predator breeding industry, which breeds lions in captivity for multiple and sometimes overlapping purposes.

This is a report in two parts.

The first is a formal academic review of the scientific and 'grey' (reports and newspaper articles) literature pertaining to the predator breeding industry. It interrogates the most recent attempt to quantify the economic significance of the industry and finds its conclusions questionable for a number of reasons. One of its claims, for instance, is that the predator breeding industry provides positive conservation value. The review examines this claim against the available literature and finds it dubitable. Even if the conservation impact was neutral, it is not clear that the genetic impairment and welfare problems justify the continuation of the industry, even under the banner of 'sustainable utilisation' and the 'wildlife economy' doctrine. This is especially important if the theoretical possibility of future adverse conservation consequences is strong. Finally, it examines the dynamics of the lion bone trade and questions whether predator breeding can satisfy demand for tiger and lion derivative parts in East-Southeast Asia. If, as it seems, legal bone exports provide a laundering channel to feed the illicit wildlife trade, South African authorities are well advised to reconsider their current position and instead set the export quota to zero.

The second part of the report provides a framework for assessing the claims – made by the predator breeding industry - of economic significance and positive conservation value. The literature is relatively clear that these claims do not correspond to reality, but no work yet exists in the public domain that tentatively quantifies the costs and benefits of the industry. The word 'tentatively' is used because the next steps required are a full forensic audit of the industry and a more rigorous cost-benefit analysis using the most appropriate scientific methods. Neither of these research propositions can be fulfilled without a full dataset of the

industry and its revenue flows. This report aims to provide a foundation on which future work can be built. In doing so, it provides more data than existing work to date. From that data, it demonstrates that current efforts to quantify the economic significance of the predator breeding industry are inadequate and likely misleading. For instance, jobs currently undertaken by volunteer tourists crowd out local labour participation. One major finding, for instance, is that potentially as many as 84 full time jobs that would otherwise be available to local job-seekers are currently undertaken by volunteer tourists who falsely believe that they are contributing to conservation. The report also demonstrates that the industry in its current form has no conservation value. To market it in that way is therefore disingenuous. In summary, the opportunity costs and negative externalities of the captive predator breeding industry in South Africa warrant substantive public policy reform and highlight the urgent need for more well-informed regulation.

Section 1: Picking a bone with captive predator breeding in South Africa

Introduction

In 2017, South Africa's Department of Environmental Affairs (DEA) issued an annual quota for the legal export of 800 lion skeletons (Cruise, 2017). Since 2008, more than 6,000 skeletons weighing no less than 70 tonnes have been shipped to East-Southeast Asia (Williams et al., 2017). These skeletons are supplied by the predator breeding industry, which breeds lions in captivity for multiple purposes. Estimates suggest that there are between 6,000 and 8,000 lions in captivity (Born Free Foundation, 2018), though the number could be as high as 14,000. In July 2018, the DEA near-doubled the export quota to 1,500 skeletons. In early July, the department's spokesperson denied that a quota had been set. It was subsequently revealed that the minister, Edna Molewa, had informed the provincial authorities in June of the quota decision. No public consultation occurred, and the DEA rationalised its decision with reference to an interim study (Williams & 't Sas-Rolfes, 2017) that had not yet been publicly released, but is now available and dated November 2017. This clearly indicates that the DEA were in possession of the report well in advance of its July 2018 decision (backdated to 7 June 2018 because of the uncomfortable fact that the Minister had notified the provinces of the decision on that date, even though the departmental spokesperson denied, in early July, that a decision had been taken).

The authors of the interim study were not involved in the decision to set a quota, nor did their work necessarily support a quota (EMS Foundation & Ban Animal Trading, 2018, p. 4). Nonetheless, the authors warn that, with a skeleton export quota limited to 800 (at the time the interim report was written - 2017), industry respondents suggested they would seek ways to sell bones illegally. Williams and 't Sas-Rolfes express concern that this would create a parallel illegal market that would come to resemble the illegal rhino horn trade with its attendant problems of organized crime. However, it seems clear that a parallel illegal market has already existed for some time and the connection of bone traders to organised crime is similarly well established. It is not clear that these developments are related to the export quota decision either, as little remains known about the economic dynamics of the

trade, and therefore the precautionary principle – refrain from trade unless the market is well understood and stable – should apply with respect to regulatory decisions that may affect the fate of wild lions. Despite the recent improvements on the economics evidence base over the last two years, the latest work and its predecessors rely on survey responses and are subject to the constraint of small sample sizes. The Williams and 't Sas-Rolfes report is no different in this respect, with only 5 respondents having answered all six sections of the online survey, and only 34 respondents (27%) having answered more than one of the sections (Williams & 't Sas-Rolfes, 2017, pp. 5–6).

Many captive breeding facilities supply lions to the canned hunting industry, which is still legal in South Africa despite widespread international and domestic objection to the practice. Skeletons from hunted lions are sold to bone traders as a by-product. Some facilities supply captive-bred lions to game ranches or private game reserves, where visitors are invited to walk with lions or to observe 'wild' lions in enclosures (where they are fed by humans – unseen to visitors – because of their inability to hunt in the wild). In the breeding process, cubs are often removed from their mothers prematurely, and volunteer tourists pay to feed and cuddle these cubs under the pretext that they are contributing towards predator rehabilitation and future release back into the wild. Facilities that exploit cubs for these purposes knowingly lie to tourists (Peirce, 2018).

Some facilities exist purely to supply the East-Southeast Asia bone trade (Schroeder, 2018), and a study of skeleton exports in 2017 found that 91% included skulls (EMS Foundation & Ban Animal Trading, 2018, p. 5). As hunters keep the skulls for trophies, this constitutes clear evidence that the bone trade is not – contrary to the DEA's assertion – merely a by-product of the hunting industry; it is separate and often independent. In short, and either way, captive predator breeding is a lucrative business; it offers multiple and overlapping revenue streams.

While the total figure is unknown, estimates suggest that upwards of 200 breeding facilities exist in the country, with one recent academic paper citing a figure of 297 (Van Der Merwe et al., 2017), only 146 of which are registered with the South African Predator Association (SAPA), which supported the research. The same paper estimates that the industry

contributes R500 million annually to the South African economy and sustains 1,162 jobs if multiplier effects are accounted for. On the basis of this calculation, the authors assert that it is 'important for local government to support these types of developments in rural areas', as 'if lion breeding was banned... [it would] result in fewer employment opportunities and reduction in new entrepreneurs in the breeding of wildlife' (Van Der Merwe et al., 2017, pp. 320–321). Perhaps most surprisingly, the authors also assert – though the authors did not study the interaction between captivity and conservation at all – that their research shows that lion breeding 'also contributes to conservation in South Africa, since the private lion industry does create healthy lion populations' (ibid).

This review provides an assessment of the debates in the literature over predator breeding. It does so according to the following categories.

First, it assesses the quality of the latest peer-reviewed contribution (Van Der Merwe et al., 2017) in the academic literature that has attempted to ascertain the economic significance of the industry for South Africa. Where relevant, it references the Williams and 't sas-Rolfes (2017) interim report too, which is based on survey questionnaire responses, but which asked different questions of lion breeders. To our knowledge, no peer-reviewed cost-benefit analysis has yet been conducted that quantifies the economic significance of the industry with a methodology that accounts for its negative externalities and opportunity costs.

Second, it addresses the question of whether predator breeding could make any positive contribution to wild lion survival and under what conditions. The corollary question is whether it may prove detrimental (Lindsey et al., 2012a). The latest IUCN Red List of Threatened Species classifies lions (*Panthera leo*) as 'vulnerable' – not yet 'endangered' but worse than 'near threatened'. In population terms, it states that 'we have greater confidence in an estimate of closer to 20,000 lions in Africa than in a number over 30,000' (Bauer et al., 2016, p. 9) and that the 'lion population is inferred to have undergone a reduction of approximately 43% over the past 21 years' (Bauer et al., 2016, p. 2). While some populations have grown, others have declined rapidly. The 16 fenced African subpopulations have grown by 29 percent since 1993 (Bauer et al., 2016, p. 4). Unfenced populations have done less well. The consequent claim that captive origin lions are thus

needed to bolster wild or wild-managed populations remains refuted (Miller et al., 2016). While the overall qualification was 'vulnerable', 'it is of great concern that the vast majority of the population is inferred to have declined at a rate that meets the criteria for Endangered' (Bauer et al., 2016). The relevant question for this review is whether captive predator breeding in South Africa affects wild populations or may do so in the future.

Third, the review deals with questions of genetic variation, animal welfare and business conducted under false pretexts. This section also highlights problems with South Africa's narrow application of the 'sustainable use' doctrine (Orr, 2016) to justify activities that potentially undermine biodiversity conservation efforts (a key objective of Section 24 of the country's constitution and legislation such as the National Environmental Management: Biodiversity Act, no. 10, of 2004).

Fourth, the review examines the dynamics of the lion bone trade (Williams et al., 2015, 2017; Born Free Foundation, 2018) and the criminal syndicates involved, highlighting latent negative externalities generated by the predator breeding industry.

Economic significance of the captive breeding industry

Shifting economic dynamics and the relative (and recent) increase in profitability of game ranching has led to significant land-use activity switching from the 1990s onwards among some land owners in South Africa. Private property rights for both land and wild animals has generated incentives, in conjunction with increased demand from wildlife tourism, to switch from farming livestock (or other agricultural and economic activities) towards game farming and ranching. The private wildlife industry in South Africa currently operates on approximately 18 million hectares, an area 2.2 times larger than state-protected wildlife areas (Van Der Merwe et al., 2017). Van der Merwe and his co-authors note that the private wildlife industry consists of consumptive and non-consumptive tourism. The distinction is contentious in some respects, as the breeding of wildlife is considered non-consumptive, though clearly breeding facilities supply consumptive exploitation such as trophy hunting, and so the distinction is muddied by the realities of the supply chain. Photographic safaris and wildlife tourism are clearly non-consumptive in that they do not directly consume the

animal(s) in question. Trophy hunting and wildlife meat production, on the contrary, is clearly consumptive.

Though a number of studies have been conducted to ascertain the relevant economic significance of lions (Cadman, 2009; Lindsey et al., 2013; Cloete & Rossouw, 2014), Van der Merwe et al. note that ‘none of these studies investigated the significance of lion breeding (from supply side point of view (sic)), except Cadman, but it lacks a sound methodology’ (2017, p. 316). They provide the first attempt in the academic literature to determine the economic significance of the predator breeding industry in South Africa. Williams and ‘t Sas-Rolfes (2017) commenced a research project in March 2017 that aims to increase understanding of the captive breeding industry and the trade in lions (and their parts), and how such a trade – under a quota system – will affect wild lion populations. This research programme will end in March 2020 and is designed to ‘provide sound scientific decision support to the DEA’ (2017, p. 3) regarding its export quota management. The authors have produced an interim report thus far, which is not yet peer reviewed. Before interrogating the overall methodology and the results of the van der Merwe et al. paper, a few important priors are necessary.

Important priors

First, the authors note that there has been a dramatic decline in lion population numbers across Africa due to habitat destruction, poaching, human-wildlife conflict, hunting and the illegal bush meat trade (Van Der Merwe et al., 2017, p. 315). This observation is not in dispute. One of the latest peer-reviewed assessments indicates that wild lion populations are declining rapidly, except in intensively managed areas. ‘African lion populations are declining everywhere, except in four southern countries (Botswana, Namibia, South Africa and Zimbabwe) ... lion conservation is successful in southern Africa, in part because of the proliferation of reintroduced lions in small, fenced, intensively managed, and funded reserves’ (Bauer et al., 2015, p. 14894; Miller et al., 2016). Wild population depletion in large habitat areas is significant, as the importance of apex predators for ecosystem health cannot be overstated. ‘Current ecological knowledge indicates that large carnivores are necessary for the maintenance of biodiversity and ecosystem function ... These facts,

combined with the importance of resilient ecosystems, indicate that large carnivores and their habitats should be maintained and restored wherever possible' (Ripple et al., 2014, p. 15).

The van der Merwe et al. paper only assesses the economic significance of captive breeding, as the results are generated from qualitative interviews conducted with 22 of the 146 active (at the time of conducting the interviews) SAPA members. Williams and 't Sas-Rolfes note that 'SAPA membership has dropped significantly during the last two-year period' (2017, p. 6), though no data exists on the organisation's website that provides a reliable estimate of total membership numbers. The Williams and 't Sas-Rolfes report does not reference the van der Merwe study, as the latter was only published in November 2017 (at the same time as the former).

As will be shown in the second part of this review, captive breeding plays no role in the conservation of wild lions despite assertions to the contrary (that the role may be indirect, for instance, through removing poaching pressure on wild lions). It is therefore unclear why van der Merwe et al. conduct their research in the context of the plight of wild lions. On the SAPA website, an article entitled "9 Myths about Captive-bred Lions" opines – in response to claims of imminent extinction – that the 'lion population is stable at between 20,000 and 30,000 cats worldwide ... In South Africa, because of the endeavours of the game ranch community, lion numbers are actually showing a healthy increase' (SAPA, 2017). South African increases, however, are relatively anomalous in global terms. SAPA's claim that the global population is stable is false, and the reference to South African increases is selective. The claim ignores the science that infers 'a decline of 43% percent based on time trend analysis of census data for 47 relatively well monitored lion subpopulations. These subpopulations approximately totalled an estimated 7,500 Lions in 2014 and comprise a substantial portion of the total species population, so that we feel confident in applying observed trends to the species as a whole as well as on a regional basis' (Bauer et al., 2016, p. 2). While it is true that a 'vulnerable' listing is not equivalent to imminent extinction, and southern African populations are doing relatively well, the wild lion population is not, on average, stable. No evidence is cited on the SAPA website for the claim of stability.

The only plausible reason that an article defending captive breeding would mention wild lion population stability is connected to the view that ‘there are numerous cases where captive-bred lions have successfully made the transition to become wild lions’ (SAPA, n.d.), or possibly that the supply of bones from captive-origin lions would be sufficient to reduce poaching pressure on wild lions (though this is not mentioned in any of SAPA’s documents). The article mentions two studies ‘of note’ but does not reference them. Again, the second section of the review will address this matter in greater depth, but it is important upfront to interrogate the economic significance of an industry in the light of its own claims about its contribution to wild lion conservation. Not only does SAPA make claims that captive breeding contributes to conservation, Van der Merwe et al. also make the explicit claim that their research shows that lion breeding ‘contributes to conservation in South Africa, since the private lion industry does create healthy lion populations’ (Van Der Merwe et al., 2017, p. 321). As mentioned in the introduction, however, this claim is not supported in the research presented. The Van der Merwe paper only claims to assess the economic significance of captive breeding from an operational expenditure perspective (and not from its purported contribution to conservation). Attention is drawn to SAPA’s views here because the interviewees in the Van der Merwe study are all SAPA members.

Second, because some breeders contribute to the wildlife ranching industry, it is important to address the fact that the relationship between ranching and wild lion conservation is also unclear. SAPA expressly attributes wild lion population health to the endeavours of the ranching industry. However, a 2017 study (Pitman et al., 2017) demonstrates that game ranching practices have become more intensive to facilitate the breeding of high-value game species. ‘Our findings demonstrate that the proportional increase in problem animal control of nuisance wildlife has far outweighed the proportional increase in game ranching trends towards more intensive practices’ (2017, p. 408). The irony is that while Van der Merwe et al., and others emphasise the conservation value of private wildlife ranching, these are increasingly the ranches that are killing apex predators. The consequences of decreased tolerance towards ecologically important free-ranging wildlife is likely to have detrimental impacts on species survival and ecosystem integrity. Ironically, the top three species killed as putative problem animals (by game ranchers) are leopards, elephants and lions. These are also among the species that generate the highest returns for non-

consumptive tourism (van Tonder et al., 2013). While further quantitative work is required, it appears that general intensive game breeding has become increasingly incentive-incompatible with broader conservation ambitions.

Aim of study and methodological approach

Van der Merwe et al. aimed to answer three research questions. First, what is the economic significance of lion breeding in South Africa? Second, how many people are employed in the captive lion breeding industry? Third, how much does it cost to breed lions in captivity? The study excluded the costs of infrastructure development and focused only on operational costs to avoid cross-farm heterogeneity and time effects (infrastructure returns generally accrue long after the initial expenditure). The value addition of answering these questions is not only to measure the scale of activity but to provide useful information for evaluative decision-making in the presence of trade-offs.

The authors used structured interviews to collect data. Their justification for using a qualitative approach (to retrieve quantitative information) is from Creswell – ‘qualitative research is an approach to exploring and understanding the meaning individuals or groups ascribe to a social or human problem’ (Van Der Merwe et al., 2017, p. 316). However, it is not clear that the meaning respondents ascribe to a problem can produce objective quantitative data that researchers could reasonably subject to multiplier analysis. The study is designed to establish economic significance, *not* to explore the meaning that breeders assign to a problem.

The second problem is that there is no way to test that the reported quantitative data is accurate and reliable. This means that data collection is subject to myriad effects, not least of which is “mirroring” – the risk that interviewees will provide the data they believe the interviewer desires to hear. Choosing every third member on the SAPA members’ list seems less like stratified purposive sampling than arbitrariness. For a purposive sample, ‘participants are selected according to predetermined criteria relevant to a particular research objective’ (Guest et al., 2006, p. 61). The authors state that they use ‘credibility’, ‘transferability’, and ‘dependability’ to establish methodological soundness and adequacy or

‘trustworthiness’ of the data. However, little substantiation is provided as to how this was accomplished. It is not sufficient to state that this is the best available method and that respondents were given a full and purposeful account of the research question. What matters is whether the data provided in response to the questions can be tested against reality.

The third problem is that it is difficult to know whether the ‘stratified purposive sampling’ employed in the study provided a large enough sample to generate statistical value. The literature recommends that a sample is sufficient once a theoretical ‘saturation point’ has been reached, though the parameters vary significantly. Van der Merwe et al. provide no guidance on how they established that the sample size was sufficient to draw valid inferences.

These three problems are devastating for the study. Average operational cost cannot easily be derived from what 22 breeders state as their running costs. The authors provide no indication of variation in the data, or levels of confidence that can be attributed to it. This does not suggest that the data is of no value. However, it does suggest that future efforts need to be more rigorous, while acknowledging that conducting research into this activity is necessarily hindered by a lack of access to open, audited financial statements.

[The application of the Social Accounting Matrix](#)

A Social Accounting Matrix (SAM) model was employed by van der Merwe et al. to determine the impact of a factor of productivity within each related industry. This is known as the multiplier effect, where a multiplier measures the changes in economic activity due to a change in spending. It captures the direct, indirect and induced effect of an increase in spending. The authors used the 2012 South African National SAM to determine these effects for captive lion breeding. The direct effect may accrue from direct expenditure, such as a breeder purchasing a fence for their property. The indirect effect is derived from what the fencing company may pay their employees and suppliers (Van Der Merwe et al., 2017, p. 317).

The authors estimate that the average running cost per breeding facility is approximately R50,000 per month (R600,000 per year). Multiplied by the total number of breeding facilities, this amounts to R178.2 million per year. 'From Table 3, it is clear that the highest spending by lion breeders is on financial and business services' (Van Der Merwe et al., 2017, p. 319) – this is derived from taking each cost item and dividing it into one of the SAM commodity divisions. However, Table 3 in the published paper is a repeat of Table 4, which measures the impact of the breeding industry on employment. One has to take the authors' word for it, then, that the production multiplier is equal to R3.93, 'which signifies that every R1 spent by a lion breeder leads to an increase in production in the South African economy of R3.93' (Van Der Merwe et al., 2017, p. 319).² Table 4 then reveals that the breeding industry supports a further 613 jobs through multiplier effects in addition to the 549 direct jobs, sustaining a total of 1,162 jobs. 'The sectors most affected regarding job opportunities are financial and business services (34.6%), construction (25.1%), and the manufacturing sector (11.6%)' (Van Der Merwe et al., 2017, p. 320). A rationale as to why these particular sectors are most affected is not offered.

The authors conclude three points from the exercise.

First, they argue (from Table 1) that because 59% of respondents self-identified as well-educated, this 'supports the notion that breeding of wildlife has become a science, and therefore is crucial in safeguarding the industry' (Van Der Merwe et al., 2017, p. 320). However, only 27% of those reported as possessing tertiary education (just over half of those 'well-educated') had university degrees. Even if one accepted the premise that self-reported tertiary education constituted being 'well-educated', it does not follow that the breeding of wildlife has become a science. As will be shown in the following chapter, it is the lack of scientific support for the practice of captive predator breeding that may have led to some of the genetic variation problems that now confront the industry.

² This researcher's attempts to retrieve the relevant information from the lead author of the journal article were unsuccessful.

Second, the authors conclude that from a regional economic development perspective, predator breeding contributes to rural development (most facilities are located in the Free State and North West provinces) and job creation. This points to one of the major shortcomings of the study, however. Even with multiplier effects – if one accepts these as legitimate – the employment effects are minimal. A total of 1,162 jobs sustained by the industry is relatively minimal, and it seems to assume no seasonality effects. In other words, one might expect that more people would be directly employed during the busier tourist seasons. The calculation also does not recognise that much of the potential labour absorptiveness of the industry may be substituted by volunteer tourism in which volunteers pay breeders to come and feed cubs and work on the facilities. Moreover, the economic and job creation effects do not consider the opportunity costs or externalities associated with the industry. This is crucial. A study of this nature can only be of value if it considers what the land might alternatively have been used for. Because it only considers captive breeding, and not the value of ranching (the subject of a separate study), the land quantity of 18 million hectares (referenced in the study) consumed by wildlife game ranching is irrelevant. This is, unless the ranching industry is predominantly dependent on its supply of lions from the captive breeding industry, but the authors do not quantify the link (if any) between breeding and ranching, or how many ranches also conduct breeding activities. Either way, to show that the captive breeding industry has economic significance, it must be demonstrated that it contributes more to the economy than its next best alternative. This has not yet been done, and future research should at least take the first steps in this direction. Moreover, if the industry generates a divergence between social costs and private returns (negative externalities), then this divergence undermines its purported economic significance. This is why the next section addresses the question of the relationship between captive breeding and wild lion conservation. If, for instance, the lack of genetic variation among bred lions necessitates the sourcing of wild lions to sustain the industry, that may generate a direct negative effect on wild lion survival. Other potential effects on wild lions will also be examined.

Third, the authors conclude that the multiplier effect of expenditure by the captive breeding industry has a positive impact on several other sectors in the respective provincial economies and consequently on the national economy. 'If lion breeding is banned or ceased

to exist, these sectors will be impacted on especially in rural areas' (Van Der Merwe et al., 2017, p. 321). This may be true, but the claim is difficult to verify in the absence of a counterfactual and/or examining what economic significance may plausibly be generated through alternative economic activities on that land.

Remarks on curious conclusions

Van der Merwe et al. are correct to point out that theirs is the first peer-reviewed investigation that attempts to determine the economic significance of captive predator breeding in South Africa. Certainly, their work demonstrates that more research is required in this direction. However, the claim that the work is based on sound methodology is potentially dubious. Qualitative interviews are undoubtedly the best form of information available in the absence of audited financial statements, but it is not clear that reliability checks were adequately employed, and the claim that every third member off the SAPA list constitutes purposive stratified sampling is questionable. Either way, the authors note that we now have better information about breeders' profiles and the geographic distribution of breeding than we had before. Thirdly, and most dubiously, the authors conclude that the 'private lion industry does create healthy lion populations' (2017, p. 321) despite the fact that SAPA has no stud books, no national level breeding plan and no rigorous disease screening programmes. But this was not in any shape or form the focus of their paper, nor do they provide any indication of what parameters might constitute a healthy population, or exactly what mechanism is at work between captive breeding and the production of such populations. They only focused, as far is evident, on captive breeding rather than the private lion industry (including ranching) more generally. This concluding line therefore comes across more as special pleading rather than a logically deduced conclusion that follows from evidence-based premises. The next section deals specifically with the available literature on how predator breeding may affect wild lion survival.

The relationship between captive predator breeding and wild lion survival

Lions are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international body consisting of more than 180 member countries, that seeks to regulate the international trade in wildlife. Species in Appendix I are threatened with extinction; no commercial international trade is permitted for wild specimens or their products. Species in Appendix II are not necessarily now threatened with extinction but may become so unless trade is regulated; 'commercial international trade is permitted at the discretion of the exporting Party, which must determine scientifically that such trade will not be detrimental to the species' survival and issue a permit for each shipment' (Bauer et al., 2018, p. 1). The Asiatic lion (*Panthera leo persica*) is listed on Appendix I and the African lion is listed on Appendix II. The top three threats to wild lion survival are prey depletion, habitat encroachment and human-predator conflict over livestock depredation. The captive breeding of lions does not address these threats. Trophy hunting and the trade in lion bone and parts are two further threats (Miller et al., 2016). While trophy hunting can contribute to securing lion habitat and community benefits, regulations are often poorly enforced in weakly institutionalised contexts. The trade in parts and bones will be discussed specifically later in this paper but suffice to note in this section that lion bone has been used since 2005 as a covert substitute for tiger bone in expensive wines made in East Asia. Some of this demand has ostensibly been met through the by-product of the "canned hunting industry" in South Africa, defined by Bauer et al as 'trophy hunting of captive bred lions in confined spaces' (2018, p. 2). Despite well-grounded theoretical fears that the presence of this industry would threaten wild tiger survival – and, by extension, wild lion survival – through demand exacerbation, no hard evidence exists for this connection as yet (Williams et al., 2017), although a recent report states (EMS Foundation & Ban Animal Trading, 2018, p. 7) that the DEA's decision is 'threatening Africa's wild lion populations, particularly because increasing demand (for tiger bones) is leading to a rise in illegal killings' (of wild lions), because lion bones masquerade as tiger bones in destination markets. Another concern regarding wild populations is that consumers in East-Southeast Asia are allegedly prepared to pay more for bones from free-ranging wild lions because of a belief that the effects are more potent than those of captive lions.

Kirkpatrick and Emerton (2010) provide at least three reasons to expect that tiger farming (and lion farming, by extension) will not help tigers in the wild (especially if the re-introduction of captive-bred tigers into wilderness areas is unviable).

First, as with most pro-trade arguments for scarce species, the assumptions are flawed – we have no reliable data to suggest that if supply increases that it will in fact cause a price reduction and thereby reduce poaching effort. The supply-side signal may – to the contrary – shift the demand curve outwards and so maintain or even increase the price. After all, the market is imperfect and likely oligopolistic, meaning that a simple increase in supply may affect price, but not in the assumed way (downwards only), especially if it has the inadvertent effect of changing consumer tastes towards increased consumption independent of price. Williams and ‘t Sas-Rolfes caution that because, in their study, a ‘large proportion of survey respondents have stated that they will seek other markets for lion bones’ (2017, p. 24), there is potential for a parallel illegal market to develop. However, it seems clear that such a market already exists, along with extensive connections to organised crime, and has occurred independently of the level at which the DEA has set the quota (EMS Foundation & Ban Animal Trading, 2018). Williams and ‘t Sas-Rolfes correctly note that we know nothing about demand elasticity for lion bones (the sensitivity of consumption behaviour to price changes). They argue that price shocks are best avoided (2017, p. 25), although the reasoning in this respect is unclear. Theoretically, if demand reduction campaigns resulted in an inward shift of the demand curve and a resultant price collapse, the incentive to breed or poach lions for their bones would disappear, solving the problem of how the existence of a predator breeding industry may affect wild lion populations beyond South Africa’s borders. The authors seem to be concerned that the setting of an insufficiently high quota may artificially signal scarcity and drive prices upwards, creating an incentive to poach wild lions. As discussed below, however, the different cost structures for breeding and poaching may be the stimulus for parallel markets developing – the level at which the quota is set may be spurious and simply provide confusing supply-side signals to the market as to the legitimacy of the trade.

Second, farmed and wild tiger parts are not perfect substitutes. The same is true for lions. Third, no evidence exists that farmed tigers or lions can be produced less expensively than

poached ones. Therefore, it is likely that a parallel market will develop – poached lions will be supplied to one segment of the market, and farmed lions to another. As the EMS/BAT report (2018, p. 36) put it: ‘If, indeed, the current price [of a complete skeleton] “at the breeding farm gate” is between ZAR30,000 and ZAR50,000, then it is plausible that illegally killing wild lions for the bone trade may be cheaper than sourcing bones from the captive-breeding industry’. This view is supported by Tensen (2016), who shows that commercial breeding is only likely to reduce the pressure on wild populations if the demand for the product does not increase due to the presence of a legal market, if farming does not rely on wild populations for re-stocking, and no laundering of illegal products into the legal trade occurs.

The role and impact of regulations and conservation authorities

In 2010, a judgment by the Supreme Court of Appeal (SCA) found against the Department of Environmental Affairs and in favour of SAPA. The DEA had brought a case against SAPA in an attempt to change the conditions under which canned hunting takes place to make it more ethical. The judgement rightly concluded that it was arbitrary for the DEA to insist, first, on introducing a minimum habituation period for captive-bred lions to assimilate to their enclosures, as no amount of time was likely to increase the probability of attaining fair-chase conditions. Second, the DEA’s insistence on a minimum enclosure size was similarly arbitrary, as any hunt in a confined space of a captive-bred lion did not constitute a fair chase. The court further ruled that lion farming was in an entirely separate category to wildlife conservation and should therefore not be regulated by conservation authorities (Supreme Court of Appeal, 2010). This part of the ruling appears to have resulted in widespread confusion over which government entity is responsible for the welfare of captive-bred lions. The DEA asserts that the Department of Agriculture, Forestry and Fisheries (DAFF) is the responsible entity as these are seen as ‘farmed animals’. This confusion and resultant passing of responsibility fails to recognise the potential *conservation* relationship between the presence of captive lion breeding and the plight of wild lions, not only in South Africa but also in other African range states.

In respect of the relationship between captive-bred lions and wild lion survival, CITES requires that – for South Africa to export lions or their derivative parts, regardless of the captive or wild origin – a non-detriment finding (NDF) must be provided by the Scientific Authority. A NDF is meant to reasonably establish that such a trade will have no adverse effects on the probability of wild lion survival.

In May 2015, the Scientific Authority of South Africa issued a NDF in respect of *Panthera leo*. It stated that there ‘are currently no major threats to wild lion populations in South Africa, although the management of re-introduced wild lions needs to be improved’ (2015, p. 1). It further notes that very few wild lions are hunted for trophies each year, and that stock is largely provided by captive populations. The NDF only considered wild and re-introduced wild populations of the African lion and did not consider captive bred populations. It does, however, quote an estimate (from Taljaard, 2009) that between 3,600 and 6,000 lions were being kept in captivity across at least 174 breeding or captive facilities. This number is at odds with more recent estimates, and again demonstrates that the industry is not being regulated. The Taljaard study is unpublished and unavailable online. Interestingly, the NDF also indicates that ‘illegal trade in captive bred lions within North West Province is suspected to take place, as this industry is large and a challenge to regulate’ (Scientific Authority of South Africa, 2015, p. 8). Overall, the NDF demonstrated that legal local and international trade (in lions and their derivative parts) posed only a low to moderate, but non-detrimental risk to the species in South Africa. The authority stated that it had no concerns relating to the export of lions in accordance with Article IV of CITES.

One of the members of South Africa’s Scientific Authority, however, Dr Paul Funston (Senior Director of Panthera’s lion programme and lead author of South Africa’s Lion Biodiversity Management Plan), condemned the quota for 800 lion skeletons (issued by the South African government in 2017) as having ‘absolutely no grounding in science’ (Panthera, 2017). In other words, the NDF did not provide grounds on which to establish the quota; it only found that – as of 2015 – there were no major threats to wild lion survival in South Africa, and it did not explicitly examine the link between captive breeding and its potential future impact on wild lion conservation. Dr Funston stated that it was irresponsible to

establish policy that could further imperil wild lions – already in precipitous decline throughout much of Africa – when the facts are clear; South Africa’s lion breeding industry makes absolutely no positive contribution to conserving lions and, indeed, further imperils them’ (Panthera, 2017).

Panthera cites anecdotal data to substantiate its assertions. First, they note that in 2016 alone, 90% of carcasses from illegally killed lions in Limpopo National Park, Mozambique, had their skulls, teeth and claws removed. Second, the rates of poisoning of lions specifically to retrieve body parts have increased dramatically in Niassa National Reserve in Mozambique. Third, a 6kg consignment of lion claws and teeth was found in an illegal rhino horn confiscation in Maputo in 2016. Finally, 42% of lions killed illegally in Namibia in 2016 had their heads, feet, tails, skin and claws removed (Panthera, 2017).

A newer NDF was gazetted in early 2018, which included reference to captive bred populations. It stated that South Africa’s healthy wild populations exist alongside ‘a large captive population of approximately 7 000 lion kept in around 260 breeding/captive facilities...’ (Scientific Authority of South Africa, 2018, p. 5). The finding reiterates the view that the hunting of captive-bred lions poses no threat to the wild lion population and ‘it is thought that captive lions may in fact serve as a buffer to potential threats to wild lions by being the primary source of hunting trophies and derived products (such as bone)’ (Scientific Authority of South Africa, 2018, p. 5). Williams and ‘t Sas-Rolfes report that they ‘currently find no substantial evidence that legal exports of skeletons from captive-bred lions have adversely affected wild populations in South Africa to date’ but nonetheless call for an urgent investigation into the ‘extent and impact of trade in other African lion range states where vulnerable wild lion populations are likely to be adversely affected’ (2017, p. 25).

The NDF appears to ignore this caution and does not consider the probability that there are essentially two different types of hunting markets – those who will hunt only under ‘fair chase’ conditions and those who attach no value to the conditions of the hunt and will hunt captive lions in enclosed spaces from which they cannot escape at reduced prices. The logical outcome is that a parallel trade will exist; to venture the idea that captive lions will

serve as a buffer to potential threats to wild lion survival is empirically untested and possibly dangerous. To further corroborate the point, the US market for canned lion trophies, the world's major market, has been closed since 2016. No evidence thus far suggests that demand for wild lion trophies has increased as a result. If it is the case, for instance, that the demand for lion bones in East Asian trade is growing, then it is not clear that bones as a derivative from the canned hunting industry will satisfy that demand, especially as the demand for canned hunting has plummeted over the last two years. Reports are already emerging of captive bred lions being slaughtered for their bones, and Williams and 't Sas-Rolfes confirm from their questionnaire responses that breeders are signalling an intention to move into this market directly. This suggests that the 2018 NDF underestimates the size of the bone trade and is unaware that what it sees as a buffer may well prove to be a catalyst for wild lion destruction. The 2018 NDF states, similarly to the Williams and 't Sas-Rolfes (2017) report, that 'at present there is no evidence to suggest that the lion bone trade between South Africa and East-Southeast Asia is detrimental to South Africa's wild lion population' (Scientific Authority of South Africa, 2018, p. 6), but it does not determine whether this trade may prove detrimental even in the medium term. Finally, the assessment states that a quota for the export of skeletons derived from captive breeding operations must be established and revised on an annual basis. It does not mention the 2017 quota for 800 lion skeletons or the increase of that quota to 1,500 in July 2018.

The possibility that the NDF underestimates the size of the bone trade and its growth is evidenced by the findings of the interim Williams and 't Sas-Rolfes report, which shows that, since 2012, the prices of lion skeletons have increased consistently from a mean of R18,000 (male) and R17,000 (lioness) respectively in that year, to R50,000 (male) and R40,000 (lioness) respectively in 2017 (2017, p. 18 figure 4.a). The increase in prices also signals a potential outward shift of the demand curve (though the data is too shaky to state this with any great confidence), as consumer preferences for lion parts may have grown as supply has grown. Moreover, the response from questions 51 and 52 of the survey – answered by only eight facilities (skewed towards those who only sell skeletons as a by-product of the hunting industry, reveals that just three facilities exported a total of 98 skeletons between them in 2017, down from eight facilities in 2016 that exported a total of 151 skeletons (Williams & 't Sas-Rolfes, 2017, p. 20 table 11).

Prior to the established quota, 381 skeletons were exported from eight facilities alone (ibid), strongly suggesting that the 2017 quota of 800 skeletons had no grounding in an understanding of the market. Moreover, if fewer facilities are exporting fewer skeletons in 2017 than in 2016 or 2015, it is not clear why the quota increased. Of course, it is impossible to infer the extent of the market from such a limited sample size, but this again demonstrates that the DEA does not have sufficiently reliable or accurate data on which to establish a quota that is required to be grounded in science. 'Once the quota was opened, it took less than two months for it to be used up' (Williams & 't Sas-Rolfes, 2017, p. 22). 74 percent of the quota applications were to sell skeletons from euthanised lions. As Williams and 't Sas-Rolfes suggest, this is indicative of the disruption to the breeding industry as a result of reduced demand for canned hunting. Breeders that had previously banked on being able to sell to the hunting market are now supplying skeletons from slaughtered lions directly to the bone trade. The incentive to reduce breeding therefore appears limited at this stage, especially with skeleton prices having increased substantially over the last six years (though some breeders have indicated that they will reduce breeding), and with the almost doubling of the 2018 bone quota.

Captive breeding and conservation

In response to the assertion that captive lions have no conservation value, SAPA contends that 'many farmers have used money from captive-lion trophy hunting to turn dusty cattle farms into lush wilderness areas' (n.d.), which constitutes conservation value as far as the breeders are concerned. Furthermore, the organisation claims that the 'ranch lion industry have (sic) satisfied the lion bone market and so made forays by poachers into our national parks unprofitable' (SAPA, n.d.).

Panthera asserts, to the contrary, that there is 'not one shred of scientific evidence showing that canned hunting and legal lion bone exports take the poaching pressure off wild lion populations. In fact, it is increasingly clear that these practices stimulate demand for wild lion, leopard and tiger parts throughout the world' (2017). SAPA claims to have invested 'millions in research, release studies, genetic enhancement, lion censuses and bloodline

management' (n.d.). Yet, not a single study in the peer-reviewed literature appears to support the view that captive-bred lions have conservation value, or even may have that value in the future. The claim that captive-bred lions can transition to wild conditions has also not been supported in the literature.

Schroeder writes that while 'captive breeders and hunting operators have created new revenue streams by producing new forms of wildlife commodities geared toward whole new classes of wildlife consumers' (2018, p. 19), it remains unclear whether the increased demand for these goods can be saturated by captive breeding, or whether such demand will generate unintended negative downstream impacts on wild stocks elsewhere in the region.

The most comprehensive paper in the literature that addresses this question is by Lindsey et al. (2012a). In response to the claims made in the Taljaard report (that the captive predator breeding industry contributed an average annual figure of R226.7 million to the economy and supported 220 direct jobs), the authors note that while these benefits may accrue, 'ethical concerns and negative publicity associated with captive-bred lion hunting could potentially off-set gains by disrupting much larger and more economically significant industries such as ecotourism and mainstream trophy hunting' (2012a, p. 18). In their paper, Lindsey et al. treat mainstream trophy hunting as a relative conservation good, given that its absence in many contexts would result in land conversion from wildlife conservation to livestock or other agricultural activity. Survey data revealed that 20 percent of clients who had hunted captive lions previously would prefer to hunt wild lions in the future. Given the relatively large size of the South African captive hunting industry, if it were to be closed down, even a small transfer of clientele to the wild hunting industry could be significant. 'A shift of 20% of the captive-bred market could lead to an increase of 42.9% in the demand for wild hunts' (2012a, p. 19). An outward shift in the demand curve for wild hunts would, however, confer negative conservation consequences where hunting is poorly regulated. Wild hunting is only sustainable if quota adherence is credibly enforced and the quotas themselves do not exceed that which is biologically sustainable. Excessive off-take is already prevalent in Namibia, Cameroon, Tanzania, Zambia and Zimbabwe.

An interesting predictive observation – in light of the Panthera statement cited above that provides anecdotal data of a potentially negative link between predator breeding and conservation – notes: ‘An increase in demand for wild lions within South Africa could lead to an increase in hunting of the species on private and communal lands adjacent to protected areas such as the Kruger National Park and the Kgalagadi Transfrontier Conservation Area, which could create sink effects similar to those seen around Hwange National Park in Zimbabwe. Such hunting would not necessarily rely on there being viable populations in hunting grounds adjacent to parks, as lions can be easily lured with the use of baits or calls and perimeter fencing is often poorly maintained and ineffective at controlling the movement of predators’ (2012a, p. 19). This happened recently in the case of the controversial hunting of a pride male lion named Skye in the Umbabat reserve bordering the Kruger National Park (Pinnock, 2018a). Conversely, where hunting is well-managed, the closure of predator breeding for canned hunting would make wild lion hunting substantially more expensive and potentially increase the conservation value of that activity as a result. However, a substantial difficulty with this line of reasoning is that ‘lion populations are particularly sensitive to trophy harvests due to the social disruption and potential for infanticide by incoming males following removal of pride males’ (2012a, p. 11). Moreover, current quotas would have to be reduced to make the industry sustainable from a conservation perspective. This is politically near-impossible.

The relationship between captive hunting and wild hunting is therefore ambiguous for wild lion survival. If captive breeding reduces pressure on wild stock, a positive conservation effect may be present. If, however, conservation value is dependent on a large, well-managed wild hunting industry, this positive effect may be undermined as it would presumably disincentivise the retention of wildlife-based land uses. Similarly, if the captive-bred hunting industry were to be banned, the increased demand for wild hunting may have positive conservation value, but only if the qualifying condition of being well-managed is credibly met.

Beyond this ambiguous effect, the more important theoretical consideration is what kind of impact the sale of lion parts to Asia may have on the demand for wild-sourced lion parts. The consumption of lion bones is not illegal in China or the other major consuming countries

and the number of bones exported from South Africa has increased in recent years. Being listed on Appendix II means that export permits for bones can be acquired without having to sell a hunt. 'From a conservation perspective, trade in lion bones from captive institutions in South Africa to Asia would be cause for concern if it were to stimulate harvest of wild lions or other felids to supply the bone trade. The market preference in China for bones from wild, rather than captive, felids could result in such a stimulus' (Lindsey et al., 2012a, p. 20). A recent investigate report notes, for instance, that leopards are now Asia's most traded big cat: 'Trade in their bones, primarily to meet demand from Chinese consumers, is one of the drivers of this trade' (Environmental Investigation Agency, 2018a); the bone is consumed in similar ways to tiger bone. This again reinforces the proposition that a legal trade in lion bones opens channel for the laundering of other felid bones, which may place pressure on wild stocks of those felids. It also makes law enforcement challenging, as officials are unable to distinguish tiger bone from other felid bones. This point was emphasised by a delegate from Vietnam at the 2018 CITES Animals Committee meeting.

SAPA's assertion, along with that of the DEA's 2018 NDF - that the sale of captive-bred derivative parts has been shown to remove the pressure on wild stock – has not been empirically shown in any available literature. There is a distinct possibility that the stimulus mentioned by Lindsey et al. would shift the demand curve outwards. Given the sheer lack of data pertaining to the demand for specifically-wild lion bones or parts, the precautionary principle would ordinarily apply. In other words, if an activity stands a theoretical chance of increasing pressure on wild stock, the probability of a detrimental CITES finding should similarly increase. As has been observed with elephant ivory and rhino horn, criminal syndicates find it economically more attractive to source stock from the wild through paying a flat rate to poachers than to source from expensive breeding stock (Harvey et al., 2017). Breeders would have to produce stock at lower marginal costs of production than poachers, which would almost certainly mean risking the health of the gene pool.

If captive-bred lions could be introduced into the wild in a sustainable manner that ensured population growth recovery, presumably the difficulties currently associated with the relationship between captive breeding and wild lion survival would become obsolete. An important paper from 2012 examines this issue (Hunter et al., 2013). The authors'

concluding assessment is that 'reintroducing large carnivores from captivity into the wild is profoundly limited by biological, technical, financial and sociological factors' (Hunter et al., 2013a).

The importance of the Hunter et al. contribution cannot be overstated because a relatively large number of registered captive breeding facilities market themselves as explicitly contributing to conservation or research. Their revenue streams are derived from this particular premise. Therefore, if it is not true that captive bred stock can be successfully or sustainably reintroduced, the regulatory indication is that – at best – such false advertising should be immediately prohibited. The truth of this particular question also determines the relative economic significance of the industry. If it is of negligible conservation value but derives a large portion of its revenue stream from that pretext, its economic significance would presumably be diminished when that pretext is exposed as false.

Hunter et al. show that population re-establishment using wild lions has been unequivocally successful, to the extent that many reserves now employ some form of population control (Kettles & Slotow, 2009; Miller & Funston, 2014). Removals from wild prides would be problematic if they compromised the quality of the source population by increasing the probability of inbreeding; it is also illegal to remove wild animals from their natural habitats and place them in captivity (Funston & Levenson, 2015). The probability of inbreeding increases inversely to the size of the source population. In other words, small populations are at greater risk of inbreeding and are unviable options in the presence of larger and therefore more suitable candidate sources.

After addressing the conditions for successful wild re-introductions, Hunter et al. show that not only is wild translocation significantly more successful on average than captive re-introduction, the 'impoverished setting of the captive environment may lead to maladaptive behaviour' (Hunter et al., 2013a), such as inexplicable male killing of adult females and high cub mortality as a result of failing to thrive. The second, and most significant problem, with captive bred populations as a source for reintroduction is that their origin may be unsuitable. The source population should ideally be as closely genetically related to the original native stock as possible. They should also show similar ecological characteristics to

those belonging to the original sub-population. In this respect, the most significant barrier to successful reintroduction is that captive-bred lions are likely to lack important local adaptation abilities, especially if they have been exposed to novel pathogens that could contaminate wild populations. The authors contend that the long history of private ownership of lions in southern Africa from various sources has created a mongrel captive population that is unfit for release into the wild. Where the need for captive-origin lions would be greatest (West and Central Africa), the wild populations are genetically distinct and not well represented in captivity. Finally, they argue that there is little supporting evidence for 'so-called pre-release training that demands close contact between people and tame lions' (Hunter et al., 2013a). Human-socialized lions present a significant risk to people with a number having been killed. This includes a recent incident at Dinokeng Game Reserve in South Africa, where Kevin Richardson – the “lion whisperer” was taking the lion for a walk during which she killed a young woman near a tented camp on the property (Associated Press, 2018).

Hunter et al. contend that since no lions have been restored to the wild by the process of pre-release training since 1999, such programmes risk detracting attention and economic resources away from securing existing lion habitat and addressing the factors that kill wild lions and their prey.

Abell and Youldon (2013) respond to Hunter et al. by noting that no evidence exists that 'lion restoration programmes using captive-origin lions are, or will be, failures' (2013, p. 25). They question the objections raised by Hunter et al. by, for instance, arguing that not enough is known about lion disease epidemiology to promote translocation unequivocally as a more efficient and effective conservation measure than captive-bred sourcing. Sourcing from healthy populations incurs the very risk that Hunter et al. are keen to avoid (sourcing from small sub-populations that may negatively affect pride dynamics and survival). Abell and Youldon further argue that the aberrant behavioural characteristics of captive prides referred to by Hunter et al. are not typical, and may not be consequences of captivity per se. Ultimately, Abell and Youldon are of the view that Hunter et al. do not sufficiently address all the factors in question and should not condemn conservation programmes that source captive-bred stock for *in situ* conservation when wild translocations are likely to prove

ineffective in themselves to address imperilled wild lion populations. In response, Hunter et al. (2013b) essentially accuse Abell and Youldon of creating arguments that appeal to speculation at best: 'It is spurious to claim that both captive-origin and wild-born approaches can play a part when the former has wasted millions of dollars and years of effort, elevated the risk to lions and people, and has not established a single, free-ranging lion' (2013b, p. 27). It is difficult to dispute that, on the basis of the available evidence, wild lions are better candidates than captive-bred lions for reintroduction success (Slotow & Hunter, 2009). It may be true that captive operations may also contribute in the future, but objective criterion for justifying capital allocation in this direction – especially in the face of competing conservation investment priorities – seems to undermine its rationale. Furthermore, Hunter et al. express their reservations towards the encounter industry that misleads the public – and policymakers – into believing that captive-sourced reintroduction is a necessary, viable and established conservation success method.

Further corroborating Hunter et al.'s point, Dunston and others (including Abell) (2017) recently conducted a study that attempted to ascertain whether captive-bred prides would be able to thrive in the wild. After comparing the territorial and hunting behaviour of captive-origin prides with wild-born prides, the authors state that 'observed hunting behaviour by the captive-origin prides indicated their ability to hunt successfully individually, however, whether they are capable of co-operative hunting remains to be established' (Dunston et al., 2017, p. 259). While the authors contend that upon relocation to a larger reserve, captive-origin prides could become self-sufficient, it is really not clear that this follows from the evidence presented. There appear to be too many caveats and too many unlikely conditions that would have to be fulfilled before conservationists could be convinced of the merits of *ex situ* reintroduction programmes. One of the critical factors that remains unexamined, for instance, is how captive-origin prides would compete with or even respond to wild prides in the same reserve. Another study by a student of Dunston's concludes that it remains unclear whether captive-origin lions would respond appropriately to unfamiliar conspecifics in the wild post-release despite having ostensibly developed natural social behaviours (Hall, 2017), even if captivity does not impede the ability of a pride to become socially cohesive (provided a host of pre-released conditions are met to ensure the replication of 'natural' behaviour) (Dunston et al., 2016).

Captive breeding, genetic fitness and the unsustainability of 'sustainable use' doctrine

The relationship between captive breeding (and its associated practices) and its conservation value is mediated not only by whether captive bred lions can be successfully reintroduced into the wild or whether the derivative parts satisfy demand in Asia, but also by the intervening variable of genetic quality.

SAPA alleges that 'the genetics of the better lion ranch populations are much more pure (sic) than that of the typical wild lion pride' (n.d.). It further states that long-term scientific studies and analyses of breeding practices by SAPA-accredited breeders show that 'lion breeders go to extraordinary lengths to avoid inbreeding' (n.d.). These studies are not linked or referenced to the article. Moreover, the reference to ranched lions (as apparently distinct from captive-bred lions) appears to be selective in this instance, as 'ranched' lions are sourced from captive bred populations and there is no evidence to suggest that the categorical distinction is warranted. Captive-bred lions who happened to grow up on a ranch are no less captive-bred than those who grow up in a cage. The sleight-of-hand rhetoric subtly introduces the idea that 'ranched' lions are some form of wild-managed population, but the difference remains an unbridged chasm.

In a peer-reviewed assessment of the literature, Richard Schroeder notes a higher incidence of genetically derived disease among captive-bred animals and that inbreeding is a significant problem. 'The weakening of the genetic pool can have serious consequences for the general vitality of the captive-bred population' (2018, p. 8). This is especially the case for lions that are bred purely for canned hunting or the bone trade, where there is no obvious short-term requirement to focus on maintaining the genetic diversity of metapopulations.

A report commissioned by the National Council of SPCA's in 2009 raised concern over this issue too. It stated that, in addition to the welfare concerns associated with captive

breeding, 'the use of growth stimulants and genetic manipulation to try and increase the size of captive lions' (Cadman, 2009, p. 14) was equally concerning.

Cousins et al., in 2010, noted that the legal requirement for wildlife utilisation systems to be surrounded by game fencing has 'led to fragmented landscapes, causing genetic isolation of species and the disruption of migratory routes... Furthermore, many ranches are too small to contain genetically healthy predator populations' (Cousins et al., 2010). These authors further highlight eight general biodiversity conservation concerns within the private ranching industry. Pertaining to genetics specifically, they call attention to the problems of deliberate cross-breeding or hybridization of species; deliberate breeding of recessive colour variations; and the genetic pollution of wild animal populations if released into the wild from unscientific intensive captive breeding programmes. Cousins et al. note that the Department of Environmental Affairs (DEA) in 2005 recognised that such practices could deplete the genetic integrity and diversity of natural populations. New regulations introduced in 2010 appear not to have helped, partly because of tension between stakeholders over the implementation costs, and because the DEA has little to no enforcement capacity to monitor the implementation of the regulations.

Pitman et al. conclude that while game ranching has widely been heralded as a conservation success – the epitome of a devolutionary rights-based approach to natural resource management – there are significant hidden costs of local decision-making 'in the absence of adequate centralised regulation and evidence-based best practice necessary to uphold conservation objectives' (2017, p. 406). Moreover, it is not clear that the acclamation of conservation success is warranted, as intensive game-ranching practices can incentivise the persecution of ecologically important species (such as apex predators) (Pitman et al., 2017). Genetic integrity appears to be at risk even in well-managed small re-introduced wild populations, and intensive ranching of game on private ranches that would otherwise constitute lion prey in the wild has inadvertently led to the persecution of wild lions near these ranches.

Given the peer-reviewed contribution by Pitman et al. and Cousins et al., it is difficult to see why SAPA insists that 'ranch lions [bred for consumptive sustainable utilisation purposes]

have significant conservation value in terms of their genetic diversity; health resilience; reintroduction purposes; socio-economic benefits; revenue-generation; and protection of wild lions by meeting demand for trophy hunting and lion bone demand' (SAPA, 2017, p. 17). The DEA's 2018 NDF, instead of heeding the warning in various reports and academic papers that captive breeding may imperil wild populations, reflects this very view.

SAPA introduces a distinction between captive-bred lions – 'ranch' and 'working/tourism' lions – that does not exist in the National Biodiversity Management Plan for the Lion (*Panthera leo*) in South Africa (NBMPL) (Funston & Levendal, 2015) (hereafter the BMP). The SAPA management plan for captive lions then also asserts that 'working/tourism' lions (as opposed to ranch lions) have 'significant conservation value in terms of their genetic diversity...' (SAPA, 2017, p. 17). No supporting evidence is offered for the claim. The 2015 BMP notes that the National Zoological Gardens (NZG) of South Africa had been requested by SAPA to undertake a genetic survey of lions held in captive facilities. This research, however, is not yet publicly available, although it began in 2013. In a recent report, the DEA responded to the following question: 'Does the DEA have systems in place to monitor the genetic integrity of captive bred lions in South Africa?' by stating that 'The National Zoological Gardens did a project with the South African Predator Association to look at the genetic diversity in the captive populations and they should be approached for further details. The TOPS [Threatened or Protected Species] regulations do require that studbooks should be kept, where appropriate' (Born Free Foundation, 2018, p. 28). The 2018 NDF assessment states that 'According to recent data (2017) provided by DEA, this number [of lions in captive facilities] is likely to be closer to 7 000 individuals kept in approximately 260 facilities' (Scientific Authority of South Africa, 2018, p. 12). Again, however, this information is not publicly available, and numerous requests for information to the Minister of Environmental Affairs elicit responses that the DEA does not have this information.

SAPA has insisted that captive-origin ranch and working/tourism lions (if one accepts their distinction) are genetically healthy and therefore of conservation value (2017, p. 17), but its own lion management plan – in Table 27-1 - notes that in both captive-bred and managed wild lions, in-breeding is a concern, especially in the former: 'In-breeding known to occur (sic) – compromises genetic integrity and provenance (origin)' (SAPA, 2017, p. 35).

In the absence of the NGZ study being available, another 2010 paper (Trinkel et al., 2010) will have to suffice as the most authoritative word on the matter.

Since 1980, there has been a rapid increase in the number of small, fenced reserves (smaller than 1000km²) in South Africa. While reintroductions to establish wild managed lion populations in these reserves have been successful, most reintroduced populations are small and will suffer serious genetic problems from inbreeding depression unless wild stock is sourced from elsewhere. Beyond this issue, and pertaining to captive breeding more specifically, inbreeding depression is common among terrestrial predators in captivity. Inbreeding 'has deleterious consequences on all aspects of reproduction and survival' (Trinkel et al., 2010, p. 375). In Madikwe, a small reserve in South Africa, the average inbreeding coefficient of cubs born each year to reproduce increased with increasing population density due to incestuous mating. Wild lions were reintroduced to Madikwe Game Reserve specifically for eco-tourism and biodiversity conservation purposes. Trinkel et al. demonstrate that eco-tourism benefited from the reintroduction, and the translocation of excess lions provided additional income. 'However, the benefit for conservation is questionable as it is clear that substantive close breeding has occurred despite the interventionist management approach' (Trinkel et al., 2010, p. 379). Madikwe has the second-largest population of re-introduced lions, and the fourth largest overall lion population in South Africa. If inbreeding in such circumstances could not be avoided, it is difficult to see how it could be avoided among "ranching lions". Trinkel and her co-authors are of the view that 'in the longer term, a major genetic intervention is required, such as introduction of new blood lines' (2010, p. 380). Slotow and Hunter (2009) recommend artificial takeovers, such as removing a two-male coalition and replacing them with unrelated two-male coalitions, as the most appropriate method for introducing new genes into a population. This has been successfully achieved in the Greater Makalali Private Game Reserve, for instance (Miller et al., 2013). Miller and Funston (2014) note that most managers of reintroduced lions in small reserves are not using available methods (such as artificial takeovers, recommended by Kettles and Slotow (2009) and contraception) to control population growth and ensure genetic diversity. They are simply trying to remove excess lions. Removal through translocation is now at saturation point, and euthanasia is therefore now the preferred removal approach. This has led to high levels of inbreeding,

which leads the authors to question the conservation value of the approximately 700 lions that exist in small, fenced, reserves.

If inbreeding is widespread among captive lion populations in South Africa, and there is little reason to suspect that this is not the case – the burden of proof remains on the industry to demonstrate otherwise – then the industry does not appear to be sustainable.

Sustainable Use

South Africa's constitution states that 'everyone has the right... to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that... secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development' (Republic of South Africa, 1996 section 24b, (iii)). Private game owners, including SAPA members, are of the view that the consumptive use of predators is therefore constitutionally justifiable, and the SCA judgment referenced above indicates a likely reading of the constitution in this manner.

SAPA states, for instance, that 'managed hunting is an especially revenue-rich form of utilization... those who oppose sustainable utilisation are inflicting the cost of conservation on landowners and yet denying them the benefits' (SAPA, 2017, p. 18). But this appears to be carefully-worded avoidance of how unsustainable some of the practices are – such as supplying to the canned hunting industry –that its members may be engaged in. Until such time as a full audit and transparent listing of all its members' breeding facilities is conducted, SAPA should expect public suspicion towards its claims. The 2018 NDF notes that the 2015 BMP for the African Lion included actions for how to improve the management of captive lions, one aspect of which was 'an audit of all lion keeping facilities' (Scientific Authority of South Africa, 2018, p. 14). Three years later, no such audit exists. Without this, it is difficult to see how a NDF, let alone a skeleton export quota, is justified.

The practices of the predator breeding industry therefore appear to fall short of the constitutional insistence on 'ecologically sustainable development' that satisfies the stipulation 'for the benefit of present and future generations'. The precautionary principle is

important here because it cautions that if current practices are likely to put the future viability of the wild lion population at risk, for instance, then they should be stopped.

As it stands, no lion scientists appear willing to confirm that the captive predator breeding industry has positive conservation value. To the contrary, the evidence appears to be pointing in the direction of potentially undermining wild lion conservation (Lion Conservationists, 2017; EMS Foundation & Ban Animal Trading, 2018).

If it were the case that SAPA simply insisted that captive-bred lions had no impact on conservation and are entirely separate from wild lions, the current policy equation may be different. However, at present, the Association explicitly claims that it makes unequivocally positive contributions to conservation. The evidence cited in this paper suggests that this is unlikely to be true. The industry may undermine conservation efforts both through the inadvertent stimulation of demand for lion bones in Asia (the subject of the next and final section), creating enforcement problems related to the illegal tiger bone trade, and through having to source wild stock to maintain genetic variation among the captive population.

The final consideration in this section is whether the economic revenue streams that make the predator breeding industry so lucrative are ethically viable. Ian Michler, for instance, draws attention to ‘the volunteer programmes that feed revenue and free labour into many of these lion farms... They entice people, often young students who believe they are making a worthy conservation contribution, into paying substantial amounts of money to offer their services to these facilities’ (Michler, 2016). A number of travel blogs also expose the deception employed by breeders. Facilities that buy or rent cubs from breeders (often on separate properties) charge tourists (many of them volunteers) to cuddle, play and take photos with cubs that have been separated from their mothers within days of birth (Peirce, 2018). This early separation, human habituation and subsequent walking with tourists renders these lions unsuitable to ‘rewilding’ efforts, despite farms’ marketing claims to the contrary (Travelrebellion, 2018). Similarly, Adam Cruise cites the Endangered Wildlife Trust’s position that captive-predator facilities give the general public the wrong impression that it is acceptable to hold carnivores in captivity (Cruise, 2017). Human-predator habituation is dangerous, as demonstrated by the fact that one of Kevin Richardson’s lions recently killed a

woman on his Welgedacht farm (mentioned earlier), along with the little known fact that, for instance, '38% of all known incidents involving carnivores were attacks by captive cheetahs', the second highest attack rate after captive lions (De Waal, 2018). Richardson himself has made public statements against the cub-petting and canned hunting industry, but any human habituation may be a form of cruelty (directly or indirectly). For instance, even though a recent publication finds that the lion encounter industry may have potential conservation education value, it scores the industry negatively on animal welfare parameters (Moorhouse et al., 2015). Fair Trade Tourism has also recently published its 'Captive Wildlife Guidelines', which were developed on the grounds of research from Oxford University's Wildlife Conservation Research Unit that 'up to four million tourists per year who visit captive wildlife attractions per year are contributing to animal welfare abuse and decline in species conservation, yet 80% of them are unaware of their negative impacts' (FTT, 2018).

There are two major ethical issues in view. First, tourists are paying to do labour that would otherwise presumably pay local job-seekers. These tourists are lured under the false pretext that they are *directly* contributing to conservation. That predator breeding may have an *indirect* conservation value is a difficult argument to market convincingly, thus facilities that use captive-bred cubs resort to lying. Second, breeders are supplying the canned hunting industry and the lion bone trade, unbeknown to volunteer tourists. The canned hunting industry is also selling its hunts as 'wild' – presumably few hunters are enticed by the thought of shooting a docile, domesticated animal. The industry therefore has to resort to marketing under false pretexts.

Exposure of the practice, combined with the controversial shooting of Cecil the Lion in Zimbabwe, led to 'a 2016 US ban on the import of trophies from captive-bred South African lions' ('t Sas-Rolfes, 2017, p. 5). As indicated above, ethical trophy hunting may be of some conservation value; what is unclear is the extent to which South African hunting (99% of which is of captive-bred lions) affects the trophy hunting of wild lions or wild lion survival more generally. 't Sas-Rolfes is drawing attention to this lack of clarity and warns of the dangers on simply banning hunting altogether – it may be an inappropriate response in light of the complex interaction between informal and formal institutions, shaped by

heterogeneous hunting preferences and other factors. This is a fair point, and trophy hunting of free-range wild lions may be an important conservation tool regardless of how one may view the matter from an ethical perspective (Nelson et al., 2013). However, the backlash against hunting in general – misguided as it may be in the eyes of some scholars – has created new dynamics and practical implications for wild lion conservation and the predator breeding industry.

The backlash against canned hunting in particular has led to a split in the South African hunting industry – PHASA remains committed to the hunting of captive-bred lions and voted at their AGM on 22 November 2017 to continue hunting captive-bred lions, an apparent reversal of a previous decision (Avery, 2017), though SAPA denies this. The decision also appears to ignore SAPA's statement that 'the key issue [to have the importation of captive-bred lion trophies re-admitted to the United States] for the captive lion industry is to demonstrate that the industry does contribute to the conservation of wild lions in South Africa and beyond' (SAPA, 2017, p. 22).

In a recent Carte Blanche interview (Summers & Watts, 2018), Richard York – current spokesperson for the Professional Hunters Association of South Africa (PHASA) – admitted that there were only eight hunting ranches (among the more than 200 captive-breeding – or related facilities – in the industry) that were currently SAPA-accredited. In other words, only eight hunting ranches in the entire country have met the appropriate standard for supplying the hunting industry with captive-bred lions that have minimal human imprinting.

Interviewer Derek Watts asked what implications this had for the other 192 facilities that were not yet accredited. York answered that 'small change happens in small increments' and that PHASA would work with breeders to improve their facilities. It does not appear, however, that PHASA members are under any obligation to only hunt in the eight accredited facilities. SAPA's lion management plan decries the anti-hunting lobbyists who oppose hunting on 'ideological and emotional' grounds, and states that 'managed hunting is an especially revenue-rich form of utilization, which impacts relatively little on the environment' (SAPA, 2017, p. 18). However, SAPA has failed to demonstrate that captive breeding has positive conservation value. Its claim that it reduces the impact of hunting on wild populations (2017, p. 39) has an ambiguous conservation effect at best (Lindsey et al.,

2012b). And, while PHASA explicitly recognises the problems of canned hunting and claims not to support the industry, there is no evidence that either SAPA or PHASA are taking sufficient steps to address the self-recognised issues of: the small size of the hunting area; the minute release period prior to the hunt; human imprinting on lions to be hunted; unethical hunting practices and ‘the misrepresentation of facts to hunting clients’ (SAPA, 2017, p. 44). The development of SAPA’s norms and standards (SAPA, 2017 Appendix A) is a start, but these do not appear to be aligned with the norms and standards stipulated in the 2015 Lion BMP. Moreover, there is no recognition of the serious governance challenges associated with each province having its own disparate set of regulations pertaining to canned hunting.

The split in PHASA led to the formation of a new hunting group called ‘Custodians of Professional Hunting and Conservation – South Africa’ (CPHC-SA, 2018). Paul Stones, one of its founding members, recognises – in the Carte Blanche interview – that with only a small skeleton export quota (800 at the time), and 8,000 lions in captivity, combined with the backlash against canned hunting (and consequent reduced demand for canned hunts), the ‘excess’ lions are going to be exploited for their derivative parts. SAPA appears to support this practice, as it states that captive breeding delivers conservation benefits by meeting the demand for trophy hunting and lion derivatives (2017, p. 43). As the next section demonstrates, however, it is not clear that the legal sale of lion bones from captive-bred lions in South Africa will be able to satisfy demand in Asia; to the contrary, it may ignite demand in ways that prove deleterious to wild lion survival by generating incentives to increase poaching efforts. This is especially concerning if SAPA and PHASA members have links to criminal wildlife trafficking networks. Moreover, Safari Club International (SCI), the world’s largest trophy hunting club, will no longer allow captive bred lion operators to advertise or market captive bred lions at its annual convention, and will reject all captive-bred lion entries for its record books (Bloch, 2018b). The Dallas Safari Club has made a similar ruling.

Williams and ‘t Sas-Rolfes point to the danger of captive lion breeders seeking alternative markets for lion derivatives in the wake of the backlash against canned hunting and the potential link to organised crime. They warn, for instance, about the potential for the rhino

poaching epidemic to be replicated in the lion domain. Indeed, the links between the known handful of South African bone traders and the criminal networks involved in the illicit rhino-horn trade are becoming increasingly well-established (EMS Foundation & Ban Animal Trading, 2018). This appears to corroborate the view that merely having an 'excess stock' of captive-bred lions may do little to prevent the large-scale poaching of wild lions.

The trade in lion bones

For SAPA to legitimise the canned hunting industry – one of the organisation's stated aims – it recognises that captive-bred lions should bear no human imprinting. Animals bred for hunting also have to look somewhat presentable, especially if they are to become a trophy. The growing bone trade, however, renders welfare concerns irrelevant from the economic perspective of breeders. 'In effect, the bone market's function is to absorb surplus animals that are often in ill health or otherwise suffering the effects of poor treatment' (Schroeder, 2018, p. 8). Beyond welfare considerations, it is not clear that exploiting surplus captive-bred lions for their derivate parts can satisfy market demand; to the contrary, legally available supply may both fuel demand and provide a laundering channel for illegal supply.

Supply and demand dynamics of illicit wildlife trade are difficult to establish without reliable data, as criminal syndicates and illegal retail outlets are not in the business of making audited financial statements publicly available. 'When it comes to the details of the money flows and economics of the lion bone trade on the South African side, very little is known' (EMS Foundation & Ban Animal Trading, 2018, p. 33). Policy decisions therefore need to be built on the best available scientific evidence, and in the absence of good economic data, the best economic theoretical considerations.

It is now well-known that the illegal trade in tiger body parts is a persistent and significant threat to wild tiger populations (EMS Foundation & Ban Animal Trading, 2018). Their bones are one of the most lucrative products sold on the illegal wildlife market. Efforts to curb this trade involve diverse strategies such as demand reduction campaigns. Confusing supply-side signals, however, like the breeding of felid substitutes (like lions) for tigers 'may be foiling efforts to curtail the market' (Williams et al., 2017, p. 4). Breeders assert that the supply of

farmed bones removes pressure on wild populations. However, the availability of a legal supply channel – given the export quota of 1,500 skeletons – may incentivise ‘poachers to target wild lions and launder their bones into these markets’ (Born Free Foundation, 2018, p. 2). The fact that lion bones were reportedly being passed off as tiger bones (and traders were not demanding to see evidence of the source) for Traditional Chinese Medicine (TCM) ingredients, made conservationists ‘nervous about the trajectory of the trade and what impact it might have on wild lion populations’ (Williams et al., 2017, p. 5). In other words, ‘the legal trade in captive bred lion skeletons and bones may be used as a cover by criminal syndicates to launder illegally obtained bones and skeletons from wild-caught animals’ (Born Free Foundation, 2018, p. 5). We also now know that ‘lion bones have been found inside containers transporting ivory and rhino horn, suggesting the same networks are involved’ (Shaw, 2017, p. 15).

The link to organised crime is important for the theoretical economics that should inform policy decisions. In June 2011, two Thai men (Phichet Thongpai and Punpitak Chunchom) were arrested for possession of lion bones. They worked for the Xaysavang Export-Import Company, based in Lao P.D.R., and confessed that the main business of the company was to trade in lion bones, supplied by the captive breeding industry. A month later, Chumlong Lemtongthai, a Thai national who worked for Xaysavang, was arrested at the same residence. Lemtongthai’s record of rhino poaching is well recorded in the literature. While Lemtongthai was sentenced to 40 years’ imprisonment for his role in the rhino horn trade, the charges against Chunchom were dropped. The court case revealed that Xaysavang Company traded in rhino horn, lion bones, teeth and claws (Williams et al., 2017). In 2013, the U.S. government offered a \$1 million reward for the dismantling of the Xaysavang network, which was said to be Asia’s largest wildlife crime syndicate (Fuller, 2013). Lemtongthai told the court that Marthinus Philippus (Marnus) Steyl – a former member of the SAPA council – had offered to supply bones to him. ‘Two other council members in 2016/17 had also previously been charged in connection with illegal rhino hunting and associated activity’ (Born Free Foundation, 2018, p. 6). Steyl is indeed in the business of trading lion bones, and sought a court order against the Free State Department of Economic Development, Tourism and Environmental Affairs on 23 June 2017 to compel them to allow him to export bones even prior to the finalisation of the export quota (a commitment made

by South Africa at the 17th CITES Conference of the Parties in 2016) (EMS Foundation & Ban Animal Trading, 2018, p. 40). Steyl has known links to Vixay Keosavang, the director of Xaysavang, an importer of lion bones (EMS Foundation & Ban Animal Trading, 2018, p. 45).

The Born Free report also sheds light on the influential relationship that SAPA has with the DEA in general and with the North West Provincial Government in particular. Moreover, the DEA has admitted that it has no official figures documenting the number of breeders in the country nor of the number jobs created by the industry, but instead relies on figures from SAPA, which in turn sponsors research at North West University, the most recent and relevant of which — Van Der Merwe et al. (2017) — was interrogated at the beginning of this paper. To other enquirers, the DEA has stated that it has requested the information from the provincial authorities, but the provincial authorities themselves deny ever having received such requests (EMS Foundation & Ban Animal Trading, 2018).

The picture that emerges from the above story is twofold. First, it is not clear that the legally available supply of lion bones from ‘excess’ captive-bred stock can satisfy demand for tiger bone products in Asia. Conversely, it may signal to the market that the trade is legitimate, thereby increasing demand and placing pressure on wild lion and tiger stock and undermining demand-reduction effects. If the supply-side signal shifts the demand curve outwards, the captive breeding industry may not be able to satiate new demand. Evidence that the demand curve for lion bones may indeed be shifting outwards is contained in a recent report that shows that – in China – lion bone is being sold at three times the price of wild tiger bone (Environmental Investigation Agency, 2018b). A similar concern exists with the arguments in favour of rhino breeding to satisfy the Asian horn market (Crookes & Blignaut, 2015; Crookes, 2017; Harvey, 2017). Williams et al. conclude that ‘while there is minimal evidence to suggest that the East-Southeast Asian bone trade is presently adversely affecting wild lions in protected areas in South Africa, the extent of this specific trade in other lion range states still requires urgent proactive monitoring and evaluation to substantiate and clarify these impacts and also those resulting from the trade in lion body parts for other purposes’ (2017, p. 18). This is especially the case in Mozambique, where law enforcement and anti-poaching efforts suffer from inadequate execution capacity.

Second, the links between SAPA council members and organised criminal syndicates is concerning, especially given their apparent influence over policymaking. Karl Amman, independent undercover wildlife market researcher, found – during his last (2018) research field trip to Asia– that none of the SA lion skeleton export permits he was given could be reconciled to legitimate import addresses (email correspondence). This corroborates the view that the primary destinations for lion bones and skeletons from South Africa are countries with poor records of addressing illegal wildlife trade (Born Free Foundation, 2018; EMS Foundation & Ban Animal Trading, 2018). Increasingly, it appears that SAPA’s objective is not to contribute to conservation – though that serves as an expedient marketing cover – but to generate revenue streams from supplying the canned hunting industry (supported by PHASA) and the illicit tiger bone product trade. It is one thing to claim that the industry’s activities are indirectly removing pressure on wild lion stocks; it is another thing entirely to wilfully create legal channels through which to launder supply to an illicit industry.

Concluding remarks

This review has examined four major aspects of the predator breeding industry in South Africa.

First, it examined the literature that claims to have evaluated the economic significance of the industry by interrogating the paper produced by van der Merwe et al. in 2017. In this study, qualitative interviews with 22 of SAPA’s 146 registered members were employed to obtain quantitative expenditure information. The results were extrapolated to generalise to all 297 facilities that the study specified were in existence. Through the application of a social accounting matrix, the study demonstrated that the industry supported roughly 1,200 jobs and generated revenue of approximately R500 million per year. The review found that it is not clear how accurate or reliable the data is, nor whether 22 qualitative interviews constitutes an adequate sample size from which to extrapolate and generalise. The relative lack of research into the economic contribution of the industry is concerning, and that SAPA, which supports this type of research, does not itself have a publicly available database of all its members and their relevant expenditures. The Taljaard study from 2009 is not publicly available, and the only other available study is by Cadman, also from 2009. No peer-

reviewed research yet exists that quantifies the opportunity costs and potential negative externalities generated by the industry. It therefore remains unclear whether this controversial industry is economically warranted, especially if it may produce adverse wild lion conservation consequences.

Second, the review assessed the claims of the industry regarding its conservation contribution. It found startling contradictions pertaining to claims over genetic integrity. SAPA's lion management plan, for instance, claimed conservation benefit through genetic integrity among the captive-bred population but in the same plan noted significant known inbreeding problems. Genetic impairment may undermine the sustainability of the industry and incentivise the illegal acquisition of wild stock to diversify the gene pool, though SAPA explicitly forbids this practice under its suggested norms and standards. Beyond genetic impairment, it is yet to be scientifically established that captive-bred lions can be successfully reintroduced to the wild, therefore undermining the claims of direct conservation value. The argument over indirect conservation value through supplying the captive-bred trophy hunting industry, and thus taking pressure off wild lion hunting, is ambiguous at best. Hunters willing to shoot captive-bred lions are in all likelihood not in the same market category as those who are committed to 'fair-chase' wild hunts. This may also be why there is no empirical evidence to suggest that eliminating canned hunting would result in greater demand for wild hunts, which would place adverse pressure on wild lion populations.

Third, precisely because the industry markets itself under conservation pretexts, this review examined the ethical dubiousness of supplying a hunting industry that explicitly sells its hunts as 'wild' whereas they are evidently 'canned'. Even if lions are 'ranchered' with minimum human imprinting, they are still of captive origin, managed by humans and lack the skills of escape that would characterise a 'fair chase' hunt. The fact that one of the eight SAPA-accredited ranches baits its lions (discussed in detail in the next section of the report) is further evidence of the disregard for the 'fair chase' principle. The SCA ruling that it is arbitrary to stipulate that time must be given to lions to habituate into their hunting enclosures is reasonable. A lion born in captivity, habituated by human imprinting, is not likely to provide a 'fair chase', whether one hunts it in 500m² or 12,000 hectares, and the

time to become accustomed to its death-habitat is immaterial. PHASA encourages its members to only work with the eight SAPA-accredited facilities as currently meeting its standard but will not explicitly condemn canned hunting. This has caused a split within South Africa's lion-hunting industry. SAPA stipulates voluntary norms and standards that avoid any human imprinting, but reports are widespread that breeding facilities lure volunteer tourists in on false conservation pretexts, extract the cubs from lioness mothers within hours of birth, bottle-feed them, graduate them to walking with tourists, and then sell them for canned hunting and the bone trade thereafter. It is not clear that SAPA is taking any steps to curb this extensive practice. The newly formed CPHC-SA recognises the untenable position of the SAPA-PHASA alliance and is unequivocal in its prediction that most of South Africa's 8,000 lions in captivity will be disembowelled and their derivative parts sold directly to the lucrative illicit 'tiger bone' trade. A number of reports confirm that this is already occurring. With reduced demand for canned hunting, and an arbitrary annual skeleton export quota, it is difficult to see what else lion farmers are going to do with their 'excess' stock (expensive to maintain). This section highlights that an overly narrow reading of the 'sustainable utilisation' doctrine in Section 24 of South Africa's Constitution – one that ignores future ecological wellbeing and next-generation benefit – may produce a highly unsustainable industry that generates large rents in the short term but produces adverse long-term conservation consequences. It may also produce adverse wild tourism outcomes if it damages South Africa's brand value, which would place further pressure on existing wild populations.

Finally, the review briefly assessed the recent literature on the relationship between predator breeding and the illicit trade in tiger derivatives. It is not promising that SAPA's credibility has been brought into question in respect of some of its members having known links to criminal syndicates involved in lion bone and rhino horn trafficking. The DEA has permitted the legal export of 1,500 lion skeletons with no grounding in science, and with the available evidence suggesting that it has been unduly influenced by SAPA. Two major conservation concerns persist. First, there is no reliable data with which to assess whether the illicit demand for tiger and lion derivative parts will shift the demand curve up or down. If the legal export of 1,500 lion skeletons has no impact on consumer tastes, then – theoretically – an increase in supply will reduce the price, increasing the quantity demanded

but potentially not creating incentives for higher supply at lower prices. However, if it changes consumer tastes for tiger and lion derivatives and pushes the whole demand curve up (which appears to be happening), then legal supply may be incapable of satiating that demand unless the breeding industry is prepared to further undermine animal welfare and genetic integrity. The most likely outcome would be the poaching of wild stock, for which there is growing anecdotal evidence. Given the volume of unknown variables, the precautionary principle suggests that South Africa should be cautious about permitting the export of any lion derivatives and move to a zero export quota. This should also temper the enthusiasm with which the DEA has received the non-detriment finding for South African lions.

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Section 2: The opportunity costs of South Africa's predator breeding and visitor-interaction industry

Introduction

Cost-benefit analyses (CBAs) are typically employed to evaluate the trade-offs entailed in policy decisions. For instance, if a major oil refinery was proposed on land near urban areas or coastal dunes, an evaluation of the latent impact should be undertaken. This is different from an environmental impact assessment, which would generally be limited to describing the environmental effects of building infrastructure such as a hydropower dam or a new uranium mine. Licenses are then distributed, or not, on the grounds of what the assessment reveals. CBAs are normally undertaken to attribute some kind of theoretically derived monetary value to the area or piece of land that is likely to be destroyed or at least negatively affected by the proposed development. In the case mentioned above, for instance, the refinery might damage an irreplaceable species of Fynbos in the coastal dune system or reduce the value of house prices in the area. If people vacate the area as a result, economic activity may be reduced, resulting in higher crime rates due to fewer employment opportunities. These negative effects are what economists call 'externalities' – the difference between private returns and social costs. Another example of an externality is pollution, in which the polluting firm does not pay for its emissions, but the costs are offloaded onto the affected society. One way that externalities can be addressed is through taxing the offending firm. An optimal tax rate depends, however, on the value of whatever entity is being harmed in the process of production.

Some are of the view that because CBAs demand 'that the advantages and disadvantages of a regulatory policy be reduced, as far as possible, to numbers, and then further reduced to dollars and cents' (Ackerman & Heinzerling, 2002, p. 1553), the entire practice is not only cold but 'a little crazy as well' (ibid). While the practice is laden with value-attribution difficulties, especially when it comes to valuing something with specifically non-pecuniary value, difficulties and inadequacies are not sufficient reason to ignore CBAs altogether. They can shed light on project externalities. Moreover, it is not practical to argue that all parts of the natural environment should be conserved because it is priceless. While one may assent

to that principle, it provides little decision-making criteria for choosing between two competing options, which is the dilemma-laden world facing the policymaker. A recent paper, for instance, wisely noted that invoking the 'infinite value' argument makes it difficult to motivate conservation management decisions that lead to better environmental outcomes (Colyvan et al., 2010).

CBA's employ various methods, all of which contain difficulties. For instance, evaluating people's stated willingness to pay (WTP) for preserving the Okavango Delta may be wildly divergent from the revenue such preservation may generate for the country through tourism. Assessing payment for ecosystem services (PES) is another method that has become recently fashionable (Hiedanpää & Bromley, 2014), but also contains difficulties.

I do not attempt to employ any one of these methods per se in this report, largely because there is insufficient information about the industry from which to run a WTP survey. Even then, the negative effects of the industry may be relatively removed from potential survey respondents, therefore skewing the results. Instead, I provide a framework for assessing two claims typically offered by the predator breeding industry in South Africa:

1. The industry argues that it is economically significant. In other words, the existence of the industry is justified because it has a multiplier effect on the regional economy in which it is embedded, supporting not only immediate jobs, but also other industries. These other industries, in turn, also generate income and employ people, and so the multiplier effects are varied.
2. The industry claims that it offers significant conservation value. There is some variety to this line of argument, normally along two strands. First, private game ownership in South Africa has ostensibly preserved land that would otherwise have been given over to agriculture, livestock farming or some other economic activity. Biodiversity preservation is thus incentivised through private ownership. Second, breeders often argue – or at least use this argument to convince paying volunteer tourists – that captive breeding allows the reintroduction of vulnerable or endangered species into the wild.

The report argues that these claims are flawed. In response to the first, it suggests that the claims of economic significance are insufficiently substantiated at present. There are no

counterfactuals; neither is consideration given to the value that may be generated by alternative investments of similar levels of capital. To the contrary, on the basis of the current evidence, this report suggests that the presence of the captive predator breeding industry may undermine the total potential economic value of South Africa's tourism sector. Moreover, because of the extensive utilisation of paid volunteers (lured under false conservation pretexts), local jobs that would be created by alternative industries are potentially foregone.

On the second, it is not clear that private game ranches necessarily contribute to conservation. In fact, what matters for conservation is less the total amount of land that is conserved than the quality of the wilderness landscape preserved (preferably large and unfragmented). A proliferation of small reserves, as the literature review revealed, may have contributed to the genetic unviability of many elephant populations in South Africa. Private game ranch ownership, contrary to popular discourse, may be an important source of fragmentation which reduces migratory options and limits genetic variation and viability. Mere total land size therefore matters relatively little for species sustainability. Additionally, the re-introduction of captive-origin lions into the wild has yet to occur successfully³. This is not to say that it will never be successful, but a number of conditions have to be met simultaneously, an unlikely proposition. Moreover, re-introduction efforts are costly, largely funded by well-meaning volunteer tourists who may not be well informed. This report argues that capital allocation towards preserving large, unfragmented wilderness landscapes (that aid large predator and mammal migration) would be far preferable to preserving a host of small private ranches.

³ SAPA claims, [in a 2016 article](#), that two lions introduced to the Warthog ranch have 'proved' that captive breeding allows easy re-introduction to the wild. But Warthog is an accredited hunting ranch, and it is not clear that anything about the introduction of these two lions has contributed to conservation. Certainly, there is no follow-up scientific research showing the progress of these two particular lions. What the article seems to miss, too, is that while a lion may preserve the instinct to hunt, this is hardly the only criteria by which successful reintroduction is measured.

In summary, this report aims to demonstrate that the opportunity costs⁴ of the predator breeding industry in South Africa, and its negative externalities⁵, provide a cogent foundation on which authorities should reconsider their support for the industry. This is further strengthened by the fact that – at present – the industry is almost entirely unregulated. Written answers to parliamentary questions (Appendix B) reveal that between the national and provincial environmental authorities, no governing body has a database of existing breeding facilities. Even SAPA does not have a publicly available list of its members and features only seven [‘accredited’](#) ranches on its website that hunt lions. PHASA lists eight SAPA-accredited ranches in its 2017 AGM minutes (https://phasa.co.za/wp-content/uploads/2018/05/PHASA_40th_AGM_PHASA_LETTER.pdf). These accredited ranches hunt captive-bred lions that have minimal human imprinting and in enclosures that have to be larger than 1000ha. This still gives the hunter an improper advantage over the lion and in no way constitutes fair chase. In fact, [‘one facility’](#) explicitly states that it baits white lions to guarantee a successful hunt for the client. It is therefore unclear how accreditation makes canned hunting more ethically acceptable, if that is indeed SAPA’s attempted purpose behind accreditation.

Methodology

This section of the report provides an economic assessment of the economic and conservation value of the ‘visitor-interaction’ (or pre-hunting/bone trade) dimensions of the predator breeding industry supply chain to South Africa. It is informed by a comprehensive review of the literature and findings are derived from a database compiled by the researcher (appendix A). The database aimed to be as comprehensive a list as possible of the number of outlets in South Africa that offer any kind of human interaction with captive-origin predators. The database does not cover the intensive breeding element of the

⁴ Economists use the concept to show that economic activities do not have value primarily in the revenue that they generate, but in generating *more* overall revenue (private returns minus social costs) than the next-best available alternative. In other words, a refinery in a residential area may generate revenue *x* and employment *y* but impose a significant social cost burden on the area through negative human health effects which may be more than *x* and *y* combined.

⁵ Negative externalities are the difference between private returns and social/environmental costs.

industry directly, as breeding has zero value in itself – breeders only make money from three revenue streams (or some combination of them):

- selling or renting to ‘interaction’ facilities,
- selling to canned hunting facilities, or
- selling directly into the bone trade.

It is not methodologically plausible at this stage to trace or evaluate what kind of money the breeders are making, or how many facilities source from specialist breeders versus breeding themselves⁶. Suffice to note that lions are being exploited at every part of the supply chain. The research value addition of this report is derived from focusing on the little-known element of cub and pre-hunting/bone trade exploitation.

The academic journal article by van der Merwe et al. (2017) purported to show the economic significance of the predator breeding industry. However, as the literature review suggested, it is not clear that telephonic interviews with 22 of an estimated 297 facilities constitutes a sufficiently large sample size nor accurate and reliable data from which to conduct a multiplier analysis and infer economic significance. Therefore, the current database was built only with publicly available information or data obtained via email (everything is recorded in written rather than spoken form). It contains the following information:

- The name of the facility. The facility was only included in the database if there was evidence that it offered human interaction with captive-bred predators (either photographs showing this, or it being explicitly advertised). There is a spectrum of ‘interaction’, from bottle-feeding cubs that have been removed from their mothers only a few hours after birth to walking with lions to viewing them from a distance. True sanctuaries were excluded from the database. These are defined as facilities that do not breed predators in captivity, care as well as possible for predators that have been rescued from exploitation, injury or impairment that cannot be released back into the wild, and do not allow any human interaction whatsoever. Those

⁶ The incredibly low response rates in the Van der Merwe et al. interviews and the Williams & ‘t Sas-Rolfes surveys provides some substantiation for how challenging it is to obtain accurate and reliable data.

facilities included in the database – the non-sanctuaries – were found through the following methods: internet searches; from a list compiled by the EMS and BAT; mentioned as potentially exploitative in Peirce (2018); from the Facebook Page ‘Volunteers Beware’ (where caution is offered); and from various lists held by the HSI, Blood Lions Campaign or the Campaign Against Canned Hunting.

- The relevant website pages from which most of the information was obtained.
- What kind of experience is being offered. This ranges from feeding to petting to walking to general ‘interaction’.
- The costs of a day visit per person converted to US dollars.
- The cost of volunteering at the facility for one week (most facilities offer the opportunity to stay for up to four weeks at slightly reduced rates per extra week).
- Annual number of day visitors – built on an assumption either generalised from similar facilities or from Tripadvisor review frequency or reasonable informants in books like Peirce’s.
- Annual number of volunteers – this is also built on assumptions explicitly articulated in the ‘assumptions’ column.
- Total revenue. From highly conservative estimates, the annual volunteer number is multiplied by the volunteer cost/week, and the annual day visitor number is multiplied by the cost of the day visit. The estimates are highly conservative because they do not include accommodation fees, or any activities only indirectly linked to the predators. Hunting is excluded. In other words, while the final figures are not derived from audited financial statements, they are an understatement, and therefore of sufficient validity to inform policy decision-making.
- Location. This could aid in GIS mapping in future studies to ascertain what alternative economic opportunities may exist in each area.

As it currently stands, the database consists of 81 named facilities. Data about revenue is publicly available or was privately obtained (via email request) for 47 of those. In other words, revenue data is missing for 33 of the facilities in the database. The researcher did not obtain information via telephone, as written data is more reliable. The sample size of 47 is already more than double the size of interview respondents in the Van der Merwe et al. study and about seven times larger than the respondent sample in the Williams and ‘t Sas-

Rolfes report.⁷ The Van der Merwe et al. study stated in the abstract that ‘lion breeders contribute R500 million (US\$42 million) annually to the South African economy’ (2017, p. 314), but the authors did not indicate how this figure was calculated and it does not appear again in the article.

Preliminary results and related methodological notes

Based on verifiable data in the database attached in Annexe 1 - from 47 facilities that generate cashflow from exploiting predators in one form or another (excluding hunting and bone-processing facilities) - the figure is \$28.5 million in annual gross revenue, which equates to about R380.9 million a year. The average revenue per facility is calculated at \$606,459. The range is incredibly wide, however, with a minimum gross revenue figure of \$88,560 a year and a maximum of \$5.1m a year.

It is challenging to ascertain how many of these facilities that offer petting or walking (or both) breed the animals themselves. It appears, from the available literature, that a large number of facilities buy or rent cubs from specialist breeders located elsewhere and then either sell them forward (to hunting or the bone trade) or give them back to the breeders (once they’ve outlived their usefulness for that particular exploitation). It also appears that a very small number of companies might breed, pet, hunt and export to the bone trade - a vertically integrated model – but use different locations for each activity. Others may breed on the very same property as petting or walking or hunting takes place (the SAPA criteria for gaining accreditation require, for instance, that breeding facilities be kept at least 1 km away from the hunting enclosure, which seems to presuppose that many hunting outfits often breed on the same property).

Because of this variation in business model and supply-chain complexity, the gross revenue figures above are only sourced from facilities that offer petting or walking or viewing of

⁷ The database (on which this report is built), the Van der Merwe et al. interviews (with SAPA members) and the Williams & t Sas-Rolfes (WtSR) survey questionnaire all cover slightly different respondents (in that some of the facilities listed in the database or the WtSR study may not be SAPA members or breed lions on their facilities per se).

enclosures (without direct interaction). Though this does not preclude the possibility of breeding on the same property, the revenue figures for selling and/or renting cubs is not captured in the database. An average revenue figure for the entire industry is therefore difficult to calculate, as insufficient knowledge exists about revenues from direct breeding activities to make relevant assumptions.

Based on an average figure of \$606 459 in gross annual revenue for 47 facilities and if the other 250 facilities (assuming 297 facilities in the entire industry) generate similar average revenue⁸, the total gross revenue value is probably closer to \$180 million per year, about R2.67 billion a year.⁹ If the industry only employs 613 people directly and supports an additional 700 (if one takes the Van der Merwe et al. figures for the sake of evaluation), the results suggest that there is an enormous amount of money accruing to facility owners, quite possibly at the expense of South Africa's reputation as a tourism destination. The revenues, while large, are only a fraction (roughly 1.85%, depending on exchange rate values) of the country's total tourism value (estimated at R144.3bn in 2016) (Statistics South Africa, 2018, p. 3).¹⁰ Furthermore, gross revenues of this magnitude do not warrant the lack of ethics, the opportunity costs and negative externalities that characterise the industry.

This report does not employ a social accounting matrix to ascertain significance through multiplier effects in other sectors, as the Van der Merwe et al. paper did. Rather, it shows that the economic significance of the industry is limited – the gross revenues are large, but the industry's clandestine nature, likely damage to wild lion populations, and tourism brand value damage mean that support for it is risky. The report makes its evaluation by showing the opportunity costs of the industry under the following main points:

⁸ This seems a reasonable assumption and is possibly an understatement. Not all of the estimated 297 facilities are earning revenue from exploiting predators for human interaction but it is reasonable to assume that the breeders are earning revenue either from selling to facilities that do so or selling to the bone trade or the canned hunting industry (or some combination thereof). Those that sell directly to the bone trade appear to be charging between R30,000 and R50,000 per skeleton (farm gate prices) (Williams & 't Sas-Rolfes, 2017; EMS Foundation & Ban Animal Trading, 2018), making revenue figures potentially an order of magnitude larger than the estimates offered here.

⁹ At an exchange rate of \$0.067 to R1, as at 17 August 2018.

¹⁰ Not all elements of the industry are tourist-facing per se, as obviously bone trading is not a tourism enterprise. However, the existence of the industry at every point in the supply chain is likely to have a negative effect on conservation and on South Africa's overall tourism brand value.

- Volunteer tourists pay to do jobs that facility owners would otherwise have to pay local labour to undertake.¹¹ Alternative economic activities would likely be at least as labour-absorptive as predator exploitation and would have more conservation value.
- False pretexts undermine the integrity of South Africa's tourism brand and therefore the potential revenue generated by tourism as consumers become increasingly ethically conscious.
- Legally breeding lions that directly and indirectly supply the Asian bone trade may ultimately imperil wild lion (and other wild felid) survival.
- Connections between some operators in the industry and transnational organised crime poses threats to wildlife conservation and national security and raises questions of corruption between governing authorities and traders.

The report begins with descriptive statistics derived from the database. These show the heterogeneity of revenue potential and product offerings. Almost all of the listed facilities market themselves as having some kind of conservation value, normally through educating tourists about predator behaviour in the wild. The report then details the opportunity costs listed above and the overall economic impact that each may have on South Africa's tourism industry and on wild lion survival (on which the region's tourism industries largely depend).

Descriptive statistics

Of the facilities that offer day visitors interactive experience with their predators, the least expensive (aside from a zoo), Moreson, charges \$4.92 for cub petting. Richard Peirce observed that within 15 minutes of arriving at this particular facility, 23 people had visited the lion cubs (2018, p. 98). There were 11 cubs held in closures of 6 X 5 metres. Assuming 80 visitors an hour (a conservative estimate as Peirce's observations were outside of peak times), 6 hours a day for 300 days a year, this amounts to annual revenue from the cubs

¹¹ It is important to note, however, that the work is designed for volunteer tourists, and the load is probably not so burdensome that each volunteer is carrying the load of a potential full-time employee. Some of the jobs are also specifically designed around volunteer tourists being subject to misinformation (like bottle-feeding 'orphaned cubs'). If human interaction and petting/walking exploitation were to stop, then of course this whole argument would become irrelevant. The more relevant argument at that stage would be to consider what the labour absorptivity of alternative economic opportunities might look like.

alone of \$708 480. The most expensive lion interaction in South Africa for day visitors is \$170 (Bagamoya). Assuming 100 visitors a day for 300 days of the year, this facility earns \$5.1 million a year. They also have a volunteer programme, but the facility did not respond to my cost enquiry¹². The price range and the product differentiation are notable. Average day prices are \$33.65, and the median is \$14.76, suggesting most business models use scale for keeping profit margins high. This is likely to have a negative effect on animal welfare, as cubs are forced to interact with tourists beyond their stress limits.

Table 1: Price range and product offering of captive-breeding facilities (or associates)

Least expensive	Most expensive	Product offering	Average Price
\$4.92	\$170	Cub-feeding and petting; walking with predators.	\$33.65

Source: Database (Appendix A), compiled by researcher.

A problematic element of the predator breeding industry is the number of volunteers who pay large sums for the privilege of working at the facilities. Almost all are lured under the pretext of working towards conservation. A few examples will suffice. [One facility states](#), in its vision and mission, that it is not affiliated to any parties that partake in canned hunting. ‘Almost all of the cubs that we nurture in the park belong to other predator breeders who are also not involved in hunting’. The facility admits to hand rearing cubs, something it claims as essential because the cubs are occasionally ‘neglected by their mothers due to the following: the mum does not have milk to feed them or the litter is simply too big for the mum to handle’. The reality is more brutal, as the stories in Peirce (2018) and Blood Lions (2015) reveal. Cubs are often removed from their mothers within hours of birth, causing the mother to become deeply distressed but ready to breed again far sooner than she would in the wild. In captivity, lionesses can produce 5 litters in the space of two years, whereas in the wild they would only produce one litter every 18 months (range 1.3 to 2.02 years). The

¹² Email sent on 5 June 2018.

particular facility mentioned above further claims that its aim is to inform and educate. However, it is unclear what tourists are being informed or educated about per se.

[Another facility](#) ‘offers you an opportunity to work/interact with the wild animals and gain experience like cleaning, building enclosures, feeding, and more with the wild animals, as well as the opportunity to unwind...’ This facility passes itself off as a sanctuary but has been [implicated](#) as an integral part of the breeding industry. Even the facilities that provide excellent care for their animals and limit human exposure entirely are not contributing to conservation, as no captive-origin lions have yet been demonstrated to be able to survive or thrive in truly wild conditions. For instance, one facility aims to re-introduce lions to the wild through first being trained by human walkers to hunt. But human habituation has repeatedly proved dangerous. The programme still has no conservation success and admits in academic papers published by researchers working at its facilities that there is extensive uncertainty over how captive-origin lions would socialise in the wild (Dunston et al., 2016).

The least expensive volunteer tourism price is \$143.50 a week, but this is for day volunteers. Most facilities require a minimum of two weeks per volunteer and generally include meals and accommodation. The most expensive price is \$1,750 a week. Again, this is a vast range. \$143.50 is relatively anomalous, and the facilities that accommodate volunteers on a longer-term basis tend to start at approximately \$250. On average, volunteer tourists can expect to pay \$624.79 a week. The median is \$434.01 per week, which suggests that the average is being pulled up by a few outliers that are especially expensive.

Table 2: Volunteer prices variation

Minimum price	Maximum price	Average price	Number of volunteers per year
\$143.50	\$1,750	\$624.79	360

Source: Database (Appendix A)

While a small number of people may be employed to service these facilities, the business model is designed to outsource the labour requirements. Volunteers maintain the infrastructure and the animals. This is work that would possibly otherwise be supplied by

the local labour force.¹³ Instead, volunteers are paying – on average – \$624 a week. Profits accrue to facility owners while suppressing the potential labour absorptiveness of the industry. Lured under false pretexts, foreign tourists are inadvertently crowding out local labour. Based only on publicly available information, at least 12 facilities openly advertise volunteer tourism packages. Each of these facilities accommodate on average 360 tourists a year – based on a conservative estimate of about 7 per week (assuming a 50-week year). That equates to potentially as many as 84 (12 by 7) direct jobs that facility owners would otherwise presumably have to support¹⁴. Every direct job in a context of high unemployment is likely to support several dependents, though these are jobs that would disappear if the industry was exposed and collapsed.

Van der Merwe et al. estimated that the predator breeding industry supported 613 direct jobs and a further 700 or so indirect jobs through the multiplier effect (2017). They argued that this is significant in a context of high unemployment, especially as rural unemployment is even higher than the country average (currently at over 27% on a narrow reading). What they failed to note was potentially as many as 84 potentially permanent jobs were being provided by volunteer tourists.

The analysis above indicates that volunteer tourism is crowding out local labour opportunities. In all likelihood, however, if volunteers recognised that predator breeding invariably has no conservation benefit, and that they were contributing instead to owners' profit at the expense of the animals' welfare, the industry in its tourist-facing form might collapse. If canned hunting and predator breeding do collapse, either through consumer preferences shifting away from unethical activities or by legislative design (or some combination thereof), there will still be at least 7,000 lions alone in captivity in South Africa whose owners will probably slaughter them for direct sale into the bone trade (Williams & 't

¹³ See the explanatory footnotes above and below.

¹⁴ The difficulty here, of course, is that if the revenue from volunteers disappeared (which it will, eventually, as more become aware of how they are unwittingly being exploited), so would the large revenues, and therefore the ability of facility owners to employ local full-time staff. However, the demand from day visitors may still be sufficient to warrant local employment. This is not an endorsement of the idea that the industry could employ more locals. Rather, it is simply noting that, at present, at least some jobs that could be supplied locally are being done by volunteer tourists who pay for the privilege! In other words, some parts of the industry, far from creating local employment, are taking jobs away from locals (assuming that day visitor demand increased to compensate for at least some of the revenue lost from unwitting volunteers).

Sas-Rolfes, 2017). As it is, predator cubs that outgrow their tourism usefulness are likely being sold to the canned hunting industry, and thereafter into the bone trade, or directly into the bone trade given declining demand for canned hunting. These dynamics will be dealt with in a later section.

Alternative economic opportunities foregone

The next variable to consider in this section is what kind of employment opportunities could be created by alternative economic activities. If the captive predator breeding industry were to collapse, the question is whether alternative activities could provide more labour-absorptive activities. There are no counterfactuals, and therefore the exercise is one of informed conjecture and reasoned calculation.

The first assumption is that lion-breeding facilities or facilities that exploit captive-origin lions for any range of purposes are not likely to be preserving irreplaceable biodiversity except perhaps inadvertently, due to the highly fragmented camp/enclosure system it supports. The argument that the land would otherwise revert to livestock farming or some other form of agriculture is not an argument in favour of the predator breeding industry. Even if the land did revert to agriculture, the resultant local employment benefit may well exceed the current employment benefits of the predator breeding industry. However, estimating alternative employment provision is challenging. Nonetheless, it is crucial.

A study by Taylor et al. (2016) estimates that approximately 6% of South Africa's total wildlife ranching acreage is under 'intensive breeding' (all species), but only one of the entire sample of private ranches surveyed admitted to breeding lions (for live sale). Fewer than 20% of the total number of wildlife ranches surveyed (251) had large carnivore populations (lions, cheetahs, and spotted hyaenas), and these correlated only with the largest properties. The authors estimated that there were 8,979 wildlife ranches in South Africa, covering a surface area of approximately 170,419km², and employing in the region of 65,000 people. None of these ranches are likely to be included in the database developed

for this project.¹⁵ However, a number of those properties that do not have wild-managed lions (but do offer predator hunting) may source their lions or other large carnivores from the facilities that are listed in the database built for this project. Estimating the total land size associated with captive predator breeding is therefore extremely difficult, especially because there are normally other activities offered to tourists on the same premises as well. For instance, it is not as if researchers can extrapolate an average ranch size from among those that have lion populations and multiply that number by 297 (the estimated total number of breeding facilities). Predator breeding facilities do not require large tracts of land due to the intensive camp/enclosure system that house multiple lions, and are therefore relatively small, except in the rare instances where predators are bred more extensively and with minimum human habituation. Moreover, intensively bred cubs tend to be sold to places like Moreson before being sold either into canned hunting or to the bone trade or back to the supplier. It is a lucrative trade per square metre of ground required.

Despite the difficulties of estimating the acreage currently consumed by the predator breeding industry and how labour-absorptive alternative economic activities might be, it may be reasonable to assume the following:

- Because many predator breeding facilities occur in relatively close proximity to one another (they are heavily concentrated in the North West and Free State provinces), a large proportion could feasibly be joined up (theoretically) to provide more ranching surface area.
- Joining up with other farms is not restricted only to those that also do predator breeding. A search on Google Earth, for instance, reveals that there are a number of facilities in close proximity to each other on land that looks as if it could feasibly be connected to form large protected areas.¹⁶

¹⁵ The database for this project only included facilities that offered cub petting, walking with predators, or the viewing of predators in small enclosures (like zoos, but not limited to zoos). This likely precludes ranches of any description, and hunting facilities were specifically excluded from this report.

¹⁶ See Google Earth for the Lion and Cheetah Sanctuary: <https://earth.google.com/web/@-25.4685062,28.4539555,1170.55448405a,1057.26239235d,35y,0h,45t,0r/data=ChcaFQoNL2cvMTFjMjBmOHY1cBgCIAEoAigC>, and follow the 'places near' tab in the top right of the screen. 'Flying' in to each of these places reveals vast areas of land that could presumably be joined up to form wilderness landscapes that would offer real conservation value.

- Transformed into larger ranches, there would be greater carrying capacity for wild-managed lions (instead of captive-origin) and an ethical, eco-tourism offering which may be less lucrative but more labour-absorptive and sustainable than captive predator exploitation.
- A conservative average farm size of 2,000 hectares. For instance, one farm (Sondela) at Bela Bela is 4,767 ha, which is on the larger end of the spectrum.
- Following Taylor et al.'s calculations (2016, p. 3), the labour absorptivity of wildlife ranching in South Africa is approximately 0.0038/ha (the median number of permanent employees per hectare on surveyed wildlife ranches).

If the land currently supporting 81 of South Africa's predator breeding facilities (those listed in the database) were joined up to form separate wilderness landscapes (perhaps 3 or 4), assuming a farm size of only 2,000 hectares each, the total land area that could be transformed would be in the region of 160,000 hectares. At present, the average wildlife ranch in South Africa is about 18.97km² (170,419 divided by 8,979), which equates to 1,897ha. A further 160,000ha towards genuine conservation could yield 608 direct permanent jobs (160,000 multiplied by 0.0038). As it stands, the van der Merwe et al. calculation of 613 jobs is an extrapolation from 22 breeders applied across the 297 estimated to exist. The calculations above suggest that 608 direct permanent jobs could be created from only 81 of those 297 facilities being joined up to offer ecotourism value. With a multiplier effect of only 3, which seems reasonable in the light of a relatively conservative inclusion of only 81 facilities, the total number of jobs that could be created through alternative land use would be 2,400 (1,800 over and above the 608 direct jobs). In other words, the labour absorption potential of alternative economic opportunities (such as ecotourism) appears to be of an order of magnitude higher than what is currently offered through predator breeding.

Predator breeding and Brand South Africa

An important consideration in the economics of the predator breeding industry is whether its existence undermines South Africa's tourism brand value. SAPA ridicules this idea by stating that the 'only reason that the ranch lion industry has any blemish on its reputation is

because people like Mr Bell and the “Blood Lions” gang are unceasingly using misinformation, slander, downright lies, innuendo, false accusations, tarnishing by association, hysteria and deception to stain the captive-bred lion industry’ (SAPA, n.d.). Its substantiating evidence for this claim is that opponents of the industry are guilty of selection bias and have used only the most obviously unethical examples to tarnish an entire industry and have failed to examine the best facilities and what they have to offer. For example, SAPA claims that eight (of the total estimated facilities of more than 200) ‘lion-breeding and hunting facilities accredited [by SAPA] are world class operations’.

This polemic is undermined by its inability to demonstrate with any scientific evidence that this is true or that captive-origin lions have any conservation value, as repeatedly claimed. No criteria or parameters are given to determine what constitutes ‘world class’. There are only eight SAPA-accredited facilities, a paltry 2.6% of the total estimated number of breeding facilities in South Africa, and a tiny proportion of the 146 SAPA members (which are not listed on SAPA’s own website). One of these eight accredited ranches, Tinashe Outfitters, baits lions for hunts:

‘Experience the thrill of white lion hunting in South Africa, and go home with one of the most prized trophies on any hunter's wishlist. Tinashe Outfitters will prepare you for the white lion safari, and our hunting team will place bait around the area in which the lions typically hunt. We will ensure that it is slightly challenging to give you the best possible opportunity at a successful shot’ (Tinashe Outfitters, n.d.).

Another accredited ranch, De Klerk Safaris, was exposed in 2016 for conducting an illegal canned hunt sold to the client as a ‘wild’ hunt (Mercer & Park, 2016). In 2011, Tienie Bamberger, the owner of Warthog Safaris, also SAPA-accredited, organised a pseudo rhino-hunt for Chris van Wyk on a farm called Leshoka Thabang, owned by Johan van Zyl (Rademeyer, 2011). Van Zyl has since been exposed as a lion bone trader with links to wildlife trafficker Nguyen Tien Hoan (the listed client for the 2011 pseudo rhino hunt who did not shoot the animal but left Bamberger’s wife and father-in-law to do so; he is linked to the DKC network too) (EMS Foundation & Ban Animal Trading, 2018, p. 84). DKC Trading was named after Chu Đăng Khoa, and he is the sole member. It operates as ‘DKC Outdoor Furniture’ in South Africa and is not listed in the White Pages. Chu Đăng Khoa is a wealthy

Vietnamese businessman who has 'used CITES trophy hunting permit loopholes to export rhino horn for trade' (EMS Foundation & Ban Animal Trading, 2018, p. 70). He was arrested in Limpopo in 2011, found guilty, fined R40,000 and deported for illegally being in possession of five rhino horns. According to the EMS/BAT report, his business has been allowed to grow without interference from South African law enforcement agencies.

These accredited ranches are among the best of what captive-bred hunting facilities have to offer. The practices are clearly unethical by the standards of the international hunting profession. Baiting certainly violates the 'fair chase' requirement. The criteria that have to be fulfilled to be accredited by SAPA are not clear, though. SAPA's own lion management plan states that 'the released lion should be alert, well adapted to its environment and able to evade the hunting party. Hunting should only be permitted once a captive-bred lion has become self-sustaining' (2017, p. 45), but these criteria may be arbitrary, as self-sustenance does not avoid the mental and physical constraints that characterise enclosed hunting or habituation, even if it is limited. Moreover, a number of its own accredited ranches have violated the norms and standards stipulated in its management plan.

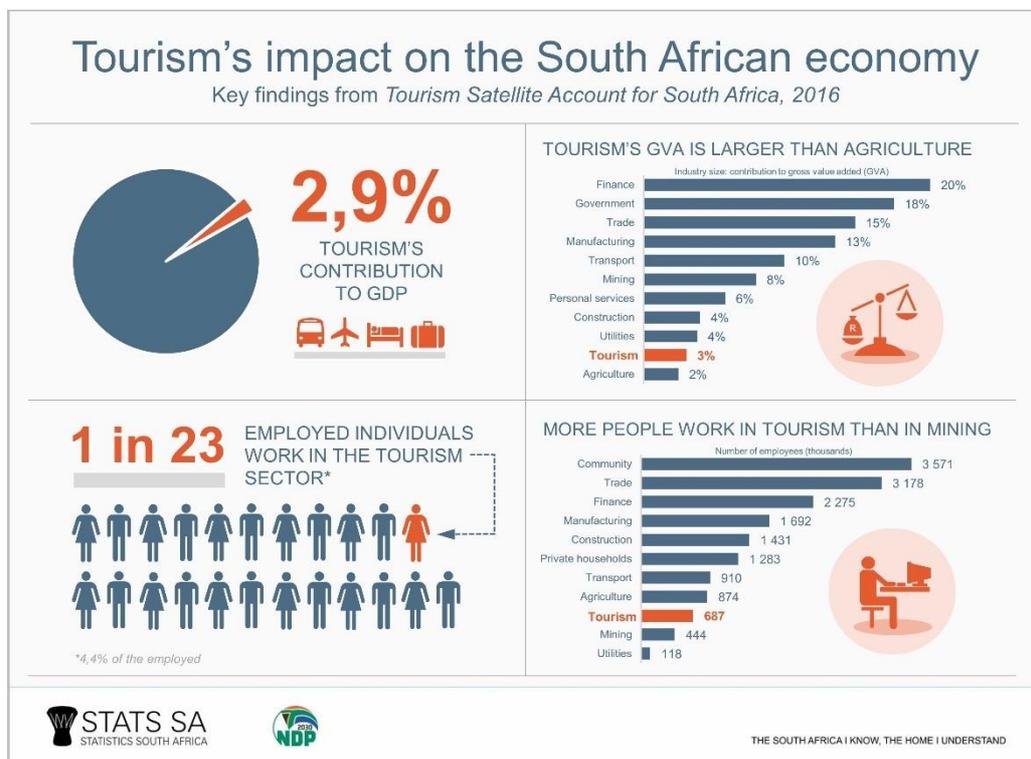
While a certain proportion of hunters are likely to continue canned hunting of lions, many are by now aware of the unethical nature of hunting captive-origin lions in South Africa. This is not attributable to 'misinformation' peddled by anyone opposed to the industry; it is more likely to be attributable to the decisions of Safari Club International (SCI) and the Dallas Safari Club (DSC) to no longer recognise South African lion trophies on its books, decision that have emanated from within the hunting industry itself. Moreover, as the SCA (2010) ruled, it is arbitrary to expect that a large enclosure or a longer habituation period is of any practical value in making the hunt more ethical as human imprinting is unavoidable in captive-origin lions and the mental and physical barriers to escaping the hunters' bullet are inherent by definition.

Strongly related to canned hunting is the breeding industry, which has been the focus of this report. Many tourists, especially volunteer tourists, are invariably unaware that they are contributing to the perpetuation of an industry that generates revenue off false pretexts and deprives the local labour force of employment opportunities in the process. Increased

recognition of the fact that so many predator cubs are hand-reared for subjection to extensive human interaction, and then likely sold into the hunting industry or directly into the bone industry, can only undermine South Africa’s tourism brand value.

Tourism in South Africa is estimated to have contributed at least 2.9% directly to gross domestic product (GDP) in 2016. As the figure below demonstrates, more people are employed in tourism than in mining – it now accounts for at least 4.4% of total employment in the country. At least one in every 23 people in the labour force are employed in tourism, and it is one of the few sectors in the country that has continued to grow over the last few years. While agriculture provides 874,000 jobs, tourism is not far behind with 687,000. Moreover, agriculture and mining are likely to become increasingly mechanised, whereas tourism is likely to be less susceptible to the labour displacing effects of new technologies. A major part of tourism’s value proposition is the engagement with people instead of machines. In an employment-scarce country such as South Africa, then, every policy effort should be made to protect South Africa’s reputation as an ethically responsible tourist destination.

Figure 1: The impact of tourism on the South African economy, 2016.



Source: STATISTICS SOUTH AFRICA (2018) Economic Analysis. In Tourism Satellite Account for South Africa. Statistics South Africa, Pretoria.

SAPA draws a distinction between lions reared for ‘ranch’ hunting with minimal human imprinting and those that are ‘working’ lions for interaction with humans. It is debatable as to whether either category is of any conservation value, and marketing the industry as a contributor to conservation is therefore unethical. While SAPA works hard to avoid negative perceptions towards its industry and to market itself as having conservation value (the phrase alone is mentioned 273 times in its management plan), it cannot escape the *empirically* warranted conclusion that lions are being exploitatively bred under false pretexts, whether ‘working’ or ‘ranch’ed’. Volunteers are often lied to about the origin of cubs that they hand-rear, bottle-feed, cuddle and so forth (that they are wild-orphaned, for instance, or that the mother could no longer look after them) (Peirce, 2018). Many hunters, similarly, do not realise that the lions they are going to hunt have no chance to escape (Mercer & Park, 2016; Michler, 2016; Summers & Watts, 2018).

With Peirce’s exposure, including the employment of under-cover ‘volunteers’; a Facebook group called ‘Volunteers in Africa Beware’¹⁷; the Blood Lions campaign; the Carte Blanche interview (Summers & Watts, 2018); website Green Girls in Africa¹⁸; and the Born Free ‘Cash Before Conservation’ report (2018), awareness of the lack of ethics in the industry is certainly growing. This is perhaps most formally recognised in the 2018 guidelines published by Fair Trade Tourism (FTT, 2018), which will likely have a wide awareness-ranging effect.

There is no hard-science method for estimating the monetary value of the damage that is being wrought on South Africa’s critical tourism sector through the captive predator breeding industry. It would be possible, however, to run a large sample-size survey of tourists that have previously travelled to South Africa and ask them whether knowing about this clandestine industry would influence their destination preferences. This is a study that should be commissioned by the Department of Tourism. It may also help to convince the Department of Environmental Affairs (DEA) that perceptions matter in the tourism game,

¹⁷ <https://www.facebook.com/volunteersbeware/posts/743189072395258>, accessed 27 June 2018.

¹⁸ <https://greengirlsinafrika.com>, accessed 29 June 2018.

and that continuing to allow the proliferation of an unregulated industry may have severely detrimental effects on the tourism sector in a world increasingly characterised by ethically conscious consumption. As it may lead to a reduction in government revenue (tourism expenditure is taxed through VAT), it would also lead to a reduction in the DEA's budget. This is especially true if the sale of South Africa's lion bones into Asian markets shifts out the demand curve and results in the increase of wild lion poaching – a scenario explored in a later section. If wild lion survival were to be imperilled because of the captive predator breeding industry, one of the key pillars supporting South Africa's tourism industry would collapse (Di Minin et al., 2012)¹⁹. The consequent socio-economic effects would be significantly welfare-reducing.

In the absence of hard data, it is worth sketching a scenario for illustrative purposes under a 'business-as-usual' trajectory (unregulated predator breeding; unscientifically-based lion skeleton export quotas; habitat destruction and fragmentation; depletion of prey species; and human/predator conflict). I make the following assumptions:

1. Lions in the wild (unfenced reserves) will be extinct within ten years (in South Africa) due to the cumulative effect of the threats to their survival mentioned above.
2. Wild-managed lions in fenced reserves may maintain population stability and attract tourists, but only if properly managed (the evidence at this stage suggests that there is insufficient use of the replacement effect in these populations).
3. Wealthier tourists – who currently have a significant game-viewing preference for the 'big-five', especially lions – are likely to become increasingly more well-informed about the prevalence of the predator breeding industry in South Africa (and its attendant latent negative impacts). This does not necessarily mean that they would choose to avoid South Africa as a destination – they may simply choose not to visit

¹⁹ The authors make the crucial point that charismatic megafauna potentially have high ecotourism value even when populations are not viable and only few individuals are present (that can be easily seen, especially by wealthier, less experienced, tourists). Of specific importance for assumption 2 is that artificially managing small populations within electrified fences may maximise economic returns but this is 'conservation for ecotourism' instead of 'ecotourism for conservation'. However, these populations – at high levels for tourism consumption – may not be viable. The authors suggest that policies governing protected areas in South Africa may need to be revised to enhance species persistence through addressing, for instance, the important conservation issues facing wide-ranging carnivores (and others) by specifying larger areas. Ultimately, ecotourism and biodiversity conservation objectives should be more aligned, as the former fundamentally depends on the latter in the long-run.

facilities that practice unethical exploitation. However, tourism is a highly competitive industry and heuristics (simple decision-making criteria informed by some level of evidence) can play a decisive role for tourists in choosing between different high-cost destinations.

4. If assumption 1 materialises in reality, wealthy tourists – some of whom may already be avoiding South Africa in the light of assumption 3 – will no longer visit South Africa, especially if the variable determining their destination of choice is the presence of (and likelihood of seeing) the big five.

The implications are as follows:

1. If the assumptions above obtain in reality, and 44.9% of the international tourist market is lost as a result²⁰ over the next decade, then South Africa's number of non-resident visitors (15,121,328 in 2016) will potentially fall to only 8,331,852 by 2026. This will, in turn, result in revenue losses of R54.51 billion, bringing the total international expenditure to R66.89 billion in 2026 (down from its current level of R121.4 billion) (Statistics South Africa, 2018, p. 15).
2. Even if only a small proportion of implication 1 is realised, the losses are still significant. They are especially significant because of the direct negative revenue impact on protected areas, which are already budget-starved. Without lions, these areas' value offering to tourists will be undermined. Biodiversity conservation without apex predators would also become exceptionally challenging.
3. The calculations in implication 1 are relatively conservative, as they do not consider the losses that would accrue from domestic demand reduction (Statistics South Africa, 2018, p. 3)). The extrapolation from Di Minin et al. therefore seems reasonable if not strictly scientific.

²⁰ This figure is an extrapolation from the Di Minin et al. study of 2012, where 519 surveys were completed, 303 of which were international tourists (58.4%). Of those 303, a striking 44.9% 'found charismatic megafauna to be of most interest' (Di Minin et al., 2012, p. 5). These are the tourists that are well-educated, earn relatively more than local tourists, stay for longer and spend more, and are more likely to contribute to conservation. Their willingness to pay (WTP) to see lions (among those who considered themselves 'safari novices') was estimated at \$120 (lion adult male), for instance (only slightly lower than seeing an adult male elephant).

The economics of the lion bone trade

A recent report by the Environmental Investigation Agency opens with the line that ‘Asia’s massive unchecked demand for skins, bones, teeth and claws continues to drive poaching of wild tigers. This demand is exacerbated by the supply of huge volumes of African lion bone, teeth and claws, sold as tiger parts to less-discerning consumers in Asia’ (Environmental Investigation Agency, 2017, p. 2). Absent DNA analysis, distinguishing between tiger and lion bone and other parts is nearly impossible. Tiger breeding in South Africa is unregulated as the DEA responds that it is an exotic species and therefore outside of the department’s regulatory ambit. None of South Africa’s tiger breeding facilities are CITES-registered, though, and exports of tigers and tiger parts from these facilities for commercial purposes would be a violation of CITES, since the tiger is listed on CITES Appendix I. However, the lion is listed on CITES Appendix II and, as noted earlier, South Africa is expressly permitted by CITES to export captive-bred lion skeletons. For the purpose of this report, it is important to understand what impact continued legal sales of lion bone skeletons to Asia might have on wild lion survival prospects. In other words, the contention is that the sale of lion bones from South Africa may undermine both wild tiger and wild lion survival for as long as lion bone masquerades as tiger bone in Asian consumption markets.

A few important priors²¹:

- It only makes economic sense to regulate a legal international trade in wild animal parts if it can be shown beyond reasonable doubt that such trade will not undermine species survival prospects.
- In order to establish reasonable doubt in respect of the above, the conditions articulated by Tensen (2016) should all be met simultaneously, and the onus is on those in favour of trade to demonstrate that those conditions can and will be met.
- In the absence of reliable and accurate demand data (for tiger bones, for instance), it generally does not make sense to establish a legal quota for how many lion bone skeletons, for instance, can be exported based on the current number of captive lions. The scientific basis for doing so is demonstrably absent. Moreover, it is a

²¹ These are taken, in part, from various publications including (Nadal & Aguayo, 2014; Crookes & Blignaut, 2015; Alden & Harvey, 2016; Tensen, 2016; Harvey, 2016, 2017; Harvey et al., 2017)

distinct possibility that the supply-side signal from South Africa may exacerbate demand in Asia, thereby undermining demand-reduction campaign efficacy and eroding any stigma effect that may currently be in operation among potential consumers.

- While the legal export of lion skeletons from South Africa's captive-bred facilities may theoretically satisfy the demand for tiger bones in Asia (as forced breeding for this purpose is technically viable – more so than with rhinos or elephants), it is not clear that it can do so at lower operating costs than poaching syndicates²². This would render both captive-bred and wild lions susceptible to poaching. Legally regulated breeders and traders would be competing with illicit syndicates for market share, a battle they are likely to lose on cost grounds alone.
- As with all proposals to regulate international trade in the products of vulnerable species, the practical transaction costs tend to be ignored in favour of theoretical possibilities. One major transaction cost in this respect is that legal trade channels provide convenient cover for illegal product supply (Environmental Investigation Agency, 2017; Born Free Foundation, 2018; EMS Foundation & Ban Animal Trading, 2018). Moreover, law enforcement officials cannot reasonably be expected to distinguish, at each relevant port of entry or arrival, or even in a final form in retail sale (such as 'cake'²³), between legal and illegal supply, and between different species (Outhwaite, 2018). There is also little reason to expect that DEA, which has demonstrated that it cannot regulate the captive predator breeding industry in South Africa (or canned hunting), is likely to be able to effectively regulate the legal export of lion bone skeletons for which it has set apparently arbitrary quotas in 2017 and 2018. This raises significant questions about why such a trade has been allowed in the first instance.

²² This is very important, and the discussion in the EMS/BAT (2018) report about 'farm gate' prices for bones demonstrates the point effectively. Capital overheads for breeders are higher than they are for poachers. And breeders require high prices in consumer markets to incentivize investment in security and maintenance. This necessarily undermines the efficacy of demand reduction campaigns designed to reduce the price of lion derivatives (and thus the incentive to poach).

²³ "Tiger 'jelly'/'cake'/'glue' (Cao in Vietnamese) is made by boiling cleaned bones for several days to condensing down the gelatine. The bone pieces are removed, and the remaining liquid is gradually reduced to a glue-like consistency which hardens into an odourless cake. It is normally cut into squares for sale and generally consumed by dissolving small pieces into medicinal wine (Nowell, 2000)." (<https://cites.org/sites/default/files/eng/com/ac/30/Inf/E-AC30-Inf-15x.pdf>, p. 5)

- Because of the risks of illegal supply entering legal product channels, and the likely relative inability of legal breeders to compete with syndicates, the incentive emerges for legal breeders to collude with illicit syndicates to share rents instead of competing for them, as is already occurring (Shaw, 2017; EMS Foundation & Ban Animal Trading, 2018). The incentives that animate such collusion are the same incentives that have generated relationships between rhino breeders and organised crime networks to smuggle rhino horn illegally (Aucoin & Deetlefs, 2018).

It is therefore difficult to understand why the authors of South Africa's 2018 NDF ventured to state that the presence of the captive predator breeding industry may act as a buffer against threats to the wild lion population. The presence of canned hunting has not led to an alleviation of demand for wild lion hunting, and there are strong theoretical grounds for assuming that they are two different markets in any event. This is demonstrated perhaps most aptly – if anecdotally – in the controversial recent case of a wild lion called Skye hunted in Umbabat on the border of Kruger National Park (Cruise, 2018; Pinnock, 2018b). The presence of an extensive domestic breeding industry has not resulted in a decline in poaching of wild lions, who increasingly have their claws, teeth and bones removed. This suggests that, as with other species such as abalone, a parallel market may emerge – one for captive-bred bones and one for wild bones. It is one thing for the NDF to claim that there is no current evidence of detriment to wild lions through the sale of lion skeletons from South Africa. It is another thing altogether – dubious too – to claim that the presence of captive breeding (especially as it is unregulated) may buffer wild lions from poaching or over-hunting threats. There is no evidence to suggest that this is true, and there are therefore cogent grounds on which to reconsider the decision to set the skeleton export quota to 1,500. Until better evidence is available, a zero quota would be advisable.

Organised crime and predator breeding

Simon Bloch, in a recent article, accused South Africa's Minister of Environmental Affairs, Edna Molewa, of being 'blissfully content to rubber-stamp the battery-breeding farms when lion cubs are ripped from their mothers after two or three days, legitimise unethical captive lion hunts and the export of lion bones to criminal wildlife trade networks in Asia, all under

the guise of “sustainable use of a natural resource” (Bloch, 2018a). He also quoted a former crime intelligence officer who stated that the pseudo-hunting of South African rhinos started with the export of lion bones to the Xaysavang Trading Company, directed by Vixay Keosavang, widely considered to be one of the world’s most prolific wildlife traffickers (Vira et al., 2014; Miller et al., 2015). The connection between captive lion breeding and organised crime has been well documented (Environmental Investigation Agency, 2017; Shaw, 2017; Williams et al., 2017; Born Free Foundation, 2018; EMS Foundation & Ban Animal Trading, 2018).

The government’s failure to act in response to these concerns, in addition to animal welfare problems (EMS & BAT, 2018; Endangered Wildlife Trust; Centre for Environmental Rights, 2018) and incidents involving human victims, may suggest a lack of capacity or a questionable relationship with the captive breeding and hunting industry (or some combination thereof). A recent investigation covered by Carte Blanche, for instance, suggests the willingness of government officials to apparently turn a blind eye to the gun-running at the root of South Africa’s rhino poaching epidemic (Schwendenwein & Austin, 2018). Organised criminal syndicates clearly do not have an interest in the conservation of South Africa’s wildlife. Its presence poses a serious security risk to the country, in addition to exacerbating the problem of illicit financial flows.

Conclusion

This report has shown that 47 facilities – that exploit predators bred in captivity for human interaction – for which revenue figures are available plausibly generate \$28.5m in gross revenue per year. On the assumption that each of the other 250 estimated facilities that benefit from captive breeding (either through human interaction, selling to the canned hunting industry or the bone trade, or some combination thereof) earn average revenue (\$606,459 a year) the captive predator breeding industry in South Africa is worth potentially as much as \$180m a year in gross revenue terms. It is worth considering this figure as a proportion of the total economic value of tourism to South Africa, not because each facility

is directly comparable in every instance²⁴, but because of the damage that the industry may inflict on South Africa's tourism brand value. The revenues, while large, are only a fraction (roughly 1.85%, depending on exchange rate values) of the country's total tourism value (estimated at R144.3bn in 2016). It is also probably reasonable to assume, given the links between bone traders and organised crime, that there is much revenue that is unaccounted for. The figures in this report are based only on verifiable, publicly available information and rational extrapolations.

The main findings are as follows:

- There is no evidence that the captive predator breeding industry is of any conservation value. It is therefore purposefully exploitative to various degrees. There is, in other words, heterogeneity in the extent of exploitation, ranging from extremely high levels of human interaction from within a few hours of birth to minimal human imprinting (the latter supplying accredited SAPA ranches with lions for canned hunting).
- There are high levels of variation in the prices charged to tourists for animal interaction, ranging from a mere \$4.90 per session to \$170 at the highest end. The average price offering is about \$33.
- A number of facilities are geared up for attracting volunteer tourists, a particularly lucrative form of exploitation where mostly foreign tourists are convinced to pay large sums of money to contribute to conservation in Africa. Again, there is variation in the levels of deceit and prices charged. The least expensive facility charges \$143.50 per week, while the most expensive charges \$1,750 per week. The average is \$624.79. Most importantly, the database suggests that there are about 360 volunteers per year, or 7 per week present on any given facility. If we assume, conservatively, that only 11 facilities offer 'voluntourism', then there are potentially as many as 84 permanent jobs that would otherwise be provided by members of the local labour force. We therefore have the beginning of evidence that paid

²⁴ Those that sell directly to the bone trade obviously have nothing to do with tourism per se, but every other element of the industry (from human interaction to hunting) does constitute a form of tourism if one counts canned hunting as a tourism activity).

volunteering crowds out local labour, thus undermining the argument advanced by van der Merwe et al. that the predator breeding industry is a significant employer.

- Using a highly conservative labour-absorption figure from the wildlife ranching industry and applying that to only 81 of the known predator interaction facilities (some of which breed on the premises), this report estimates that 608 alternative direct jobs could be created through transforming those facilities into larger pockets of wilderness landscapes amenable to ecotourism offerings. The multiplier coefficient is unknown, but the figure is at least comparable to the 613 direct jobs estimated by van der Merwe et al. (though their figure is an estimate derived from all 297 facilities). Using a multiplier of three, alternative industry could support in the region of 1,800 jobs. Again, we have the beginning of evidence here, subject to further research, that suggests that supporting captive breeding does not necessarily contribute to job creation that could not otherwise be obtained through more ethical and conservation-enhancing activities.
- The opportunity costs and negative externalities associated with the predator breeding industry may – along with other threats facing wild lion survival – undermine South Africa’s brand attractiveness as a tourism destination by up to R54.51bn over the next decade. Even if it were only a small proportion of this, the losses would be significant, especially as much of this revenue currently aids conservation objectives in large wilderness landscape such as the Kruger National Park and the KZN reserves.
- The lion bone trade may be particularly lucrative, and breeders who now may find it difficult to sell their lions to human interaction facilities or into canned hunting may be likely to sell bones directly into the Asian trade where they often masquerade as tiger bones. This poses a threat to both wild lion and wild tiger survival, as the evidence does not suggest that the presence of a legal trade is doing anything to disincentivise the poaching of lions in the wild. It is also not clear that the South African government, which does not regulate predator breeding, can reasonably regulate a legal export of lion skeletons. This raises the risk of illegal supply being laundered through legal channels. Moreover, there is no scientific evidence that supports the quota figure of 800 (2017) or 1,500 (2018) lion bone skeletons a year as a conservation-supporting number. The lack of science and regulation is

concerning, and some conservationists have reasonably raised concerns of corruption.

- Further supporting the view that corruption should be investigated is the documented link between bone traders and organised crime. Questions have been asked, for instance, as to why known kingpins in the rhino-horn trafficking debacle have not been arrested despite damning evidence (Schwendenwein & Austin, 2018).

In closing, it is clear that the predator breeding industry has no conservation value and attracts both day visitors and high-paying volunteer tourists under false pretenses. Furthermore, the revenues that it generates – while highly lucrative for the owners – constitute a tiny proportion of South Africa’s tourism industry, one of the biggest employers in the country. The damage to South Africa’s brand that the predator breeding industry is causing, and may continue to cause in the future, may undermine tourism revenue potential significantly. There are other high-cost destinations that offer more ethical opportunities to observe the ‘big five’ in the wild, which continues to be among the most important drawcards to attract tourists to South Africa. If South Africa loses its share of high-income tourists who visit South Africa specifically to observe the big five (and are educated, ethically conscious and conservation-minded), it will simultaneously lose the revenue it requires to fund the conservation of large wilderness landscapes. Without these large landscapes, charismatic megafauna will be imperilled because the sustainability of predator populations on fenced reserves is increasingly questionable.

From this research alone, there are strong grounds on which to propose, very simply, that the predator breeding industry in South Africa be closed down. It is not an irreplaceably valuable industry. At worst, it is a highly unethical industry that is damaging to conservation, socio-economic welfare and South Africa’s tourism brand value.

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Appendix A

Please find the online database here:

<https://docs.google.com/spreadsheets/d/1ypURpOaG2a7hOpTddLDbFv97Y2LMW-V1CPjfCwbJ0/edit?usp=sharing>

Appendix B



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Ref:02/1/5/2

MINISTER

QUESTION NO. 1189 FOR WRITTEN REPLY: NATIONAL ASSEMBLY

A draft reply to **Mr R K Purdon (DA)** to the above-mentioned question is enclosed for your consideration.

**MS NOSIPHO NGCABA
DIRECTOR-GENERAL**

DATE:

DRAFT REPLY APPROVED/AMENDED

**DR B E E MOLEWA, MP
MINISTER OF ENVIRONMENTAL AFFAIRS**

DATE:

NATIONAL ASSEMBLY

(For written reply)

QUESTION NO. 1189 {NW1283E}

INTERNAL QUESTION PAPER NO.12 of 2018

DATE OF PUBLICATION: 20 April 2018

Mr R K Purdon (DA) to ask the Minister of Environmental Affairs:

What is the government's position on the relationship between captive-bred predators and the survival of wild predator populations in southern Africa? NW1283E

1189. THE MINISTER OF ENVIRONMENTAL AFFAIRS REPLIES:

The Non-Detriment Finding made by the Scientific Authority of South Africa as published in the Gazette on 23 January 2018 states that the trophy hunting of lion poses no threat to the wild lion population of South Africa and it is thought that captive lions may serve as a buffer to potential threats to wild lions by being the primary source of hunting trophies and derivatives such as lion bones. It must be noted, however, that the captive bred lions and the wild lions are bred in different environments and managed differently. The department is finalising its compliance assessment of breeding facilities as part of what will inform the future position on captive lion breeding in South Africa.

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Ref:02/1/5/2

MINISTER

QUESTION NO. 1187 FOR WRITTEN REPLY: NATIONAL ASSEMBLY

A draft reply to **Mr R K Purdon (DA)** to the above-mentioned question is enclosed for your consideration.

MS NOSIPHO NGCABA
DIRECTOR-GENERAL

DATE:

DRAFT REPLY APPROVED/AMENDED

**DR B E E MOLEWA, MP
MINISTER OF ENVIRONMENTAL AFFAIRS**

DATE:

NATIONAL ASSEMBLY

(For written reply)

QUESTION NO. 1187 {NW1281E}

INTERNAL QUESTION PAPER NO.12 of 2018

DATE OF PUBLICATION: 20 April 2018

Mr R K Purdon (DA) to ask the Minister of Environmental Affairs:

What (a)(i) is the total number of predator breeding facilities in the country and (ii) is the detailed breakdown of the number of the specified facilities registered with the (aa) SA Predators Association and (bb) other associations, (b) are the names of each of the other associations and (c)(i) is the type of each predator and (ii) is the number of each type of predator found at each of the specified facilities?

1187. THE MINISTER OF ENVIRONMENTAL AFFAIRS REPLIES:

- (a) (i) The current estimate is that there are 300 lion breeding facilities in South Africa. This is based on reports provided by the provincial issuing authorities.
 - (ii) (aa) the lion breeding facilities register with the Provincial Authorities as competent Authorities; hence the data referred to in (a) (i) (the Department, therefore, does not have information on the detailed breakdown of the number of the specified facilities registered with SA Predators Association and other associations. Such information on the registration aspects to respective associations can be sourced from associations themselves;
 - (bb) As indicated above, information on any other associations is also not available to DEA.
- (b) Information on the names of other associations is not available to DEA. However, DEA works, or cooperates, with a number of associations individually or through various forums, depending on issues at hand.
- (c) (i) Information on the type of each predator is not available to DEA and are closely connected with and under the control of the Provincial Issuing Authorities
- (ii) Information on the number of each type of predator found at each specified facilities is not available to DEA and are closely connected with and under the control of the Provincial Issuing Authorities.

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