

RESPONSE

The assessment of the role of trophy hunting in wildlife conservation

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Scientists have debated the role of trophy hunting in wildlife conservation for decades (Dickson, Hutton & Adams, 2009). Wildlife conservation requires funding and identification of priorities that go beyond the simple protection of wildlife. Setting aside large areas of natural habitats and protecting their wildlife bears extensive and crippling costs for governments and local communities (McCarthy *et al.*, 2012; Barua, Bhagwat & Jadhav, 2013).

Wildlife viewing tourism generates considerable amounts of money that economically may justify wildlife protection from financially competing land uses, such as agriculture, or forest exploitation. However, viewing tourism is not always sufficient to offset the costs associated with wildlife conservation (Selier & Di Minin, 2015). Many National Parks have failed to protect their wildlife (e.g. Western, Russell & Cuthill, 2009), in regions of political instability, in remote wilderness areas, or where wildlife densities are low. In these situations, sustainable trophy hunting may be a viable alternative for wildlife conservation (Lindsey *et al.*, 2006).

Poor management, however, may undermine the sustainability of trophy hunting and jeopardize the persistence of harvested species, such as over harvest, lack of reinvestment in conservation and development of local communities, or corruption (Lindsey, Roulet & Románach, 2007). Moreover, trophy hunting may decrease the proportion of large adult males and modify the social organization of hunted species, or induce undesirable evolutionary consequences (Coltman *et al.*, 2003; Milner, Nilsen & Andreassen, 2007). Therefore, under certain conditions, trophy hunting may be more detrimental to wildlife conservation than beneficial.

The undesirable effects of trophy hunting may partly explain why it is difficult to reach a consensus on its role in wildlife conservation. A major problem is also the lack of long-term monitoring studies on harvested populations, which evaluate whether these populations can sustainably thrive under trophy hunting regimes.

In Crosmar, Côté & Fritz (2015), we aimed to partly fill this gap using long-term population monitoring data on population size and structure for several species of large African herbivores. We showed that harvested populations

of large herbivores in trophy hunting areas may perform as well, and sometimes even better, than in National Parks where trophy hunting is not authorized. However, as Buckley and Mossaz (2015) pointed out, Crosmar, Côté & Fritz (2015) is a case study. More replication is needed in other systems, as well as within the same system, using several protected and non-protected areas where trophy hunting occurs. Trophy hunting appeared to be a sustainable conservation mode for some large herbivores in our study, but we contend that this is not necessarily the case in all hunting areas in Africa and elsewhere, and for every species.

The sustainability of trophy hunting may depend upon the type of management. In our study, harvest rates were conservative, scrupulously monitored by wildlife authorities and abided by the hunting operators, at least during the time period from which data were collected (i.e. 1977–2010). Moreover, leases for hunting concessions were set over several continuous years so that hunting operators were willing to reinvest in the management and the protection of their hunting concessions. The fate of wildlife populations in areas where trophy hunting occurs may also vary with land use and land tenure. Indeed, wildlife densities generally decline with increasing human presence and activities (Caro, 1999). In Crosmar, Côté & Fritz (2015), there were no human settlements in the hunting concessions, and only viewing tourism and trophy hunting occurred. However, since the end of the study period, that is, 2010, land-use management has changed and human encroachment increased at the edge of Hwange National Park. Some hunting concessions were fragmented, and their leases reduced, although quotas did not change much, suggesting higher pressure on animals compared with the previous longer term management approach. The willingness of operators to reinvest in anti-poaching, wildlife management or community relations has probably decreased, as well as local incentives towards wildlife conservation to the detriment of poaching, agriculture and logging. This may ultimately have impacted large herbivore populations in the hunting areas surrounding the National Park since then. As

for any conservation options, the ethics and value system of the managers as well as the users can impact the efficiency of management of trophy hunting.

Finally, the resilience of wildlife populations to trophy hunting may be species-specific, with less resilient species usually showing lower reproductive rates, more complex social organizations or whose body parts are illegally traded in international criminal markets (e.g. Bennett, 2015). Many threatened and endangered species fall into these categories. Allocating trophy hunting quotas for these species is likely not sustainable. These species are also often the most charismatic, and as they become more rare, their prices on the trophy hunting market considerably increase (Palazy *et al.*, 2012). The sales of hunting permits for these species may be essential for the financial sustainability of trophy hunting and, therefore, to the protection of large areas of natural habitats (e.g. African lion *Panthera leo*, Lindsey *et al.*, 2012; Polar bear *Ursus maritimus*, Weber *et al.*, 2015). However, the dramatic downside of the sole marketing value for rare and endangered species could lead to a market-type speculation, creating the conditions for extinction under anthropogenic Allee effect (Palazy *et al.*, 2012; but see Harris, Cooney & Leader-Williams, 2013).

While trophy hunting may be useful to wildlife conservation, it is thus not a guarantee. To properly tackle this question, we agree with Buckley & Mossaz (2015) that we need more studies to understand when and where hunting tourism is beneficial or not to wildlife conservation. And following Selier & Di Minin (2015), we urge scientists to establish long-term monitoring systems that integrate the social and financial benefits of trophy hunting for local communities and consider the costs and benefits of different conservation alternatives. The ethics of choosing conservation as a land use and its associated management rules should be confronted with the needs and expectations from local livelihoods. Thus, we also urge the promotion of more studies on the ethics behind conservation practices and their associated value systems.

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