Adopting a utilitarian approach to culling wild animals for conservation in National Parks

Iain J. Gordon

1Division of Tropical Environments & Societies, James Cook University, Townsville, Queensland, Australia
2Fenner School of Environment and Society, Australian National University, Acton, Australian Capital Territory, Australia
3The James Hutton Institute, Aberdeen, UK

Correspondence
Iain Gordon, Division of Tropical Environments & Societies, James Cook University, 1 University Drive, Townsville, QLD 4811, Australia.
Email: iain.gordon@jcu.edu.au

Abstract
As human populations increase and become wealthier, the demand for red meat will increase. Much of this increased demand will be supplied through the traditional livestock supply chains; however, there are alternative commodities that can be used to meet some of the demand. Game meat harvested from wildlife is a growing commodity in the developed world, valued for its nutritional qualities and taste. However, there are some perverse management actions whereby wildlife, culled for conservation purposes (usually because they are deemed to be overabundant within National Parks and Protected Areas), are often not utilized as either human or pet food. In this Perspective, I highlight how the products from these culled animals in NPs are used, or not, and discuss some innovative ways in which the products are, or could be, brought into the economic and livelihood system (i.e., utilitarian conservation). These include bringing products from culled animals into the human and pet food supply chains.

KEYWORDS
conservation cull, elephants, game meat, human consumption, kangaroos, large mammalian herbivores, National Parks, pet food

Over the next 30 years, the human population is expected to increase from 7.5 Billion, currently, to between nine and 11 Billion (United Nations, 2017). This growing population is also getting richer; for example, the Gross Domestic Product of lower- and middle-income countries has increased by 180% in the past 10 years (World Bank, 2019). This increase in wealth is associated with changing dietary habits, as people shift from a grain-based diet to one that includes increasing amounts of meat—initially poultry but then, in some case, pigs, and red meat from goats, sheep and cattle (Alexander et al., 2015; Alexandratos & Bruinsma, 2012; Delgado, Rosegrant, Steinfeld, Ehui, & Courbois, 1999). Converting land to agriculture and livestock production, drives native wildlife species into smaller and smaller ranges, some of which are included in National Parks and Protected Areas (NPs from here on) (e.g., Ogutu et al., 2016). The managers of a number of NPs have come to rely on culling programs to reduce densities of overabundant wildlife species (so-called consequential conservation; Hampton, Warburton, & Sandøe, 2019). Many of these culling programs leave the carcasses where they lie or bury them (e.g., ACT Government, 2017, discussed further below). The issue I will cover in this Perspective is the utilization of wildlife products from animals culled in NPs (mainly meat but could include hides, feathers, horns or tusks), that is, utilitarian conservation from animals culled within NPs. I will concentrate on species of large mammalian herbivores, because...
these species’ close evolutionary relationship with domestic livestock means that humans can generally consume their meat, and wildlife are often the species that are overabundant in NPs (e.g., Hone, 2007; Jewell, Holt, & Hart, 1981). The arguments I put forward in this Perspective apply to NPs across the globe and also to situations where there are culls of overabundant wildlife to meet conservation objects outside NPs. Broader arguments for, and against, the use of wildlife to replace livestock meat in the human food supply chain are covered elsewhere (e.g., Coad et al., 2019; Prins, Grootenhuis, & Dolan, 2012; Wallach, Bekoff, Batavia, Nelson, & Ramp, 2018; Wilson & Edwards, 2019). In addition, as has been highlighted by Pérez-Barbería (2017) and Wilson and Edwards (2019), sourcing meat from wildlife has a much lower greenhouse gas footprint than does meat produced from livestock. There is also a growing lobby to reduce the consumption of red meat altogether for ethical, welfare and human greenhouse gas footprint reasons (de Boer, de Witt, & Aiking, 2016; Kaiser, 2018; Milligan, 2015).

Culling of wild animals in any context is a highly polarized and heated debate (see Hampton et al., 2019). The issue of culling animals inside NPs especially is an anathema to many people (Ramp, 2013; Wallach et al., 2018), who view NPs as places where animals can live freely and nature can take its course (Atttfield, 2015). Unfortunately, in this age of the Anthropocene, where human impacts are spread far and wide across the globe, very few, if any, NPs are wholly natural. This comes about, for example, because populations of wildlife, that used to range over large areas in search of a spatially sporadic food supply or water, are now restricted to a smaller area of their range (Owen-Smith, Slotow, Kerley, Van Aarde, & Page, 2006), or because predators, that used to control the size of wildlife populations, have been extirpated, or their numbers dramatically reduced, through, for example, poaching (Beschta & Ripple, 2009; Treves, Plumptre, Hunter, & Ziwa, 2009). Where predators have been lost from NPs, they can be reintroduced, but this is not without risk and failures are common (Wolf & Ripple, 2018). Restoration of predation through reintroduction programs would be the ideal option to control overabundant wildlife species, however, where returning predators is not chosen as a management option, or where there is insufficient predation, culling is often the only other realistic approach.

In relation to the control of overabundant wildlife populations in NPs, as opposed to that implemented to reduce infectious diseases (e.g., African buffalo, Syncerus caffer, Caron, Cross, & Du Toit, 2003), the shot individuals are often healthy adults. In some operations, the culled animal is left where it is shot, in which case the carcasses are used by native scavengers or omnivores and mean that ultimately the carcasses become part of the nutrient cycle (Heinrich, 2012; Mateo-Tomás et al., 2015). However, they can also cause problems for example, invasive species supplementation, feral pigs, Sus scrofa (see review by Fielding, Newey, van der Wal, & Irvine, 2014). In other cases, the carcasses are buried, either inside or outside the NP (ABC News, 2015). This is often done to reduce the likelihood of disease, or because of potential issues with the public seeing culled animals lying in public spaces (e.g., ACT Government, 2018).

Now the question is “What are the innovative ways in which the products from culled animals in NPs could be brought into the economic and livelihood system?”.

The ethics of culling wildlife within NPs, and not using the meat or other products from those animals is complex (Wallach et al., 2018 vs. Hampton et al., 2019 for a discussion of the broader issues of wildlife ethics and management, so called compassionate conservation); however, the opportunity to sell the meat, from those culled animals, would provide added revenue to the cash-strapped NPs, especially in developing countries. My own view is that the use of the products from culled animals means that they can provide some utility as opposed to being wasted if they are buried or left on the ground (see also Parent, 2017), potentially causing perverse ecosystem effects (a utilitarian conservation approach within the consequentialism conservation paradigm advocated by Hampton et al., 2019).

As a case study, I will use the eastern grey kangaroo, Macropus giganteus, conservation cull in the Australian Capital Territory (ACT). The purpose of the cull, in the Canberra Nature Park (CNP), is to “maintain densities of kangaroos at levels that maintain grassland conservation values. In particular the aim is to achieve a grazing regime favorable for the conservation of plants and small animals that frequent the ground-layer vegetation.” (ACT Government, 2017). Note that this is a cull to meet animal welfare (removing animals that are emaciated) and conservation objectives, and the ACT Kangaroo Management Plan 2010 does not permit commercial use of kangaroos (c.f. Wilson & Edwards, 2019). The culling operation has been highly controversial because of the proximity of the CNP to peri-urban areas of the city of Canberra (Descovich, Tribe, McDonald, & Phillips, 2016); however, in 2015, a survey indicated that kangaroo culling was supported by 87 and 85% of respondents when it was undertaken for animal-welfare or conservation reasons, respectively (Micromex Research, 2015). Of course, the public in the ACT expect the kangaroos to be killed humanely (Ampt & Owen, 2008). Whilst most of the culled kangaroos in the ACT are buried, some of the meat is used to make baits to attract and poison foxes and wild dogs (ACT Government, 2019). However, the cull itself costs up to A$500,000 per annum, approximately A$270 per animal shot (about Regional, 2018). Another study, in peri-urban areas in southwestern Australia, showed a cost of A$36 per kangaroo shot.
(Mawson, Hampton, & Dooley, 2016). These culling costs could be offset by offering game licenses or the right to hunt animals within NPs, or selling the meat into the human or pet food supply chains (e.g., Department of Interior, 2014; and see below). Even where the conservation agencies cull the animals, they could enter into arrangements with businesses/NGOs to have the carcasses removed from the NP and/or stored and processed in appropriate facilities, in order to ensure the wildlife products meet regulatory, and food safety standards (e.g., Wilson & Edwards, 2019 for kangaroo meat). However, there is also a general lack of knowledge of both the markets and amongst potential consumers of the meat harvested from wildlife (e.g., Marescotti, Caputo, Demartini, & Gaviglio, 2019).

The concept of the use of wildlife as a resource for human consumption is not new (Prins et al., 2012), but the controversy over harvesting of wild animals continues, especially where they are perceived to be overabundant (e.g., Hampton et al., 2019; Wilson & Edwards, 2019). If harvested with the correct sanitation procedures, wild game meat can enter the human food supply chain, and is a healthier option than meat from domesticated livestock (Ampt & Owen, 2008; Hoffman & Wiklund, 2006; Valencak, Gamsjäger, Ohrnberger, Culbert, & Ruf, 2015). For example, the American bison, *Bison bison*, population in the Yellowstone National Park in the USA is currently viewed as too large to protect the biodiversity and natural heritage values of the Park, and is risking the biosecurity of neighboring livestock enterprises (Mosley & Mundinger, 2018). In 2000, an Interagency Bison Management Plan (IBMP) was implemented, and a culling program has been in operation since then, with culled bison going into traditional livestock meat works used for human consumption. In 2016–2017, 748 animals were consigned to the meat processing facilities (Geremia, Wallen, & White, 2018), and then distributed to local Indigenous groups (Wilson & Edwards, 2019). In the Theodore Roosevelt National Park, again in the USA, the population of elk/red deer, *Cervus elaphus*, was initially managed by removing live animals, in the 1990s; however, because of worries about the spread of chronic wasting disease through animals removed from the NP, culling operations were initiated in the mid-2000s, and the meat is butchered locally and distributed to the volunteers, food pantries across the State of North Dakota and to Indigenous groups (McCann, Whitworth, & Newman, 2016). In the case of the kangaroo cull for the CNP (see above), since the cull started in 2009 over 15,620 kangaroos (including pouch young) have been killed (Table 1). There is a substantial, and growing, global market for kangaroo meat that is filled through commercial harvesting of wild kangaroos (Wilson & Edwards, 2019). The meat from the culled adults in the CNP would total approximately 165,500 kg, which would have a wholesale value of A$98,000, or shop value of approximately A$2.2 M (figures from Wilson and Edwards (2019) and Coles online [accessed 25th March 2019]).

Globally, there are significant conflicts between local communities and conservation managers, particularly in the developing world (Solikhu & Schraml, 2018). In most NPs, local people are not able to harvest wildlife and are prosecuted if they do so (Goldman, 2011; Weeber, 2016). One has to question the ethics where wildlife meat is sold to people in cities or abroad at high prices, when local people do not have ready access to meat. As in the cases of the American bison and elk culling programs described above, the provision of meat from animals culled in NPs to local communities could help to alleviate some of those tensions but lack of access to animals within NPs by Indigenous communities living next to NPs will continue to be an issue (also Thomsen & Davies, 2007).

Because of sanitation (disease and parasites) and quality (lack of chilling facilities) control, many of the carcasses from wild animals that result from culling operations within NPs, may not suitable for human consumption (Spiegel & Greenwood, 2019; Wilson & Edwards, 2019). There are, however, other supply chains that carcasses can feed into, for example, the pet food industry. In the USA alone, the pet food market was valued at nearly US$25B in 2016, and is expected to increase to US$30B by 2022 (Statistica, 2019). It is estimated that about 5.9 M tons of meat (beef, pork and chicken; Okin, 2017) in the USA is used in the pet food industry per annum (with over 90 M dogs and 94 M cats kept as pets in the USA in 2017–2018 [American Pet Products Association, 2019], and this number is growing by 4% per annum). Globally the pet food market is a significant

| Year       | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------|------|------|------|------|------|------|------|------|------|------|
| Independent adults | 494  | 1,839 | 2,439 | 1,554 | 1,149 | 1,521 | 1,689 | 1,989 | 1,124 | 1,822 |
| Pouch young   | 560  | 701  | 800  | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  |

Abbreviation: N/A, not available.

Sources: (Table 8, p. 44); https://www.legislation.act.gov.au/View/di/2017-37/current/PDF/2017-37.PDF.

ACT Government (2018) Eastern Grey Kangaroo. Conservation Culling Advice 2018. Environment, Planning & Sustainable Development Directorate, ACT Government, Canberra, Australia.

https://www.environment.act.gov.au/parks-conservation/plants-and-animals/urban_wildlife/local_wildlife/kangaroos/2018-conservation-cull.
economic opportunity for wildlife products, with pet owners increasing the amount that they spend on their pets, and increasingly looking for differentiated quality products (Lambertini, Buchanan, Narrod, & Pradhan, 2016). Specifically branded raw wildlife meat that is sourced from conservation culling, may gain a premium in the market place (e.g., Taste of the Wild, 2019). As with the human food supply chain, quality control and sanitation are necessary in the provision of meat for the pet food industry. For example, FitzGerald, Fletcher, Paul, Mansfield, and O’Hara (2011) report hepatotoxicosis in dogs consuming a diet of camel, *Camelus dromedarius*, meat, and Tan, Al Jassim, D’Arcy, and Fletcher (2016) found over 45% of samples from camels culled in the field were contaminated by indospicine (the toxin that can cause hepatotoxicosis).

Some projects and governments are testing the market for meat from culled wildlife feeding into pet food supply chains, thereby reducing the demand on domestic livestock from this market. For example, the Australian Feral Camel Management Project removed nearly 27,000 feral camels over 4 years, that were supplied into the pet food supply chain (Virtue, Gee, Secomb, O’Leary, & Grear, 2016), developing a commercial revenue stream across landholders and land managers responsible for conservation outcomes (Hart & Edwards, 2016). However, this program was ceased following industry concerns raised about the indospicine levels in camel meat camel supplied to the pet meat supply chain (FitzGerald et al., 2011). Also in Australia, the Victorian Government is trialing kangaroo meat being processed into pet food (Victoria Department of Environment, Land, Water and Planning, 2019). In a very recent development there are reports that the Government of Botswana will use the meat from its culled elephants for the pet food trade (BBC, 2019).

To conclude, no terrestrial part of our planet is immune from the impacts of humanity; the consequences of our activities can create problems of overabundant wildlife populations within NPs, with significant negative effects on biodiversity. As the human population grows, these impacts will only increase. In reality, culling is likely to become an even more important part of NP managers’ armory, even in the face of public pressure for compassionate conservation. Therefore, it is likely that there will be increased culls in NPs, requiring managers to consider the value and welfare of individual animals, and the views of the general public who fund NPs; using the meat and other parts from culled animals is one way to partially resolve this tension so as not to waste the lives of those animals. A word of caution, however, culling within NPs should only be to meet objectives for the broader conservation of wildlife species and not used as a means of allaying public calls of population reductions to meet, for example, nuisance control outside NPs (e.g., example of Mauritian flying fox, *Pteropus niger*; Vincenot, Florens, & Kingston, 2017). Also, to be clear, I am not advocating for an economic justification for conservation culling, I am being pragmatic and calling for the waste of life to stop.

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**CONFLICT OF INTEREST**

The author declares no conflict of interest.

**AUTHOR CONTRIBUTIONS**

I.J.G. is the sole author of this Perspective and takes responsibility for the opinions and ideas therein.

**ORCID**

*Iain J. Gordon* https://orcid.org/0000-0001-9704-0946

**REFERENCES**

ABC News. (2015). ACT kangaroo cull closes for another year with calls for commercial roo meat harvesting in Canberra. https://www.abc.net.au/news/2015-07-07/act-kangaroo-cull-ends-calls-for-commercial-meat-harvest/6602150?pfmid=sm.

About Regional. (2018). Canberra kangaroo cull to increase by 30%, May 7 to July 27. https://aboutregional.com.au/canberra-kangaroo-cull-to-increase-by-30-may-7-to-july-27/.

ACT Government. (2017). Eastern grey kangaroo: Controlled native species management plan. Canberra, Australia: ACT Government.

ACT Government. (2018). https://www.environment.act.gov.au/parks-conservation/plants-and-animals/urban_wildlife/local_wildlife/kangaroos/2018-conservation-cull.

ACT Government. (2019). https://www.environment.act.gov.au/parks-conservation/plants-and-animals/urban_wildlife/local_wildlife/kangaroos/2019-kangaroo-cull.

Alexander, P., Rousevell, M. D., Dislich, C., Dodson, J. R., Engström, K., & Mora, D. (2015). Drivers for global agricultural land use change: The nexus of diet, population, yield and bio-energy. *Global Environmental Change*, 35, 138–147.

Alexandratos, N., & Bruinsma, J. (2012). *World agriculture towards 2050/2050: The 2012 revision* (ESA Working paper No. 12-03). Rome, Italy: Food and Agriculture Organization.

American Pet Products Association. (2019). Pet Industry Market Size & Ownership Statistics. https://www.americanpetproducts.org/press_industrytrends.asp. 
Statistica. (2019). Size of the U.S. pet food market in 2016 and 2022 (in billion U.S. dollars). https://www.statista.com/statistics/755068/us-pet-food-market-size/

Tan, E. T., Al Jassim, R., D’Arcy, B. R., & Fletcher, M. T. (2016). Level of natural hepatotoxin (Indospicine) contamination in Australian camel meat. Food Additives & Contaminants: Part A., 33, 1587–1595.

Taste of the Wild. (2019). Using 100% Australian fresh Lamb & Venison. https://www.tasteofthewild.com.au/.

Thomsen, D., & Davies, J. (2007). People and the kangaroo harvest in the south Australian rangelands, Canberra, Australia: Rural Industries Research and Development Corporation.

Treves, A., Plumptre, A. J., Hunter, L. T., & Ziwa, J. (2009). Identifying a potential lion Panthera leo stronghold in queen Elizabeth National Park, Uganda, and Parc national des Virunga, Democratic Republic of Congo. Oryx, 43, 60–66.

United Nations. (2017). World population prospects: The 2017 revision. New York, NY: Population Division, Population Estimates and Projections Section, United Nations Department of Economic and Social Affairs http://esa.un.org/unpd/wpp/index.htm

Valencak, T. G., Gamsjäger, L., Ohmberger, S., Culbert, N. J., & Ruf, T. (2015). Healthy n-6/n-3 fatty acid composition from five European game meat species remains after cooking. BMC Research Notes, 8, 273.

Victoria Department of Environment, Land, Water and Planning. (2019). Kangaroo pet food trial. Retrieved from https://www.wildlife.vic.gov.au/our-wildlife/kangaroos/kangaroo-pet-food-trial.

Vincenot, C. E., Florens, F. V., & Kingston, T. (2017). Can we protect Island flying foxes? Science, 355, 1368–1370.

Virtue, J. G., Gee, P. D., Secomb, N. M., O’Leary, P. R., & Grear, B. P. (2016). Facilitating feral camel removal in Australia through commercial use. The Rangeland Journal, 26, 143–151.

Wallach, A. D., Bekoff, M., Batavia, C., Nelson, M. P., & Ramp, D. (2018). Summoning compassion to address the challenges of conservation. Conservation Biology, 32, 1255–1265.

Weeber, S. C. (2016). Nodes of resistance to green grabbing: A political ecology. Environment and Social Psychology, 1, 104–117.

Wilson, G. R., & Edwards, M. (2019). Professional kangaroo population control leads to better animal welfare, conservation outcomes and avoids waste. Australian Zoologist, 40, 181–202. https://doi.org/10.7882/AZ.2018.043

Wolf, C., & Ripple, W. J. (2018). Rewilding the world’s large carnivores. Royal Society Open Science, 5, 172235.

World Bank. (2019). World bank data for low and middle income countries. https://data.worldbank.org/income-level/low-and-middle-income.

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