

## Short Communication

# Ivory poachers and poison: drivers of Africa's declining vulture populations

DARCY OGADA, ANDRÉ BOTHA and PHIL SHAW

**Abstract** Four species of African vultures have been recategorized as Critically Endangered, and two as Endangered, on the IUCN Red List. Their declining status is attributed partly to the impacts of widespread poisoning. Prior to 2012 poisoning of vultures was mostly associated with illegal predator control by livestock farmers, in which vultures were typically unintended victims. More recently, ivory poachers have been using poisons to kill elephants *Loxodonta africana* or to contaminate their carcasses specifically to eliminate vultures, whose overhead circling might otherwise reveal the poachers' presence. Between 2012 and 2014 we recorded 11 poaching-related incidents in seven African countries, in which 155 elephants and 2,044 vultures were killed. In at least two incidents the harvesting of vulture body parts (for fetish) may have provided an additional motive. We show that vulture mortality associated with ivory poaching has increased more rapidly than that associated with other poisoning incidents, and now accounts for one-third of all vulture poisonings recorded since 1970. This recent surge in the illegal use of poisons exposes weaknesses in the regulations, for which we propose measures aimed primarily at retail controls. However, because ivory poachers already operate outside any legal framework, African governments require international support in applying more punitive sentencing against mass wildlife poisoning.

**Keywords** African vultures, elephant, illegal wildlife trade, pesticides, poaching, rhino, scavengers, wildlife poisoning

Arguably nature's most important scavengers, vultures provide essential ecosystem services by feeding on decomposing carcasses and thus reducing the risk of disease transmission (Ogada et al., 2012). In India the collapse of vulture populations has resulted in an increase in the number of feral dogs, the main reservoir for rabies, which has subsequently led to an increase in rabies infections in

humans; the associated health care cost is estimated to be USD 34 billion (Sudarshan et al., 2007; Markandya et al., 2008). Despite their importance nearly 70% of vultures (and condors) are categorized as threatened or near threatened on the IUCN Red List (BirdLife International, 2015).

Populations of African vultures are at critically low levels. In just three generations the populations of seven species have declined by at least 80%, and four species have been recategorized as Critically Endangered and two as Endangered (Ogada et al., 2015; BirdLife International, 2015). Since the 1970s the major quantifiable threats to Africa's vultures have been poisoning (61% of recorded deaths) and unsustainable harvesting for trade in fetish (29%; Ogada et al., 2015). Across Africa poisoning is most often associated with illegal predator control, where lions *Panthera leo*, hyaenas *Crocuta crocuta*, leopards *Panthera pardus*, jackals *Canis mesomelas* and other predators are targeted by livestock farmers, and vultures typically become the unintended victims. Poison is the ultimate weapon as it is silent, cheap, easy and effective, and because of its illicit nature the majority of incidents are never detected or reported, making the true impacts on populations difficult to quantify (Vyas, 1999; Ogada, 2014).

Beginning in 2012 a substantial new threat to Africa's vultures emerged as a consequence of a spate of elephant poisonings linked to ivory poaching. Prior to 2012 there were a few, mostly anecdotal reports linking vulture mortality to elephant poisoning (Ledger, 1980; Truscott, 2011; Roxburgh & McDougall, 2012), which indicates that the threat probably began earlier but remained poorly documented and underreported. During 2012–2014 mortalities associated with elephant poisoning accounted for one-third of all vulture mortalities recorded since 1970 (Ogada et al., 2015). Typically vultures were poisoned in large numbers while feeding on contaminated elephant carcasses, the most commonly reported species being the white-backed vulture *Gyps africanus*, followed by the lappet-faced vulture *Torgos tracheliotos*. However, in the majority of incidents the species of vulture was not determined, either because the observer was inexperienced or the carcasses were in an advanced state of decay. For these reasons no information on age class has been reported. Hooded *Necrosyrtes monachus*, white-headed *Trigonoceps occipitalis* and Cape vultures *Gyps coprotheres* have also been recorded but the latter two are frequently misidentified as white-backed vultures by field-based personnel who often report on these incidents but have limited bird identification skills. In

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Received 28 May 2015. Revision requested 22 September 2015.

Accepted 30 September 2015.

TABLE 1 Details of 11 vulture poisoning incidents at elephant carcasses poached for ivory in seven African countries.

Year	Month	Country	Location	No. of vultures poisoned	No. of elephants poisoned	Reference
2012	Mar.	Botswana	Kwando	200*	1	Anonymous (2012)
2012	July	Zimbabwe	Gonarezhou National Park	191	1	Groom et al. (2013)
2013	May	Botswana	Kwando	326	3	McNutt et al. (2014)
2013	May	Mozambique	Gonarezhou Transfrontier Park	78	1	T. Otto (pers. comm.)
2013	July	Namibia	Bwabwata National Park	500*	1	IUCN (2013)
2013	Oct.	Zimbabwe	Hwange National Park	219	135	Zimbabwe Parks & Wildlife (2013); Muboko et al. (2014)
2013	Oct.	Zambia	North Luangwa National Park	476	4	Sichone (2014)
2013	Nov.	South Africa	Imfolozi Game Reserve	37	1	A. Botha (unpubl. data)
2013	Dec.	Zambia	Mfume, South Luangwa	6	1	R. McRobb (pers. comm.)
2014	May	DRC	Virunga National Park	10	3	African Conservation Foundation (2014)
2014	July	Zimbabwe	Zambezi National Park	1	4	Zimbabwe Parks & Management Authority (2014)

\*Estimates based on the number of vulture skulls and other bones found at the scene.

addition to vultures, other scavenging species are killed at poisoned elephant carcasses, including hyaenas and bateleurs *Terathopius ecaudatus*.

During March 2012–July 2014 there were 11 known incidents in which vultures were poisoned at the carcasses of elephants that had been killed illegally, in seven sub-Saharan African countries (Table 1). One hundred and thirty-five of the 155 elephants killed were poisoned in a single incident in Zimbabwe, where cyanide was used. Collectively, the 11 incidents caused the deaths of at least 2,044 vultures (mean = 186 vultures per incident; range 1–500) as well as one lion, five hyaenas, two African wild dogs *Lycaon pictus* and two bateleurs, illustrating the disproportionate vulture mortality associated with ivory poaching. Although the majority of incidents reported here occurred in southern Africa, we have heard of at least two unsubstantiated cases from East Africa.

The rate of increase in vulture mortality as a result of poisoning associated with ivory poaching since 2012 greatly exceeds that associated with other types of poisoning incidents since 1970 (Fig. 1). Similarly, the number of vulture fatalities associated with each ivory poaching incident (median = 191;  $n = 11$ ) is more than 30 times that recorded in other poisoning incidents since 2012 (median = 6;  $n = 33$ ). Since 2014 ivory poaching incidents leading to multiple vulture fatalities have continued to occur, most recently in northern Kruger National Park, in September 2015 (A. Botha, pers. obs.), and in a series of incidents in Hwange and Matusadona National Parks, Zimbabwe, in October 2015 (News24, 2015). We emphasize again that underreporting and the illicit nature of poisoning incidents mean that the number of fatalities reported here is probably an underestimate. Although it may appear that vultures are merely

unintended victims in these incidents, poachers have a strong motive to kill vultures, whose overhead circling is an indicator of a dead animal lying below. Because vultures inadvertently perform the role of aerial sentinels, revealing the poachers' locations to local wildlife authorities, they have become targets in their own right (Roxburgh & McDougall, 2012; Groom et al., 2013; Ogada, 2014). In at least two incidents, in Zimbabwe (Groom et al., 2013) and in South Africa (A. Botha, unpubl. data; Table 1), the poachers had an additional motive, to kill vultures for their body parts (typically the head), which are used for fetish.

Worryingly, there is evidence that the use of poisons to kill elephants and rhinoceros in sub-Saharan Africa is increasing. The first known report of rhinoceros poisoning in South Africa was in 2005 (Reuters, 2005), and the intensive and widely reported use of poisons to kill elephants elsewhere in sub-Saharan Africa began in 2012. A total of six rhinoceros and 181 elephants are known to have been poisoned in 17 incidents in Botswana, Democratic Republic of Congo, Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe (Table 1; Reuters, 2005; The East African, 2012; Guardian, 2012; Moonga, 2013; Endangered Wildlife Trust, unpubl. data). These numbers are probably underestimates of the actual totals, given both underreporting and the difficulty of obtaining mortality data related to poisoning of elephants and rhinoceros. Recent killing methods include lacing watermelons, oranges and pumpkins (and cabbages in the case of rhinoceros) with pesticides (e.g. aldicarb and carbofuran), and poisoning salt licks and waterholes with pesticides or cyanide. All of these methods kill non-target species and are environmentally destructive; however, the tainting of waterholes is particularly reckless given the myriad species that rely on them, including humans and livestock.

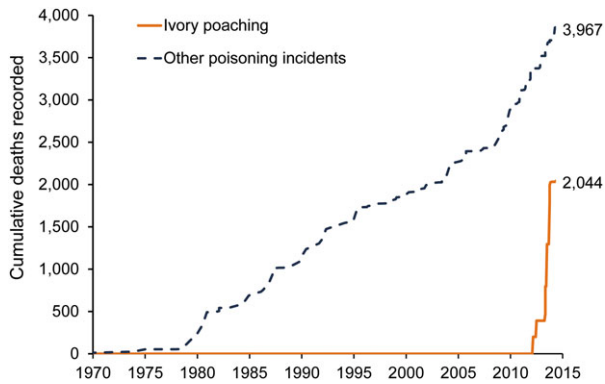


FIG. 1 Cumulative African vulture deaths caused by illegal poisoning (n = 6,011), associated either with ivory poaching (n = 2,044), in which vultures are targeted, or with other poisoning incidents (n = 3,967), in which vulture deaths are typically incidental.

The recent surge in the use of poisons for poaching represents a further exploitation of weak regulations and enforcement regarding the accessibility and misuse of toxic pesticides and other substances. As a first step, African governments must ensure that pesticides listed on Annex III of the Rotterdam Convention (2015) and others that are widely implicated in wildlife poisoning (e.g. carbofuran) are no longer freely available over the counter, restricting their sale through a small number of licensed and trained distributors, and sold only in limited quantities to individual customers. Distributors should maintain a registry of the names and contact information of customers, and of the quantities of these pesticides sold, so that their misuse can be tracked more easily. Illegal importation or smuggling of these substances should also be stamped out at ports of entry.

International donors supporting anti-poaching efforts need to recognize the seriousness of this threat, and work with their African partners to curtail it. Industries involved in the manufacture or use of the most abused poisons (aldicarb, carbofuran and cyanide) must take greater responsibility for their misuse, and develop innovative solutions to phase out their manufacture and use. We further recommend: (1) Strengthening the legal framework to prosecute offenders and their employers; (2) Improving laboratory testing facilities in order to prosecute offenders; (3) Education regarding pesticide regulations, including training of law enforcement officers, sensitizing of magistrates, and national campaigns to raise awareness; (4) Training rangers and other field personnel to manage incidents effectively, including neutralizing poisoning sites, and collecting reliable data on incidents so that preventative actions can be focused; (5) Establishing a single continent-wide database to monitor the scale and distribution of poisoning incidents, and requiring national wildlife authorities to submit all poisoning data regularly; (6) Investigating the effects on human health of ingesting meat or of using vulture body parts harvested from poisoned carcasses.

Unrestricted access to toxic pesticides and poisons is having devastating effects on Africa's natural resources and the people who rely on them. As billions of dollars are being spent on the war against poaching, poachers are adopting increasingly secretive and lethal means of killing pachyderms, with devastating consequences for vultures. Wildlife authorities in many African nations are overwhelmed by the increasing use of poisons for poaching (Guardian, 2012; Moonga, 2013). This includes their use in the widespread harvesting of bushmeat and fish, with unknown consequences for human health (du Feu, 2001; Opere-Ankrah, 2007; Odino, 2011; Mzumara et al., 2015).

Whether these illicit activities will prove responsive to the measures advocated here remains to be seen, given that the recent acceleration in vulture poisoning is the work of elephant poachers, for whom the implementation of trade controls is likely to be of little consequence as they are already operating outside any legal framework. However, we should recognize that the intensity with which poisons are now being used to kill elephants, rhinoceros, vultures and, incidentally, other species, represents a paradigm shift. African governments should be afforded the international legislative backing and material support required to apply more punitive sentencing in cases of poaching with poisons.

## Acknowledgements

We thank M. Kinnaird and C. Beale for helpful comments, and P. Hancock and J. Bradley for reports from Botswana. We also thank T. Otto and R. McRobb for reports from Mozambique and Zambia, respectively. J. Blanc provided comments and further information regarding elephants. We particularly thank the reviewers, A. Margalida and P. Mundy, whose helpful comments improved the manuscript.

## References

- AFRICAN CONSERVATION FOUNDATION (2014) Elephants killed for their ivory in Virunga National Park, DR Congo. <http://www.africanconservation.org/in-focus-current-threats/elephants-killed-for-their-ivory-in-virunga-national-park-dr-congo> [accessed April 2015].
- ANONYMOUS (2012) Kwando 1 poached elephant report. Unpublished report produced for Raptors Botswana.
- BIRDLIFE INTERNATIONAL (2015) IUCN Red List for birds. <http://www.birdlife.org> [accessed 14 November 2015].
- DU FEU, T.A. (2001) *Fish and Fisheries in the Southern Zone of the Takamanda Forest Reserve, South-west Cameroon*. Report to the Cameroon-German (GTZ) Project for the Protection of Forests around Akwaya (PROFA).
- GROOM, R.J., GANDIWA, E., GANDIWA, P. & VAN DER WESTHUIZEN, H.J. (2013) A mass poisoning of white-backed and lappet-faced vultures in Gonarezhou National Park. *Honeyguide*, 59, 5–9.

- GUARDIAN (2012) Poachers take to poisoning jumbos. <http://www.ipppmedia.com/frontend/index.php?l=42686> [accessed January 2015].
- IUCN (2013) Vultures – the silent victims of Africa’s wildlife poaching. [http://www.iucn.org/news\\_homepage/news\\_by\\_date/2013/?13529/Vultures--silent-victims-of-Africas-wildlife-poaching](http://www.iucn.org/news_homepage/news_by_date/2013/?13529/Vultures--silent-victims-of-Africas-wildlife-poaching) [accessed April 2015].
- LEDGER, J. (1980) Vultures poisoned in Caprivi. *Vulture News*, 3, 15.
- MARKANDYA, A., TAYLOR, T., LONGO, A., MURTY, M.N., MURTY, S. & DHAVALA, K. (2008) Counting the cost of vulture decline—an appraisal of the human health and other benefits of vultures in India. *Ecological Economics*, 67, 194–204.
- M McNUTT, J.W., BRADLEY, J. & HANCOCK, P. (2014) Report on Kwando vulture poisoning investigation 16 November 2013. *Babbler*, 59, 40–46.
- MOONGA, C. (2013) Zambia: ZAWA exposes poaching scam. <http://allafrica.com/stories/201312020437.html> [accessed April 2015].
- MUBOKO, N., MUPOSHI, V., TARAKINI, T., GANDIWA, E., VENGENSAYI, S. & MAKUWE, E. (2014) Cyanide poisoning and African elephant mortality in Hwange National Park, Zimbabwe: a preliminary assessment. *Pachyderm*, 55, 92–94.
- MZUMARA, T.I., PERRIN, M.R. & DOWNS, C.T. (2015) The drinking habits of the Lilian’s lovebird and incidents of poisoning at waterholes. *African Journal of Ecology*, <http://dx.doi.org/10.1111/aje.12216>.
- NEWS24 (2015) Hwange National Park elephants, vultures killed in another cyanide attack. <http://www.timeslive.co.za/scitech/2015/10/05/Hwange-National-Park-elephants-vultures-killed-in-another-cyanide-attack> [accessed 16 November 2015].
- ODINO, M. (2011) Measuring the conservation threat that deliberate poisoning poses to birds in Kenya: the case of pesticide hunting with Furadan in the Bunyala Rice Irrigation Scheme. In *Carbofuran and Wildlife Poisoning: Global Perspectives and Forensic Approaches* (ed. N. Richards), pp. 53–69. Wiley, Chichester, UK.
- OGADA, D.L. (2014) The power of poison: pesticide poisoning of Africa’s wildlife. *Annals of the New York Academy of Sciences*, 1322, 1–20.
- OGADA, D.L., TORCHIN, M.E., KINNAIRD, M.F. & EZENWA, V.O. (2012) Effects of vulture declines on facultative scavengers and potential implications for mammalian disease transmission. *Conservation Biology*, 26, 453–460.
- OGADA, D., SHAW, P., BEYERS, R.L., BUIJ, R., MURN, C., THIOLLAY, J.M. et al. (2015) Another continental vulture crisis: Africa’s vultures collapsing toward extinction. *Conservation Letters*, <http://dx.doi.org/10.1111/conl.12182>.
- OPARE-ANKRAH, Y. (2007) *The bushmeat trade, livelihood securities, and alternative wildlife resources*. MPhil thesis. Norwegian University of Science and Technology, Trondheim, Norway.
- REUTERS (2005) Poachers poison rhinos in S Africa reserve. [http://www.nzherald.co.nz/international-fund-for-animal-welfare/news/article.cfm?o\\_id=500452&objectid=10124960](http://www.nzherald.co.nz/international-fund-for-animal-welfare/news/article.cfm?o_id=500452&objectid=10124960) [accessed April 2015].
- ROTTERDAM CONVENTION (2015) ANNEX III CHEMICALS. <http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/tabid/1132/language/en-US/Default.aspx> [accessed January 2015].
- ROXBURGH, L. & MCDUGALL, R. (2012) Vulture poisoning incidents and the status of vultures in Zambia and Malawi. *Vulture News*, 62, 33–39.
- SICHONE, C. (2014) Zambia: farmer jailed six years for poaching. <http://allafrica.com/stories/201403200304.html> [accessed April 2015].
- SUDARSHAN, M.K., MADHUSUDANA, S.N., MAHENDRA, B.J., RAO, N.S., ASHWATH NARAYANA, D.H., ABDUL RAHMAN, S. et al. (2007) Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey. *International Journal of Infectious Disease*, 11, 29–35.
- THE EAST AFRICAN (2012) Tanzania battles elephant poaching. <http://www.theeastafrican.co.ke/news/Tanzania-battles-elephant-poaching/-/2558/1395686/-/view/printVersion/-/n88qf7/-/index.html> [accessed January 2015].
- TRUSCOTT, R. (2011) Zimbabwe poachers poison water. <http://www.news24.com/Africa/Zimbabwe/Zimbabwe-poachers-poison-water-20110918> [accessed April 2015].
- VYAS, N.B. (1999) Factors influencing estimation of pesticide-related wildlife mortality. *Toxicology and Industrial Health*, 15, 186–191.
- ZIMBABWE PARKS & WILDLIFE (2013) Unpublished report.
- ZIMBABWE PARKS & MANAGEMENT AUTHORITY (2014) Press statement by the Minister of Environment Water and Climate Hon Saviour Kasukuwere on the poisoning of four elephants in Zambezi National Park. <http://www.zimparks.org/index.php/media-centre-pr/press-releases> [accessed April 2015].

## Biographical sketches

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