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LETTERS

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CONSERVATION LETTER: RAPTOR PERSECUTION

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Raptor persecution is an ongoing pervasive, global conservation concern, with potentially significant impacts for some species and populations. This Conservation Letter provides a scientific review of global raptor persecution and concludes by highlighting lessons learned and potential solutions. This letter is not intended as an exhaustive literature review. Rather, the intent of the Raptor Research Foundation (RRF) is to provide readers with enough evidence-based examples that they can appreciate the scope and prevalence of raptor persecution, understand the potential effects on raptor species and populations, and understand at least in a basic way the challenges associated with addressing raptor persecution across regions.

Persecution of raptors, including capture for illegal sale and trafficking, and intentional killing through poisoning, shooting, trapping, and other methods (collectively "take"), is an ongoing global conservation concern (Brochet et al. 2016, 2017, McClure et al. 2018). Raptors also are persecuted when they or their eggs are taken illegally for food, sale, trade, medicine, or cultural reasons (Pohja-Mykrä et al. 2012, Woolaver et al. 2013, Williams et al. 2014).

Historically, persecution sanctioned by local or national governments was often bounty-based and intended to eliminate entire populations or communities of raptors for the protection of livestock or game species (Newton 1979, Woolaver et al. 2013). In the United States, the Bounty Acts of 1917 and 1949 sanctioned the killing of at least 128,273 Bald Eagles from 1917 to 1952 (Robards and King 1966). Finland and the Falkland Islands (Malvinas) also paid bounties to support the extermination of raptors through much of the first half of the twentieth century (Woods and Woods 1997, Pohja-Mykrä et al. 2012).

Today, raptors continue to be taken when they are perceived as predators of domestic animals (Pohja-Mykrä et al. 2012, Dwyer et al. 2019) or of game important to human hunters (Royal Society for the Protection of Birds [RSPB] 2015, Brochet et al. 2016, 2017). In Argentina, 30 endangered Chaco Eagles (*Buteogallus coronatus*) and 29 Andean Condors (*Vultur gryphus*) received at rehabilitation centers in Chile between 1993–2014 were shot apparently due to concerns over predation of livestock (Barbar et al. 2016, Pavez and Estades 2016). In other areas, raptors are poisoned rather than shot in the interest of predator control (Whitfield et al. 2003, Ogada 2014). In 2016, 40 raptors, including Hen Harriers (*Circus cyaneus*), one of England's rarest breeding birds, were illegally shot in the United Kingdom (UK) in the defense of game bird species (RPSB 2016).

International trafficking of wildlife products, including raptors, is a highly profitable billion-dollar industry dominated by organized crime (European Union [EU] 2016). Feathers, including those from raptors, are some of the most common wildlife products imported illegally into the United States, with nearly 900,000 documented from 2005 to 2014 (Indenbaum 2015). In 2009, the US Fish and Wildlife Service (USFWS), in collaboration with the Navajo Nation, concluded an investigation that resulted in the seizure of an estimated 8413 migratory bird parts and products, including 61 eagles, 186 hawks, and 24 falcons, of varying conservation statuses (USFWS 2016). In India, Ahmed (2010) recorded the capture and sale of over 1000 owls of 13 species traded between 1992 and 2008, in spite of legal protections. The trafficking of raptors for the pet trade is also a growing problem. In Indonesia, the growing popularity of wild-caught owls as pets has been anecdotally

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linked to increased visibility of owls in popular culture (e.g., the *Harry Potter* franchise; Nijman and Nekaris 2017).

Raptors are frequently taken for food, use in falconry (Wyatt 2009, Dixon et al. 2012, Shobrak 2015), cultural reasons (Ahmed 2010, Buij et al. 2016), or killed as sport. Buij et al. (2016) studying West and Central Africa markets, found approximately 70% of diurnal raptor species were on sale for bushmeat and for use in traditional practices. Amur Falcons (*Falco amurensis*) have also been trapped for food in the Nagaland Region of India, an important migratory stopover area for the species (Dalvi et al. 2013). In China, local governments encourage residents to capture eagles and other raptors for falconry festivals and tourism centers, in conflict with the Chinese National Animal Protection Act (Ma 2013).

Effects on Raptor Populations. Persecution of raptors impacts populations at local, regional, and global levels (Brochet et al. 2016, 2017, McClure et al. 2018). Red Kite (*Milvus milvus*) numbers declined sharply in the UK as a result of government-sponsored persecution (Newton 1979) and the species is now listed as decreasing or extinct in many parts of its range (Mougeot et al. 2011, BirdLife International 2013). Elsewhere in Europe, the European action plan for the endangered Bonelli's Eagle (*Hieraaetus fasciatus*) lists persecution as a leading cause of declining numbers of breeding pairs and decreasing range (Arroyo and Ferreiro 1997). The endangered Steppe Eagle (*Aquila nipalensis*) has been extirpated in parts of its range and is in decline in other areas, due to habitat conversion combined with human persecution (BirdLife International 2015).

Of the 2646 raptor carcasses of 52 species recorded in West and Central Africa between 2008 and 2013, 27% were listed as Near Threatened to Endangered on the International Union for Conservation of Nature Red List (Buij et al. 2016), and Africa's raptors are experiencing significant declines, some at rates of loss >80% in three generations (Ogada et al. 2016). In India, approximately 140,000 Amur Falcons killed in 2012 resulted in significant effects on the global population (Weidensaul 2018). Though Amur Falcons are listed as Least Concern (Birdlife International 2016), the loss of so many birds runs contrary to the conservation practice of keeping common species common. In Argentina, Barbar et al. (2016) suggested persecution was an important threat to the Chaco Eagle. Elsewhere in the Americas, the Guadalupe Caracara (*Caracara lutosa*) is now extinct, largely because of persecution by European settlers (Greenway 1967) and collection for scientific specimens (Abbott 1933).

Methods to Reduce Persecution. Identifying the root causes of raptor persecution can help determine the most effective methods to reduce these activities (EU 2016, Fairbrass et al. 2016, Brochet et al. 2017). Because the reasons behind raptor persecution vary across locations, and are shaped by the cultural and historic conditions within locations, no single conservation strategy will suffice. A multi-tiered strategy involving community education and outreach, enforcement of environmental laws, and economic incentives will likely be necessary to curb raptor persecution globally (Dalvi et al. 2013, Nyirenda et al. 2017). For example, effective curtailment of persecution for profit may require a different mechanism than persecution for cultural reasons. Although a great many countries are signatories to international treaties and action plans, large-scale persecution continues where international obligations have not translated into national regulations, monitoring systems, or active enforcement (EU 2016, Brochet et al. 2017). It should also be noted that addressing such a complex, global problem as raptor persecution must involve action at local, national, and international scales (EU 2016, Brochet et al. 2016, 2017).

In North America, migration bottlenecks such as Hawk Mountain and Cape May, which were historically sites of mass raptor shootings sanctioned by government-funded bounties, now serve as conservation and education centers for the public and as focal points of ecotourism and research (Bildstein 2008). In Africa and India, fact-based environmental education for all ages, and environmental stewardship sermons at churches have made inroads in local communities that were previously responsible for mass raptor-poaching events (Patton and Bhaskar 2014, Nyirenda et al. 2017). Legal protections for raptors can also be effective in reducing persecution if they are actively enforced. In India, volunteer and paid conservation officers, including former poachers, serve as "boots on the ground" to protect Amur Falcon roosting and migration sites (Patton and Bhaskar 2014). In terms of livelihood incentives, former poachers have been successfully employed as wildlife researchers or ecotourism guides, and economic incentives such as micro-grants can protect raptor roosts on private property (Patton and Bhaskar 2014, Nyirenda et al. 2017). Once persecution is addressed, recovery of persecuted populations may be possible. For example, the Red Kite, though still listed as Near Threatened, has increased from perhaps 20 breeding pairs to over 2200 in response to a reintroduction program in the UK (Holling 2012). Although raptor persecution still serves as a major threat to raptor populations worldwide, multifaceted conservation strategies are effective in curbing poaching and shooting at the community level, and serve as success stories for future conservation efforts.

As a leading professional society for raptor researchers and raptor conservationists, the RRF is dedicated to the accumulation and dissemination of scientific information about raptors, and to resolving raptor conservation concerns (Raptor Research Foundation 2018). Persecution remains an ongoing conservation concern, presenting a global threat to raptor populations. Based on the science summarized here, resolving the frequency and distribution of raptor persecution will allow long-term co-occurrence of raptor populations with human populations.

The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the USFWS.

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