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UNINTENTIONAL AND INTENTIONAL POISONING OR HARASSMENT OF CRANES RELATED TO AGRICULTURE

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Global intensification of agriculture and concomitant increase in diversity and use of chemicals for control of plant, insect, and other pests threaten cranes that use agricultural landscapes. Crane mortalities have been linked to a range of chemicals, most commonly organophosphates and carbamates. Cranes also are expanding the types of agricultural habitats they use and foods they consume, which can expose them to novel chemicals or chemically treated situations. In developed countries, application of more toxic agrochemicals has declined as the most toxic chemicals have been banned, formulations have been improved for greater efficacy, and farmers' understanding of applications have improved, but use continues to grow in developing countries (Ecobichon 2001). Poisoning risks to cranes from misuse or illegal use of agrochemicals are higher in developing countries where governments lack strong regulatory, registration, and educational systems for proper usage. D. Nankinov (2009) considers poisoning with DDT as the main reason for the extirpation Demoiselle Cranes on their breeding grounds in North-East Bulgaria. Residue levels of some of the more toxic agrochemicals remain high in some areas of South and Southeast Asia (Ali et al. 2014; Tran et al. 2014), exposing cranes to potentially damaging levels through their foods. For example, wetlands that Sarus Cranes use for breeding and non-breeding season in the Mekong River basin are hotspots of high concentrations of DDT and other persistent organic pollutants (Tran et al. 2014).

Cranes have been sickened or killed through both intentional and unintentional poisoning from agrochemicals, primarily pesticides. The large number of reports and range of crane species (reviewed in Austin 2017) indicates poisoning by agrochemicals is a serious and possibly growing problem. Identifying where the problem exists is often difficult – documentation of poisoning can be problematic because of lack of reporting and limited resources for testing to verify the cause of death. Individuals may be uninterested or unwilling to report poisoning incidents. Death of a few birds often go unnoticed, whereas mass mortalities receive more attention and may be more representative of the severity of the problem. For example, 3–4 separate poisoning incidents around the South Luangwa National Park, Zambia, resulted in a total of 60 Grey Crowned Cranes killed in less than a year between 2015 and 2016 (Kerryn Morrison, personal comm. 2017). Where incidents have been reported, data quantifying the number of birds killed are often inadequate, and reasons for the poisoning often unclear.

Unintentional (accidental or incidental) poisoning appears to occur more frequently and cause more mortalities than intentional poisoning (killing in response to crop damage). Unintentional poisoning usually occurs when timing or location of chemical applications to crops coincides with crane foraging activities. Poisoned cranes often have ingested planted seeds that have been treated with insecticides or fungicides;

others have been poisoned by ingesting seeds treated to prevent insect or rodent damage in storage. In the Grambower Moor region in northeastern Germany, 40 Eurasian Cranes were killed by ingestion of zinc phosphide, a rodenticide used to control voles in fields (Gunter Nowald, personal comm. 2017). Poisoning may be a significant factor in the decline in Red-crowned and White-naped Cranes, and mortalities may be much higher than suspected (James Harris, personal comm. 2016). Red-crownedCranes have been killed after consuming treated seeds in many locations in China, most often on migration or wintering areas (Su and Zou 2012). Six White-naped Cranes were accidentally poisoned at Duolun, China when they fed on winter wheat (*Triticum aestivum*) seeds treated with pesticides, a farming practice commonly used in China to protect seed from invertebrates; the incident was reported and four cranes later recovered after treatment (Jiao et al. 2014). Sarus, Siberian, and Eurasian Cranes died in several events from feeding on wheat seed treated with monocrotophos or the organophosphate insecticide chlorpyrifos at the Keoladeo National Park, India (Pain et al. 2004). In Mongolia in 2002, more than 340 dead or dying birds, including 145 Demoiselle Cranes, were observed at several localities after about 3,500 km² of steppe were treated with the rodenticide bromadiolone, to control a population explosion of voles, although the full scale of mortality is unknown (Natsagdorj and Batbayar 2002, cited in BirdLife International 2004). At the Khurkh River Valley in northeastern Mongolia, use of defoliants to prepare fields for planting led to a significant decline of the local population of Demoiselle Cranes and death of two Demoiselle Cranes in 1989 (Popov, 2000). The Khurkh River Valley is also very important breeding and staging area for White-naped Cranes. In Russia, poisoning of Demoiselle and Eurasian Cranes increased significantly with indiscriminate application of agrochemicals used in no-till management (Malovichko 2011). In the Transbaikalia region of Russia, numerous cases of deaths of Demoiselle Cranes were reported during the 1970-1980s, a period of active agricultural development, because of extensive use of rodenticides and pesticides on crop fields (Goroshko, 2002). Few chemicals were used in the region during 1990-2000s because of economic problems and significant reduction of agriculture associated with the collapse of the Soviet Union (Ilyashenko 2017). But since middle 2010s, the scale of agricultural production and chemical use has increased, renewing threats to cranes from agrochemical poisoning (Oleg Goroshko, personal comm., 2017). Demoiselle Cranes are under high risk of poisoning because this species is closely connected with agriculture fields during breeding and migration, more so than other crane species in Russia and Mongolia.

Fidelity of migrant cranes to breeding and wintering areas increases risks of large or repeated mortality events due to poisoning, which then may eliminate a portion of a population. Rapid, local declines of Blue Cranes in South Africa during the 1980s and 1990s coincided with many reported cases of poisonings from all parts of the country (McCann et al. 2001). The large number of poisoning incidents and evidence of high adult mortality for Red-crowned Cranes on their migration and wintering areas in China (Su and Zou 2012) suggest poisoning remains an important source of mortality for that endangered species. White-naped Cranes, which share a similar range, also may suffer substantial poisoning mortality. Protected areas that attract and hold concentrations of cranes are often very important to the conservation of a population; however, those cranes may then be exposed to treated crops when they leave protected areas to feed in the surrounding agricultural fields (Ma et al. 1999). Therefore, particular actions, such as regulations limiting use or pesticide training and education to minimize risks, may be needed to minimize pesticide exposure of cranes that feed on private lands around protected areas.

Some pesticides are particularly toxic to birds, and some of the most toxic chemicals have been discontinued at the global scale once their toxicity to birds was known (e.g., aldrin). However, others remain available and are used in limited areas. Carbofuran (also known as Furadan; any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government) is a carbamate insecticide and nematicide used to control insects and nematodes in a wide variety of field crops; it has been responsible for many bird mortalities around the world (Richards 2011). Its use is banned or highly restricted in most developed countries but is still widely used in Africa and Asia. Many bird species in Kenya have suffered extensive mortalities from carbofuran (Richards 2011), and its use continues to threaten Grey Crowned Cranes. The chemical remains locally available in eastern Africa and is still used by farmers and by poachers. Monocrotophos, a broad spectrum, systemic organophosphate insecticide, is

banned in the US and European Union but is widely used elsewhere. Its use has resulted in a large number of cases of poisoning of non-target species, particularly birds, including Sarus and Eurasian Cranes in India (Pain et al. 2004).

Agricultural chemicals also have been used to intentionally kill cranes to prevent crop damage and also for illegal harvest, although direct proof is usually lacking (see also Illegal take, including hunting, trapping and poisoning). Using poisons to take cranes is more likely in areas where hunting is prohibited or people can't afford guns. In southern and east Africa, farmers have intentionally poisoned cranes and other birds that damaged crops (Williams et al. 2003, Ogada 2014). Farmers were more likely to consider poisoning cranes to reduce depredation when crops were stressed by drought. An uncertain number of Blue Cranes were poisoned with diazinon (used to control blowflies in sheep) on a sheep and cattle farm over a three- to five-year period in the Northern Cape of South Africa after they were attracted to newly-planted fields and an irrigation pivot; estimates ranged from 200 to 1,000 killed (Wildenboer 2015). Musyimi (2008) found that poisoning of cranes in parts of Kenya to reduce crop depredation was a common occurrence. Intentional poisoning was identified as the cause of mortality of Sarus Crane families in a paddy crop ecosystem in India (Borad et al. 2002), and Black Crowned Cranes in East Africa (McCann 2003, Williams et al. 2003). In Australia, a company was fined for intentionally poisoning at least 10 Brolgas using the insecticide fenamiphos (District Court of Queensland 2014). Agrochemicals also have been used in bait for illegal harvest of birds and resulted in cranes deaths (see details in Illegal take, including hunting, trapping and poisoning).

Farmers may harass or deliberately kill cranes when they believe their crops are threatened. In the Transbaikalia region of Russia, there are many cases of farmers shooting Demoiselle Cranes at staging areas as a response to crop damage; the less numerous White-naped, Hooded, and Eurasian Cranes were also shot (Goroshko et al. 2008, Goroshko, 2012). Harassment of foraging cranes can reduce foraging time and food acquisition, force birds to feed on poorer quality sites, or take more risks to feed (Luo et al. 2012). Various harassment tactics are used to keep cranes out of crops, including scaring away territorial pairs, deploying flags, dogs, and other deterrents; removing eggs; and moving or destroying nests. Effects of such disturbances are most deleterious for breeding birds (see also Human interference/disturbance, especially at nest sites). Harassment or interference with nesting or chick-rearing cranes increases the vulnerability of eggs or chicks to predators and probability of reproductive failure. Nest destruction by farmers in Uganda is one of the most common threats to Grey Crowned Cranes (Olupot et al. 2009). Eggs or adults also may be intentionally taken for food (see details in Illegal take, including hunting, trapping and poisoning).

Our understanding of the occurrence and magnitude of unintentional and intentional poisoning, and the implications to crane health and vital rates, remains poor and relies largely on anecdotal information. Increased community awareness and education about crane biology and poisoning risks could improve reporting of poisoning events. Improved monitoring and focused research that incorporates biology and socio-economics will be important for developing effective measures to prevent further incidents (Loss et al. 2015).

SPECIES AND KEY LOCATIONS CURRENTLY MOST AT RISK

- Black Crowned Crane in West Africa
- Blue Crane in South Africa
- Grey Crowed Crane throughout its range
- Red-crowned Crane in China
- Sarus Crane in India
- White-naped Crane throughout its range
- Demoiselle Cranes throughout its range

KEY RESEARCH AND MONITORING NEEDS

- Improve monitoring, reporting, and documentation of poisoning events to more effectively detect and develop appropriate solutions to emerging problems
- Develop and encourage non-chemical approaches to control pests or improve field nutrients, such as biocontrols, composting, and other more organic farming methods
- Develop strategies to help farmers deal with crop damage from cranes so they are not compelled to poison or harass birds intentionally

HIGHEST PRIORITY CONSERVATION ACTIONS

- Strengthen regulation, control of distribution, and enforcement of chemical uses to prevent incidental and intentional misuse.
- Work with pesticide manufacturers, national, and local stakeholders to reduce the use and environmental impacts of chemicals toxic to birds.
- Increase training and information resources available to farmers and agricultural agencies to improve awareness of pesticide toxicity and appropriate application methods. Develop regional pesticide centers to provide authoritative information, public education, training, monitoring, and chemical testing for governments, farmers, NGOs, and the public (Ogada 2014).

REFERENCES

Ali U, Syed JH, Malik RN, Katsoyiannis A, Li J, Zhang G, Jones KC. 2014. Organochlorine pesticides (OCPs) in South Asian region: A review. Science of The Total Environment 476–477: 705–717.

Austin JE. 2017. Threats to cranes related to agriculture. *In* Austin JE, Morrison K, Harris J. Cranes and Agriculture – a global guide for sharing the landscape. IUCN/SSC Crane Specialist Group, pp xx–-xx.

District Court of Queensland. 2014. Osprey Australia Pty Ltd v Richard Ashley Kidston (Department of Environment and Heritage Protection) [2014] QDC. Queensland District Court, Cairns, Australia. [Online] 28www.sclqld.org.au/caselaw/QDC/2014/028

Ecobichon DJ. 2001. Pesticide use in developing countries. Toxicology 160: 27–33.

Goroshko OA. 2002. Status and conservation of populations of cranes and bustards in South-Eastern Trans-Baikal Region and North-Eastern Mongolia. Dissertation, All-Russian Institute for Nature Protection, Moscow, Russia. P. 1-194. [In Russian.]

Goroshko. O.A. 2012. Common Crane, White-naped Crane, Hooded Crane, Demoiselle Crane, p. 118-125. In E.V. Vishnyakov et al. [eds.], Red Book of Zabaikalsky Kray. Novosibirsk Publishing House, Novosibirsk.

Goroshko, O. A., J. E. Cornely, and S. H. Bouffard. 2008. Reduction of crop depredations by cranes at Duarsky State Biosphere Reserve, Siberia. Proceedings of the North American Crane Workshop 10: 65-70.

Jiao S, Lei G, Li F, Mirande C, Batbayar N, Wang T, Cui J. 2014. Poisoned White-naped Cranes were rescued, released and arrived at Poyang Lake successfully. Newsletter of China Ornithological Society 23(2): 28

Ilyashenko E. 2017. Regional and historical patterns of agriculture. In Austin JE, Morrison K, Harris J, editors. Handbook on Cranes and Agriculture: A global Guide for Sharing the Landscape. Baraboo, Wisconsin: International Crane Foundation. pp xxx-xxx.

Jiao S, Lei G, Li F, Mirande C, Batbayar N, Wang T, Cui J. 2014. Poisoned White-naped Cranes were rescued, released and arrived at Poyang Lake successfully. Newsletter of China Ornithological Society 23(2): 28

Loss SR., Will T, Marra PP. 2015. Direct mortality of birds from anthropogenic causes. Annual Review of Ecology, Evolution, and Systematics 46: 99-120.

Luo J, Wang Y, Yang F, Liu Z. 2012. Effects of human disturbance on the Hooded Crane (*Grus monacha*) at stopover sites in northeastern China. Chinese Birds 3:206-216.

Ma Z, Wang Z, Tang H. 1999. Habitat use and selection by Red-crowned Crane *Grus japonensis* in winter in Yancheng Biosphere Reserve, China. Ibis 141: 135–139.

Malovichko LV. 2011. Causes of Crane Death in the Stavropol Region. In: Cranes of Eurasia (biology, distribution, migrations, management). In: Ilyashenko EI, Winter SV, editors. Cranes of Eurasia (biology, distribution, migrations, management). Proceedings of the International conference "Cranes of Palearctic: biology, conservation, management (in memory of Academician P.S. Pallas)", Volgograd, Russia, 11–16 October 2011. Moscow, Russia: Crane Working Group of Eurasia. Issue 4. p 567-570.

MaMing R, Zhang T, Blank D, Ding P, Zhao X. 2012. Geese and ducks killed by poison and analysis of poaching cases in China. Goose Bulletin. 15:2-11.

McCann K, Morrison K, Byers A, Miller P, Friedmann Y, editors. 2001. Blue Crane (*Anthropoides Paradiseus*). A Population and Habitat Viability Assessment Workshop. Final Workshop Report. Apple Valley, Minnesota, USA: Conservation Breeding Specialist Group (SSC/IUCN).

Nankinov DN. 2009. The Demoiselle Crane (*Anthropides virgo*) history in Bulgaria. Russian ornithological Journal, 18 (480): 695–704.

Musyimi Z. 2008. African Crane Trade Project: Kenya Case Study. Unpublished report for the International Crane Foundation / Endangered Wildlife Trust Partnership. 16 p.

Natsagdorj T, Batbayar N. 2002. The impact of rodenticide used to control rodents on Demoiselle Crane (*Anthropoides virgo*) and other animals in Mongolia. Unpublished report. *Cited in* BirdLife International. 2004. Pesticides continue to poison birds on a large scale. Presented as part of the BirdLife State of the world's birds website. [Online] www.birdlife.org/datazone/sowb/casestudy/158.

Ogada DL. 2014. The power of poison: pesticide poisoning of Africa's wildlife. Annals of the New York Academy of Sciences 1322: 1–20.

Olupot W, Mugabe H, Plumptre AJ. 2009. Species conservation on human-dominated landscapes: the case of crowned crane breeding and distribution outside protected areas in Uganda. African Journal of Ecology 48:119–125.

Pain DJ, Gargi R, Cunningham AA, Jones A, Prakash V. 2004. Mortality of globally threatened Sarus cranes *Grus antigone* from monocrotophos poisoning in India. Science of the Total Environment 326: 55–61.

Popov V.V., 2000. On the distribution and ecology of cranes in Eastern Mongolia, p. 189-190. In Tz.Z. Dorzhiev, E.N. Yelayev, and V.E. Yesheyev [eds.], The otnithological observation in Russia. Iss. 2. Buryat State University Press, Ulan-Ude.

Richard N, editor. 2011. Carbofuran and Wildlife Poisoning: Global Perspectives and Forensic Approaches. Chichester, UK: John Wiley & Sons, Ltd.

Su L, Zou H. 2012. Status, threats and conservation needs for the continental population of the Red-crowned Crane. Chinese Birds 3(3): 147-164.

Tran T, Barzen JA, Choowaew S, Engels JM, Van Ni D, Mai NA, Inkhavilay K, Soben K, Sethik R, Gomontean B, Thuyen LX, Kyi A, Huy Du N, Nordheim N, Tung Lam HS, Moore D, and Wilson S. 2014. *Persistent organic pollutants in wetlands of the Mekong Basin*. Scientific Investigations Report 2013–5196, U.S. Geological Survey, Reston, Virginia. 140 pp. doi: 10.3133/sir20135196.

Wildenboer N. 2015. Blue crane massacre: tests confirm poison. Independent Online South Africa 11 March 2015. Online: www.iol.co.za/news/crime-courts/blue-crane-massacre-tests-confirm-poison-1830197.

Williams ETC, Beilfuss RD, Dodman T. 2003. Status survey and conservation action plan for the Black Crowned Crane *Balearica pavonina*.