Protected areas in Africa are too small to safeguard rapidly declining vulture populations

June 27 2022

African white-backed vulture (Gyps africanus). Credit: Leibniz-IZW/Jan Zwilling

Vultures perform important ecosystem functions as they clean the

landscape by eating carcasses and thus limit the spread of wildlife diseases. Yet, vulture populations are rapidly declining, mainly owing to intentional and unintentional poisoning. Against this background, an international team of scientists performed the first comprehensive comparative analysis of movement data of three species of threatened Gyps vultures across Africa. They found that individual home ranges can be as large as 75,000 km^2 and thus significantly exceed existing protected areas.

These results are published in the journal *Biological Conservation*. Clearly, larger Vulture Safe Zones need to be established to safeguard vulture populations. A new project at the Leibniz Institute for Zoo- and Wildlife Research (Leibniz-IZW) aims to further advance scientific evidence for vulture conservation through newly developed tags equipped with an Artificial Intelligence (AI) and Internet of things (IoT) communication technology in satellite networks.

The paper presents the first comparative analysis of the movement ecology of three vulture species in Africa, the African white-backed vulture (Gyps africanus), Rüppell's vulture (Gyps rueppelli)—both are listed as critically endangered by the IUCN—and the Cape vulture (Gyps coprotheres), listed as vulnerable. Across two regions in eastern and southern Africa, the scientists analyzed a large set of telemetry data from individuals captured and tagged in 18 countries over 15 years (2004 to 2019), and set them in relation to data on species, age, breeding status, season and region. They evaluated the overlap between identified home ranges and existing protected areas which covered a wide range from National Parks to game-controlled areas and community conservation areas.

"Our analysis shows that African Gyps vultures have some of the largest home ranges of any terrestrial, non-migratory species in the world, enabled by their energetically efficient soaring flight and required for

their use of a dispersed and ephemeral food source: carrion," say authors Corinne J. Kendall (North Carolina State University and North Carolina Zoo).

For example, adult white-backed vultures have average home ranges of about 24,000 km^2 in east Africa and 31,500 km^2 in southern Africa. Cape Vultures and Rüppell's vultures soar over even larger areas, averaging 36,000 km^2 and 75,000 km^2, respectively. "We also see that immature birds cover significantly larger areas than adults," adds Ortwin Aschenborn (University of Namibia and Leibniz-IZW). "For example, immature white-backed vultures in southern Africa have average home ranges of just shy of 100,000 km^2 with a maximum of almost 300,000 km^2 in one individual in our dataset."

Adult birds can compete better for the scarce food resources and therefore need smaller ranges. Additionally, breeding birds are bound to a much smaller operating radius. The scientists also identified seasonal variations in home range sizes, for example with Rüppell's vultures covering larger areas during wet season months in East Africa, a time period with limited food supply.

In the light of these movements it is inevitable that vultures spend a significant amount of time soaring above non-protected areas. Cape vulture home ranges had the least annual average overlap with protected areas, 34% for adults and only 16% for immature birds. This dramatically increases their exposure to and use of human-related food sources from livestock farms and meat processing sites. It also increases the risk of being exposed to environmental toxins such as agricultural pesticides and poisoned baits for carnivore control, a technique still widely practiced in southern and eastern Africa. "While protected areas are a common and successful conservation tool for safeguarding various components of biodiversity, these findings show that their utility is limited for species with large individual home ranges or migrating

species," conclude Aschenborn and lead author Adam Kane (University College Dublin). "Protected areas usually minimize land use conversion, habitat degradation and the use of environmental toxins or pollutants such as pesticides or poisons targeting conflict species. Yet, vultures do not know these boundaries and evidence-based conservation action needs to address challenges outside these areas."

Globally, vultures are one of the fastest declining groups of birds, even of vertebrates. Populations of the three species included in these analyses are estimated to have declined by more than 90% over the last three generations. The conservation status of the African white-backed vulture was reassessed from "least concern" to "near threatened" in the 2007 IUCN Red List. Only five years later, the species was further "upgraded" to "endangered" and in October 2015, its status was changed to "critically endangered" as the actual ongoing decline was more severe than previously expected.

In Southeast Asia, Vulture Safe Zones (VSZ) have been set up in unprotected areas to reduce the influx of environmental pollutants such as diclofenac, a non-steroidal, anti-inflammatory drug. VSZ have been an effective strategy for vulture conservation in places or regions where diclofenac bans across large areas are operable because this type of poisoning is unintentional. Vultures, just like other birds of prey, are long-lived species at the top of their food chains, which means that they are vulnerable to accumulating toxins in their bodies through their food. "For VSZ to be successful in an African context, it requires vast areas to be nearly poison-free," says Aschenborn. "The sizes of such areas need to be much larger than Etosha National Park (~23,000 km^2) in Namibia, for example. If we consider the average range of an immature Rüppell's vulture of about 175,000 km^2, we can clearly see the challenges associated with this concept." During periods of limited food availability, for example in wet seasons, vulture restaurants with supplementary feeding at pivotal locations may be an additional tool for

conservation to reduce the risk of poisoning.

"Our findings show how important it is for international collaboration to protect wide-ranging species such as vultures," Adam Kane says. "It is challenging but can foster meaningful research and conservation projects by unifying people to a collective purpose."

Since the beginning of 2022, Ortwin Aschenborn has been part of a new and ambitious research project at the Leibniz-IZW that aims to further advance scientific evidence for vulture conservation. As part of the project, the two research subprojects GAIA-Sat-IoT and SyNaKI will develop a new generation of tags for vulture research. The tags will be a combination of sensors (GPS locations and acceleration data for example) and an on-board camera with on-board artificial intelligence algorithms that decode data and images of the movements and behavior of individuals to facilitate the automatic classification of behaviors. This allows for a real-time uplink to a satellite network specially developed for the purpose of seeing and analyzing the world of vultures through their very own eyes. Additionally, the subprojects will develop decentralized, AI-based data analyses on various tags on vultures and lions to unravel the movements and behaviors within bird flocks, and the carnivore and scavenger communities.

"The high-tech approach will facilitate new insights into the behavior of individuals and the dynamics of their ecosystem," says Dr. Jörg Melzheimer, head of the project at the Leibniz-IZW. "We will not only better understand vultures and how they tackle the challenges to survival and reproduction, we will also learn about it faster. The intention of our project is to link human, animal and artificial intelligence for watching the ecosystem in real time, for example detecting disease outbreaks or hotspots of poisoning immediately."

More information: Adam Kane et al, Understanding continent-wide

variation in vulture ranging behavior to assess feasibility of Vulture Safe Zones in Africa: Challenges and possibilities, *Biological Conservation* (2022). DOI: 10.1016/j.biocon.2022.109516