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The State of Bearded Vulture, *Gypaetus barbatus* in Armenia

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Abstract. The last update of the conservation status of the Bearded Vulture (*Gypaetus barbatus;* Linnaeus, 1758) in Armenia was undertaken in 2009 for the appropriate edition of Red Book of Animals of Armenia (2010), using data collected in the period 2003–2008. Here, over ten year later, we provide an update on this conservation status using data collected between 2009 and 2019. Results show that the species'population is now 11–12 breeding pairs; there has been a slight increase in the population. The annual breeding success, measured as fledglings per occupied nest, ranged between 0.86 and 1 (mean = 0.96 ± SD = 0.054) during 2003–2019. Current threats are related to direct persecution for trophies or for keeping as pets; poisoning by heavy metals at municipal dumps is also a potential threat. The proposed conservation measures include (1) a change in policies governing the possession of trophy specimens and captive breeding, particularly the requirement for an inventory of all existing specimens and the introduction of obligatory procedure of issuing a certificate of origin for each new specimen; (2) increase of punishments for illegal shooting or trapping; (3) strengthening of the inspection body to improve control; (4) improving public outreach aimed at raising the value of this species nationwide; (5) improving waste management. These measures should be accompanied by species monitoring.

Introduction

Armenia is a relatively small (29,743 sq km), landlocked mountainous country, where elevation varies from 375 to 4090 m above sea level. Such large range in elevations creates various climatic conditions and therefore many different landscapes, including semi-desert, juniper woodland, deciduous forest, mountain steppe, and sub-alpine area. The terrain is rigorous containing number of deep canyons, cliffs, and rocky outcrops (Aghababyan *et al*. 2015). The fauna is rich, including number of ungulates, such as Bezoar Goat (*Capra aegagrus*), Armenian Mouflon (*Ovis ammon gmelini*), Roe Deer (*Capreolus capreolus*), and Wild Boar (*Sus scrofa*). Therefore, the region is quite sufficient for Bearded Vultures (also known as Lammergeyer), which find here both food and nesting places. The Bearded Vulture is distributed across the mountainous regions of Eurasia and in Eastern Africa, however its density can be quite low in some areas (Orta *et al*. 2019). It is classified as Near Threatened in IUCN Global Red List, with a decreasing population trend, and a global population of 1,300–6,700 mature individuals (BirdLife International 2017). Within Europe the situation of the species is worse: it is classified as Vulnerable with a European population varying from 1,200 to 1,600 mature individuals (BirdLife International 2015a).

The Bearded Vultures in Armenia is inhabited by subspecies *G.b. aureus* Hablizl, 1783. Among the four species of Old World Vultures inhabiting Armenia (Adamyan and Klem 1999, Cramp and Perrins 1993), the Bearded Vulture remains one of the most difficult for study and conservation, on account of its huge territories, hardly accessible breeding areas and nests, slow maturation, and narrow diet. Those obstacles have resulted in only fragmentary studies on the species until 2002 (Aghababian *et al*. 2004). As a consequence, in 2002–2003 a country-wide monitoring program of this species was launched. Some preliminary results were published in 2004 (Aghababian *et al*. 2004, Aghababyan & Bildstein 2004) and have been used for Red Book of Animals of Armenia (Aghasyan & Kalashyan 2010), in the assessment of Emerald Sites of Armenia (Fayvush *et al*. 2016), and for a recent multi-species action plan on the African-Eurasian Vultures (Botha *et*

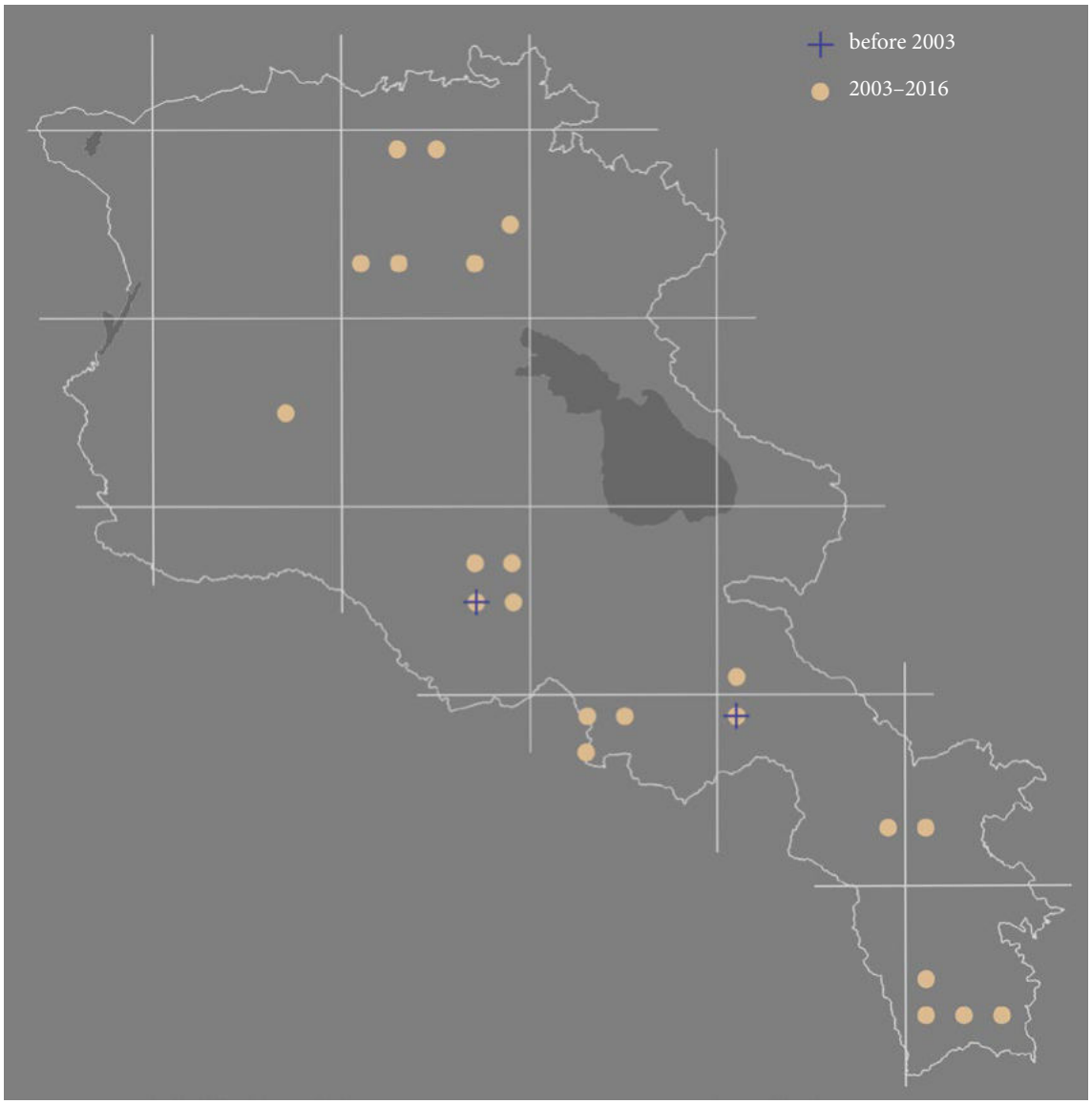

Figure 1. Distribution map of Bearded Vulture in Armenia as of 2019.

al. 2017). After over 15 years of monitoring it is timely to update our knowledge of the status of the species, especially considering the upcoming Red Book of Animals of Armenia, planned for implementation in 2020–2021. Thus, this paper is aimed at describing the population trend of the species during 2003–2019, and the status of the Bearded Vulture in Armenia, including threats and existing and required conservation measures, i.e. a foundation for the assessment of its conservation status.

Materials and methods

At the beginning of focused data collection on the species there were three known nests of Bearded Vulture in Armenia (Adamian & Klem 1999, Aghababyan 1999, Geilikman 1965). In 2002, we conducted a pilot study and located three more nests, and in addition several nesting areas were identified by behavior of the species. Subsequently, in 2003, we started systematic data collection on Bearded Vultures in Armenia. Monitoring of the species was implemented via counts of the breeding pairs through occupied nests. Also, road-side vehicular surveys were implemented aimed at estimating the number of non-breeding individuals, which have been differentiated by age and moulting patterns. In addition, we collected data on location of each nest, and to understand some peculiarities of the species' diet we have climbed to the nests of seven pairs of Bearded Vultures 12 times. In total, the study involved over 40 people who covered almost the

Figure 2. Typical habitat of Bearded Vulture in Armenia.

entirety of Armenia: the extreme north-east still requires more detailed surveying.

In order to calculate population trends, we used this multi-year data series processed using TRIM 3.0 software (Van Strien *et al*. 2004). An Index was calculated using log-linear poison regression; then the deviations were calculated and presented as a linear function, showing populations' growth or decline. Statistically significant change is stated at the $p<0.05$ level, otherwise the population is considered stable. Mapping of the population was implemented using ArcGIS 10.0 software. To estimate the threats to Bearded Vultures, we conducted surveys of hunters, and of main online and offline market places where the mounted specimens of raptors are sold; we also conducted questioning of farmers and veterinarians.

Results

Distribution and biological peculiarities in Armenia

The Bearded Vulture breeds almost throughout Armenia (see Figure 1), occupying a wide variety of open and semi-open landscapes with deep gorges and high cliffs taking the elevation range from 600 to 2,200 m a.s.l. (see Figure 2). The species usually avoids dense forests, wetlands and bogs. Bearded Vulture is a year-round resident, breeding in small caves and grottos, or on covered cliff ledges, avoiding south-facing cliffs. Usually each pair changes its nesting place within the range of two kilometers, every 3–5 years (sometimes even after 2 years). The incubation period begins in January; usually Bearded Vultures have one egg in the clutch, although cases of two eggs are known though in such cases only one nestling survives. Fledglings leave the nest in late May – early June, depending on elevation. The principal food is medium to large size carrion, which includes, but is not limited to bezoar goats, domestic sheep (*Ovis aries*), goat (*Capra aegagrus hircus*), donkey (*Equus africanus asinus*), dog (*Canis familiaris*), badger (*Meles meles*), red fox (*Vulpes vulpes*), and wolf (*Canis lupus*); its diet includes up to 85% bones. There are reports of consumption of tortoises and live mammals from the other parts of species' distribution range (Orta *et al*. 2019), but this has never been observed in Armenia.

Population dynamics

The current population estimate for Breaded Vultures in Armenia is 11–12 breeding pairs. The population trend during the last ten years shows slight increase (see Figure 3); in 2007–2009 at least one pair was added in the well-studied

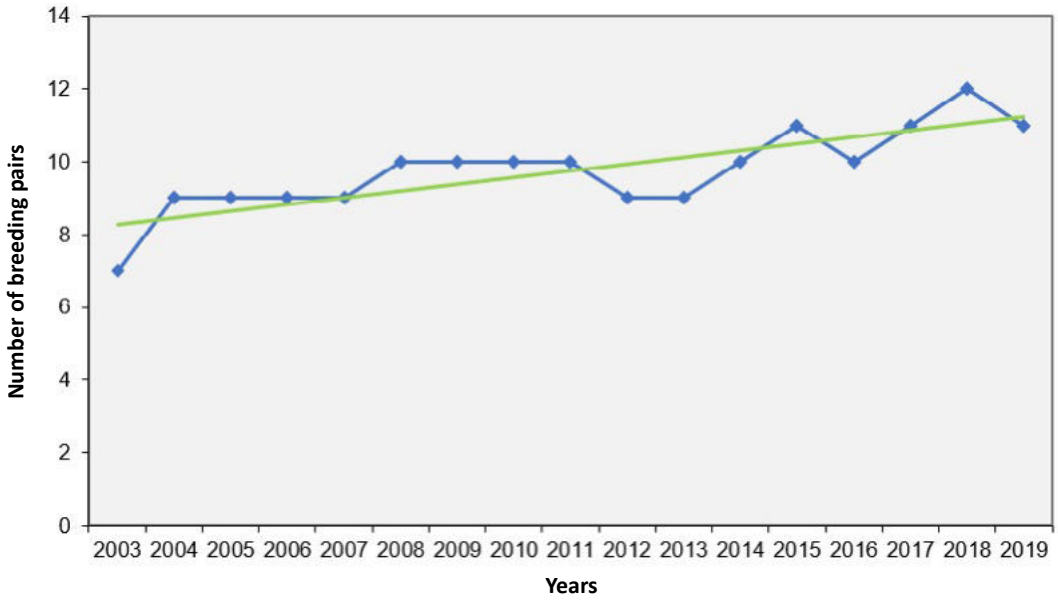

Figure 3. Graph of population dynamic of Bearded Vulture in Armenia during 2003–2019.

Southern Armenia, and in 2010–2019 at least one pair was added in Central-southern region of the country. Since 2003 the annual percentage of breeding success measured as number of nests with fledglings per number of occupied nests, has varied between 0.86 and 1, with a mean of 0.96 (SD = 0.054).

Discussion

Causes of the observed population trend

The slightly increasing population trend and relatively high breeding success are most probably related to ability of the species to find enough food throughout its breeding range in Armenia. All the visited nests were full of remains of the dead animals, and it looks like that the vultures use their nests for the storage of carrion, for consumption during periods of food shortage. During our observations of Bearded Vulture behavior during nestling rearing, very few were observed returning to the nest without food. The population increase in south Armenia, of one pair, is most probably linked to the opening of new poultry farm in that area, which produces significant amounts of waste that is not efficiently utilized. There has been a moderate increase of population of Bezoar Goats in Armenia (WWF Armenia, personal communication), which may possibly support a further increase in the Bearded Vulture population.

The observed cases of non-productive nests have occurred when one of the partners in the pair have been replaced by a relatively young bird (4 and 5 years-old). Often, in such cases, we were informed about a case of poaching in the area, and therefore it can be suggested that such replacements were the result of the death of one of the partners due to illegal shooting. In a very few cases we were informed about stealing of the nestling from a nest; we have never observed dead nestlings in the nest. Thus, it appears, that at current some threats to the breeding population are related to direct persecution for trophy specimens, or to Bearded Vultures being taken to be kept as pets. Another possible threat comes from poisoning by heavy metals at municipal dumps, because due to lack of separate garbage collection, people are disposing the batteries, mobile phones and other devices together with the food remains. Although poisoning by heavy metals from dumps was not considered in global assessment of the species (BirdLife International 2017), cases of lead poisoning of Bearded Vulture have been described from South Africa (Krueger & Amar 2018), although these incidents had another source of lead.

Present conservation measures

The Bearded Vulture in Armenia is evaluated as Vulnerable (Aghasyan & Kalashyan 2010). At current the breeding sites of the species in Khosrov Nature Reserve, Zangezur Biosphere Complex, and Dilijan National Park are protected. All the other breeding sites are included in the Emerald

Network, protected under Bern Convention (Fayvush *et al*. 2016).

Proposed conservation measures

At first, we propose that the conservation status of the species should be changed from Vulnerable to the higher one. It is fitting the criteria of Critically Endangered in accordance to IUCN criteria D1: 25 pairs or less (IUCN Standards and Petitions Committee 2019), however potentially the population also could be rescued from the neighboring countries: Caucasus part of Turkey, Georgia, Azerbaijan and Caucasus part of Iran (BirdLife International 2017), since the Georgian population is estimated as 22–25 breeding pairs and Azerbajan's population — around 30 breeding pairs (Abuladze 1998). The Turkey's total population is estimated as 160–200 breeding pairs, but there is no specific number for the Caucasus part of the country (BirdLife International 2015b).

Therefore, the conservation status is more relevant to Endangered, in accordance to criteria D: number of mature individuals is 250 or less (IUCN Standards and Petitions Committee 2019). Taking into account the current and potential threats, the proposed conservation measures for the species include: (1) a change of the policy on trophy collection and having animals as pets; in particular the introduction of an obligatory procedure of issuing a certificate of origin for every trophy or bird in captivity; (2) increase in punishments for the illegal hunting and trapping of the species; (3) strengthening of Inspectorate for Nature Protection and Mineral Resources and development of its cooperation with the Hunters' Unions in the country; (4) development of a targeted educational and public outreach program aimed at Armenian Hunters; and (5) improvement of waste management at municipal dumps. These conservation measures should be supported by continuous monitoring of the species with two purposes: (i) to track its population trend further, and (ii) to indicate the efficiency of undertaken conservation measures.

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