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Impact of Trophic Conditions on Biological Parameters of Egyptian Vultures *(Neophron Percnopterus)* In Azerbaijan

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Abstract
Impact of anthropogenic factors on the biological parameters of Egyptian vultures in Gabala district, one of their main settlements, has been studied. The results showed that reduction of food supply is the main cause for worsening of demographic indicators in populations. Worsening of trophic condition has caused decrease of individuals in population and pairs engaged in breeding. Those birds that 'objected' reproduction were newly developed pairs and those with weak social connections. In view of this, supplementary feeding of Egyptian vultures in nature was organized. Such betterment in food supply enabled stabilization of number of the pairs engaged in breeding in the population. Stabilization in quantity dynamics allowed elimination of degradation in populations occurred during past ten years.

Keywords: Egyptian vulture, factor, food, impact, breeding.

1. Introduction
Intensive anthropogenic transformation of landscapes has been causing instability and worsening of trophic conditions for Egyptian vultures *(Neophron percnopterus)* like many other necrophage birds *(Gypaetus barbatus, Neophron percnopterus, Aegypius monachus).* Due to direct and indirect effects of anthropogenic factors the number of Egyptian vulture populations have decreased and their settlements been lost in Southernern and West Europe (Donazar et al.2002; Carrete et al.2007; Cortes 2009; Sara and Vittorio 2009 et al.), Caucasus region (Mnasekanov and Tilba 2014; Abuladze 2008; Ghasabyan 2011; Kononova 2012; et al.), Central Asia (Pestov 2012), India (Cunningham 2006) and become extinct in Ukraine (Appak et al.2007. Due to toxic impact of antiobiotics and antiparasite vanishing of Egyptian vultures was inevitablein South-East Asia (India Pakistan and Nepal) and in Bulgaria, Spain (Lemus et al 2008; Angelov 2009;). Use of diclofenac drug in veterinary medicineresulted in death of other necrophage birds *(Gyps bengalensis, Gyps indicus, Gyps tenuirostris)* along with Egyptian vultures.
Birdlosses also happen because of poisened traps, electric shock on electric posts (Carrete et al.2009; Hernandez and Margalida 2009; Angelov 2012) and bullet injuries (Dzhamirzoev and Bukreev 2009; Aghababyan and Ananyan 2011).
One of the main degradation of Egyptian vulture populations is shrinkage and instability of food base (Mnasekanov and Tilba 1998; Donazar et al.2010; Markus 2013 et al.).
Starting from 1960's international nature protection organizations, states, various charity funds increased financial aid aimed at elimination of negative anthropogenic impacts and the research works on sustainable protection of necrophage birds including Egyptian vultures intensified. Developments in space surveillance, geo-information systems and computing enabled monitoring as well as analysis of processes taking place in ecosystems of Egyptian vulture settlements. In this regard, researches targeted at modelling of nest locations, limiting factors, food supply, bioclimatic indicators and bird migrations are being successfully implemented. As a result, certain populations of Egyptian vultures including their numbers stabilized in South-Western Europe, Balkans as well as Caucasus regions (Abuladze 1989; Appak 2001 et al; Kurtev and Angelov 2008; Galuchin 2008; Kozlov 2008; Cortes-Avizanda and Donazar 2010; Shovengerd 2010; Gradev and Garsia 2012 et al.).
As of now we cannot claim that efficient protection of Egyptian vultures in their aerials has fully solved the problem. Because, more anthropogenic press has further realized loss of this species in natural systems. First of all, the range of limiting factors affecting the birds, their living places and food base is wide. There is ongoing expection of emergence of new limiting factors in various zones of the aerials. One of the examples is wide spread usage of diclophenac and

related drugs in treatment of pets (Fisk, 2014). Secondly. narrow food adaptation (they feed with animal corpses that are infrequently located) and also to low breeding potential (breeding usually lasts 5 months, individual produces 1-2 babies, feeds a nesting for 2-3 months). Thirdly, poor study of their settlement areas and insufficient information about conditions of Egyptian vulture populations may lead to extinction of this species.

Thus, study of Egyptian vultures, which are included in the Book of Endangered Animals of Azerbaijan with the status of 'endangered species sensitive to negative factors', in Azerbaijani territory is of high importance. Main reasons demanding research of this species in Azerbain as one of the main settlements of these birds not only in Caucasus but also in the entire Eurasian region are given below.

It was found out that the number of Egyptian vultures in Azerbaijan made 200 pairs in 1990 (Abuladze 1995, 63) while this figure decreased till 2014 making only 96-100 pairs (Karimov 2014, 194).

The main reason is gradual shrinkage of food supply. That is, the number of animals which make the food base of these vultures has decreased due to illegal and unplanned hunting and loss of their living aerials. Compared to 1960-70 period the number of Asian moutons *(Ovis orientalis)* in Nakhchivan territory decreased by 30-35%, the aerial of wild goat *(Capra aegagrus)* diminished by 50-55%. At present, only 750 Asian moutons *(Ovis orientalis)* and 1900 head wild goats *(Cervus elaphus)* remain in Azerbaijan. Number of Caucasian chamois *(Rupicapra rupicapra)* makes 630 while there are 675 red deer *(Cervus elaphus)* and 1650 rose deer *(Caprelous caprelous)* left. Some of these species are extinct in Talysh Mountains (Guliyev 2012).

Furthermore, during past 20 years, rise in civil economies (i.e. constructions, planting) in settlement areas of Egyptian vultures, quantitative and qualitative changes in development of cattle-breeding (diminishing pastures, abolishment of collective farms engaged in cattle-breeding, development of cattle-breeding in large indoor complexes, decrease of animals in household economies), growth of vet and sanitation services, utilization of corpses, production of animal produces (i.e. leather, heads, legs, intestines) and other anthropogenic factors caused shrinkage of food supply. Importance of studying the food supply of these vultures in Azerbaijan was empathized in relevant literatures (Karimov 2014, 195).

Successful solution of the problem requires researching the parameters, which allow objective assessment of the impact of food supply levels in settlement areas over the Egyptian vultures' populations.

Considering all the issues discussed above we began studying the factors affecting reproduction and demographic parameters, situation in food supply of Egyptian vultures, and also determining ways and means for their neutralization in Azerbaijan territory.

2. Materials and methods

For nesting Egyptian vultures arrive to Azerbaijan territory in early April leaving it in September. The main nesting area is in Gabala region, in an area adjacent to Turyanchay National Reserve. Therefore, the study was held in this region during 2013-2014. This territory located 400-650 meters from sea level enjoys a sophisticated landscape comprised of fast flowing Mountain Rivers and canyon type rocks as well as changing climate. Hence, the food base for the vultures in this area includes corpses of wild artiodactyls animals accidentally fallen from rocks, moved by river floods, killed by predators as well as other pet and wild animals hit by cars on highways or died of diseases as well as aging. We did observations near households, roads, river banks, pastures and roads leading to pastures registering the animals. Near the nesting areas there are households, Gabala-Agdash highway and pastures. Inputs from local residents assisted us in revealing places with animal corpses.

During June-July of 2013 the animals died within the reserve and its neighboring areas were logged and their masses were identified in order to understand the food supply. In parallel, we defined the total masses by multiplying the number of Egyptian vultures by the number of living masses. By dividing the total masses of dead animals with total mass of Egyptian vultures we were able to specify food size per individual. We found that during the period of nestling's feeding in nests the food supply was not sufficient to fulfill the demand of both the parents and babies.

In August-September of 2013 and April-August of 2014, supplementary food was supplied to Egyptian vultures with the purpose of optimizing feeding conditions. This process encompassed a period of natural incubation, baby feeding and nest leaving. The impact of both food shortage and extra feeding over quantitative dynamics of individuals in populations was studied. For this reason, we registered empty nests used and not used by the vultures. Also, the number of pairs engaged and not engaged in breeding, individuals joining emigration and immigration as well as the number of nestlings in the nests and death cases were logged.

Monitoring was conducted en route, on-site, and depending on the landscapes of territories automobile and horses were also utilized along with walking. Along the research route and on sites we studied origins and characteristics of negative factors on the birds and their babies in the nesting camps as well as feeding stations.

Devices used during the monitoring included Yukon 10x50 binocular, Kowa TSN-601.20x 60 telescopes and also Sony DSC N10 digital still camera. We also used Alston x2 portable voice-recorder.

3. Results and discussion

Analysis of the materials show that during 2004-2010 instable quantity changes in Egyptian vultures' populations and decrease of individuals engaged in breeding took place. Whereas, a steady quantity dynamics is typical to Egyptian vultures like other necrophage birds. This species achieve stability within their populations in accordance with opportunities of the living conditions.

Egyptian vulture populations arriving to Azerbaijan for nesting have faced gradual degradation. There is no information about negative factors affecting those populations, which winter in Africa. We collected following results when studying negative factors.

Location of nests in canyon rocks and right treatment of household residents situated 500-2000 meters away help minimazing hazards. Since more 'obvious' negative factors are revealed quicker they got eliminated within laws. Although they are not afraid of closeness to human Egyptian vultures avoid fatal outcomes of dangerous factors thanks to wide range of adaption reactions compared to other necrophage birds.

When approaching the study of this problem within the framework of the biocenotic regulation of numbers in populations (Frederics, 1927) and also theories of limiting factors that complete it (Andevart and Birch, 1954), only two of the numerous factors, which ensure living of the species,

play crucial role. These are availability of satisfactory biotopes for nesting and essential level of food supply (Meydus, 2008).

Adequate nesting biotopes exist in Azerbaijan and its national reserves, and thus, not considered as limiting factors for Egyptian vultures. Results show that the limiting factor, which is 'undefeatable' by Egyptian vultures is related to food conditions. It was found out that the total mass of animal corpses in the 23 ha of food area for Egyptian vultures provide an individual with 0, 8-1, 7 kg of food. A portion of this quantity is used for maintenance of one adult individual while 25-50% is fed to nestlings (Appak 2007).

In order to clarify whether this food volume meets the demands of the birds and nestlings during breeding we studied the number of pairs engaged in breeding as an indicator. For this purpose, during 2004-2012 we analyzed the quantity changes of breeding pairs in the population. It was found that the number of individual in the population changed in an instable manner (maximum 34, minimum 4). Although all individuals in the population were mature ones non-brooding nests still (left empty) existed. Number of non-brooding nests increased by 55, 5% in 2004, 66.6% in 2006, 78, 2% in 2007, 74, 1% in 2009, 73, 5% in 2010. For this reason, while the number of breeding pairs in 2004 stood at 88, 8% in the following years it gradually decreased to 52, 9% in 2010. In 2004-2010 the quantity dynamics in the population continued with hesitation thanks to biotic potential of the species. Even if no nestling death was observed the nest efficiency was not high. That is, only 1 nestling was registered in each nest of brooding.

Because the influence of food shortage is not 'obvious' its negative outcomes emerged much later. In such a *hypothetical* condition the quantity dynamics in Egyptian vulture populations continued in a fluctuating manner (with intervals), which is not specific to them. This indicates to changes happening in trophic conditions, which provide their living, and also to the start of degradation process in the species.

We found that below changes in population structure were the cause for the degradation process. That is, since food shortage creates danger for the population the efficiency of mechanisms ensuring stable quantity dynamics has weakened, in return, mechanisms safeguarding decrease in quantity have arisen. Mutual exchange of information between individuals through sophisticated signal system influences the physiological processes (nerve and humoral) in bird organism directing the activity of population's individuals to right direction. As a result, the number of pairs engaged in breeding decreased in the population. In other words, due to food shortages some young pairs in the population did not participate in breeding by avoiding 'competition' with older individuals "in favor of" the population they belong to. Those birds that 'refrain' from breeding were mainly the young pairs and individuals in their early nesting stage and with weak social connections. The fact that newly developed pairs make the majority of the ones 'refusing' to join breeding is also noted in griffon vulture populations. (Tilba 2003, 266-267).

Successful breeding in populations during food shortage is defined by 'competition' among older individuals. Monogamy lowers competition in populations, creates hierarchy and doing so, ensures efficient use of food resources in the territory for the pairs engaged in breeding. That is, the number of breeding pairs in the Egyptian vultures' population has decreased in proportion to local food availability. The reason for such breeding strategy is about enabling provision with food the developed babies till their maturing and breeding.

Omission of mature individuals in breeding process has led to weakening of demographic indicators of the population. We deemed it necessary to improve food conditions for Egyptian vultures considering such change in population's structure as an alarming symptom. Several feeding stations were set up in certain places close to the vultures' population for the purpose. For feeding we used wastes from meat shops, meat and poultry processors as well as corpses of animals killed on highways and roads. The food was provided every 5-7 days during August-September in 2013 and April, May, June, and August in 2014 according to the quantity of birds in the area. For every feeding session each individual received 1, 39-1, 45 kg of food. If we add this volume to the food available for each bird in the area (0,8-1,7 kg + 1,45-1,39 kg) then the total size per individual made 2,25-3,09 kg.

In 2014 the number of individuals in the population increased to 36 from 9-34 and brooding nests grew to 13 from 4-9 compared to 2004-2010. The number of breeding pairs increased to 26 from 8-18. The babies that left nests increased to 14 from 4-9 individuals.

In following years it is planned to carry out additional feeding and monitoring of Egyptian vultures in the nature. In this regard, we have submitted instruction and monitoring plan to the scientific organization of Turyanchay State Nature Reserve regarding the terms and rules for supplementary feeding.

4. Findings

Generalization of research materials confirms that the main factor negatively affecting the biological parameters of Egyptian vultures settled in Gabala region is degrading food conditions. Existence of large poultry and cattle breeding enterprises as well as meat processors in the territories adjacent to the national reserve accomplish additional feeding for Egyptian vultures.

In today's conditions of more anthropogenic press on landscapes as well as shrinkage in food base using additional feeding as a biotechnical method in certain zones by including it to protection program can greatly help in a stable development of these vultures in Azerbaijan and its worldwide protection.

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