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## Main limiting factors affecting biological parameters of necrophage birds Tahir Karimov

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This research article studies sources, forms and levels of limiting aspects that influence biological parameters of sedentary species of cinereous vultures (*Aegypius monachus*), Eurasian griffons (*Gyps fulvus*), lammergeyers (*Gypaetus barbatus*) as well as nomadic and nesting species of Egyptian vulture (*Neophron percnopterus*) in the territory of Azerbaijan Republic. Monitoring and logging were conducted in 43 nesting spots belonging to 4 species. It has been revealed that there are many satisfactory nesting biotopes in Azerbaijan and they are not limiting factors for scavenger birds. The main limiting factor is food shrinking. With the purpose of optimizing food supply during breeding periods supplementary feeding was organized in the nesting spots of these species. This resulted in increase of pairs participating in breeding by 1.2–1.6 times in the populations. On the basis of laws of Azerbaijan Republic on protection of biodiversity it was possible to lower and eliminate effects of anthropogenic factors by ensuring proper protection of these species and organizing landscapes for usage of planting, industry and recreation considering living conditions of the species as well as increasing knowledge of local inhabitants. All these activities will ensure stable and sustainable development of necrophage bird populations in Azerbaijan, also contributing to their protection in a global scale.

**Key words:** Azerbaijan, Eurasian griffon, cinereous vulture, Egyptian vulture, lammergeyer, limiting factors, food supply.

## Основные лимитирующие факторы, влияющие на биологические параметры птиц-некрофагов Тахир Керимов

В статье представлены анализ, описание источников и форм лимитирующих факторов, влияющих на биологические параметры черного грифа (*Aegypius monachus*), белоголового сипа (*Gyps fulvus*), бородача (*Gypaetus barbatus*) и стервятника (*Neophron percnopterus*) на территории Азербайджана. Проводился мониторинг и учет 4 видов птиц на 43 гнездовых участках. Было установлено, что на территории Азербайджана существует много подходящих гнездовых биотопов, и для птиц-падальщиков этот фактор не является лимитирующим. Основным лимитирующим фактором, влияющим на биологические параметры птиц-падальщиков, является уменьшение кормовой базы. Для улучшения кормовых условий на местах гнездования было организовано искусственное кормление птиц-падальщиков. В результате в популяциях повысилось число пар, участвующих в процессе размножения, в 1,2–1,6 раза. Благодаря соблюдению законодательства Азербайджанской Республики по охране биоразнообразия, эффективному обеспечению охраны видов, правильному использованию ландшафтов для земледелия, промышленности и рекреации, а также повышению экологического просвещения населения, стало возможным уменьшить воздействие некоторых антропогенных факторов на птиц-падальщиков. Все это создает возможность для стабильного развития популяций птиц-падальщиков на территории Азербайджана, а также помогает их охране в международном масштабе.

**Ключевые слова:** Азербайджан, белоголовый сип, черный гриф, бородач, стервятник, лимитирующие факторы, кормовая база.

### Introduction

Intense transformations of landscapes result in degradation of necrophage birds population by negatively affecting the biological parameters (i.e. number of species, structure of population, area of aerial, attachment of the species to living settings, fertility and level of death, movements, migrations) of necrophage birds within their living aeriels.

The limiting factors that affect biological parameters and degradation of species are of wide spectrum and various origins are of hazardous nature since they tend to appear in new forms in concrete situations (Baranov, Bliznetsov, 2011; Belik, 2013; Galushin et al., 2001; Dzhannirzoyev et al., 2009 et al.). Both anthropogenic factors as well as global and local climate changes (Khubiyev, Karavayev, 2012; www.climatechange.ru) have been negatively affecting the biological parameters of necrophage birds in various forms and levels within their living aeriels depending on ecological and living conditions.

Some examples are discussed below.

Prior to its ban in 2006 the diclofenac drug used in treatment of pets caused 95% loss of Asian population of Indian vultures (*Gyps indicus*), white-rumped vultures (*Gyps bengalensis*) and Egyptian vultures (Ghasabyan, 2011; Vultures on the brink, 2013).

The main limiting factors of Eurasian griffons and cinereous vultures (*Aegypius monachus*) in Crimean peninsula include shootings, traps, commercial stuffed birds, removal of nestlings from nests and anthropogenic factor such as ecotourism (Appak, 2001).

Decrease in Eurasian griffons, cinereous vultures, Egyptian vultures and lammergeyer birds in the Caucasus region is chiefly caused by poor food supply, poisoning from herbicides, making stuffed birds and also commercial use by photographers and small zoos. It is stated that population of these species may vanish if the mentioned reasons are not eliminated (Abuladze, 2008; Il'yukh, Khokhlov, 2010; Mnatsekanov, Til'ba, 1998; Parfenov, 2006; Sultanov et al., 2008).

Negative affect of worsening of trophic conditions on the number of Eurasian griffons, cinereous vultures, Egyptian vultures and lammergeyers is also found in Turkmenistan (Yefimenko, 2009).

It has been found that anthropogenic transformation negatively affects the nest-builder populations and quantity of Eurasian griffon and cinereous vultures in the landscapes of southern Siberia. It has been further discovered that due to warming of climate the borders of aerals keep changing. Lammergeyers attempt returning to north while cinereous vultures move to east and southwards, their original aerals (Baranov, Bliznetsov, 2011; Meydus, 2008).

One of the main aerals of cinereous vultures, Eurasian griffons, Egyptian vultures and lammergeyers in Eurasia is located in Azerbaijan. In Azerbaijan territory cinereous vultures, Eurasian griffons as well as lammergeyers are considered sedentary while Egyptian vulture is nesting and nomadic. However, consistent scientific data about limiting aspects of these species in Azerbaijan have not been collected (The Red Book of Azerbaijan, 2013). Today, as anthropogenic pressure on landscapes and also climate changes occur, it is of vital importance to study limiting aspects of these species. Studying these aspects plays fundamental role in defining protection strategy of these species that are included in global and regional book of endangered animals (Belik, 2014).

Considering matters discussed above we started a mission on studying negative factors affecting the lives of cinereous vultures, Eurasian griffons, lammergeyers as well as Egyptian vultures and their neutralization in Azerbaijan territory.

### Materials and methods

Monitoring and records were carried out during 2004–2014 in the 5 nesting spots of cinereous vultures (15 nests), 13 spots of Eurasian griffons (61 nests), 21 spots of Egyptian vultures (60 nests), 4 spots of lammergeyers (4 nests) located in Major and Minor Caucasian and Talysh mountains, civil neighborhoods as food target areas, highways, on the valleys of Turyanchay, Goychay and Garachay, which cause animal losses following floods and also pastures surrounding villages.

These works were implemented on the plains using the method by V.I.Osmolovskaya, A.N.Formozov (1952), on mountainous areas using the method of V.A.Abuladze (1989) «Logging of birds in mountainous conditions» and finally, along the route and at stationary conditions by using the method of «Logging of distribution and number of raptor birds» by E.G.Sultanov et al. (2008). This activity required 297 days and 15 thousand kilometers of distance covered. Depending on the landscapes of territories movement along the research route was on foot, using automobile and horses.

Stations, log spots and routes were noted on maps and entered to GPS device to simplify further repeat navigation. Devices used during the monitoring included Yukon 10x50 binocular and Kova TSN-601.20x 60 telescopes. As an on-site journal, we used Alsten x2 portable recorder.

### Results and discussion

The data collected since year 2004 indicates existence of various limiting factors with negative effect on necrophage birds in the territory of Azerbaijan Republic. These factors include shortage of food (26.31%), farming (15.80%), recreation (15.80%), weather conditions (15.80%), and commercial activities (10.52%), shootings of birds and nests (5.26%) and removal of nestlings from nests (5.26%). Effect of the limiting factors is defined by biological characteristics and parameters of the species (Baranov, Bliznetsov, 2011; Belik, 2014). Therefore, we deemed it expedient to characterize the limiting factors affecting cinereous vultures, Eurasian griffons, lammergeyers and Egyptian vultures by species.

Location of 75,4% of 61 nests of Eurasian griffons in Azerbaijan in unprotected areas increases risk of exposure to anthropogenic factors. Thus, anthropogenic type of impacts on Eurasian griffons are related to factors such as constructions held in nesting areas, road laying, planting fields, removal of nestlings for commercial purposes as well as making stuffed birds. One of the biggest colonies of Eurasian griffons in Caucasus is located in Istisu in Guba region. There are sulphur thermal springs located 100–150 meters away from the rocks where the colony is settled. During past 7 years many tourists visit this area during spring-summer periods. Uneasiness factors created by traffic and human activity around the colony, bird (*Turdus merula*, *Coturnix coturnix*, *Alektoris chukar*, *Phasianus colchicus*) and rabbit (*Lepus europaeus cyrensis*) hunting resulted in anthropophobia in birds.

Each year, at the beginning of brooding, there were observed 1–2 cases of nest leaving and leaving of 2–3 weaker nestlings from nests more late compared to their peers. Also, we logged 3 cases of nestling removals from nets as well as 1 case of making a stuffed bird from a trapped one for commercial purposes. Due to worsening living conditions of the population the number of pairs engaged in breeding has decreased from 20 to 12. Relevant agencies have proposed measures for protection of this colony during breeding period (March-July), which is located in an unprotected area and facing degradation processes.

12 nests of cinereous vultures out of 15 in Azerbaijan territory are located in Turyanchay State National Park. Although the area is protected the main danger for cinereous vultures and Eurasian griffons are recreation (tourism and relaxing) as well as pasturing. Unplanned ecotourism and unattended observations create stress in nesting sites. As a result, we noticed that 1 nest was left by the birds permanently and eventually, the egg was eaten by hooded crows (*Corvus corone cornix*) that nest in the vicinity. Cinereous vultures in Azerbaijan nest only on juniper (*Juniperus* L.) trees. By nesting on juniper tree they protect themselves and their nestlings. The reason is that juniper trees release 30 kg of phytoncides in a day (Sukhanova, electronic resource). Therefore, juniper tree cannot be regarded as a factor limiting settlement of cinereous vultures in Azerbaijan. The main factor relates to shortage of food. This in turn results in rejection of brooding by many species.

In recent years, with the help of radio-telemetry it was found out that due to food shortage sedentary Eurasian griffons and cinereous vultures fly from Southern Caucasus to Arabian peninsula and Persian gulf, many of them do not return or die (Khubiev, Karavayeva, 2012; Gavashelishvili, Ghasabyan, 2011).

63,3 % of 60 nests of Egyptian vultures in Azerbaijan are located in unprotected areas and close to residences. Main dangers for this species include injuries and killings while feeding in damp areas near households and on highways (they eat foxes, hedgehogs, turtles) hit to death on the Agdash-Gabala highway.

Out of reach location of the nests protects from removing eggs and nestlings. Therefore, making stuffed birds and illegal keeping them in small zoos are not observed in the country.

Since lammergeyers populate away from human habitats in subalpine and alpine zones with minor farming and agriculture activity they receive little anthropogenic impact. Three out of registered four nests are situated in Major Caucasus (Babadagh, Ilisu, Zagatala reserves) in 2000–2200 meters. In 2014, low weather temperature of –25–30°C and 1–2 meter thick snow in that region disturbed bird nesting. Such weather condition is met in this region every 5–10 years. In these bad climatic conditions, those artiodactyls animals which are food objects for lammergeyers move to warmer mountain zones. Lammergeyers that are deprived of food supply in the alpine and subalpine areas are forced to leave their permanent food and nesting zones during January-February. Lammergeyers do not nest during January-February. That's why there were no registered lammergeyer brooding in their 3 permanent nesting spots during monitoring of April, 2014.

It's worth noting that wide range of adaptation reactions of these species allows them to avoid fatal consequences of anthropogenic factors of transient nature.

Nevertheless, there exist dangerous factors of anthropogenic origin that are "obscure", those continue on growing manner and the ones, the negative outcomes of which emerge afterward. Those factors have been directly and indirectly affecting food supply of scavenger birds. The direct affects relate to quantitative and qualitative changes in development of cattle-breeding. That is, abolishment of collective farms engaged in cattle-breeding, development of cattle-breeding in large indoor complexes, decrease in animals in household economies, and utilization of animals died by various reasons harmfully affect food supply of these necrophage birds.

Illegal and unplanned hunting of wild artiodactyls animals as an indirect human effect on food supply of these species is associated with shrinking of their number and aeriels. As of 2012 total number of red deer

(*Cervus elaphus*) in Azerbaijan made only 700–800 heads. The aerial of chamois (*Rupicapra rupicapra*) in Major Caucasus has decreased by 50–55 % and their number in the country makes only 650–700 heads. In Talysh region they are uprooted. The number of goitered gazelles (*Gazella subgutturosa*) has decreased from 50–60 thousands to 8 thousands. Wild goats (*Capra aegagrus*) are uprooted in Talysh region. Their aerials in Nakhichevan AR has decreased by 50–55 %. The number of moutons (*Ovus orientalis*) decreased by 30–35 % with only 750–800 heads left (Kuliyev, Askerov, 2012).

In Turkmenistan, 6 fold decrease in artiodactyls animals from anthropogenic affects resulted in 4 folds decrease of cinereous vulture (Yefimenko, 2009).

Since many negative factors of anthropogenic character (unplanned ecotourism, illegal hunting, commercial purposes) that affect bird numbers in populations are easily revealed they have been eliminated within law and by enlightening local residents. The variety of limiting factors affecting the food supply is rich, the outcome of which appear late and in more dangerous manner. Considering this we provided supplementary feeding in 6 regions (Gabala, Shaki, Oghuz, Agdash, Goychay and Yevlakh). Monitoring revealed decrease in emigration of Eurasian griffons, cinereous vultures and Egyptian vulture populations. On contrary, we observed the immigrant pairs returning to previous and unused nests, and participating in breeding. This resulted in increase of pairs participating in breeding by 1.2–1.6 times in populations.

Following supplementary feeding a 6–12 times increase in the number of inexperienced young individuals of the populations settled in the periphery area was observed. Strengthening of trophic connections with the area by the individuals boosts pair development for participating in future breeding.

Due to climate changes happening in Azerbaijan territory (Safarov, 2003) adaptation of scavenger birds to these variations develops slower compared to changes occurring in ecosystems. Study of the references shows that the scavengers lost their traditional habitats in Murovdagh, Lankaran and Zagatala following changes within the ecosystem. Those populations that used to breed in those areas during 20<sup>th</sup> century are not observed today (The Red Book of Azerbaijan, 2013; Kuliyev, Askerov, 2012).

### Conclusion

Above-mentioned factors influence food supply of scavengers in direct and indirect ways. Direct effect is related to quantitative and qualitative changes in the development of cattle-breeding. While the indirect impact includes decrease in number of artiodactyls animals that make the food basis of these birds.

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 scavenger populations in Azerbaijan and their worldwide protection.

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