International Journal of Genetic Engineering 2024, 12(1): 1-4
DOI: 10.5923/j.ijge.20241201.01

Ecology and Significance of Synanthropic Species in the Desert Zone of Uzbekistan (as an Example of Birds and Mammals)

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Abstract The purpose of the study is to study the ecology and importance of synanthropic species of mammals and birds found in the desert zone of Uzbekistan. Obligate and facultative synanthropic species found in the studied area were determined according to their number per area unit, the nature of meeting, the level of connection with human economy and the distance of bringing people closer to themselves.Through a comparative study of the distribution of some synanthropic species, the factors that attract them to urban landscapes, including the extremism of habitats in the desert ecosystem under the influence of natural and anthropogenic factors, amenities (food resources, shelter) were studied. The importance of synanthropic species in human economy was revealed based on the analysis of their participation in biodegradation. Some recommendations for managing the behavior of synanthropic species have been developed.

Keywords Synanthropization, Streptopelia decaocto, Apus apus, Sturnus vulgaris, Pica pica, Corvus monedula, Corvus cornix, Ondatra zibethicus agrocenoses, Biocenotic, Biodamages

1. Introduction

All living organisms have evolved to live in natural environments. However, global environmental crises and human economic activities lead to synanthropization of some species [2,3,4,5,13]. This process continues today more intensively and causes the formation of a number of problems related to the synanthropization of species, including some epidemiological and unsanitary problems.

A number of works on the study of synanthropic species have been carried out in the world, but special studies on synanthropic species have not been carried out in Uzbekistan, their species composition, distribution, ecological characteristics, importance, participation in bio damages and behavior management issues have not been studied [7,14]. In particular, long-distance migration of birds, crossing the borders of several countries, and being in different biocenotic relationships with many other species make it necessary to study them epidemiologically and serologically. In recent years, the development of livestock and poultry breeding in Uzbekistan, the introduction of new animal species and breeds increases the importance of the complex study of synanthropic species. Therefore, it is important to study the importance of synanthropic species in human and his economy [1,6,9].

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Received: Dec. 20, 2023; Accepted: Jan. 9, 2024; Published: Jan. 12, 2024
Published online at http://journal.sapub.org/ijge

2. Materials and Methods

Research materials were collected from Guzor, Mubarak districts of Kashkadarya region, Bukhara, Karakul, Jondor, and Shafirkan districts of Bukhara region the residential areas of Uzbekistan, located in the desert zone, and birds and mammals were selected as synanthropic species. Ecological, zoological and questionnaire survey methods were used in the collection of materials. The method proposed by Vladyshevsky (1973) was used to determine the degree of synanthropization of species. To determine the number of species in different sectors of human economy, the method of counting animals proposed by Ravkin and Chelintsev was used [8,10,11,12].

3. Results and Its Discussion

Species are usually divided into obligate and facultative synanthropists based on their relationship with humans. In the literature, the concept of obligate synanthropes is usually applied to species that live permanently in cities, and facultative synanthropes to those that temporarily live in cities. The life of these species is strongly connected to man

and his economy, and they cannot live outside the human habitat. Such species move with people in the process of developing new lands and thus expand their range.

Spermophilus fulvus, Ellobius tancrei and Ondatra zibethicus are facultative synanthropes from mammals found in the desert zone of Uzbekistan, Streptopelia decaocto, Apus apus, Sturnus vulgaris, Pica pica, Corvus monedula, Corvus cornix are examples of birds. The life of these species is weakly connected to the human economy, and they have adapted to live in agrocenoses and gardens located far away from human settlements at the same time. The probability that these species will become synanthropic species in the future is very high.

As a result of the studies, several criteria were developed in order to determine the levels of synanthropization of bird species found in the desert zone of Uzbekistan (table). According to these criteria, 6 of the bird species found in this region are obligate and 6 are facultative synanthropes.

When determining obligate and facultative synanthropes of mammals, their number per area unit and the degree of connection with human economy were taken into account.

According to the results of the questionnaire survey and literature analysis, until the 70 s of the last century, Spermophilus fulvus was found mainly in the desert zone. During this period, the desert was a favorable environment for them to live, that is, food and shelter. In recent years, the exploitation of the area of this species for various purposes and the sharp reduction of plant biomass in the desert, the sharp increase in the area of grain crops in agrocenoses are the reason for their entry into cultural landscapes. In 2018-2020, the breeding of Spermophilus fulvus was recorded in the centers of Bukhara and Qaravul districts of Bukhara region, and in cemeteries of Guzor district of Kashkadarya region in 2023.

Ondatra zibethicus was acclimatized to Uzbekistan for fur in the 50s of the last century. Currently, it is widespread in almost all water bodies of the republic, especially in the collector and canals, in the coastal zones of lakes. In the following years, its occurrence was noted in the reservoirs of all regions and even in the channels of Ankhor, Borijar, Solor, Junariq in the city of Tashkent. This situation can be explained by the cessation of industrial hunting of Ondatra zibethicus since the 1990s, the development and interconnection of irrigation systems that allow the species to spread.

Rattus norvegicus is a widespread species in all urban landscapes of Uzbekistan. It is especially abundant in biotopes polluted by household waste. Rattus norvegicus feeding and breeding in places with high humidity (banks of collectors, canals and various irrigation systems and basements of buildings) were noted in city and district centers of the studied regions and in the city of Tashkent.

The classification of synanthropes found in the desert zone of Uzbekistan into obligate and facultative species can be conditionally accepted in a certain sense. Because here the facultative or obligatory types may have different content in other regions. This situation can be explained by the different natural and ecological conditions of each region.

Table 1. Criteria for determining the degree of synanthropy of obligate and facultative synanthropic bird species found in the desert zone of Uzbekistan

№	The name of the species	Criteria for determining the degree of synanthropy								
		average number per 10 hectares		manifestation feature			degree of connection with the human economy		the distance to bring a person closer to himself	
		more than 5	less than 5	settled	nester	wintering	strong	weak	1-5 meters	more than 5 meters away
1	Columba livia	+		+			+			
2	Streptopelia decaocto			+			+			
3	Streptopelia senegalensis	+		+			+			
4	Apus apus				+			+		
5	Hirundo rustica	+			+		+			
6	Sturnus vulgaris			+		+		+		
7	Acridotheres tristis	+		+			+			
8	Pica pica			+			+			
9	Corvus monedula			+		+		+		
10	Corvus frugilegus	+		+		+	+			
11	Corvus cornix					+	+			
12	Passer montanus	+		+			+			

The synanthropic species recorded in the desert zone of Uzbekistan live directly in and around the human farm and have topical, trophic and other types of biocenotic relations with people, domestic animals, cultivated crops. In most cases, the results of such relationships are negative. In particular, it is observed that the above-mentioned synanthropic mammals destroy grains, fodder and food products stored in houses in villages, destroy plants and participate in other similar biodamages.

The above-mentioned synanthropic birds actively participate in the spread of various diseases by destroying agricultural crops, feeding livestock and poultry, creating unsanitary conditions, creating noise as a polluting factor in roosting colonies, and other biodamages.

It is known that there are many diseases that are spread and have natural foci associated with animals, and many people and national economy suffer as a result of such diseases every year. Parasites that cause these diseases, most of which are transmissible, are mainly spread by wild synanthropic species.

The presence of synanthropic birds among the large number of meeting and migrating birds in Uzbekistan increases the relevance of this issue. The transmission of viral diseases, especially from migratory birds, to humans, and some of these diseases can spread over long distances and be unexpectedly transmitted to humans is very dangerous. This risk is exacerbated by the large gathering of synanthropic species in a small area, including nesting colonies, roosting and feeding sites, and biocenotic interactions with other species, increasing the potential for the spread of disease-carrying parasites.

In order to prevent the occurrence of such negative situations, the following is recommended:

- continuous monitoring of distribution areas of synanthropic species;
- identification and assessment of factors that attract synanthropic species to urban landscapes;
- introducing the use of modern and selective means of managing the number of synanthropic species;
- epidemiological and serological study of synanthropic species;
- study of biocenotic relations between synatropous species and domesticated animal species.

4. Conclusions

In Uzbekistan, the ecology and importance of synanthropic species have not been studied. In recent years, global ecological crises in the region and human economic activities have caused the synanthropization of some species and further expansion of their importance in the human economy. Such a situation increases the relevance of epidemiological and serological studies of synanthropic species. Synanthropic species found in the desert zone of Uzbekistan were divided into obligate and facultative synanthropes according to the number per area unit, the nature of meeting, the degree of connection with human economy and the distance of bringing people closer to themselves. Through a comparative study of the distribution of some synanthropic species, the factors that attract them to urban landscapes were determined. Based on the study of the participation of synanthropic species in biodegradation in the human economy, their importance was evaluated and some recommendations were developed for managing their behavior.

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