The Ecology of Bats (Chiroptera) of the Shahdagh National Park of Azerbaijan

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Abstract

The Shahdag National Park was founded on the 8th December 2006 on the basis of Ismailli and Pirgulu reserves. It is the largest park in the republic, with a total area 130,508.1 hectares and is located in the north of the country, on the southern slope of the Greater Caucasus mountain chain, on the border with Georgia and Russia. The highest mountain of Azerbaijan - Bazarduzu and southernmost point of Russia are situated in the Shahdag national park – the height is 4466 metres above the sea level. It has been established for the first time that the territory of the park is inhabited by 17 species of bats, which ecology has not been explored by anybody, of which 6 species are included in Red Data Book (2013) of the republic as a rare and vanishing species.

Keywords: bats, insects, horseshoe, Shahdag, mouse-eared bat, long-eared bat, noctule bat

I. INTRODUCTION

Bats or Chiroptera are one of the most insufficiently explored groups of placental mammals not only in our republic but also in the world. There are works with data of more than half a century ago (Kuzyakin, 1950; and several works (Rahmatulina 1971;1989) dedicated to ecology, fauna and zoogeography of the bats. However, there are a few special works, which would be dedicated to the study of Chiroptera in natural conditions in a separate reserve or national park (Nikulin, Chistyakov, 2010).

Bats in the Shahdag National park are found almost everywhere: on the slopes of ridges, up to the upper limit of the forest, in river valleys, settlements. The aim of this work is to study the biological peculiarities and spread of bats living in the explored areas. The obtained data, in our opinion, supplement the information on peculiarities of spread and trophic biology of Chiroptera in the territory of the Shahdag National park located in the highlands of the north-eastern and partly of the north-western part of Azerbaijan.

II. MATERIALS AND METHODS

Observations and collection of material held in the Shahdag National park in 2012-2016. The research covered the previously permanent stations, where it was expected to meet the bats. The main places of observation were different settlements, abandoned buildings, roofs and attics, forest areas, surroundings of water bodies, agroecososis located at several points. Chiropteralead nocturnal and crepuscular life, so the researches were carried out at night, or more precisely, when dusk fell and until about midnight. For capturing of Chiroptera in the previously marked areas were established spider webs of 6 metres in length and 2.5 metres in breadth. Usually from 4 to 6 webs were used simultaneously. The next morning during examination of spider webs occasionally were found dead Chiroptera, apparently it is the result of stress suffered by bats during capturing. They underwent morphometric analysis, then fixed in 5% neutral formalin for further laboratory researches. Captured live specimens first underwent morphological analysis, the weights of several specimens were measured, and then placed in
cloth bags, where contained up to 5-8 hours (for the collection of feces) and then released into the wild in the place of capturing. Furthermore, to study the feeding were used mobile traps by (Borisenko, 1999), which, unlike the spider webs, allow to capture specimens directly in their hunting areas, which is important in the study of feeding of bats. The study of ration composition was occurred on the basis of analysis of insects in excrements by (Shiel et al., 1997). During reasearchs we caught 37 bats, among which were identified 17 species. More than 340 fragments of arthropods of their food residues were analysed.

III. RESULTS AND DISCUSSION

Fauna and ecological and biological peculiarities of bats (Chiroptera) are studied in the Khanty-Mansi Autonomous Okrug of Russia in Belgorod and Leningrad regions of Russia (Nikulin, 2008, 2009; Nikulin, Chistyakov, 2010), in Turkmenia (Strelkov, 1978), in Azerbaijan (Rahmatulina, 2005), in the north-west of Russia and in the south-west of the Pskov oblast (Chistyakov 2000, 2001).

All bats of the Shahdag National park are insectivorous and nomadic animals, that is, spend the winter in areas with warmer climates of living environment. Most of Chiroptera feed on flying insects, some species, while hunting, skilfully running along the ground. They can collect prey from grass, leaves and branches of trees, flying over the meadows or in the forest. A long-eared bat quite often eats flightless insects, their larvae and spiders, although in the ration of a long-eared bat are dominated nocturnal butterflies.

Most bats prefer to hunt over the surface of the water of static or slowly flowing water bodies, flying not far away from their daytime shelters, so we chose points on the banks of a river or lake, overgrown with deciduous trees. Many species of Chiroptera are needed protection because are at the vanishing point, and in pursuance of peculiarities of the way of living, they are particularly vulnerable.

In the Shahdag National park there are Chiroptera of the genus (Rhinolophus), family (Rhinolophidae) species—the lesser horseshoe bat (Rhinolophus hipposideros Bechstein, 1800). It should be recognised that this species are not particularly widespread, it can be found locally in Shamakhi and partly Ismaili rayons in the landscapes of foothill and mountain forests. This species is very flexible, for several decades it disappeared in Belgium, the Netherlands and northern Germany (with the exception of Bavaria, Thuringia and Saxony), in a large part of Poland, in Switzerland and Austria is remained fragmentary, in Spain most of the colonies have disappeared in connection with the construction of new houses, in the north of France the number is significantly reduced. It is no coincidence that in recent years the number of the less horseshoe bat is reduced not only in our country but also in the world, therefore, as a rare and vanishing species is included in Red Book of some countries, including in Azerbaijan. According to Rahmatulina (1971, 1995, 2005), the greater horseshoe bat Rhinolophus ferrumequinum Schreber, 1774, is very small in number. On the territory of the Shahdag National park, it is confined to the foothills and low mountains, as well as to the plains, where there is suitable shelters for little animals: karst caves, crevices, erosion scars in the river cliffs, natural and artificial catacombs, appropriate human buildings. In the mountains on the territory of Oguz rayon this species is found up to 3200 m above sea level and is considered the most large representative of the horseshoe bats in Europe.

Geoffroy's bat Myotis emarginatus Geoffroy, 1806 in Shahdag National park is mainly distributed in the high mountains in the border area with Russia, especially with Dagestan. This is a small bat, whose weight is usually 5-10 g, body length is 46-54 mm, forearm length is 39-45 mm, wing-spread is about 22-29 cm. Due to difficult access and small number, the biology, spread, and other morphological
and biological characteristics of Geoffroy's bat are explored extremely insufficiently. They feed on various insects, located both in the air and on the leaves of plants, doing this very quickly.

The lesser mouse-eared bat – *Myotis blythii* Tomes, 1857 – is a small bat of Myotis genus, as a species is named after English zoologist and pharmacist, founder of the zoological school in India Edward Blyth. This species can be found in the north-western part of the park, that is only in Ismailli and rarely in Gabala rayons in arid and forest landscapes. The lesser mouse-eared bat is a migrant little animal, because they live in the park in the spring and summer and autumn seasons. They are common in the plains and in the high mountains, and even reach 2,300-2,500 metres above sea level. According to some authors (Rahmatulina, 2005), the small number in the Greater Caucasus is related to the lack of underground structures (caves, tunnels, basements, qanats – an ancient water plumbing etc.), which are a favorite shelter of this species.

The barbastelle or western barbastelle– *Barbastella barbastellus* Schreber, 1774 is a species of bats of the genus Barbastella. Its distribution area is not so wide in the republic, mainly located in the lower part of Gobustan, Ismailli and Shamakhi. A small part of distribution area of this species falls into the territory of the Shahdag National park. They are small in number, and are found in the habitats of the small horseshoe bat in various areas – from arid to temperate, and prefer broad-leaved forests. In the Shahdag National park they are found up to 2000 m above sea level, inhabit with different beetles, small butterflies, mosquitoes. They are distributed everywhere, usually in the winter they can be found in Shamakhi and Gabala rayons, and in the autumn months descend into the Samur-Davachi lowland.

Blasius’s horseshoe bat – *Rhinolophus blasii* Peters1866, the distribution area is not particularly wide in the researched parks, are found on the southern slopes of the Greater Caucasus in the surroundings of the city of Shamakhi. For this species is characterised the fact that they lead an underground life, small in number, prefer to settle at altitudes from 800 to 1,500 m, are confined to mountain forests zones.

Bechstein’s bat or long-eared bat – *Myotis bechsteinii* Kuhl, 1817 is distributed mainly in the European parts of the National park on the southern slope of the Greater Caucasus. This species occurs on the territory of Gabala rayon, part of which is part of the Shahdag National park, around the settlements, on the roofs of the old abandoned houses. Late at night they fly out to feed, and feed in the gardens and forests near the shelters. Due to the fact that the Bechstein’s bat is small in number, not only in explored parks, but also in general in the republic, it was included in Red Book as rare and vanishing species.

Natterer’s bat– *Myotis nattereri* Kuhl1817 is one of the few innumber species in the Shahdag National park. Few specimens were found in the European part of territory of the park, more precisely in the village of Khazra of Gabala rayon in the summer and autumn. Bioecological characteristics of Natterer’s bat are explored insufficiently.

The whiskered bat – *Myotis mystacinus* Kuhl, 1817. This species is the smallest among the Myotis, which are found in the territory of Azerbaijan. The Shahdag National park are found everywhere, up to 2,000-2,500 metres above sea level. They inhabit all landscapes, the least common in the mountain meadows. Shelters are very diverse, they can be found in the roots of trees and under rocks, in crevices of rocks, cliffs and buildings, under slate and tile of the schools and other buildings.

The brown long-eared bat *Plecotus autitus* Linnaeus, 1758 is distributed throughout the Shahdag National park, but mostly in mountain areas up to 2,200 metres above sea level. It is found in all seasons in the forest and arid landscapes. Unlike the brown long-eared bat the grey long-eared bat – *Plecotus*
**austriacus Fischer** 1829, is distributed mosaically in the park. This species first found in 1981 in the northern part of the republic on the territory of Qusar rayon, near the village of Anigh, at an altitude of 1,100 m. (Rahmatulina, 2005). Brown and grey long-eared batwere studied in detail in the past, during the Soviet Union period, by Strelkov (1988).

The common noctule—*Nyctalus noctula Schreber*, 1775, the largest species of bat, is distributed in the forest landscapes where there are settlements. In the Shahdag National park this species is a few in number and not found everywhere and in different seasons of the year. Our observations reveal that the common noctule spend the winter in the lowlands, and in the summer and autumn flies to the mid-mountain landscapes of the Greater Caucasus. This fact testifies to their seasonal movements. From the genus *Nyctalus*, the lesser noctule—*Nyctalus leisleri Kuhl* 1817 is known as the only discovery, was found in 1939 by Kuzyakin (1950) in the Qusar rayon, which is currently part of the territory of the Shahdag National park. Both species are rare and, compared to other bats, are of few in number.

The common pipistrelle—*Pipistrellus pipistrellus Schreber* 1775. This species is one of the widely distributed and numerous Chiroptera not only in the territory of the National park, but also in the whole republic. They are found year-round almost in all landscapes and agrocnoses of altitudinal belts of the park up to 2,000-2,500 metres above sea level. The main cluster falls on the plains and mountain forest cenos or anthropogenic landscapes. They form summer and winterclusters. The common pipistrelle initiallypreys around of its shelter, and then within the settlements, especially around electric lights and over the water bodies. They also prey in forest meadows, river valleys, gardens, over the fields and plantations. They feed on small beetles, mosquitoes and other insects and thus play an important role in the destruction of the blood-sucking parasites and vegetable-feeder pests in the territory of the National park.

Nathusius’s pipistrelle—*Pipistrellus nathusii Keyserling et Blasius*, 1839. This species is found in the territory of the Shahdag National park in mountainous landscapes ranging from 300 to 1,200 metres above sea level. In the winter season descend into the plains, in the spring, summer and autumn prefer forest landscapes, so Nathusius’s pipistrellis belongs to migrant species of Chiroptera. To the genus pipistrelle (*Pipistrellus*) also belongs—Kulh’s pipistrelle—*Pipistrellus kuhlii Kuhi* 1817. Unlike Nathusius’s pipistrelle, Kulh’s pipistrellisia a settled species among bats, is found in all seasons of the year and its distribution are reach up to 1,800-2,000 metres above sea level. Kulh’s pipistrelle is a synanthrope, and based on that prefers anthropogenic landscapes. In the Shahdag National park they are clustered in the European part, especially in the foothills of Ismailli and Oguz rayons. Analysis of feces and the contents of the gastrointestinal tract of the birds, which were found dead, reveal that pipistrelle feeds on various insects, especially beetles, spiders, ants etc.

The serotine bat—*Eptesicus serotinus Schreber*, 1774. In the territory of the Shahdag National park is found everywhere, up to 2,000 metres above sea level and is synanthropic species, so all the serotine bats settle in the attics, on the roofs of abandoned buildings. They are distributed across the all landscapes of altitudinal belt of the region, but the peak of their population density corresponds to 1,200-1,800 metres above sea level. In comparison to other bats the serotine bat flies out to feed early, an hour after sunset. In the high-mountains the serotine bat begins to feed at low temperature in early spring, but due to lack of insects they quickly return.

Thus, researches of fauna and ecology of Chiroptera in the Shahdag National park reveals that they distributed irregularly, and their life cycle is clearly divided into summer and winter periods. It was found that the little animals are active only during the warm season, settle in various summer shelters—in attics, hollows, caves and tunnels. In the winter they hide in secluded places where the temperature...
never drops below zero: most often these are the same caves and tunnels. If there are not such shelters near the “summer apartments”, bats migrate to tens or even hundreds of kilometers – among them, as among the birds, there are real migrant species.

Alongside with the aforesaid, Chiroptera have a certain economic importance. They feed mainly on a variety of insects – pests of agriculture and, destroying a significant number of them, play an important protective role in the nature and agrocenosis.

IV. CONCLUSION

The highest mountain of Azerbaijan - Bazarduzu and southernmost point of Russia are situated in the Shahdagh national park – the height is 4466 metres above the sea level. It has been established for the first time that the territory of the park is inhabited by 17 species of bats, which ecology has not been explored by anybody, of which 6 species are included in Red Data Book (2013) of the Azerbaijan Republic as a rare and vanishing species.

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