



SPECIES COMPOSITION, BIOECOLOGICAL CHARACTERISTICS AND CONSERVATION PROBLEMS OF SMALL MAMMALS IN THE TERRITORY OF THE STATE NATURE CONSERVATION RESEARCH INSTITUTION OF THE "SURKHAN" STATE RESERVE (KO'HITANG MOUNTAIN RANGE)

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Abstract

This article presents the species composition, distribution, population dynamics, and conservation problems of small mammals — representatives of the orders Rodentia, Insectivora, Chiroptera, Lagomorpha, and Carnivora — inhabiting the territory of the State Nature Conservation Research Institution of the "Surkhan" State Reserve (Ko'hitang mountain range, Surkhondaryo region). Field research conducted during 2025, wildlife census data from 2023-2025, and the reserve's scientific reports from the past decade were analyzed. The study found that 26 mammal species have been recorded within the reserve's territory, of which 20



belong to the small-mammal group, including the order Chiroptera, represented by 5 species. The results of the 2023-2025 spring and autumn counts showed that the populations of *Nystix indica* Kerr, 1792, *Meles meles* Linnaeus, 1758, *Martes foina* Erxleben, 1777, and *Lepus tolai* Pallas, 1778 have remained stable or shown an increasing trend. The article concludes with scientific-practical recommendations on expanding the reserve's territory, strengthening veterinary-prophylactic measures, and introducing a temporary hunting moratorium.

Keywords: Ko'hitang, State Nature Conservation Research Institution of the "Surkhan" State Reserve, small mammals.

INTRODUCTION

Surkhondaryo region is one of the areas of the Republic of Uzbekistan with distinctive natural complexes, notable for the antiquity of its fauna: some animal species formed within this territory, while others arrived from neighboring areas. Distinctive animal species are distributed across the deserts and oases, and the mountain and tugai forests, of Surkhondaryo. In preserving biodiversity, it is important to study the rare animal and plant species found within Uzbekistan's territory and to carry out work toward restoring their populations.

Most of the existing data on the small-mammal species occurring within the territory of the State Nature Conservation Research Institution of the "Surkhan" State Reserve, and on the status of their populations, date back to the first half of the 20th century — a fact that provided the basis for undertaking the present study. A scientifically grounded study of the ecological characteristics of these species under natural conditions serves both to organize efforts toward their preservation and protection, and to clarify their place within the fauna of the Ko'hitang mountains.

The small mammals belonging to the class Mammalia (phylum Vertebrata) that occur within the reserve's territory mainly consist of representatives of the orders Rodentia, Insectivora, Chiroptera, Lagomorpha, and Carnivora. The reserve is located in the southwestern part of the Pamir-Alay mountain system, on the eastern



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slope of the Ko'hitang range, where numerous small-mammal species of these orders are distributed; however, their complete species composition, population status, and other bioecological characteristics have so far not been sufficiently studied.

Studying the bioecological characteristics of the representatives of this ecological group found within the reserve, determining the status of their populations and the causes behind the limitation of their range, addressing the problem of natural reproduction, and developing conservation measures are among today's pressing tasks.

Purpose and objectives of the study

The purpose of the study is to examine the bioecological characteristics of small mammals distributed within the territory of the State Nature Conservation Research Institution of the "Surkhan" State Reserve and its surrounding areas, to study the problems of their conservation, and to develop and put into practice recommendations for a system of conservation measures.

To achieve this purpose, the following tasks were carried out: the reserve's scientific reports for 2010-2024 and the wildlife censuses conducted during that period were analyzed; data collected on the occurrence, numbers, and ecological characteristics of rare animal species in the area were studied; and the results of the field observations carried out in 2025 were compared with, and analyzed against, existing long-term data.

RESEARCH MATERIALS AND METHODS

The field research made use of the following methods: collecting and analyzing anonymous survey data from reserve staff and from residents of the villages surrounding the reserve — Xatak, Xo'janqo, Kampirtepa, Shalqon, Sherjon, Qizilolma, and Vandob — and analyzing wildlife census data collected at the State Nature Conservation Research Institution of the "Surkhan" State Reserve (the census was carried out using a count-based method along 9 predetermined routes



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and reference points). The long-term wildlife census data were subjected to statistical analysis.

Scientifically accepted research methods were employed: direct field observation using binoculars and a spotting scope; counting animals along linear routes and from reference points; studying the plants consumed by the animals; studying signs of life activity (tracks, burrows, droppings, etc.); analyzing camera-trap imagery; and processing statistical data. Long-distance observation and photography were carried out using an AG-60 spotting scope and Nikon binoculars, as well as camera traps. Relevant scientific literature on the subject was reviewed and analyzed.

The research work began at the administrative building of the State Nature Conservation Research Institution of the "Surkhan" State Reserve and was carried out along 7 predetermined routes: scientific observations were conducted while camping in the mountains along the designated routes for 3-4 days at a time, with such expeditions organized 2-3 times per month. A Niva 4x4 vehicle was used to reach the survey areas; observation work was equipped with a camera, camera traps, binoculars, a tent, a sleeping bag, a GPS device, a night-vision device, and a spotting scope.

RESEARCH RESULTS

General information

Mammalia is the most highly developed class of vertebrates; its principal distinguishing features are live birth, the nursing of young with milk, a highly developed nervous system and sensory organs, and a constant body temperature maintained through a thermoregulatory system. These characteristics have allowed mammals to become widely distributed across the globe and to adapt to diverse ecological conditions. Today there are more than 4,500 mammal species in 26 orders worldwide, of which 105 species occur within the territory of Uzbekistan. Taxonomic study and monitoring of vertebrates within the reserve's territory has mainly focused on large vertebrates, while small mammals — particularly representatives of the order Chiroptera — have so far remained almost entirely unstudied. At the same time, it has been noted that among the animal species



included in the reserve's species list, the share of Mammalia representatives is considerably higher than that of other classes. The present study focused mainly on representatives of the orders Chiroptera, Insectivora, Rodentia, and Carnivora.

Species composition

A total of 26 mammal species have been recorded within the territory of the State Nature Conservation Research Institution of the "Surkhan" State Reserve, of which 20 species belong to the small-mammal group (Table 1).

No.	Species name	Order
1	Plecotus auritus	Insectivora
2	Hemiechinus auritus (Gmelin, 1770)	Chiroptera
3	Myotis blythii (Tomes, 1857)	Chiroptera
4	Rhinolophus ferrumequinum (Schreber, 1774)	Chiroptera
5	Plecotus auritus (Linnaeus, 1758)	Chiroptera
6	Pipistrellus pipistrellus (Schreber, 1774)	Chiroptera
7	Lepus tolai Pallas, 1778	Lagomorpha
8	Felis lybica Forster, 1780	Carnivora
9	Nystix indica Kerr, 1792	Artiodactyla*
10	Meles meles (Linnaeus, 1758)	Carnivora
11	Martes foina Erxleben, 1777	Carnivora
12	Dryomys nitedula (Pallas, 1778)	Rodentia
13	Marbled polecat, Vormela peregusna (Gueldenstaedt, 1770)	Carnivora
14	Allactaga elater (Lichtenstein, 1825)	Rodentia
15	Rattus turkestanicus (Satunin, 1903)	Rodentia
16	Ellobius tancrei Blasius, 1884	Rodentia
17	Microtus juldaschi (Severtsov, 1879)	Rodentia
18	Mus musculus (Linnaeus, 1758)	Rodentia
19	Sylvaemus uralensis (Apodemus sylvaticus), Pallas, 1811	Rodentia
20	Crocidura suaveolens (Pallas, 1811)	Rodentia



* Although the goitered gazelle (jayra) taxonomically belongs to the order Artiodactyla (even-toed ungulates), owing to its body size and the reserve's established monitoring practice it is conventionally treated within this ecological group (small mammals).

The order Chiroptera is represented by 5 species, comprising roughly 19% of all mammal species recorded in the reserve. The species identified are: from the family Rhinolophidae, *Rhinolophus ferrumequinum* (Schreber, 1774); and from the family Vespertilionidae, *Myotis blythii* (Tomes, 1857), *Eptesicus serotinus* (Schreber, 1774), *Plecotus auritus* (Linnaeus, 1758), and *Pipistrellus pipistrellus* (Schreber, 1774). This list does not yet include any Chiroptera species listed in the Red Book of the Republic of Uzbekistan; identifying such species will require a deeper study of the order's species composition, distribution, and bioecological characteristics.

Population dynamics (2023-2025)

The results of the wildlife censuses conducted each spring and autumn in the reserve are presented in Table 2.

Year	Season	Goitered gazelle, head	Stone marten, head	Badger, head	Tolai hare, head
2023	Spring	72	24	36	102
2023	Autumn	85	20	42	116
2024	Spring	91	23	42	131
2024	Autumn	93	28	44	124
2025	Spring	81	25	43	119
2025	Autumn	94	30	47	131

Table 2 shows that during 2023-2025 the numbers of *Nystix indica* Kerr, 1792, *Martes foina* Erxleben, 1777, *Meles meles* (Linnaeus, 1758), and *Lepus tolai* Pallas, 1778 remained stable or showed an increasing trend. This primarily indicates that the conservation measures being carried out within the reserve's territory are yielding positive results.



2025 field observations

The main results of the field observations conducted in various sections of the reserve during 2025, together with the data collected for the "Natural Complex Monitoring Log," are summarized in Table 3.

Period (2025)	Section / area	Main results
28-30.01	Xatak section (Toshliyurt, Oltikunlik, Qo'ldaroz, Palangdara, Olmabuloqsoy, Soybog')	11 Chiroptera individuals were recorded flying out of the Ajinakamar shelter within 1 hour; tracks of <i>Lepus tolai</i> Pallas, 1778 and <i>Nystix indica</i> Kerr, 1792 were found in all ravines; 16 burrows of <i>Nystix indica</i> Kerr, 1792 / <i>Meles meles</i> (Linnaeus, 1758) were identified.
15.02	Xo'janqo section (Quruqqo'l, Qopdara, Qo'ldaroz, Qo'nishlisoy)	More than 15 Chiroptera individuals were recorded flying out of a shelter in Qopdara; about 30 <i>Nystix indica</i> Kerr, 1792 burrows; the beginning of the mating period of <i>Felis lybica</i> Forster, 1780 was observed; in the shelters there were many tracks of <i>Rattus turkestanicus</i> (Satunin, 1903), <i>Ellobius tancrei</i> Blasius, 1884, and other small rodents.
28-30.05	Xatak section and surrounding area (concurrent with the spring wildlife census)	15-20 Chiroptera per day; 21 <i>Lepus tolai</i> Pallas, 4 <i>Meles meles</i> (Linnaeus, 1758), 3 <i>Martes foina</i> Erxleben, 1777, and 15 <i>Nystix indica</i> Kerr, 1792 were recorded; a <i>Nystix indica</i> Kerr, 1792 lying in front of its burrow during the day was video-recorded.
24-26.06	Sherjon section	12 Chiroptera (3 distinct types) within 1 hour; 9 <i>Martes foina</i> Erxleben, 1777, 1 <i>Meles meles</i> (Linnaeus, 1758), 2 <i>Nystix indica</i> Kerr, 1792; about 20 burrows; <i>Felis lybica</i> Forster, 1780 was the most frequently recorded predator on camera traps.
09-11.07	Qizilolma and Shalqon sections	6 camera traps were installed in the upper part of the mountain; 20 adult <i>Ovis vignei</i> Blyth, 1841 ssp. rams were encountered; 12-20 Chiroptera per day (2-3 types); 15 <i>Lepus tolai</i> Pallas, 1778, 3 <i>Meles meles</i> (Linnaeus, 1758), 6 <i>Nystix indica</i> Kerr, 1792; the daytime sun-basking behavior of <i>Nystix indica</i> Kerr, 1792 (observed about twice a year) was recorded; camera traps also captured <i>Felis lybica</i> Forster, 1780, <i>Martes foina</i> Erxleben, 1777, <i>Sarga falconeri</i> Wagner, 1839, <i>Ovis vignei</i> Blyth, 1841 ssp., <i>Sus scrofa</i> Linnaeus, 1758, <i>Canis lupus</i> (Linnaeus, 1758), and small Aves.



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Period (2025)	Section / area	Main results
21-22.07	Kampirtepa section	5 camera traps were installed near steep rocky canyons and springs; the area was found to be a summer habitat for <i>Gypaetus barbatus</i> , <i>Gyps fulvus</i> Hablizl, and <i>Aegypius monachus</i> ; 15-20 Chiroptera per day; 6 <i>Lepus tolai</i> Pallas, 1778, 2 <i>Meles meles</i> (Linnaeus, 1758) (tracks), 6 <i>Nystix indica</i> Kerr, 1792 (tracks); 16 burrows; video footage captured a <i>Gypaetus barbatus</i> carrying <i>Sarga falconeri</i> Wagner, 1839 bones to the spring.
09-11.09	Vandob section (Jiydabuloqsoy, Olmabuloqsoy, Korxona, Darayg'ulsoy)	About 50 Chiroptera individuals were observed flying; tracks of <i>Lepus tolai</i> Pallas, 1778, <i>Meles meles</i> (Linnaeus, 1758), <i>Martes foina</i> Erxleben, 1777, and <i>Nystix indica</i> Kerr, 1792 in all ravines; about 15 <i>Nystix indica</i> Kerr, 1792 burrows.
18-20.11	Xatak section and surrounding area (concurrent with the autumn wildlife census)	15-20 Chiroptera per day; 24 <i>Lepus tolai</i> Pallas, 1778, 4 <i>Meles meles</i> (Linnaeus, 1758), 3 <i>Martes foina</i> Erxleben, 1777, 12 <i>Nystix indica</i> Kerr, 1792 recorded.

In January 2025, no tracks of *Meles meles* (Linnaeus, 1758) were encountered anywhere within the reserve's territory, nor were any captured on camera traps; this pattern has been observed for several years, giving grounds to assume that *Meles meles* (Linnaeus, 1758) enters a period of winter dormancy during a certain part of the winter.

During the 2025 observations, in addition to *Nystix indica* Kerr, 1792, *Martes foina* Erxleben, 1777, *Sarga falconeri* Wagner, 1839, *Ovis vignei* Blyth, 1841 ssp., *Sus scrofa* Linnaeus, 1758, *Canis lupus* (Linnaeus, 1758), and other large animals, camera traps also captured thousands of images of small Aves, which testifies to the stabilization of populations within the reserve's territory.

Bioecological characteristics of individual species

Plecotus auritus (Linnaeus, 1758). Body length 2.8-40 cm; a mammal adapted for flight, with forelimbs transformed into wings and an elastic skin membrane between the fingers, shoulders, sides of the body, and hind legs forming a



continuous wing. The total number of teeth ranges from 20 to 38. They are mainly nocturnal animals that navigate and locate their prey (flying insects) by echolocation (emitting ultrasonic waves and receiving the reflected signal). During the day they rest hanging head-down in caves, rock shelters, tree hollows, and building attics and crevices. Females usually give birth to one, occasionally two, young per year; cases of survival up to 15-17 years in captivity have been recorded. The order is divided into two suborders — Megachiroptera (1 family) and Microchiroptera (16 families); in Uzbekistan, the families Rhinolophidae (4 species) and Vespertilionidae (16 species) have been recorded, of which 4 species are included in the Red Book of the Republic of Uzbekistan.

(Nystix indica Kerr, 1792). Body length 70-90 cm, weight 15 kg. Referred to in this article by the name "Nystix indica Kerr, 1792," this is a small mammal covered with thick, needle-like quills — 7-8 mm in diameter and 30-50 cm long, in white, black, and brown shades; being hollow inside, the quills do not weigh the animal down and help prevent it from sinking in water, and the body may carry up to 30,000 quills. The forefeet have 4 toes and the hind feet 5 toes each. The total number of teeth is 20. It breeds 1-2 times a year, producing 2-4 young, which it nurses with milk for 3 months. It lives up to 10 years in the wild and up to 20 years in captivity. It digs a multi-chambered burrow up to 10 m long and up to 4 m deep; it does not hibernate but spends much of the winter within its burrow. When danger arises, it suddenly halts as soon as a predator draws near, so that its quills pierce the attacker (the popular belief that it can "shoot" its quills has no scientific basis).

Martes foina Erxleben, 1777. A relatively small predator with an elongated, sturdy body, short legs bearing sharp claws, a large round head, and short ears. Body length exceeds 50 cm; coloration is brownish, with a pale patch on the chest. A typical inhabitant of mountainous terrain, living in rocky gorges, deciduous forests, and juniper stands, and among cliffs and boulder piles. Mainly nocturnal, it feeds on rodents, birds, and large insects, as well as fruits and berries. In March-April it builds a nest in a tree hollow or rock crevice and produces 1-8 (usually 3-5) young; the young begin hunting independently at 2.5-3 months of age, and the male does not take part in raising them. The population living around the reserve



formerly hunted the stone marten actively for its fur; today the principal threat to the species is not human impact but snakebite.

Felis lybica Forster, 1780. Resembles the domestic cat but is larger and more consistent in coloration. Body length (excluding tail) 50-60 cm, tail 28-35 cm; the body is yellowish-brown with dark spots on the back, and the tail bears 6-8 rings. Distributed across Africa, Central and Middle Asia, Transcaucasia, and Southeastern Europe; some populations were domesticated roughly 10,000 years ago and are considered the ancestor of the domestic cat. In Uzbekistan it occurs in deserts, in reed beds along lakes, in foothills, and occasionally in mountains (up to 3,000 m). Mainly nocturnal, it feeds on rodents, birds, lizards, and large insects. It mates in February-March and gives birth to 2-5 (usually 3) kittens in April-May; the young remain with the mother for 5-6 months. It is among the predators most frequently recorded on camera traps within the reserve's territory.

Rattus turkestanicus (Satunin, 1903). A typical inhabitant of the mountainous areas of Uzbekistan, Tajikistan, and Kyrgyzstan; although it resembles the widespread grey rat, it is distinguished by its smaller body and white belly. It occurs in deciduous forests, mountain-river valleys, rock piles, orchards, and settlements; in areas with clay soil it digs a long, branched burrow up to 7-10 m. It is nocturnal and does not hibernate; the female breeds 3-4 times a year, producing up to 12 young each time. It feeds on fruits, nuts, plant seeds, and other food, storing up to 7-14 kg of provisions in its burrow for winter. Near settlements it can cause considerable damage to agricultural crops and residential property.

Lepus tolai Pallas, 1778. Has large ears and sandy brownish fur that does not change color during the winter molt; weight does not exceed 1.5-2.5 kg. Distributed across Central Asia, Kazakhstan, Southern Siberia, Mongolia, China, Northwestern India, Afghanistan, Iran, and Northeastern Africa. In Uzbekistan it lives in deserts, tugai thickets, foothills, and mountains. It feeds on grasses and shrubs, and in winter on wormwood and the bark of trees and shrubs; it typically forages at night and rests during the day in a hollow beneath a stone or shrub. It breeds 2-3 times a year (from March to September); the first litter numbers 1-2 young, and subsequent litters 3-5; the young are born with open eyes and a full



coat of fur. Within the reserve's territory, its principal enemies are the lynx, wolf, fox, snakes, and birds of prey.

DISCUSSION

The data collected show that the mammals inhabiting the Ko'hitang mountains are interconnected through the food chain, such that a change in the bioecological status of any one species affects the others as well; within this process, small mammals hold particular significance. The mild winter and early spring of 2025 did not bring about negative changes in the lives of small-mammal populations, and the overall condition of these populations is assessed as satisfactory. Clear evidence of this is provided by the thousands of camera-trap images of *Meles meles* (Linnaeus, 1758), *Nystix indica* Kerr, 1792, *Lepus tolai* Pallas, 1778, *Martes foina* Erxleben, 1777, *Felis lybica* Forster, 1780, small rodents, and bats, as well as by the tracks of rats and mice and the droppings found in caves.

At the same time, a number of factors are threatening the stability of small-mammal populations. First, the growing number of predators is placing pressure on the numbers of species that serve as prey. Second, the Ko'lvat, Zarvus, Panjob, Sayrob (Boysun range), Gurdara, Daroyig'o'l, Davlon, and Darabuloq massifs, together with the northern areas of the Tangidevolsoy river — located outside the reserve and constituting the main range of small mammals — have not been incorporated into the reserve; although some of these areas hold protected-zone status, the actual level of protection remains insufficient. Third, the absence of adequate veterinary-prophylactic measures for livestock poses an epizootological risk. Fourth, the growing number of licensed hunters, together with the regular violation of hunting regulations, constitutes an additional source of pressure. Fifth, as animal numbers increase, their movement beyond the reserve's boundaries into nearby settlements heightens the risk of poaching and dog attacks.



CONCLUSION AND SCIENTIFIC-PRACTICAL RECOMMENDATIONS

Based on the research conducted, the following conclusions were reached:

1. A total of 26 mammal species have been recorded within the territory of the State Nature Conservation Research Institution of the "Surkhan" State Reserve, of which 20 species belong to the small-mammal group, including the order Chiroptera (bats), represented by 5 species.
2. According to the results of the 2023-2025 spring and autumn counts, the populations of the goitered gazelle (*Nystix indica* Kerr, 1792), stone marten (*Martes foina* Erxleben, 1777), badger (*Meles meles* (Linnaeus, 1758)), and Tolai hare (*Lepus tolai* Pallas, 1778) show stable or increasing trends, which testifies to the effectiveness of the conservation work being carried out in the reserve.
3. The species composition, population status, and distribution areas of the order Chiroptera have not yet been sufficiently studied, and further research in this area is needed; such research may, in turn, provide grounds for including rare bat species in the reserve's official fauna list.

Based on the conclusions above, the following scientific-practical recommendations are proposed:

- expand the reserve's core territory to include the Ko'lvat, Zarvus, Panjob, Sayrob (Boysun range), Gurdara, Daroyig'o'l, Davlon, and Darabuloq massifs, together with the northern areas of the Tangidevolsoy river;
- study the low mountains south of the Kelif-Sherobod plain and, where warranted, consider the possibility of establishing an additional protected natural area in this territory;
- in order to reduce anthropogenic impact and epizootological risk on small mammals, strengthen veterinary-prophylactic measures in the livestock-grazing areas around the reserve;
- introduce a 3-4 year hunting moratorium for the purpose of wildlife conservation, and establish a procedure requiring hunters to surrender and store their firearms with the internal affairs authorities during the breeding season (when hunting is not permitted);



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- conduct an environmental impact assessment regarding fire safety for the military installations located in the area (surveillance cameras, solar panels), and strengthen liability measures against persons responsible for causing fires;
 - expand environmental education work among the population living around the reserve, and strengthen awareness efforts aimed at preventing poaching;
 - organize dedicated, in-depth research on the order Chiroptera.

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