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RESEARCH ARTICLE

Bats of the Katon-Karagay National Natural Park (Kazakhstan Altai) and the first data of their altitudinal distribution and diet

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Abstract

Bat fauna surveys were conducted in the Katon-Karagay District of East Kazakhstan. The presence of six species was confirmed within Katon-Karagay National Park: *Myotis petax*, *Myotis sibiricus*, *Myotis ikonnikovi*, *Eptesicus* (*Cnephaeus*) *nilssonii*, *Vespertilio murinus*, and *Plecotus ognevi*. We also recorded *Murina hilgendorfi*, which had previously been reported in Kazakhstan only once in the Western Altai. In addition, the article reports the discovery of a notable specimen of the genus *Murina* found 28 km from the Chinese border. For three species (*Plecotus ognevi*, *Murina hilgendorfi*, and *Myotis petax*), evidence of reproduction was recorded in the study area. The most common species, found in almost all surveyed biotopes and observed at higher elevations above sea level, was *Plecotus ognevi*. Dietary analysis revealed that the overall trophic spectrum of the seven bat species studied encompassed members of the order Araneae (class Arachnida) and eight orders of the class Insecta (Ephemeroptera, Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera, Trichoptera, and Hemiptera). In most bats, representatives of the Lepidoptera order served as the main prey, whilst representatives of the order Diptera, even if they had a predominant abundance in the biotope, composed a minor proportion of the bat diet.

Keywords
Altai, bats, Chiroptera, diet, distribution, *Eptesicus*, Katon-Karagay National Park, Kazakhstan, *Myotis*, *Murina*, *Plecotus*, *Vespertilio*

Introduction

Bats (Chiroptera) represent a unique group of mammals that play an important role in terrestrial ecosystems as regulators of insect populations, including agricultural and forestry pests (Lissovsky et al. 2025). The study of their fauna, distribution, and ecological characteristics has not only fundamental zoological, but also applied environmental significance.

Information about the bat fauna of the Kazakhstan Altai began to be recorded in 1899, and in the 1980s it was systematised in a number of works (Strelkov and Shaymardanov 1983; Strelkov 1983; Mammals of Kazakhstan 1985). They included not only information on species composition, but also the first data on diet (Mammals of Kazakhstan 1985) and the distribution patterns of bats (Strelkov 1983). These works summarised the accumulated knowledge of that period, including the results of field research, museum collections, and literature data. In subsequent years, the faunal data were supplemented by new records (Zinchenko 1999, 2007; Belyalov 2014).

Eleven species have been registered in the Kazakhstan Altai: pond bat *Myotis dasycneme* (Boie, 1825); eastern water bat *Myotis petax* Hollister, 1912; Siberian whiskered myotis *Myotis sibiricus* Kastshenko, 1905; Ikonnikov's bat *Myotis ikonnikovi* Ognev, 1912; David's myotis *Myotis davidii* Peters, 1869; Ognev's long-eared bat *Plecotus ognevi* Kishida, 1927; common noctule *Nyctalus noctula* (Schreber, 1774); northern bat *Eptesicus* (*Cnephaeus*) *nilssonii* (Keyserling and Blasius, 1839); serotine bat *Eptesicus* (*Cnephaeus*) *serotinus* Schreber, 1774; parti-coloured bat *Vespertilio murinus* Linnaeus, 1758; and Hilgendorf's tube-nosed bat *Murina hilgendorfi* Peters, 1880. It should be noted that, due to the development of molecular genetics methods, the taxonomic status of many species has recently been revised (Benda and Tsytsulina 2000; Matveev et al. 2005; Spitzenberger et al. 2006; Kruskop et al. 2012; Cláudio et al. 2023), therefore, in earlier works the aforementioned species appeared under different names.

In general, the bat fauna can be characterised as boreal, with the infiltration of several species from dry steppe zones and deserts (Strelkov 1983). Some of the above-mentioned species are found in the Altai only in the low-altitude zone (pond bat, serotine bat), or no higher than the mid-altitude zone (Hilgendorf's tube-nosed bat), whilst most are found at different elevations, including highlands (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985; Zinchenko 1999, 2007; Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024, 2025; Baeva et al. 2025; Gribkov et al. 2025; Viskontene et al. 2025).

In 2001, the Katon-Karagay National Natural Park, with an area of 643,477 ha, was established in the south-western part of the Kazakhstan Altai, on the Sarymsakty, Altai Tarbagatai, and Southern Altai ridges, and on the southern macroslopes of the Listvyaga and Katunsky ridges, encompassing a number of intermountain basins. All types of mountainous terrain are present within its territory: high-altitude (more than 2,000 m a.s.l.), mid-altitude (1,000-2,000 m a.s.l.), and low-altitude (up to 1,000 m a.s.l.) (Gabdullina et al. 2022). No special studies of bat fauna had been conducted in the national park, and the bat species living within were listed based on literature data: *Myotis petax*, *Myotis sibiricus*, *Myotis ikonnikovi*, *Plecotus ognevi*, *Nyctalus noctula*, *Eptesicus* (*Cnephaeus*) *nilssonii*, and *Vespertilio murinus* (Prokopov 2006).

It is well established that all bats of temperate latitudes are insectivorous, however, in order to avoid direct competition for food resources, various species occupy different trophic niches, differing in hunting behaviour, prey preferences, foraging activity timing, and use of different hunting sites (Smirnov and Vekhnik 2014).

The distribution of potential bat prey in mountain ecosystems is naturally determined by vertical zonation, which acts as one of the key ecological filters structuring both invertebrate communities and trophic relationships at the level of higher-order consumers. In the low-altitude zone, characterised by a relatively stable temperature regime and a long growing season, diverse and numerous insect communities are formed, in which thermophilic taxa play a dominant role (Lepidoptera, Coleoptera, Diptera, and Hymenoptera) (Hodkinson 2005). With increasing elevation into the mid-altitude zone, a restructuring of zoocenoses is observed: species richness decreases, the proportion of cold-resistant and short-cycle forms increases, and the seasonal dynamics of adult emergence changes. In the highlands, where temperature conditions become a limiting factor and the period suitable for active life is sharply curtailed, invertebrate communities are characterised by low abundance, a high proportion of specialised and endemic species, as well as strict adherence of life cycles to short-term periods of warming and food resources availability (Körner 2007).

The purpose of the present work is to analyse the distribution of bats across the Katon-Karagay National Natural Park, including their dietary specialisations and foraging activity timing.

Materials and methods

The study was conducted in the Katon-Karagay District of the East Kazakhstan Region. Bats were captured from 8 to 26 July 2025 across various biotopes, spanning an elevational range from 730 to 2,060 m a.s.l. (Fig. 1). Geographic coordinates of the capture sites were recorded using a Garmin GPS receiver, whilst elevations and distances were determined according to Google Earth. The maps were created using ArcGIS PRO. Bats were captured during nocturnal hours using mist nets of vari-

ous sizes (17x3, 12x3, 8x3, 5x2, and 3x2 m), deployed across suspected flight paths (Mitchell-Jones and McLeish 2004), as well as via a mobile trap (Borisenko 1999).

In parallel with the bat capture, imago insects were collected at the same sites using a light trap equipped with an ultraviolet lamp (Dubatolov 2012). The time of activity of bats and insects (UTC +5) were recorded.

Identification of bats was based on morphological traits according to the taxonomic keys (Mammals of Kazakhstan 1985; Nikulkin et al. 2018; Tiunov et al. 2021). The identification of some individuals was confirmed by analysis of the cytochrome c oxidase subunit I gene fragment (COI), the resulting DNA sequences were deposited in GenBank under the accession numbers: PZ533049, PZ533050, PZ533051, PZ534463, and PZ534464.

For the captured bats, forearm length was measured with calipers, sex was determined, and, where possible, age and reproductive status were recorded (Borisenko 2000). All specimens were weighed on a CAS RE-260 scale. Some were weighed for 1-5 hours after capture, whilst others were held in cotton bags in a cool, shaded place for 13-16 hours before weighing. For these specimens, the body condition index (BCI), as modified after Vasenkov and Potapov (2007), was calculated. The index was estimated as the ratio of the observed body mass (g) to the expected one, where the latter was calculated as the cube of forearm length (cm) multiplied by a species-specific regression coefficient:

$$\mathrm{BCI} = \frac{\text{observed body mass, g}}{\text{species–specific regression coefficient, g/cm}^3 \text{ x (forearm length, cm)}^3}.$$

For *Myotis petax*, the regression coefficient is 0.14; for *Plecotus ognevi* – 0.12; for *Eptesicus* (*Cnephaeus*) *nilssonii* – 0.15 (Vasenkov and Potapov 2007).

One specimen of *Myotis sibiricus* was collected in 96% alcohol and stored in the funds of the Department of Science, Environmental Monitoring and Information of the Katon-Karagay State National Natural Park (No. 1405). The remaining animals were banded and released into the wild. Bird rings with hand-smoothed edges (Masing 1996) and bat rings (Masing et al. 1999), also hand-smoothed, were used for banding. The morphological characteristics of captured bats and their ring numbers are presented in Suppl. material 1: Table S1.

To analyse the diet, droppings from the majority of captured bats were collected non-invasively in dry test tubes. Each excrement was soaked and softened in a Petri dish, then examined under a binocular microscope. Arthropod fragments were sorted using dissecting needles and identified to the lowest possible taxonomic level (order) following to Shiel et al. (1997), as well as by comparison with the insect collection obtained at the foraging sites of the captured bats (Suppl. material 2: Table S2).

To determine the importance of individual prey groups, their frequency rate (F, %) was recorded. It was calculated as a ratio of the number of samples in which a given category of prey was found to the total number of samples (Smirnov and Vekhnik 2014; Smirnov 2018). To assess prey selectivity, the abundance of the main insect taxa found at the foraging site (Fasulati 1971) was compared with the abundance rate of prey in droppings samples (Smirnov 2018). The abundance rate of prey (A, %) was calculated as the arithmetic mean of the abundance of a given prey in all samples examined (Smirnov and Vekhnik 2014).

Photographic observations from various years (2011-2026) provided by local residents and Katon-Karagay State National Natural Park staff were also used to investigate the distribution of bats in the study area (Fig. 1, Table 1).

To assess whether the sex ratio differed significantly from 1:1, we used Pearson's chi-squared (χ^2) goodness-of-fit test.

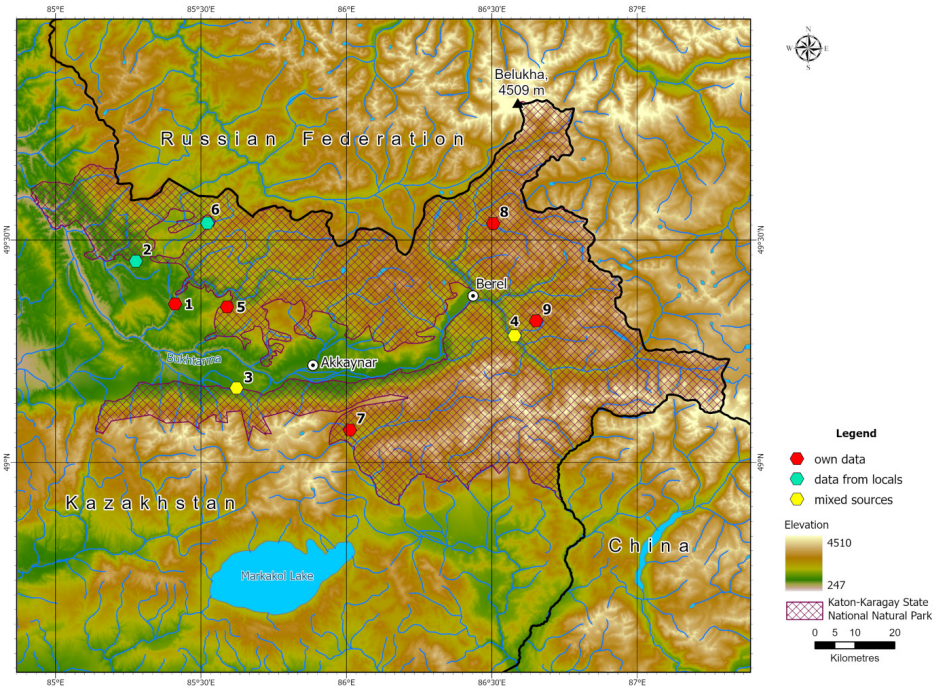

Figure 1. Research locations: **1** – Aksu (Beloye) Village (730 m a.s.l.); **2** – Zhazaba (Yazovaya) Village (820 m a.s.l.); **3** – Katon-Karagay Village (1,085 m a.s.l.); **4** – Arshaty (Archaty) Village (1,220 – 1,270 m a.s.l.); **5** – Bekalka (Fykalka) Village (1,280 m a.s.l.); **6** – Aksharbak (Verkh-Katun) Village (1,350 m a.s.l.); **7** – Verkhneye Zimoveye ranger station (1,710 m a.s.l.); **8** – Rakhmanovskie Klyuchi Village (1,810 m a.s.l.); **9** – Takhtayzhurt area (2,060 m a.s.l.).

Table 1. Photographic observations of bats, made by local residents and Katon-Karagay State National Natural Park staff (2011-2026)

No	Location of observe	Elevation (m a.s.l.)	Bat species	Sex	Observation date	Observer	Note
1	Zhazaba (Yazovaya) Village	820	*Eptesicus* (*Cnephaeus*) *nilssonii*	–	05.08.2025	Viktor Kachesov	The photographs depict two bat individuals, one alive and one dead
2	Katon-Karagay Village	1,085	*Eptesicus* (*Cnephaeus*) *nilssonii*	–	15.08.2011	Vladimir Vorobyov	Photograph of one live bat (Fig. 9)
3	Katon-Karagay Village	1,085	*Eptesicus* (*Cnephaeus*) *nilssonii*	–	21.08.2018	Kenzhibek Elubaev	One bat captured by a local resident
4	Katon-Karagay Village	1,085	*Vespertilio murinus*	–	24.08.2018	Bolat Baigunakov	One bat individual was found at a facility under construction
5	Arshaty (Archaty) Village	1,220	*Murina* sp.	–	16.06.2025	Zhomart Amanbaev	A single bat individual was found under a car in the yard of a private residence (Fig. 4)
6	Arshaty (Archaty) Village	1,220	*Plecotus ognevi*	♂	30.07.2025	Bolat Kubeshov	At night, one bat flew into the Arshaty forestry office
7	Arshaty (Archaty) Village	1,220	*Plecotus ognevi*	♀	29.08.2025	Aset Nuksiev	One bat captured by a domestic cat in a residential house
8	Arshaty (Archaty) Village	1,220	*Eptesicus* (*Cnephaeus*) *nilssonii*	–	23.02.2026	Zhomart Amanbaev	One dead specimen was found at the Arshaty forestry office
9	Aksharbak (Verkh-Katun) Village	1,350	*Plecotus ognevi*	–	27.07.2017	Myrzahan Kilibaev	Photograph of one live bat

Table 2. Bat diet in different biotopes

Location	Elevation (m a.s.l.)	Biotope	Bat species	Diet (A, % / F, %)	Environmental insects (A, %)
Aksu (Beloye) Village	730	The Belaya River floodplain. A semi-waterlogged meadow on the outskirts of the village, featuring riparian willow (*Salix* sp.) and birch (*Betula* sp.)	*Myotis petax*	Ephemeroptera (A, 70.6% / F, 100%) (Fig. 11 b, c); Hymenoptera (A, 22.6% / F, 55.7%); Diptera (A, 2.8% / F, 25.3%) (Fig. 11 f); Lepidoptera (A, 2.3% / F, 29.1%); Trichoptera (A, 1.5% / F, 21.5%); Coleoptera (A, 0.2% / F, 6.3%)	Diptera (94.1%), Lepidoptera (2.9%), Trichoptera (1.2%), Hemiptera (1.2%), Ephemeroptera (0.6%)
			Myotis sibiricus	Lepidoptera (A, 60.7% / F, 100%); Hymenoptera (A, 24.5% / F, 57.1%); Coleoptera (A, 11.3% / F, 85.7%) (Fig. 11 e); Diptera (A, 3.4% / F, 57.1%); Trichoptera (A, 0.1% / F, 14.3%)	On the night of 23-24 July, 2025 the mass emergence of Ephemeroptera was observed
			Vespertilio murinus	Lepidoptera (A, 83.5% / F, 100%); Ephemeroptera (A, 12.8% / F, 50.9%); Coleoptera (A, 1.2% / F, 20.75%) (Fig. 11 d); Hemiptera (A, 1.1% / F, 37.74%); Hymenoptera (A, 0.9% / F, 18.9%); Neuroptera (A, 0.5% / F, 11.3%); Diptera (A, 0.06% / F, 3.8%)	
Katon-Karagay Village	1,085	The Katonka River floodplain in the central part of the village. Apple orchards, poplars (*Populus* sp.), sparse birch (*Betula* sp.), and Siberian spruce (*Picea obovata*)	*Eptesicus* (*Cnephaeus*) *nilssonii*	Coleoptera (A, 41.3% / F, 82.3%); Lepidoptera (A, 28.2% / F, 94.1%); Hemiptera (A, 19.2% / F, 53%) (Fig. 11 n, p); Trichoptera (A, 9.5% / F, 53%); Diptera (A, 1.8% / F, 23.5%)	Lepidoptera (47.5%), Diptera (37.9%), Trichoptera (7.3%), Coleoptera (6.4%), Hemiptera (0.3%), Hymenoptera (0.3%), Neuroptera (0.3 %)

Location	Elevation (m a.s.l.)	Biotope	Bat species	Diet (A, % / F, %)	Environmental insects (A, %)
The vicinity of Arshaty (Archaty) Village	1,220	The Bukhtarma River floodplain. A riparian Siberian fir (*Abies sibirica*) forest with an admixture of birch (*Betula* sp.), Siberian cedar pine (*Pinus sibirica*), Siberian spruce (*Picea obovata*), and willow (*Salix* sp.) near the village	*Myotis petax*	Trichoptera (A, 94.6% / F, 100%) (Fig. 11 g, h, i); Lepidoptera (A, 3.1% / F, 32.2%); Hemiptera (A, 1.6% / F, 1.7%); Diptera (A, 0.25% / F, 6.8%); Coleoptera (A, 0.24% / F, 8.5%); Araneae (A, 0.24% / F, 1.7%) (Fig. 11 a); Ephemeroptera (A, 0.02% / F, 1.7%); Hymenoptera (A, 0.02% / F, 1.7%)	Diptera (59.1%), Trichoptera (27.2%), Lepidoptera (13.4%), Hymenoptera (0.3%) On the night of 16-17 July, 2025 the mass emergence of Trichoptera was observed
			Myotis ikonnikovi	Trichoptera (A, 99.5% / F, 100%); Lepidoptera (A, 0.5% / F, 60%)	
			Eptesicus (*Cnephaeus*) *nilssonii*	Trichoptera (A, 86.3% / F, 100%); Coleoptera (A, 8.8% / F, 100%); Hemiptera (A, 3.15% / F, 84.6%) (Fig. 11 o); Lepidoptera (A, 1.1% / F, 85%); Neuroptera (A, 0.5% / F, 30.8%) (Fig. 11 j); Diptera (A, 0.1% / F, 7.7%)	
	1,270	The upland on the right bank of the Bukhtarma River, above the village. The dry rocky slope of Mount Karatas with rock outcrops, steppe-like vegetation, and scattered Siberian cedar pines (*Pinus sibirica*). There is a Muslim cemetery nearby	*Plecotus ognevi*	Lepidoptera (A, 90.5% / F, 100%); Coleoptera (A, 9.5% / F, 50%)	Lepidoptera (74.6%), Diptera (16.3%), Trichoptera (8.6%), Coleoptera (0.5%)
The vicinity of Bekalka (Fykalka) Village	1,280	Siberian fir (*Abies sibirica*) tall-herb taiga forest, intersected by a small creek	*Myotis ikonnikovi*	Lepidoptera (A, 68.7% / F, 100%) (Fig. 11 l); Coleoptera (A, 21.6% / F, 87.5%); Neuroptera (A, 6.9% / F, 62.5%) (Fig. 11 k); Hymenoptera (A, 2.7% / F, 62.5%) (Fig. 11 q, r)	Lepidoptera (72.3%), Diptera (24.4%), Trichoptera (2.2%), Coleoptera (1.1%)
			Plecotus ognevi	Lepidoptera (A, 83.6% / F, 94.4%); Neuroptera (A, 15.8% / F, 16.7%); Hymenoptera (A, 0.6% / F, 5.6%)	
			Murina hilgendorfi	Lepidoptera (A, 79.7% / F, 100%) (Fig. 11 m); Coleoptera (A, 20.3% / F, 100%)	

Location	Elevation (m a.s.l.)	Biotope	Bat species	Diet (A, % / F, %)	Environmental insects (A, %)
Verkhneye Zimoveye ranger station in the Kara-Koba valley	1,710	The Kara-Kaba basin between the Altai Tarbagatai and Southern Altai ridges. A shrubby meadow steppe with *Dasiphora fruticosa*. There is a small Siberian spruce (*Picea obovata*) stand and willow (*Salix* sp.) thickets along the creek banks near the ranger station	*Plecotus ognevi*	Lepidoptera (A, 90% / F, 100%); Diptera (A, 2% / F, 40%)	Diptera (81.8%), Lepidoptera (13.6%), Hymenoptera (2.3%), Trichoptera (2.3%)
Rakhmanovskie Klyuchi Village	1,810	The edge of a Siberian cedar pine (*Pinus sibirica*) and Siberian fir (*Abies sibirica*) forest at the foot of the mountain near the Rakhmanovskie Klyuchi Sanatorium	*Myotis sibiricus*	Hymenoptera (A, 64% / F, 100%); Diptera (A, 22.7% / F, 75%); Neuroptera (A, 12.5% / F, 25%); Coleoptera (A, 0.7% / F, 75%)	Diptera (59%), Lepidoptera (41%)
			Plecotus ognevi	Lepidoptera (A, 70.8% / F, 90%); Diptera (A, 24.7% / F, 40%); Hymenoptera (A, 4.5% F, 10%/)	
Takhtayzhurt area	2,060	An alpine meadow with granite outliers at the timberline. Open Siberian cedar pine (*Pinus sibirica*) forest with juniper	*Plecotus ognevi*	Lepidoptera (A, 100% / F, 100%)	Lepidoptera (51.1%), Diptera (37.9%), Trichoptera (5.5%), Hymenoptera (4.1%), Hemiptera (0.7%), Coleoptera (0.35%), Neuroptera (0.35%)

Results and discussion

Species essays

In total, 49 vesper bats of seven species were captured: *Myotis petax*, *Myotis sibiricus*, *Myotis ikonnikovi*, *Eptesicus* (*Cnephaeus*) *nilssonii*, *Vespertilio murinus*, *Plecotus ognevi*, and *Murina hilgendorfi* (Fig. 2, Suppl. material 1: Table S1). Additionally, observations of local residents of nine individuals of three species (*Eptesicus* (*Cnephaeus*) *nilssonii*, *Vespertilio murinus*, and *Plecotus ognevi*), and one individual of the genus *Murina* were documented (Table 1, Fig. 2). Evidence of reproduction in the study area was obtained for three species: *Plecotus ognevi*, *Murina hilgendorfi*, and *Myotis petax*.

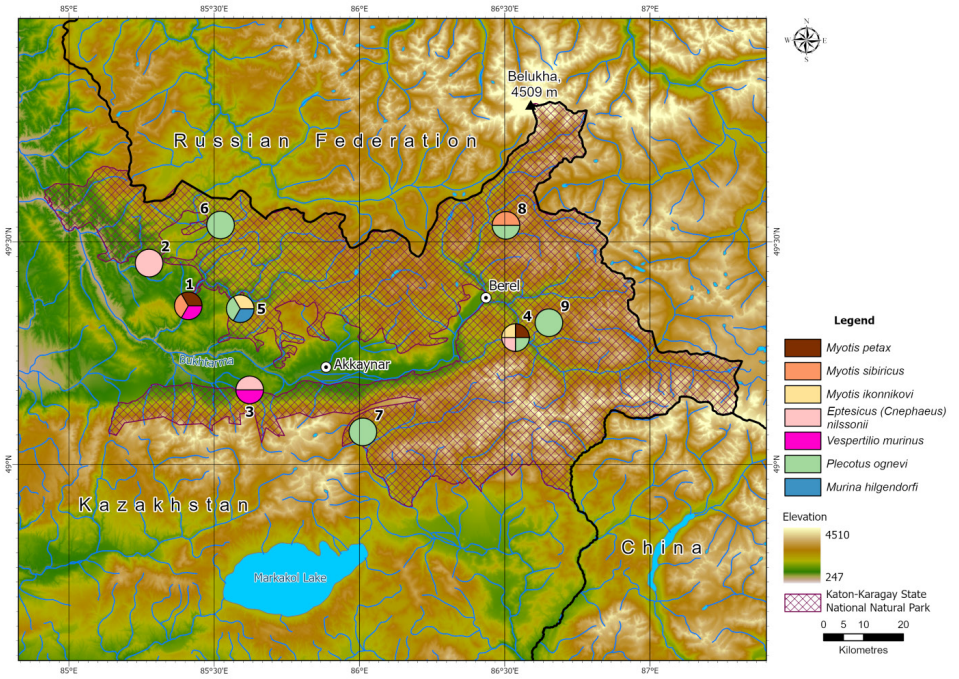

Figure 2. Bat species found in the surveyed locations: **1** – Aksu (Beloye) Village (730 m a.s.l.); **2** – Zhazaba (Yazovaya) Village (820 m a.s.l.); **3** – Katon-Karagay Village (1,085 m a.s.l.); **4** – Arshaty (Archaty) Village (1,220 – 1,270 m a.s.l.); **5** – Bekalka (Fykalka) Village (1,280 m a.s.l.); **6** – Aksharbak (Verkh-Katun) Village (1,350 m a.s.l.); **7** – Verkhneye Zimoveye ranger station (1,710 m a.s.l.); **8** – Rakhmanovskie Klyuchi Village (1,810 m a.s.l.); **9** – Takhtayzhurt area (2,060 m a.s.l.).

Hilgendorf's tube-nosed bat *Murina hilgendorfi* (Peters, 1880)
Fig. 3

This species was previously known as *Murina leucogaster* Milne-Edwards, 1872 (Kruskop et al. 2012).

On the night of 25-26 July 2025, two females were captured over a creek in the taiga forest near Bekalka Village (1,280 m a.s.l.), one of them lactating (Suppl. material 1: Table S1), indicating reproduction in the surveyed area. This is the first record of the species in the Katon-Karagay District, and the second in the Republic of Kazakhstan (Belyalov 2014).

The first discovery of Hilgendorf's tube-nosed bat in Kazakhstan was made on 1 June 2013 in the Western Altai. One individual was found in an apiary in a coniferous forest near Seryy Lug Settlement (1,200 m a.s.l.), 30 km east of Ridder Town (Belyalov 2014). The presence of this species in the Kazakhstan part of the Altai had been previously assumed based on frequent records in adjacent territories near the Kazakhstan-Russia border (Strelkov and Shaymardanov 1983). In the Russian part of the Altai, *Murina hilgendorfi* has been recorded in the low- and mid-altitude mountain taiga forests, wintering in caves (Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024, 2025; Baeva et al. 2025).

Figure 3. *Murina hilgendorfi*, ♀, Bekalka (Fykalka) Village (1,280 m a.s.l.), 26 July 2025. Photo by Irina Baeva.

Some 108 km north-west of the first Kazakhstan record, in the vicinity of Tigirek Village, Altai Territory (470-500 m a.s.l.), reproduction of this species was documented (Vasenkov and Tomilenko 2005; Baeva et al. 2025). The new Kazakhstan registration of the Hilgendorf's tube-nosed bat lies 170 km south-east of the previous one (Belyalov 2014), approximately 180 km south of the nearest known records in the Altai Republic (Red Data Book 2017), and 270 km south-east of the breeding sites in the vicinity of Tigirek Village (Baeva et al. 2025).

***Murina* sp.**

We have at our disposal photographs (Fig. 4) of an animal which has brown fur colour, taken on 16 June 2025 in Arshaty Village, 28 km north-west of the China-Kazakhstan border (Table 1, No. 5). Unfortunately, the animal's corpse has not been preserved, and its morphometric measurements are unavailable. It may therefore be assumed that an individual *Murina hilgendorfi* of atypical colouration was found, or the animal represents a vagrant of a currently unregistered species from the north-western part of China, where new species continue to be described (Luo et al. 2025). The area requires further research.

Figure 4. *Murina* sp., Arshaty (Archaty) Village (1,220 m a.s.l.), 16 June 2025. Photos by Zhomart Amanbaev.

Ognev's long-eared bat *Plecotus ognevi* Kishida, 1927
Fig. 5a, b

The species was separated from the brown long-eared bat *Plecotus auritus* Linnaeus, 1758 (Spitzenberger et al. 2006).

It was the most common species, found in almost all surveyed biotopes (Table 2) in the mid- and high-altitude zones (Fig. 2), with an approximately equal sex

ratio ($\chi^2 = 0.9$, $p > 0.05$). Ognev's long-eared bats frequently enter human dwellings and outbuildings (Table 1). This species reproduces in the research area (lactation was recorded in the second half of July) (Fig. 5 b).

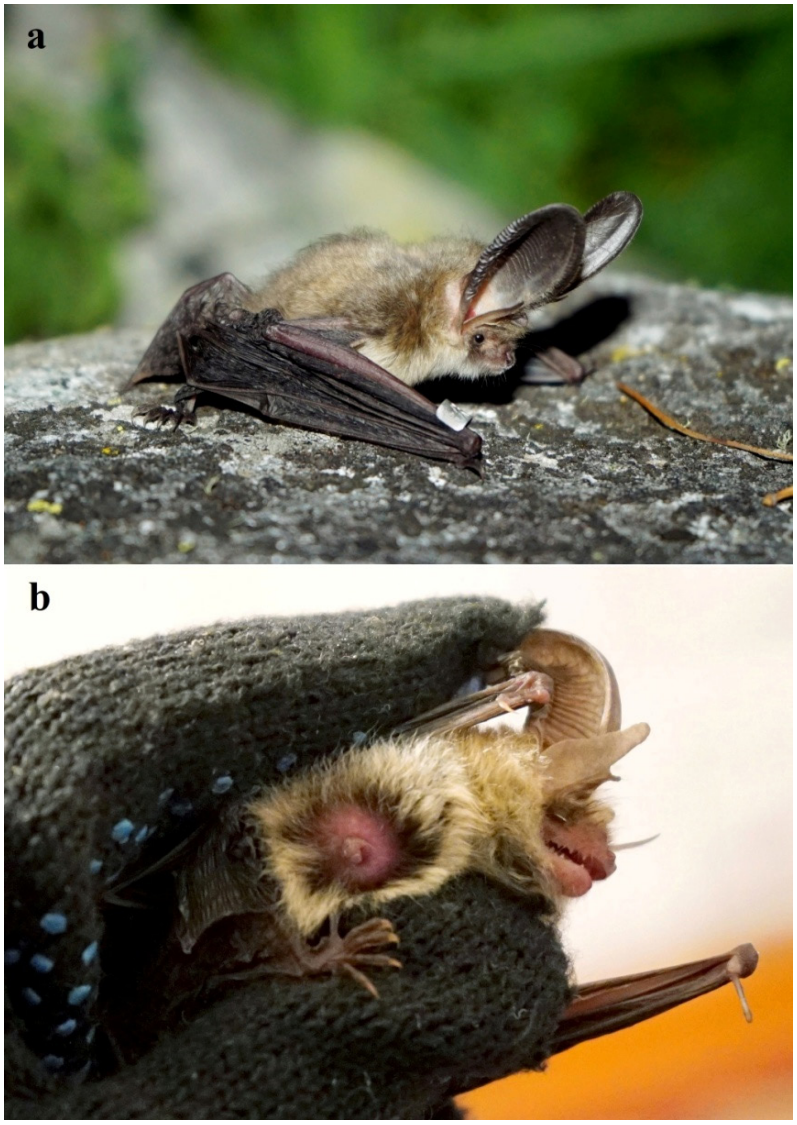

Figure 5. *Plecotus ognevi*: **a** – ♂, Rakhmanovskie Klyuchi Village (1,810 m a.s.l.), 13 July 2025; **b** – ♀, lactating, Arshaty (Archaty) Village (1,270 m a.s.l.), 19 July 2025. Photos by Irina Baeva.

We captured 16 individuals: 10 males and six females, of whom three females were lactating (Suppl. material 1: Table S1). Three females were captured in the vicinity of Arshaty Village (1,270 m a.s.l.) on 18-19 July 2025, two of them lactating; four males and one female were captured in the taiga forest near Bekalka Village (1,280 m a.s.l.) on 25-26 July 2025; one lactating female - in the Verkhneye Zimoveye ranger station territory (1,710 m a.s.l.) on 21-22 July 2025; five males and one female - in Rakhmanovskie Klyuchi Village (1,810 m a.s.l.) on 12-14 July 2025; one male at the Takhtayzhurt area (2,060 m a.s.l.) 19-20 July 2025. In the late summer of 2025, local residents encountered a male and a female in Arshaty Village (1,220 m a.s.l.); one individual was found on 27 July 2017 in Aksharbak Village (1,350 m a.s.l.) (Table 1).

Previous researchers registered *Plecotus ognevi* in the Kazakhstan Altai in the upper reaches of the Bukhtarma River, near Katon-Karagay and Berel villages, as well as along the shores of Lake Markakol (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985; Zinchenko 1999, 2007).

In the Russian part of the Altai, the species is also common, recorded in summer and during wintering in caves; it inhabits a range of habitats from the low-altitude mixed forests to high-altitude landscapes (Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024, 2025; Baeva et al. 2025; Gribkov et al. 2025).

Eastern water bat *Myotis petax* Hollister, 1912
Fig. 6

The species was separated from the water bat *Myotis daubentonii* (Kuhl, 1817) (Matveev et al. 2005).

Bats with an equal sex ratio were captured in the riparian biotopes of Aksu Village (730 m a.s.l.) over the Belaya River, and near Arshaty Village (1,220 m a.s.l.) in the floodplain of the Bukhtarma River. Thirteen individuals were captured: seven males and six females (Suppl. Material 1: Table 1): comprising three males and three females in the vicinity of Arshaty Village on 16-17 July 2025, four males and three females in Aksu Village on 23-24 July 2025. Five captured individuals from Aksu (three males and two females) were subadults, and an adult female from Aksu had lactated in the current season. This constitutes indirect evidence of reproduction by species in the research area.

In the Kazakhstan Altai, *Myotis petax* was recorded near water bodies at various elevations: near Podgornoye Village in the vicinity of Öskemen (Ust-Kamenogorsk) City (about 300-400 m a.s.l.); in the Zyryanovskiy District on the Khamir River near Stolbukha Village (580 m a.s.l.); in the floodplain of the Belaya Uba River (750-900 m a.s.l.); in Urunhayka Village on the shore of Lake Markakol (1,500 m a.s.l.) (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985; Zinchenko 1999, 2007). In the adjacent territories of the Russian Altai, eastern water bats have been registered throughout the area in summer, and overwinter in caves, being a wide-

spread and abundant species (Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024, 2025; Baeva et al. 2025; Gribkov et al. 2025; Viskontene et al. 2025).

Figure 6. *Myotis petax*, Arshaty (Archaty) Village (1,220 m a.s.l.), 17 July 2025. Photo by Irina Baeva.

Siberian whiskered myotis *Myotis sibiricus* Kastshenko, 1905
Fig. 7

Previously, it was included within Brandt's myotis *Myotis brandtii* Eversmann, 1845 (Kruskop et al. 2012).

Three females were captured (Suppl. material 1: Table S1): two in the riparian willow-birch forest of Aksu Village (730 m a.s.l.) on 23-24 July 2025, and one on the edge of a Siberian cedar pine and Siberian fir forest near Rakhmanovskie Klyuchi Village (1,810 m a.s.l.) on 14-15 July 2025. One specimen from Aksu was collected in 96% alcohol and stored in the funds of the Department of Science, Environmental Monitoring and Information of the Katon-Karagay State National Natural Park (No. 1405). DNA sequences of the specimen from Rakhmanovskie Klyuchi and the second specimen from Aksu (which had lactation experience) were deposited in GenBank under the accession numbers PZ534463 and PZ534464, respectively.

In the Kazakhstan Altai, previous records of *Myotis sibiricus* are known from the upper reaches of the Bukhtarma River, near Katon-Karagay and Akkaynar (Cher-

novaya) villages (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985); as well as in the Markakol basin on the Urunhayka River (Zinchenko 1999). In the adjacent territories of the Russian Altai, the species occurs in summer in forest and forest-steppe landscapes, and during winter in caves (Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva et al. 2025; Baeva 2025; Gribkov et al. 2025).

Figure 7. *Myotis sibiricus,* ♀, Rakhmanovskie Klyuchi Village (1,810 m a.s.l.), 14 July 2025. Photo by Irina Baeva.

Ikonnikov's bat *Myotis ikonnikovi* Ognev, 1912.

The species is listed in the Red Data Book of the Republic of Kazakhstan (2010).

Two males and one female of atypical colouration were captured (Suppl. material 1: Table S1). One male was captured in the riparian forest near Arshaty Village (1,220 m a.s.l.) on 16-17 July 2025. A female of an unusual reddish colour without brown tones and with pronounced pubescence of the muzzle (Fig. 8), and a male of typical colour, were captured over a creek in the taiga forest near Bekalka Village (1,280 m a.s.l.) on 25-26 July 2025. DNA sequences of all captured individuals were deposited in GenBank under the accession numbers PZ533049, PZ533050, and PZ533051, respectively.

In the Kazakhstan Altai, previous records of *Myotis ikonnikovi* were documented in the Uba River basin on the Tigiretskiy Ridge, as well as in the Katon-Karagay

District within the upper reaches of the Bukhtarma River - near Katon-Karagay and Akkaynar (Chernovaya) villages (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985). It is a rare mountain taiga forest species in the Russian part of the Altai; its hibernacula is still unknown (Goretovskaya et al. 2002; Rosina 2004; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva et al. 2025; Gribkov et al. 2025; Viskontene et al. 2025).

Figure 8. *Myotis ikonnikovi,* ♀, atypical colouration, Bekalka (Fykalka) Village (1,280 m a.s.l.), 26 July 2025. Photo by Irina Baeva.

Northern bat *Eptesicus* (*Cnephaeus*) *nilssonii* (Keyserling, Blasius, 1839)
Fig. 9

The change of the taxonomic status is considered in Cláudio et al. (2023).

We captured five males (Suppl. material 1: Table S1): three in Katon-Karagay Village (1,085 m a.s.l.) on 8-10 July 2025 and two in the vicinity of Arshaty Village (1,220 m a.s.l.) on 16-17 July 2025. The species is limited synanthropic. *Eptesicus* (*Cnephaeus*) *nilssonii* individuals were observed by local residents: in Zhazaba Village (820 m a.s.l.) on 5 August 2025, in Katon-Karagay Village (1,085 m a.s.l.) on 15 August 2011 and 21 August 2018; the corpse of one dead animal, probably failed to hibernate in the building, was found in Arshaty Village (1,220 m.a.s.l.) on 23 February 2026 (Table 1).

In the Kazakhstan Altai, the species was previously noted in Katon-Karagay (Mammals of Kazakhstan 1985) and on Lake Markakol (Zinchenko 1999). In the adjacent territories of the Altai from the Russian side, the species is common, from foothills to highlands. It has been registered in summer and overwinter in caves (Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024; Baeva et al. 2025; Gribkov et al. 2025).

Parti-coloured bat *Vespertilio murinus* Linnaeus, 1758
Fig. 10

We captured seven males (Suppl. material 1: Table S1) in Aksu Village (730 m a.s.l.) on 23-24 July 2025. One *Vespertilio murinus* specimen was recorded at a facility under construction in Katon-Karagay Village (1,085 m a.s.l.) on 24 August 2018 (Table 1).

As a highly synanthropic species, it frequently inhabits human settlements (Conservation and Rehabilitation of Bats 2025). The species is a long-distance migrant, undertaking flights of many hundreds of kilometres. In Kazakhstan, parti-coloured bats were found throughout the country, but the closest to the Kazakhstan Altai was recorded only in the Zaisan basin (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985). In the adjacent territories of the Russian Altai, the species is common in summer. It occurs in various landscapes from arid steppes to mid-altitude forests, and frequently roosting in human settlements (Goretovskaya et al. 2002; Rosina 2004; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva et al. 2025). The exact location of the hibernacula of this ecologically plastic species remains open. The northern boundary of the *Vespertilio murinus* wintering area probably lies in southern Kazakhstan, but occasional winter records are located much further north, in Siberia (Strelkov 2001).

In our study, we were unable to capture the **common noctule *Nyctalus noctula* (Schreber, 1774)**. This species typically flies above the treetops and is therefore rarely captured in mist nets (Mammals of Kazakhstan 1985; Vasenkov 2009). The common noctule undertakes long-distance migrations. The Altai mainly serves as a transit zone for migrating individuals from wintering grounds in southern Kazakhstan to breeding sites in the Ob Valley in Russia, although the situation is more complex. For example, based on early spring and late autumn occurrences, wintering of the common noctule is assumed in the vicinity of Lake Teletskoye (Russia, Altai Republic), whilst the only known maternity colony of this species in Kazakhstan lies in the foothills of the Kalbinskiy Altai (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985). Geographically, the records closest to the Katon-Karagay National Natural Park occurred on Lake Markakol (Zinchenko 1999).

Our captures also did not include the **pond bat *Myotis dasycneme* (Boie, 1825)**, which is known from the adjacent territories of the Altai in the low-altitude zone near rivers and lakes. In the Kazakhstan Altai, the pond bat has been recorded in the

foothills in the vicinity of Öskemen (Ust-Kamenogorsk) City (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985; Zinchenko 2007). In the Russian part of the Altai, the pond bat is not numerous but is regularly recorded in summer and in wintering caves (Goretovskaya et al. 2002; Rosina 2004, 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2024, 2025; Baeva et al. 2025).

Figures 9–10. 9 – *Eptesicus* (*Cnephaeus*) *nilssonii*, Katon-Karagay Village (1,085 m a.s.l.), 15 August 2011. Photo by Vladimir Vorobyov. **10** – *Vespertilio murinus*, ♂, Aksu (Beloye) Village (730 m a.s.l.), 24 July 2025. Photo by Miras Chaikin.

Based on geographically proximate records, it is assumed that the long-tailed myotis and David's myotis also inhabit the Katon-Karagay National Park.

Long-tailed myotis *Myotis longicaudatus* Ognev, 1927. This species was shown to be distinct from *Myotis frater* G. Allen, 1823 (Ruedi et al. 2015; Kazakov et al. 2025). This is one of the rarest bat species in the northeastern Palaearctic (Kazakov et al. 2025). The long-tailed myotis is expected to be recorded in Kazakhstan (Strelkov and Shaymardanov 1983). Rare summer records (Goretovskaya et al. 2002; Rosina 2004; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva et al. 2025) and isolated winter records (Rosina 2005; Baeva 2025) from the south of Western Siberia (Russia) mainly originate from the immediate vicinity of the Kazakhstan border.

David's myotis *Myotis davidii* Peters, 1869. Previously, it was included within the whiskered bat *Myotis mystacinus* Kuhl, 1819 (Benda and Tsytsulina 2000). In

Kazakhstan, it has been recorded in the Southern Altai, in the lower reaches of the Kurchum River in the northwest of the Zaisan basin. Further south, in the desert zone, it is widespread. The dependence of the distribution of this species on terrain features is not clear (Strelkov and Shaymardanov 1983; Mammals of Kazakhstan 1985). On the Russian side, it has been recorded in the Northern, Northeastern, Eastern, and Central Altai, from low- to high-altitude zones, and is considered a rare species throughout (Red Data Book 2017). Geographically, the record closest to Katon-Karagay National Natural Park was obtained on the Katunsky Ridge in the Multa River valley, just 47 km north of the border with Kazakhstan and the national park (Viskontene et al. 2025).

It should be noted that our study, as well as previous works describing the bat fauna of the Kazakhstan Altai (Strelkov and Shaymardanov 1983; Strelkov 1983; Mammals of Kazakhstan 1985; Zinchenko 1999, 2007; Belyalov 2014), concerns primarily the summer bat fauna. No caves suitable for bat hibernation have been found in the Kazakhstan Altai, although limestone formations are present and the discovery of hibernation caves remains possible (Nekhoroshev 1962; Vistingauzen 2009). In the adjacent territories of the Russian Altai, hibernation sites of numerous bat species in caves are well documented (Goretovskaya et al. 2002; Rosina 2005; Vasenkov and Tomilenko 2005; Vasenkov 2009; Red Data Book 2017; Baeva 2021, 2024, 2025). For the sedentary bat species recorded within the national park, such as the northern bat *Eptesicus* (*Cnephaeus*) *nilssonii*, the literature documents movements of only 10–30 (Smirnov et al. 2020), maximum 100–450 km (Dietz and Kiefer 2020; Russo 2023) from summer roosts to hibernation sites. Therefore, the hibernation sites of these species are likely to be located within the study area.

The Kazakhstan Altai, and the Katon-Karagay National Park in particular, has high potential for new bat records, but owing to its difficult accessibility, the area remains poorly understood in terms of hibernation caves, breeding sites, and altitudinal distribution of species.

Foraging and diet

The body condition index (BCI) was calculated for five specimens of *Eptesicus* (*Cnephaeus*) *nilssonii* (three males from Katon-Karagay and two males from Arshaty), five specimens of *Myotis petax* (one adult female, one adult male, and three subadult males in Aksu), and one specimen of *Plecotus ognevi* (lactating female captured in the Verkhneye Zimoveye ranger station) (Suppl. material 1: Table S1). Lactating female *Plecotus ognevi* (n=1) and adult specimens of *Myotis petax* (n=2, male and female) had a body weight corresponding to the average summer values for this region (Vasenkov and Potapov 2007). Deviations ranged from -6% to +5%. *Myotis petax* subadults (n=3, males) exhibited a weight deficit ranging from 17 to 29%. Four specimens of *Eptesicus* (*Cnephaeus*) *nilssonii* (three males from Katon-Karagay and one male from Arshaty) had a weight deficit ranging from 17 to 32%, whilst other male from Arshaty had a weight close to normal (deviation -2%).

The activity of bats is directly dependent on the activity of their potential prey - crepuscular and nocturnal insects. In addition, both factors are largely determined by weather conditions, which are characterised by growing unsteady as altitude increases (Hodkinson 2005). This underlies the ability of bats to initiate foraging activity before dusk, extend it past dawn, and maintain high hunting activity throughout the night, synchronising with the most favourable weather conditions (Bobrinskoy et al. 1944, Kruskop 1998).

Darkness fell between 19:50 and 20:00, with dawn beginning at 02:00 (UTC+5, Kazakhstan). For example, on a clear night on 23–24 July, in Aksu (730 m.a.s.l.), *Myotis sibiricus* were captured by mist nets at 20:08 and 20:29, immediately after sunset, whilst in Rakhmanovskie Klyuchi (1,810 m.a.s.l.), where brief rain showers occurred several times during the day followed by clear weather – observed on 12–13, 13–14, and 14–15 July – *Myotis sibiricus* were foraging as early as 19:22–19:40, under a bright sky, before sunset. In the Takhtayzhurt area (2,060 m a.s.l.), on the night of 19-20 July, bats foraging activity was first observed, at sunset, at 19:35, and extended past dawn, until 02:30. At lower altitudes, both in clear weather and when brief rains occurred during the night, bats foraging activity was not observed before 20:00 (immediately after sunset) and had ceased by 01:50 (before dawn).

There was also a difference in the foraging onset time between species. In Aksu (730 m a.s.l.), *Myotis petax* were first captured at 20:10 (immediately after sunset), and *Vespertilio murinus* – from 20:45 onwards. In Rakhmanovskie Klyuchi (1,810 m a.s.l.), *Myotis sibiricus* began foraging (as noted above) before sunset, at 19:22–19:40, whilst *Plecotus ognevi* appeared in captures only after sunset, at 20:00–20:25.

Dietary analysis revealed that the overall trophic spectrum of the seven bat species studied encompassed members of the order Araneae (class Arachnida) and eight orders of the class Insecta (Ephemeroptera, Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera, Trichoptera, and Hemiptera) (Table 2, Fig. 11). Representatives of the order Lepidoptera formed the dietary basis of most of the species studied. Despite Diptera dominating in half of the surveyed biotopes according to light trap data, bats showed a preference for energetically more valuable prey – Lepidoptera – and, during the mass emergence of Trichoptera (observed on 16–17 July in Arshaty), representatives of this order also. The proportion of Diptera in the diet was negligible.

Among the species studied, *Plecotus ognevi* had the highest proportion of Lepidoptera in its diet; however, individual specimens of this species exhibited specific food preferences. Representatives of Neuroptera, Diptera, Hymenoptera, and Coleoptera were also identified in the faeces of this species. The diet of the *Murina hilgendorfi* specimen was dominated by Lepidoptera, with minor Coleoptera involvement.

The most pronounced orientation towards mass food resources and a wide range of prey items was exhibited by *Myotis petax*. During the mass emergence of Ephemeroptera in Aksu (23–24 July) and the mass emergence of Trichoptera in Arshaty (16–17 July), these groups formed the dietary basis of this species. In ad-

dition, Lepidoptera, Hemiptera, Diptera, Coleoptera, Hymenoptera, and Araneae were recorded in the diet of *Myotis petax*.

A similar strategy – focusing on mass food resources alongside substantial individual dietary variation – was identified in *Vespertilio murinus*, *Eptesicus* (*Cnephaeus*) *nilssonii*, and *Myotis ikonnikovi*. Certain individuals of these species exhibited specific prey preferences (Suppl. material 1: Table S1), which were most apparent in the consumption of secondary food items (Table 2). Nevertheless, the overall foraging strategy – targeting insect groups dominant in the biotope – was maintained.

The diet of *Vespertilio murinus* was dominated by mass prey items, namely Lepidoptera and Ephemeroptera, whilst Coleoptera, Hemiptera, Hymenoptera, Neuroptera, and Diptera were present in smaller quantities.

The diet of *Eptesicus* (*Cnephaeus*) *nilssonii* was based on Coleoptera (despite their low abundance in the biotope), Trichoptera (a mass food resource in Arshaty), and Lepidoptera (the dominant group in Katon-Karagay). Hemiptera, Neuroptera, and Diptera were also recorded in the diet.

The diet of *Myotis ikonnikovi* was characterised by a pronounced individual variation. A male from Arshaty preferred mass prey, namely Trichoptera, with a minor contribution of Lepidoptera. In contrast, a male from Bekalka favoured Coleoptera, whereas Neuroptera and Lepidoptera (the latter being the dominant group in the biotope) constituted only a small fraction of its diet. A female from Bekalka, by contrast, fed predominantly on Lepidoptera (mass prey) along with a minor proportion of Coleoptera, Hymenoptera, and Neuroptera.

The greatest discrepancies between diet composition and the structure of the local entomofauna were recorded in *Myotis sibiricus*. An individual from Aksu (the night of 23–24 July) consumed a substantial amount of Lepidoptera, as well as Hymenoptera, Coleoptera, Diptera, and Trichoptera; however, no Ephemeroptera were detected in its diet, despite the mass flight of this group during the capture period. The diet of the *Myotis sibiricus* individual from Rakhmanovskie Klyuchi was dominated by Hymenoptera, with a minor contribution of Diptera, Neuroptera, and Coleoptera; this stood in sharp contrast to the light trap captures, which consisted exclusively of Diptera (the dominant group) and Lepidoptera.

In half of the surveyed biotopes, the diets of bats contained taxonomic groups of insects that were not recorded in the light trap captures. Furthermore, a mass emergence of Ephemeroptera was recorded in Aksu on 23–24 July; these insects constituted a significant proportion of the diets of *Myotis petax* and *Vespertilio murinus*, yet were virtually unrepresented in the light trap captures. This highlights the limitations of the light-trapping method for an adequate assessment of entomofauna structure. To obtain a more comprehensive overview of prey availability, it is advisable to supplement light traps with alternative insect sampling methods.

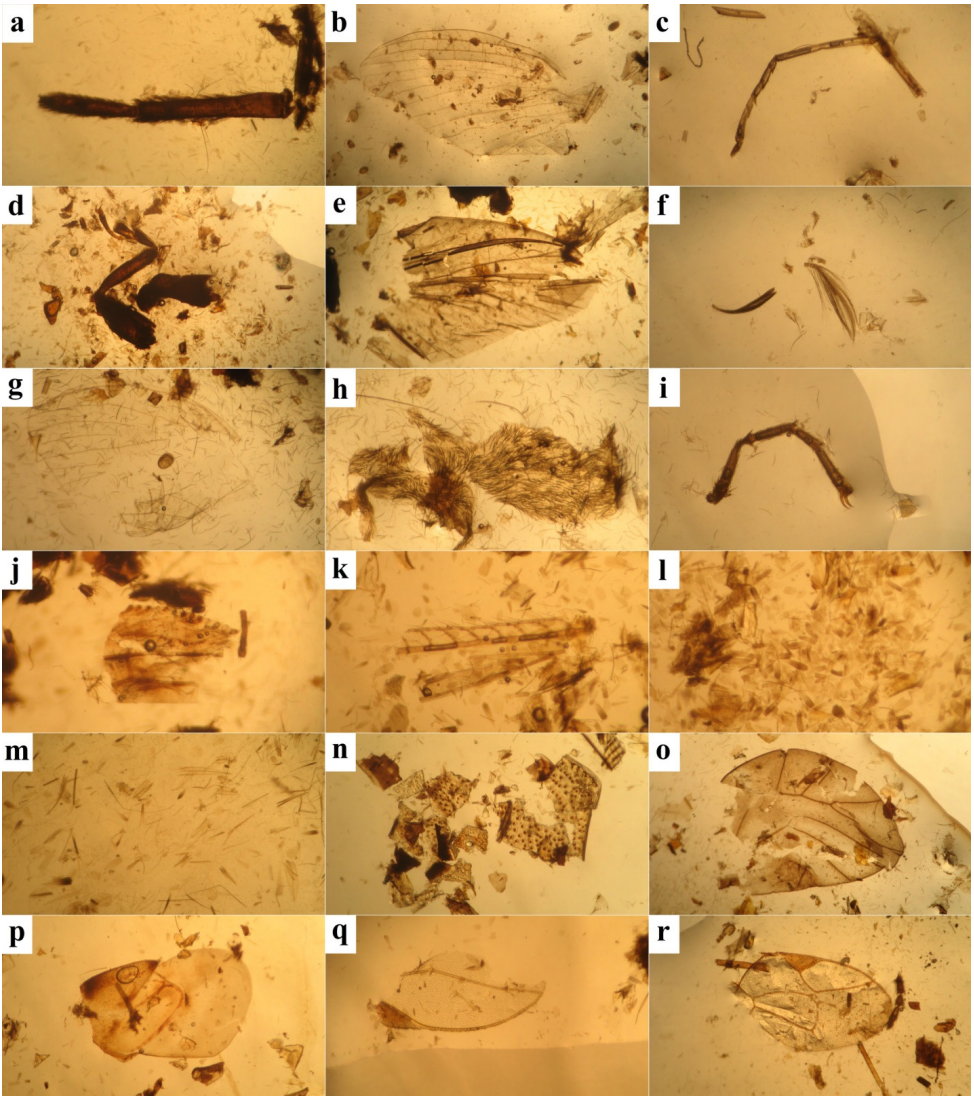

Figure 11. Arthropod fragments in bat faeces: **a** – Araneae leg (*Myotis petax*, Arshaty), **b** – Ephemeroptera wing (*Myotis petax*, Aksu), **c** – Ephemeroptera leg (*Myotis petax*, Aksu), **d** – Coleoptera leg (*Vespertilio murinus*, Aksu), **e** – Coleoptera wing (*Myotis sibiricus*, Aksu), **f** – antenna of Chironomidae, Diptera (*Myotis petax*, Aksu), **g**, **h** – Trichoptera wings (*Myotis petax*, Arshaty), **i** – Trichoptera leg (*Myotis petax*, Arshaty), **j** - Neuroptera wing fragment (*Eptesicus* (*Cnephaeus*) *nilssonii*, Arshaty), **k** – Neuroptera wing fragment (*Myotis ikonnikovi*, Bekalka), **l** – Lepidoptera scales (*Myotis ikonnikovi*, Bekalka), **m** – Lepidoptera scales (*Murina hilgendorfi*, Bekalka), **n** – Hemiptera, fragment of spotted chitin from the body (*Eptesicus* (*Cnephaeus*) *nilssonii*, Katon-Karagay), **o** – Hemiptera (Psylloidea) wing (*Eptesicus* (*Cnephaeus*) *nilssonii*, Arshaty), **p** – Hemiptera (Heteroptera) wing (*Eptesicus* (*Cnephaeus*) *nilssonii*, Katon-Karagay), **q** – Hymenoptera wing fragment (*Myotis ikonnikovi*, Bekalka), **r** – Hymenoptera wing (*Myotis sibiricus*, Rakhmanovskie Klyuchi). Photos by Dmitriy Smirnov.

Thus, a continuum of trophic strategies trends was observed among the individuals of the seven bat species studied: from narrow specialists (*Plecotus ognevi*, *Murina hilgendorfi*), through species exhibiting high individual variation whilst maintaining an opportunistic strategy (*Vespertilio murinus*, *Eptesicus* (*Cnephaeus*) *nilssonii*, *Myotis ikonnikovi*, and *Myotis sibiricus*), to broad opportunistic euryphages (*Myotis petax*).

Conclusions

The presence of six species was confirmed within Katon-Karagay National Park: *Myotis petax*, *Myotis sibiricus*, *Myotis ikonnikovi*, *Eptesicus* (*Cnephaeus*) *nilssonii*, *Vespertilio murinus*, and *Plecotus ognevi*. We also recorded *Murina hilgendorfi*, which had previously been reported in Kazakhstan only once in the Western Altai. *Nyctalus noctula* was not recorded during our study.

For three species (*Plecotus ognevi*, *Murina hilgendorfi*, and *Myotis petax*), evidence of reproduction in the study area was recorded.

In the low-altitude zone (up to 1,000 m a.s.l.), *Myotis petax*, *Myotis sibiricus*, *Eptesicus* (*Cnephaeus*) *nilssonii*, and *Vespertilio murinus* were recorded. Among the captured *Myotis petax*, there were subadults of both sexes and a post-lactating female. *Myotis dasycneme*, which is known to occur at such altitudes in the adjacent territories of the Altai, was not found.

All the species we encountered were recorded in the mid-altitude zone (1,000-2,000 m a.s.l.): *Myotis petax*, *Myotis sibiricus*, *Myotis ikonnikovi*, *Eptesicus* (*Cnephaeus*) *nilssonii*, *Vespertilio murinus*, *Plecotus ognevi*, and *Murina hilgendorfi*. Lactation was observed in *Plecotus ognevi* and *Murina hilgendorfi*.

In the high-altitude zone (above 2,000 m a.s.l.), *Plecotus ognevi* was recorded.

Based on geographically proximate records, it is assumed that *Myotis longicaudatus* and *Myotis davidii* also inhabit the Katon-Karagay National Park.

Dietary analysis revealed that the overall trophic spectrum of the seven bat species studied encompassed members of the order Araneae (class Arachnida) and eight orders of the class Insecta (Ephemeroptera, Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera, Trichoptera, and Hemiptera). In most bat species, representatives of the order Lepidoptera constituted the primary prey. Despite Diptera dominating half of the biotopes studied, this energetically less valuable prey constituted a negligible proportion of the bat diet.

The foraging time of bats of the same species may vary with increasing altitude owing to changes in weather conditions. In this regard, further observations of bat foraging activity across different altitudinal zones would be worthwhile.

Based on the capture of an unidentified specimen of the genus *Murina* in Arshaty Village, we consider further noteworthy records near the border with northwestern China to be possible. It would also be worthwhile to explore the Katon-Karagay National Park area for caves. Owing to poor accessibility and frequent

weather changes in high-mountain regions, the territory remains poorly studied, including with regard to altitudinal distribution, and requires further investigation.

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Supplementary material 1

Table S1. Characteristics of captured bats and their prey preferences

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Data type: table

Link: https://journal.asu.ru/biol/article/view/20089/17077

Supplementary material 2

Table S2. Insects collected in a light trap

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Data type: table

Link: https://journal.asu.ru/biol/article/view/20089/17078