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"One ticket to the Baltic, please": Documenting the first occurrence of *Pipistrellus kuhlii* (Chiroptera: Vespertilionidae) in Kaliningrad

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ABSTRACT. Data on the first record of *Pipistrellus kuhlii* (Kuhl, 1817) in February 2026 in Fort 1 Stein, Kaliningrad, are presented. Possible routes of the species' arrival in the north-western part of Russia, the physiological condition of the bat during hibernation in an atypical area, and the ectoparasites infesting this individual are discussed.

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KEY WORDS: Kuhl's pipistrelle, adventive species, range expansion, hibernation*, Carios vespertilionis,* Baltic coast.

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Первая находка средиземноморского нетопыря *Pipistrellus kuhlii* (Chiroptera: Vespertilionidae) в Калининграде

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РЕЗЮМЕ. Приведены данные о первой находке в феврале 2026 г. средиземноморского нетопыря *Pipistrellus kuhlii* (Kuhl, 1817) в форте № 1 "Штайн" города Калининграда. Обсуждаются возможные пути попадания вида на северо-запад России, физиологические особенности его гибернации в нетипичных условиях и зараженность найденной особи эктопаразитами.

КЛЮЧЕВЫЕ СЛОВА: средиземноморский нетопырь, заносной вид, расширение ареала, гибернация, *Carios vespertilionis,* Балтийское побережье.

Introduction

Kuhl's pipistrelle *Pipistrellus kuhlii* (Kuhl, 1817) is southern in origin and predominantly a Mediterranean bat species. Most *P. kuhlii* records are from the south of 46°–47°N latitude (Vernier & Bogdanowicz, 1999). Since the 1950s, there has been an evident northward expansion of its distribution, with more northerly observations from France to Russia along the entire northern limit of its range, including some observations from latitudes as high as 53°–54°N (Brosset, 1951; Strelkov & Ilyin, 1990; Leger, 1992; Cel'uch & Ševčík, 2006; Sachanowicz *et al.*, 2006; Reiter *et al.*, 2007; Bobrov *et al.*, 2008; Barti, 2010; Lada, 2010; Smirnov & Vekhnik, 2011; Wawrocka *et al.*, 2012; Presetnik *et al.*, 2014; Uhrin *et al.*, 2014; Minoransky & Malinovkin, 2015; Ancillotto *et al*., 2016; Maxinová *et al*., 2016; Amichai & Korine, 2023). The northernmost records of this species were noted at 64° and 66° latitudes, both in the major port cities (Severodvinsk, Arkhangelsk Region, Russia; and Salekhard, Yamalo-Nenets Autonomous Area, Russia) (Orlova, 2024, 2025). In Russia, Kuhl's pipistrelle has also demonstrated a clear eastward range expansion (Smirnov & Vekhnik, 2011; Snit'ko & Snit'ko, 2019; Orlova *et al.*, 2020; Orlova, 2025). Alteration of natural habitats can be one of the prerequisites for species' range expansion, and in those cases the more synanthropic *P. kuhlii* may replace more sensitive species that shun human activity, as has been documented for its congener *P. pipistrellus* (Arlettaz *et al.*, 2000).

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Currently, 15 bat (Chiroptera: Vespertilionidae) species have been registered in the Kaliningrad Region; eight of them remain in this area year-round (Masing & Busha, 1983; Rumyantseva & Belyakov, 2006). *Eptesicus* (*Cnephaeus*) *serotinus* (Schreber, 1774), *E. (C.) nilssonii* Keyserling & Blasius, 1839, *Barbastella barbastellus* Schreber, 1774, *Plecotus auritus* (Linnaeus, 1758), *Myotis brandtii* Eversmann, 1845, *M. nattereri* (Kuhl, 1817), *M. daubentonii* (Kuhl, 1817), and *M. dasycneme* (Boie, 1825) are sedentary and undergo long-term hibernation in the fortifications of Kaliningrad annually. In 2015, the greater mouse-eared bat *M. myotis* (Borkhausen, 1797) was also found in Fort 11 Dönhoff, Kaliningrad (Markovets & Bushinskaya, 2017). *Pipistrellus kuhlii* has not previously been recorded in the Kaliningrad Region (Rumyantseva, 2010). In this paper, we describe the case of a wintering specimen of Kuhl's pipistrelle in the Kaliningrad Region, discuss possible routes by which the species may have arrived in the north-west of Russia, and provide data on its physiological condition and the ectoparasites collected.

Material and methods

The fortifications of Kaliningrad were surveyed for the presence of wintering bats in February 2026 (Table 1). Bat species were identified using taxonomic keys (Dietz & von Helversen, 2004). A specimen of Kuhl's pipistrelle is currently held in the collection of the Zoological Museum of Moscow State University (Moscow, Russia) under the number 29/26. Ectoparasites were collected and identified according to standard methodology (Whitaker, 1988; Sándor *et al.*, 2021).

Table 1. The fortifications of Kaliningrad surveyed for the presence of wintering bats in February 2026.

No. and name of the fort	Coordinates	Dates of visits
No.1 Stein	54.7061°N, 20.6054°E	8 February 2026
No.2 Bronzart	54.7481°N, 20.6010°E	13 February 2026
No.4 Gneisenau	54.7643°N, 20.4879°E	9 February 2026
No.5 Friedrich Wilhelm III	54.7523°N, 20.4434°E	14 February 2026
No.8 König Friedrich I	54.6647°N, 20.4304°E	11 February 2026
No.10 Canitz	54.6508°N, 20.5285°E	10 February 2026
No.11 Dönhoff	54.6568°N, 20.5676°E	14 February 2026

The ambient temperature and humidity were measured using a Testo 410-2 vane anemometer equipped with humidity and temperature sensors (Testo SE, Germany; temperature measurement error is 0.5°C; humidity — 2.5%). Thermal images of the pipistrelle's body were obtained using Testo 875-1i thermal imager (Testo SE, Germany; error is 2% of the measured values).

Results and discussion

Specimen. A young male Kuhl's pipistrelle was discovered on 8 February 2026 in Fort 1 Stein, Kaliningrad (Kaliningrad Region, Russia; 54.7062°N, 20.6054°E) (Fig. 1). The bat was found with its weight estimated at 5.81 g and a forearm length of 36 mm, both within the normal range for the species (Dietz & von Helversen, 2004; Amichai & Korine, 2023). Visual inspection revealed no external injuries or signs of emaciation.

The animal was lying on the brick floor of the third (combat) tier of the central gorge block, in close proximity to the exit of a lateral staircase associated with a mechanical ammunition hoist shaft, in a room that was freezing over. The specimen lay one metre from the exit to the courtyard, partially exposed to sunlight. The temperature of the floor around the pipistrelle was –3.15°C. The bat itself was in a deep state of hibernation. On thermograms (Fig. 2), the temperature radiated by the surface of the body varied from –2.7°C to –1.5°C. Lower temperatures were recorded in areas adjacent to the floor, whilst higher temperatures were noted closer to the chest. The mean body surface temperature was –2°C. The indoor air temperature was 0.5°C and the relative humidity was 69.1%. No air movement — whether wind or draught — was detected.

At first, the pipistrelle seemed dead; however, upon measurement and examination for ectoparasites, it began to warm up. Later, when brought to room temperature, it became active, attempting to fly, grooming itself, and drinking greedily when offered. This behaviour proves the possibility of the species short-term survival at extremely low environmental temperatures.

Ectoparasites. The specimen was infested with five larvae of the short-legged bat tick, *Carios vespertilionis* Latreille, 1796. The larvae were attached separately to both the ventral and dorsal sides of the body. This tick is a common polyxenous bat ectoparasite widely distributed across the Western Palaearctic. *Pipistrellus kuhlii* is known to be one of its primary hosts (Sándor *et al.*, 2021). In Russia, *Carios vespertilionis* had been found on Kuhl's pipistrelle in other regions (Orlova *et al.*, 2020). No fleas, bat flies, or gamasid mites were collected on this specimen.

Notes on ambient conditions. The mean temperature of the chambers in which bats have been wintering in Fort 1 Stein was 1.19±0.23°C. Generally, bat species with high ecological flexibility regarding ambient temperature during hibernation are able to overwinter in this shelter. Chiroptera recorded in Fort 1 in February 2026 were *Barbastella barbastellus* (11 specimens), *Myotis brandtii* (11), *M. nattereri* (69), *M. daubentonii* (18), *Eptesicus nilssonii* (9), *E. serotinus* (1), and *Plecotus auritus* (1). For these vespertilionid bats, hibernation at low temperatures, including below zero, is commonly observed (Urbańczyk, 1991; Masing & Lutsar, 2007; Belkin *et al.*, 2020; Malyavina *et al.*, 2025). At the same time, the northern bat (*E. nilssonii*)

apparently possesses a suite of physiological and biochemical characteristics that enable it to tolerate lower temperatures (Uzenbaeva *et al.*, 2014, 2015; Antonova *et al.*, 2015).

The Fort 1 Stein follows a classic hexagonal (large) layout typical of the Biehler standard. Its large floor area, high ceilings, numerous entrances, and vertical ventilation shafts situated at the same height as the

Fig. 1. *Pipistrellus kuhlii* found in Fort 1 Stein, Kaliningrad in February 2026. A — general appearance; B — snout; C — genitalia.

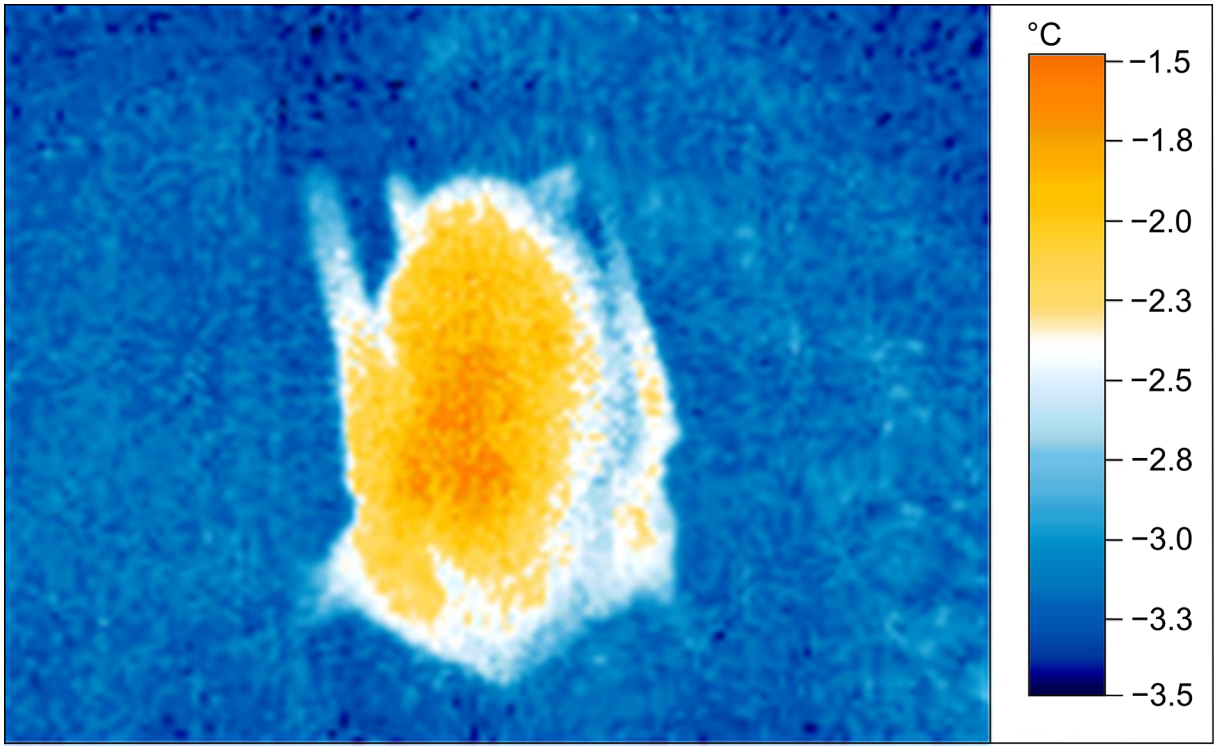

Fig. 2. Thermal image of *P. kuhlii* at the time of its discovery in the Kaliningrad.

hall floors all contribute to a strong dependence of the shelter's microclimate on external air temperature, so that temperatures within the shelter, especially in the entrance halls, can fall below zero. The discovery of Kuhl's pipistrelle — a species southern in origin — in such conditions is therefore of particular interest.

The bat's unusual position in a cold and illuminated room may reflect the species' indiscriminate choice of hibernacula. The optimal temperature for its torpor, as indicated by experimental studies and field observations, is approximately 5–15°C, depending on the wintering site and region (Muñoz-Garcia *et al.*, 2012; Ben-Hamo *et al.*, 2013; Dalhoumi *et al.*, 2018; Hukov *et al.*, 2020; Lesiński & Janus, 2023; Kaci *et al.*, 2024). Throughout much of its range, *P. kuhlii* does not enter continuous, winter-long hibernation, but intermittently remains active during the winter (Mendelssohn & Yom-Tov, 1999; Dalhoumi *et al.*, 2018; Kaci *et al.*, 2024). Wawrocka *et al.* (2012) argue that relatively high temperatures during hibernation define the life cycle and behaviour of *Pipistrellus kuhlii*, contribute to energy saving, decrease predation risk, and promote parturition and subsequent offspring development. All of these features may play crucial roles in species' expansion to previously unoccupied areas, particularly in the harsh climate of the temperate zone. In light of the above, conditions in Fort 1 do not correspond to those suitable for this specimen and are likely to lead to its death.

In the Lower Volga region, the mummified corpses of this species have frequently been removed from cracks in window embrasures. Apparently, a certain part of bats perish in such shelters during unsuccessful wintering attempts (Il'in & Smirnov, 2000). The fact that this pipistrelle was found on an open horizontal surface (the floor) rather than in a typical shelter such as a crack or roof fissure may indicate an interruption of hibernation: the animal may have been disturbed by an anthropogenic factor (noise or light from excursion groups) or by a sharp change in external temperatures.

Notes on occurrence in the Kaliningrad Region. Morphologically, the discovered specimen belongs to the 'eastern' morphotype, the subspecies *P. kuhlii lepidus*, which is known to be spreading from Central Asia towards the north-west (Sachanowicz *et al.*, 2017; Shpak *et al.*, 2025). This subspecies has already been recorded hibernating in nearby areas: in Poland and Belarus (Lesiński & Janus, 2023; Shpak *et al.*, 2025). In July 2020 in southern Poland (Kraków) was also recorded the young male *P. kuhlii kuhlii*. The authors claim this find to be reliable evidence of the species' reproduction in Poland (Postawa & Marchewka, 2021).

However, an independent, unaided flight by this bat from the nearest currently known localities to Kaliningrad would be unlikely. Kuhl's pipistrelles have been ringed in Armenia, Azerbaijan, France, Italy, and Spain (Hutterer, 2005). No long-distance movements have ever been recorded. In Armenia, seasonal roost changes of 1–3 km were documented, with a maximum of 5 km (Yavrouyan, 2002; Hayrapetyan & Harutyunyan, 2016), which supports the view that Kuhl's pipistrelle a sedentary species incapable of long-distance migration (Bogdanowicz, 2004). In addition, documented records of this species within adjacent territories are currently limited, despite active bat rehabilitation work in which *P. kuhlii* individuals are regularly received during winter from natural areas (Godlevska, 2012; Thor & Bielecki, 2021; Prylutska, 2022).

Meanwhile, the introduction of this specimen appears more plausible (Petrosyan *et al.*, 2020). *Pipistrellus kuhlii*, as a generalist, adaptable, synanthropic species, actively uses various man-made structures and seldom occurs in natural shelters. The roost sites it is known to occupy include cracks in clayey bluffs, crevices in chalk, drywall delaminations, sheet-metal roofing, spaces under eaves, cavities within stone walls, under window frames and shutters, etc. (Il'in & Smirnov, 2000; Il'in *et al.*, 2003). It has also been observed using cavities in the cars as daytime roosts (Il'in, 2000).

There are documented cases of a Kuhl's pipistrelle becoming lodged in one of the sensors of an aeroplane, which led to an emergency stop of the aircraft (Zabashta & Smirnov, 2022), and of the passive transport of pipistrelles by lorry from Italy to the Netherlands (Lina, 1990) and southern England (Hutson, 1992, 1996). Another member of the genus *Pipistrellus*, *P. nathusii* (Keyserling & Blasius, 1839), has been recorded extending its range by travelling on a ship (Dietz & von Helversen, 2004). The record of *P. nathusii* in the Novosibirsk Region may likewise be explained by human-mediated transport (Tomilenko & Vasenkov, 2026). The authors of the present paper also witnessed a young male *Nyctalus noctula* (Schreber, 1774) being transported from the Stavropol Territory (Russia; 44.0386°N, 43.0648°E) to Saint Petersburg by train. In early September 2023, the bat flew into a window frame on the fifth floor of a block of flats, apparently entered a backpack unnoticed, and was discovered a day and a half later, already in the train compartment. Thus, there is a sufficient body of evidence for the incidental transport of bats by humans into areas where those species do not typically occur. Moreover, the Kaliningrad Region is a popular travel destination, and Kuhl's pipistrelle could have been brought in this means.

In any case, *Pipistrellus kuhlii* has expanded, and continues to expand, its range into areas from which it was previously absent. This occurrence represents a new influence on the native ecosystem — an influence whose scale is not yet known or extensively studied, but which suggests at least some degree of resource competition (Razgour *et al.*, 2010, 2011). However, the species' northward expansion has been somewhat slower than ensemble distribution models predict (Ancillotto *et al.*, 2016). At present only isolated records exist from Belarus, Poland, and the Kaliningrad Region. This delay in colonisation of areas with suitable climatic conditions may be attributable to the species' lack of capacity for long-distance migration. Nevertheless, its ability to exploit man-made structures as roosts and to be transported inadvertently by human conveyance is likely to continue promoting its northward expansion.

Similar concerns apply to the synanthropic *Vespertilio murinus* Linnaeus, 1758, which has expanded its wintering range in part owing to its ability to hibernate in multi-storey buildings (Strelkov, 2001; Godlevska, 2013). At present, the opportunistic selection of both summer and winter roost sites and commensalism with humans appears to be the decisive factors underpinning the competitive advantage of synanthropic bat species over that dependent solitary on natural habitats.

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