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First record of *Lepus timidus* (Linnaeus, 1758) from Novaya Zemlya, Russian Arctic (Lagomorpha, Leporidae)

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Abstract
Mountain hare (*Lepus timidus*) is a widespread species that lives throughout the continental tundra zone of Eurasia, as well as over the greater part of the northern forest zone. For a long time, the presence of the mountain hare in the fauna of the Novaya Zemlya Archipelago was assumed. However, documented evidence from the archipelago was lacking. In 2017, two fragments of the lower jaw of a single specimen were found in the Bezymyannaya Bay area on Yuzhny Island, Novaya Zemlya, Russia. This record confirms the presence of the species on the archipelago, while its status remains unclear. The jaw fragments from Novaya Zemlya contained dry meat remnants, indicating that this individual died relatively recently (i.e., no more than 10 years ago). It is likely that the species periodically visits the archipelago, without forming a viable population there.

Keywords
Fauna, High Arctic, *Lepus timidus*, mammals, new record, Russia, Yuzhny Island.

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Introduction

Located in northwestern Russia, Novaya Zemlya is one of the most inaccessible and poorly studied archipelagos in the world. The vertebrate fauna of this archipelago is described in a few works (Kalyakin 1993; Gavrilo 2015; Kvie et al. 2016; Spitsyn 2015, 2016; Rozenfeld and Spitsyn 2017; Spitsyn et al. 2016, 2017; Bolshakova and Bolshakov 2018). Kalyakin (1993) provided a comprehensive overview of mammal and bird species that were recorded from this insular land and surrounding areas, and noted records of *Lepus timidus* (Linnaeus, 1758) from the Vaigach Island (70°N). In contrast, this species was not recorded from Novaya Zemlya in the 19th or 20th century, although it was assumed that it could have been there (Kalyakin 1993). This species is widespread and lives throughout the continental tundra zone of Eurasia, over a large area of the northern forest zone, as well as on some islands and in the Alps (Smith ans Johnston 2019).

In this study, we report the first reliable record of *Lepus timidus* from Novaya Zemlya. This site is located over 300 km north of the Vaigach Island, in which the hare was recorded previously. These localities are also separated by a 60 km wide marine strait between Yuzhny and Vaigach islands.

Methods

The Novaya Zemlya Archipelago was studied by us in 2015 and 2017. Six model locations were observed.

Three model locations were at the Severniy Island: Russkaya Gavan' Bay, Bogaty Island (76.2°N, 062.7°E), Oranskiye Islands (77.0°N, 67.7°E), and Cape Zhelaniya (76.8°N, 068.5°E). Also, three locations were studied on the Yuzniy Island: Belushya Bay (71.5°N, 052.3°E), Malye Karmakuly (72.3°N, 052.7°E), Bezymyannaya Bay (72.8°N, 052.5°E). Lower jaw fragments of *Lepus timidus* were found in a tundra site during a field survey at the Bezymyannaya Bay area in 2017. The finding was obtained during studies of bird fauna of the archipelago by method of route accounting. Total length of land routes is 470 km. The samples were deposited in the Russian Museum of Biodiversity Hotspots (RMBH) of the Federal Center for Integrated Arctic Research of the Russian Academy of Sciences, Arkhangelsk, Russia. The jaw images were taken using a Canon EOS 80D camera (Canon, Tokyo, Japan).

Results

New record. Two fragments of the lower jaw (with dry meat remnants) of a single specimen of *Lepus timidus* (Linnaeus, 1758; Fig. 1) were collected in Russia, on the Novaya Zemlya Archipelago, Yuzhny Island, Bezymyannaya Bay area (72.87°N, 053.62°E; Fig. 2), 21 July 2017, coll. Spitsyn (RMBH, Lem035).

Identification. The following characteristic was used to determine species identification: the first anterior tooth root of the lower jaw in *Lepus timidus* is strongly inclined backwards (Kuznetsov 1975). *Lepus timidus* is the only hare species which occurs in Arctic Eurasia, as the range of *Lepus europaeus* (Pallas, 1778) does not extend to the Arctic Region (Thulin 2003).

Discussion

This novel record of mountain hare is located more than 300 km north of Vaigach Island, which eliminates the possibility that the jaw fragments were carried to the site by predatory birds. However, it is unclear whether the species can form a viable population on the archipelago or occasionally visits the archipelago via ice cover. In general, *L. timidus* is a species adapted well to extreme polar environments, because its range extends beyond 77°N on the Taimyr Peninsula, Russian Arctic (Thulin 2003). The presence of dry meat remnants on the jaw fragments from Novaya Zemlya indicates that this animal had recently died (i.e., no more than 10 years ago).

Acknowledgements

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Authors' Contributions

VMS collected specimens, took the pictures and wrote the text; NIB wrote the text as a co-author.

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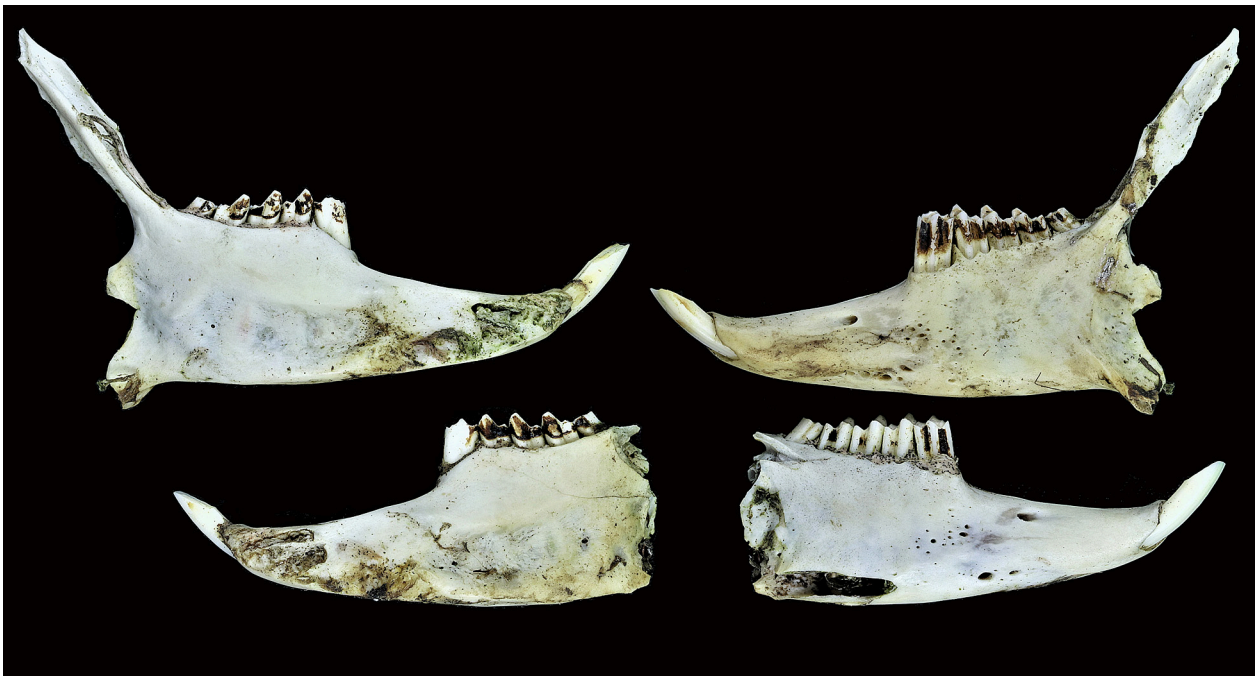

Figure 1. Lower jaw fragments of *Lepus timidus* (Linnaeus, 1758) from the Novaya Zemlya Archipelago (photo by Vitaly M. Spitsyn).

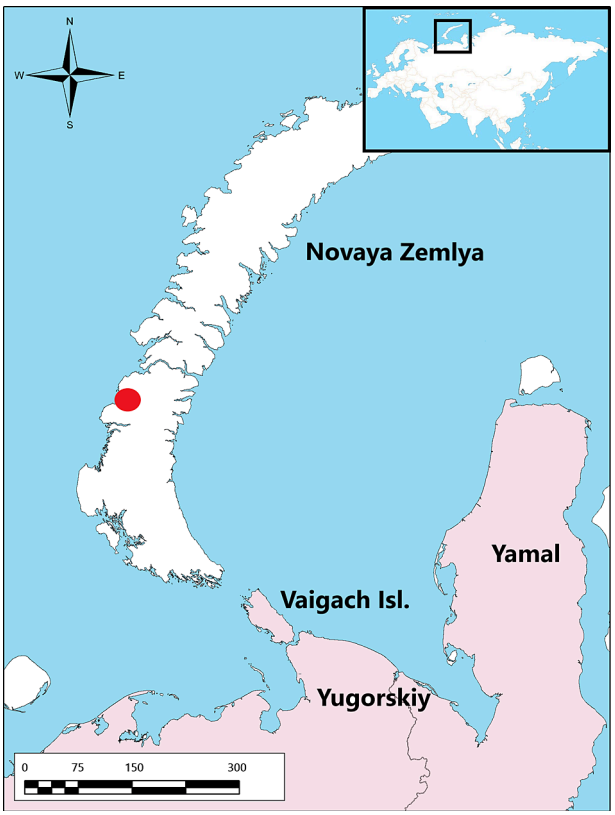

Figure 2. Distribution of *Lepus timidus* (Linnaeus, 1758) in the Novaya Zemlya region. The pink area indicates the previously known distribution of *L. timidus*, and the red dot indicates the novel record for the species.

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