

The experience of reintroducing the Olkhon mountain vole to insular ecosystems of the Lake Baikal area

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Abstract

This short communication reports the initial results of the experimental reintroduction of the Olkhon mountain vole *Alticola olchonensis*, an endemic mammal species of the Lake Baikal area. In 2019–2020, several dozen young individuals born in the vivarium of the Institute of Systematics and Ecology of Animals SB RAS (Novosibirsk, Russia) were released into the wild on Borokchin Island (the Maloe More Strait, Lake Baikal). The Olkhon mountain vole used to inhabit this island but disappeared in the early 21st century. The reintroduction outcomes can be considered successful as the young-of-the-year voles have survived the winter and bred.

Keywords: *Alticola*, biodiversity, Lake Baikal, mountain voles, Olkhon island, threatened species, wildlife conservation

Introduction

The sustainability of a natural ecosystem refers to its ability to continuously maintain its structure, the relationships between elements, and their function (Begon et.al., 2005). The abundance of constituent species and their functional diversity play a crucial role in maintaining the ecosystem's sustainability since the continuous flow of energy and the cycle of matter in the ecosystem depend on this factor (Gaston, 2000; Chapin et.al., 2011). Therefore, biodiversity in the ecosystem is an essential criterion for its sustainability (Schvarts, 2004; Field et.al., 2009). Biodiversity conservation in the unique and vulnerable ecosystems of the Lake Baikal basin is becoming particularly important.

The insular ecosystems are always characterized by low taxa richness and incomplete occupancy of ecological niches in communities (May, McLean, 2007). Furthermore, insular faunas and floras often contain apparently relict species and higher taxonomic categories, while on the other hand containing young endemic species. These two aspects can sometimes be observed simultaneously: an apparently relict genus can be represented by young species (one or several) that have been isolated rather recently.

The terrestrial vertebrate fauna of the Lake Baikal depression is interesting due to the fact that several heterogeneous faunistic complexes are mixed here: the lake occupies a unique place at the junction between the arid and humid belts, the zones affected by the Atlantic and Pacific oceans, as well as the interaction between the cold boreal and Central Asian continental atmospheric fronts (Galaziy, 1993). The Lake Baikal depression starts in the middle taiga zone, passes through the southern taiga zone, and embraces the steppe zone. The depression is completely surrounded by mountain ranges and uplands, which affect the air mass migration and the distribution of precipitation, thus forming a unique complex of climatic conditions. Here, the horizontal zonation is closely intertwined with the altitudinal one. Furthermore, the unique nature of the Cis-Baikal region is determined by a certain degree of its isolation from other landscapes. That is the reason why endemic and relict animal species are common for the fauna of Lake Baikal (Litvinov, 1982). The high percentage of Baikal endemic species is typical of aquatic animals. The Olkhon mountain vole *Alticola olchonensis* Litvinov, 1960 (Rodentia: Cricetidae), is the only terrestrial mammal found nowhere else in the world except the Baikal region. This species has a relict origin directly related to Lake Baikal's origin, the formation of the Baikal Rift zone, and the rocky steppe landscapes remaining since ancient times (Litvinov, 1960, 1970; Litvinov et.al., 2000).

The aim of the present work was to study the possibility of the successful reintroduction of the Olkhon vole on the islands of Lake Baikal. Because of its relic origin, small and discontinuous habitat, and declining population number, the Olkhon mountain vole can be classified as an endangered species (Gerrie & Kennerley, 2016). The loss of any biological species threatens human civilization by disrupting the biological balance (MacArthur, 1955). As recently reported, the largest habitat patches of the Olkhon mountain vole are located on Lake Baikal islands, which have been isolated for an appreciably long time, are characterized by a set of different conditions and limited migration, and can be viewed as biological systems that can be used to analyze and simulate the eco-evolutionary processes occurring in contemporary animal populations and communities (Litvinov et.al., 2000; Abramov et.al., 2017).

Material and methods

For the studies on the reintroduction, we used forty-three Olkhon mountain vole individuals (21 females and 22 males) of a new generation born in the vivarium of the Institute of Systematics and Ecology of Animals SB RAS (Novosibirsk, Russia) from breeding pairs (n=9) captured in the Tazheran Steppe and Hubyn and Olkhon Islands in 2017 and 2018. To capture animals we used standard Sherman live-traps placed suitable for the mountain voles' habitats, under rocks, on rodents' paths, near food stores (stocked herbaceous plants) and latrines.

In the vivarium, voles were kept in Ferplast's cages («Mini Duna Multy») in pairs, with natural light periods and temperatures throughout the year. The places of capture and location of the vivarium (Novosibirsk) are located almost at the same latitude, so we can assume that the lighting conditions and temperature regime in the vivarium as much as possible correspond to the natural.

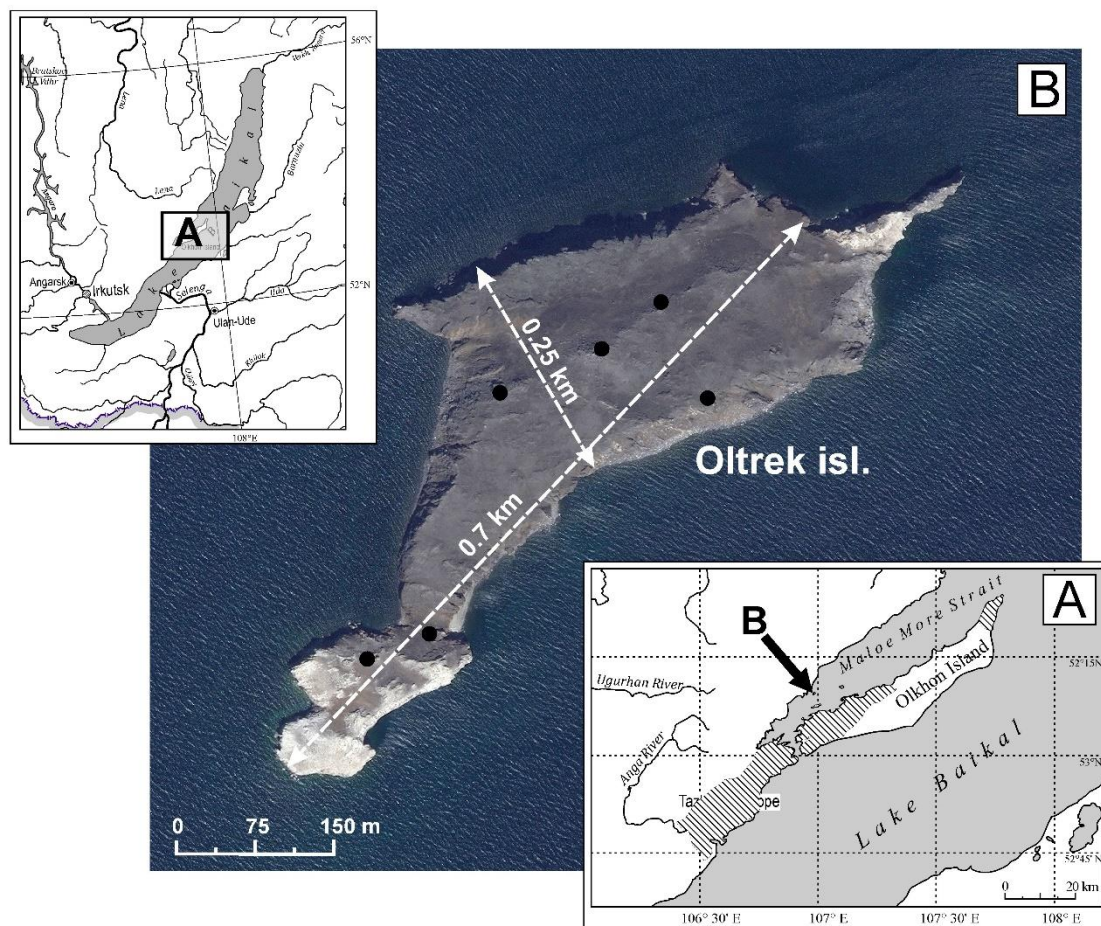


Figure 1. Map of Borokchin Island with a range of Olkhon vole (oblique hatching) and locations of release in 2019 (black dots)

In July 2019 we brought voles to their natural habitats on Lake Baikal. Borokchin (Oltreki) Island, one of the small islands in the Maloe More Strait, was selected to conduct field studies on the reintroduction of the Olkhon mountain vole. This species used to inhabit the island but

currently no longer occurs there. The location of this island and the range of *Alticola olchonensis* are shown in Figure 1.

Results and discussion

Recently, there has been a trend toward the abrupt narrowing of the habitat-suitable range of the Olkhon mountain vole and the reduction of its habitat (Litvinov et al., 2012). Our studies indicate that isolated populations of the Olkhon mountain vole can occur on islands of the Maloe More Strait and Olkhon Island for considerably long periods of time. The size of insular populations can become minimal during certain periods. A decline in population size is followed by a noticeable rise; these variations occur on isolated islands and the mainland non-synchronously. The declines in the population size of this species observed over the past years can be indicative of the trends leading to the disappearance of the Olkhon mountain vole from the islands (Litvinov et.al., 2000).

The key factors contributing to the reduction of the population size of the Olkhon mountain vole are as follows: (a) the scarce predators (both terrestrial ones and raptors) that occasionally appear on the islands (common weasel and ermine reach the islands over ice in winter; red fox can cause especially significant damage to the Olkhon mountain vole population); (b) competition with other vole species that periodically migrate to the islands: they can quickly drive the native species out of the area; and (c) the anthropogenic impact that has been intensified recently because of the booming number of tourists visiting the islands and tourism activities. The influx of day cruisers and motor boats mooring to the shoreline poses a risk of introducing non-native mammalian species to the islands. The organizers of tourist trips to the islands dramatically alter the appearance of rocky biotopes by laying down stone verges and treading numerous paths for tourists, thus destroying the scarce shelters of the Olkhon mountain vole that is extremely conservative when it comes to habitat selection.

Research into the theriofauna and communities of mammals of Borokchin Island have been conducted since the mid-21st century. Over this period, the Olkhon mountain vole was the only captured species, and the red fox was spotted occasionally. It is likely that the Olkhon mountain vole was the only small mammal species inhabiting Borokchin Island before 1987, while the northern red-backed vole (*Myodes rutilus* Pallas, 1779), grey red-backed vole (*Craseomys rufocanus* Sundevall, 1846), and tundra vole (*Alexandromys oeconomus* Pallas, 1776) migrated to the island in the late 1980s (Litvinov et al., 2012). Our studies have shown that the Olkhon mountain vole no longer occurred on this island in the 21st century. In 2011, the tundra vole was spotted in the habitats typical of the Olkhon mountain vole, and we did not find signs of the presence of this species (grass stocks, fresh droppings).

43 individuals of a new generation of *Alticola olchonensis* were brought to Borokchin Island in July of 2019. At an age of 35–45 days, the young animals were released at their “ancestral homeland” (Fig. 2). By this very age, Olkhon voles develop the basic instinctive behaviors in nature: they become more cautious, start reacting to threats by hiding in shelters, differentiate between the in-group and out-group members, dry grass blades and pile them up to stock up on food for winter, and become independent. The same features are characteristic of a species close to them – Tuva silver vole (*Alticola tuvunicus* Ognev, 1950) (Lopatina et.al., 2017). Meanwhile, their behavior is appreciably flexible at this age, and the young animals adapt to new conditions more easily.



Figure 2. Olkhon voles released at Borokchin Island in 2019.

Over the next two years (2020–2021), we continued to follow up on the “returnees” and signs of their presence in the new habitat (droppings and stored dried grass). In late June 2020, a young-of-the-year specimen was captured in the area where the Olkhon mountain voles had been released the year before, which clearly indicated that the released animals have successfully survived winter and bred. During the same period, seven more Olkhon mountain vole individuals born in the vivarium of the ISEA SB RAS in May–June 2020 were released into the wild on the island. During the summer of 2021, we spotted tracks, fresh droppings, and stored fresh grass clippings: the reintroduced Olkhon mountain voles continue dwelling on the island. The contemporary world has witnessed an appreciably large number of examples when an animal species was reintroduced to a locality that it used to inhabit previously but disappeared for some reason (most typically due to the anthropogenic impact). We hope that returning the Olkhon mountain vole to the islands of Lake Baikal will be regarded as an example of successful reintroduction in future years.

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