Consequences of the Introduction of the Russian Red Tree Squirrel
Sciurus vulgaris exalbidus (Pallas, 1778) to Omsk Oblast

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Abstract—In Omsk oblast, the red squirrel Sciurus vulgaris is represented by three chorological groups with
different geographic and demographic characteristics. The first group lives in the southern taiga subzone and
northern mixed and deciduous forests and represents an indigenous group of S. v. martensi. The second group
is formed in the southern subzone of mixed forests as a result of the introduction in 1957–1960 of S. v. exalbidus
into the territory of habitation of S. v. martensi and represents a hybrid group different from the aboriginal one
in the ratio of native color morphs and population dynamics and density. The third group is formed in the central
forest-steppe in artificial pine plantations as a result of the introduction in 1976–1984 of S. v. exalbidus into the
free area; it is small with sparse density and a characteristic ratio of color morphs.

Keywords: Omsk oblast, range, red squirrel, subspecies, introduction, demographic indices
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INTRODUCTION

The intentional introduction of the red squirrel Sciurus vulgaris was initiated in the Soviet Union in 1927; introductions were conducted in 18 republics, krais, and oblasts of Russia, where more than 6000 specimens were released. At present, the squirrel lives in coniferous and mixed forests of Eurasia from the Atlantic to Pacific coasts, on Sakhalin, and in Japan; the squirrel has naturalized in Crimea, the Tien-Shan, and the Caucasus. The squirrel penetrated into Kamchatka as early as 1929 as a result of natural expansion of its range (Bobrov et al., 2008; Chuzherodnye vidy..., 2012).

Several subspecies of the red squirrel Sciurus vulgaris Linnaeus, 1758 inhabit West Siberia: S. v. martensi Matschi, 1901, S. v. exalbidus Pallas, 1778, S. v. altaicus Serebrennikov, 1928, and S. v. kalbinensis Selevin, 1935 (Ognev, 1940; Bobrinsky et al., 1965; Sokolov, 1977; Kolosov et al., 1979; Gromov and Erbaeva, 1995; Pavlinov et al., 2002; Mashkin, 2007).

The red tree squirrel S. v. exalbidus is the largest in size and has the most valuable fur among other squirrels; it lives in pine forest bands in Cis-Altai steppes of the southern zone of Western Siberia and Kazakhstan (Larin, 1953). Its dispersion occurred in habitats of aboriginal subspecies, in particular, in Tatarstan, Novosibirsk oblast, and Altai and Krasnoyarsk krais. From 1946 to 1963, 19 releases were made and 2667 specimens were introduced into pine forests of European Russia, Ukraine, Lithuania, and Crimea and into island forests of Northern Kazakhstan (Pavlov et al., 1973). It was reported that the red tree squirrel is distributed in pine forest bands along the Irtysh and Ob rivers to the north to Novosibirsk (Chuzherodnye vidy..., 2012).

It was established that releases of red tree squirrel into some regions (Kirov and Bryansk oblasts) with high abundance of other squirrel subspecies were not successful. When crossing with native squirrels, the introduced species vanished rapidly among more numerous populations, and in a year or two, it was impossible to recognize features inherent to introduced animals. According to Chesnokov (1989), the releases of red tree squirrels into the range of native squirrels to improve the fur quality were not a success. The improvement of fur quality was not recorded in the regions of alien squirrel release. This was not because the work was performed primitively and without scientific control, but because it was conducted without scientific grounds. Without statistical, ecological, and genetic foundations, the measures aimed at intraspecific hybridization are condemned to failure.

The fur color of squirrels reflects their geographical and individual variability. It is manifested in the size of a white spot on the belly, in the color of the back and tufts of hair on its ears, and especially in tail color. Certain color morphs of squirrels can be identified (red-, brown-, dark-, black, and gray-tailed squirrels). Each subspecies in native habitats is characterized by a typical quantitative ratio of specimens with a certain fur color (Table 1).
To date, the results of S. v. exalbidus introduction to the territory of Omsk oblast have not been analyzed. The aim of the study is to assess the consequences of S. v. exalbidus introduction to the territory of Omsk oblast.

The tasks of the study are as follows:
— to study the features of the Russian red tree squirrel introduction to the territory of Omsk oblast;
— to reveal the consequences of its introduction to the territory of Omsk oblast.

MATERIALS AND METHODS

The field studies were conducted over a 19-year period (from 1994 to 2012). The materials were collected during ecological expeditions in Omsk oblast and on the basis of analysis of biological materials and archival data of the Omsk Regional Agency for Hunting and using bibliographical materials. The squirrel population was estimated according to the data obtained during winter route visual counts and skin procurements. The ratio of color morphs was determined according to the materials of regional procurements of fur skins, visual counts, and taking pictures of S. v. exalbidus in the Krasnoyarsk-Chernoluchie zone. The natural zonation of Omsk oblast is presented according to Zaikov (1977).

The study was carried out in Omsk oblast, which occupies a vast territory within forest, forest-steppe, and steppe zones in the southwestern part of the West Siberian Plain. The territory of Omsk oblast stretches 600 km from north to south (53°–58° N) and 300 km from west to east (70°–76° E). It covers the northern part of the Ishim-Irtysh interfluve and a wide band of the territory occupies the Irtysh-Ob interfluve. The geographical position of Omsk oblast determines the diversity of its natural conditions. The latitude zonation of the vegetation distribution is distinctly expressed on the plain territory.

RESULTS

The Western Siberian S. v. martensi inhabits coniferous forests in seven northern districts of Omsk oblast: Ust-Ishimskii, Tevrizskii, Tarskii, Znamenskii, Sidelnikovskii, Muromtsevskii, and Bolsheukovskii districts. The total area of the districts is 62507 km², the area of habitat of squirrels is 25430 km². Over the period of 1994–2010, the maximum density of the population was recorded in Ust-Ishimskii and Tarskii districts and averaged 6.7–7.3 ind./10 km²; the maximum relative abundance was 37.7 ind./10 km² in 2000. The long-term average density was 4.4–5.1 ind./10 km² in Tevrizskii district, 2.0 ind./10 km² in Znamenskii district, and 0.54 ind./10 km² in Bolsheukovskii district, where large areas of coniferous and mixed forests were cut down. The average density of the squirrel population in the main habitats in Omsk oblast was about 4 ind./10 km² (Sidorov et al., 2009, 2011).

In 1927–1941, the Russian red tree squirrel S. v. exalbidus was transported from the Baltic forests to pine forests near the Ob River in Novosibirsk oblast, and in 1957–1960, squirrels were transported to Omsk oblast and released in the vicinity of the village of Il’inka, Muromtsevskii district. The first release of 108 squirrels was performed in 1957, the second release of 200 specimens was in October 1958, and the third release of 173 squirrels was in October 1960 (Table 2).

The second introduction was attempted in 1976: five squirrels S. v. exalbidus were released into pine plantations near the city of Nazyvaevsk in Novosibirsk oblast. Control visual counts of 1978 revealed young squirrels of a new generation. In 1978, nine squirrels

<table>
<thead>
<tr>
<th>Color morph</th>
<th>Form of melanism*</th>
<th>Red tree squirrel</th>
<th>Altai</th>
<th>Kalbin</th>
<th>Western Siberian</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>S. v. exalbidus</td>
<td>S. v. altaicus</td>
<td>S. v. kalbinensis</td>
<td>S. v. martensi</td>
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<td>Red-tailed</td>
<td>Pheomelanists</td>
<td>&lt;50</td>
<td>−0</td>
<td>&gt;50</td>
<td>−3</td>
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<tr>
<td>Brown-tailed</td>
<td>Pheo + eumelanists</td>
<td>−0</td>
<td>−50</td>
<td>&lt;50</td>
<td>−50</td>
</tr>
<tr>
<td>Dark-(black)tailed</td>
<td>Eumelanists</td>
<td>−0</td>
<td>−50</td>
<td>−0</td>
<td>−50</td>
</tr>
<tr>
<td>Gray-tailed</td>
<td>M-melanists</td>
<td>&gt;50</td>
<td>−0</td>
<td>−0</td>
<td>−0</td>
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</tbody>
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* Eumelanins pigment fur in brown and black; pheomelanins pigment fur in red and yellow; M-melanists are specimens with phenotypical manifestation of specific mutation of melanocytes.