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Source: *Folia Zoologica*, 67(1):1-5.

Published By: Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic

<https://doi.org/10.25225/fozo.v67.i1.a6.2018>

URL: <http://www.bioone.org/doi/full/10.25225/fozo.v67.i1.a6.2018>

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# Dormouse (Gliridae) status in Lithuania and surrounding countries: a review

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Received 16 January 2018; Accepted 15 March 2018

**Abstract.** Lithuania and surrounding countries are situated in the northern part of dormouse (Gliridae) distribution ranges. Garden dormouse may be extinct in all these countries because the last observations of this species were recorded in the end of 20<sup>th</sup> century. Fat dormouse is rare and declining in Lithuania and surrounding countries because of destruction of their habitats – felling of mature oak-dominated forests. Forest dormouse is rare because western limit of its distribution range goes through Latvia, Lithuania and Poland. Status of the hazel dormouse is different in the countries concerned. This species is common and widespread in Lithuania, but red-listed in Latvia and Belarus, and absent in large deforested areas in Poland. The hazel dormouse may be extinct in Estonia, but common and not threatened in southern Sweden. In different countries, status of the hazel dormouse depends on anthropogenic influence on its habitats and probably also on investigation level. Some outdated information on distribution and status of some dormouse species is presented in the IUCN red lists.

**Key words:** garden dormouse, hazel dormouse, fat dormouse, forest dormouse

## Introduction

Lithuania and surrounding countries – Latvia, Belarus, Poland, Estonia, Finland and Sweden – are situated in the northern part of dormouse (Gliridae) distribution ranges. Northern distribution limit of the hazel dormouse (*Muscardinus avellanarius*) reaches Sweden and Estonia, the garden dormouse (*Eliomys quercinus*) – Finland and Estonia, the fat dormouse (*Glis glis*) and the forest dormouse (*Dryomys nitedula*) – Latvia and Belarus (IUCN 2017). It could be expected that living conditions should be sub-optimal on the northern periphery of ranges, and dormice should be rare here (Juškaitis et al. 2015). In general, this assumption is correct. With few exceptions, all dormouse species living in Lithuania, Latvia, Estonia, Poland and Belarus are included in the Red Data Books of these countries (Table 1). However, in some cases, the status of the same dormouse species is different in adjacent countries. None dormouse species is included in the Red Data Book of the Kaliningrad region which is adjacent to Lithuania (Dedkov & Grishanov 2010), and it seems that dormice are data deficient in this region. In general, new data on dormice and their status are very scant in the Russian Federation (but see Orlov et al. 2013).

In Lithuania, special searches of rare dormouse species – garden, fat and forest dormice – was carried

out using nestboxes several times during last three decades, and hazel dormice also were recorded during these studies. Since 1990, ten populations of the fat dormouse, two populations of the forest dormouse, but none population of the garden dormouse were discovered. Numbers of 10 × 10 km squares with localities of the hazel dormouse known increased from 28 in 1988 up to 150 in 2017 (Juškaitis 2003 and unpublished). Although actual distribution of the hazel dormouse in Lithuania is investigated insufficiently, results of research on dormouse distribution in Lithuania enables us to assess the status of all four-dormouse species rather well.

The aim of the present paper is to review the status of four dormouse species in Lithuania and surrounding countries, situated in the northern part of dormouse distribution ranges, in comparison to the rest of their ranges, and to discuss possible reasons of different dormouse status in separate countries.

### *Garden dormouse (Eliomys quercinus)*

In Lithuania, garden dormice were recorded in a single locality sixty years ago. In 1957-1959, females with litters of 4-6 young were found four times in nest boxes in southern Lithuania, Varėna district. Garden dormice were recorded in dry Scots pine (*Pinus sylvestris*) forest with common junipers (*Juniperus*

**Table 1.** Status of dormouse species in the Red Data Books and Red lists of separate countries situated in the northern part of their ranges.

Country	Dormouse species				References
	Garden dormouse	Hazel dormouse	Fat dormouse	Forest dormouse	
Lithuania	Extinct or possibly extinct	+	Vulnerable	Rare	Rašomavičius 2007
Latvia	Rare	Rare	Shrinking	Rare	Andrušaitis 2000
Belarus	Vulnerable	Near threatened	Vulnerable	+	Kachanovskii et al. 2015
Poland	Critically endangered	+	Near threatened	Near threatened	Głowaciński 2001
Estonia	Data deficient	Data deficient			Estonian eBiodiversity 2018
Finland	Regionally extinct				Rassi et al. 2010
Sweden		+			Berglund & Persson 2011

Explanation: + dormouse species is present, but not red-listed in this country.

*communis*) and a ground cover of moss and lichens (Jezerskas 1961). Special searches using nestboxes were carried out in this area in 1990, 1997-1998 and 2015-2016, but garden dormice were not found. It is believed that garden dormice are extinct in Lithuania. Many new localities of the hazel dormouse as well as some localities of rare dormouse species – the fat dormouse and the forest dormouse – were recorded during last three decades, but any current information about presence of the garden dormouse is absent in Lithuania. The status of this species in the Red Data Book of Lithuania was changed in 2000: from the 4<sup>th</sup> category (Indeterminate species) to the 0 category (Extinct or probably extinct species; Rašomavičius 2007).

Status of the garden dormouse is similar in surrounding countries (Table 1). Garden dormouse is red-listed species in Latvia, Estonia, Finland, Belarus and Poland. In the first half or middle of the 20<sup>th</sup> century, many localities of the garden dormouse were recorded in Latvia and Estonia, several localities in Belarus and Poland, but any record of this species is absent in these countries in the 21<sup>st</sup> century. The latest documented records of the garden dormouse are in Latvia from 1985, in Estonia from 1986, in Finland from 1989, in Belarus from 1996 and in Poland from 1998 (Andrušaitis 2000, Głowaciński 2001, Luomus 2014, Kachanovskii et al. 2015, Estonian eBiodiversity 2018).

In the Finish Red List, category of the garden dormouse was changed from “Endangered” to “Regionally Extinct” (Rassi et al. 2010). Live trapping was done in

four localities with the recent confirmed observations in Finland in 2013. The total trapping effort was 3386 trap-nights, but garden dormice were not captured (Luomus 2014).

In the second half of the 20<sup>th</sup> century, distribution range of the garden dormouse considerably declined in large area of the Russian Federation. Although the garden dormouse is not included in the Red Data Book of the Russian Federation, but it is included in Red lists of even 14 regions of this country. The garden dormouse is considered to be extinct in the Tver region (Orlov et al. 2013).

The species is considered extinct in Slovakia, red-listed in Ukraine, Croatia, Czech Republic, Romania and Italy (Bertolino 2017). In Germany, garden dormouse is declining or even extinct in some regions, but it is considered common west of the River Rhine (Meinig & Büchner 2012). The species is still common in south-west Europe: large parts of Portugal, Spain, France and Italy (Bertolino 2017).

Old records of the garden dormouse from Finland, Estonia and Latvia were included in distribution map of this species in the Atlas of European mammals (Mitchel-Jones et al. 1999), and later in the IUCN red list (IUCN 2017). So, both these distribution maps are outdated: northern part of the distribution range of the garden dormouse is much smaller now.

#### *Hazel dormouse (Muscardinus avellanarius)*

In Lithuania, hazel dormouse is relatively common and widely distributed across almost all the country. Although there are many blank areas in the Lithuanian

distribution map, majority of them are related only with the lack of data because special dormouse search has not been carried out. In some of the best investigated areas, dormice were found in every forest or in every 10 × 10 km square. In total, hazel dormice were recorded in 150 such squares until 2018. However actually, hazel dormice should be present in more than 500 out of about 700 squares covering area of Lithuania, because suitable habitats are present in majority of these squares.

Status of the hazel dormouse is different in surrounding countries (Table 1). This species is red-listed in Latvia, Estonia and Belarus (Andrušaitis 2000, Kachanovskii et al. 2015, Estonian eBiodiversity 2018). Hazel dormouse could be even extinct in Estonia, because the last time this species was recorded in 1990 (Estonian eBiodiversity 2018), and hazel dormice were not found during special search in 2009 (Jaik 2010).

In Latvia, hazel dormice are distributed sporadically in western part, one locality is known in central part, but the species is absent in eastern part of the country (Pilāts 1994, Andrušaitis 2000). However, there are many localities of the hazel dormouse in northern Lithuania along the border with Latvia. Thus, presence of the hazel dormouse in southern Latvia along the border with Lithuania could be expected. In Belarus, 20 localities of the hazel dormouse are known after 2000 (Kachanovskii et al. 2015). However, according to extent of forest cover and forest stand composition in Belarus, this species should be much more common in this country. In Poland, hazel dormouse is not red-listed species, but it is absent or only solitary localities are known in central and north-western Poland (Atlas Ssaków Polski 2018). This could be due to very extensive deforestation in these parts of the country in the past (Jurczyszyn & Wołk 1998).

Status of the hazel dormouse in southern Sweden is similar to Lithuania. There are now so many new observations of the species in southern Sweden that it no longer remains on the Red list of the country since 2005. There are at least 2 000 000 ha of suitable habitats for the hazel dormouse in Sweden, and the national population should be at least 2 million adults in spring (Berglund & Persson 2012).

In parts of its north-western range (e.g. the United Kingdom, the Netherlands, Belgium, Germany, Denmark) hazel dormouse populations are declining and fragmented because of habitat loss and fragmentation (IUCN 2017). Ongoing decline in dormouse abundance was recorded in the United Kingdom despite a high level of species protection

and widespread conservation measures (Goodwin et al. 2017). In central and southern parts of the range, populations of hazel dormouse are considered stable, although this species is red-listed in Romania (Botnariuc & Tatole 2005). According to proportion of the hazel dormouse in diet of owls (Obuch 2011), hazel dormice should be especially abundant in Slovakia.

Summarising, status of the hazel dormouse is different in separate countries situated on the northern part of its range. Status of the hazel dormouse does not depend on geographical latitude, but depends on anthropogenic influence on its habitats in separate countries. Habitat loss, habitat fragmentation and forest management improper for this species are the main reasons for decline of the hazel dormouse (Bright & Morris 1996). In Lithuania, all these negative factors are negligible. Forest management, which includes small-scale clear-felling, is favourable for the hazel dormice in Lithuania (R. Juškaitis, in preparation).

It should be noted that some outdated information is presented in the IUCN red list (IUCN 2017): the hazel dormouse is not declining in Sweden, and it is probably extinct in Estonia.

#### *Fat dormouse (Glis glis)*

Fat dormouse is a rare species in Lithuania: only ten localities are known at present, and they are concentrated in the southern part of the country along the two biggest rivers – Nemunas and Neris. Dormice are extinct in two localities where they were recorded in 1936, and presumably extinct in some other sites. Mature mixed forests with old pedunculate oaks (*Quercus robur*) and old hazels (*Corylus avellana*) are the main habitats of this species in Lithuania (Juškaitis & Augutė 2015). Felling of such forests is the main reason of decline of this species in the country. Fat dormouse is included in the Lithuanian Red Data Book (2<sup>nd</sup> category – Vulnerable species) and in the List of strictly protected species of Lithuania (Rašomavičius 2007).

Fat dormouse is red-listed species also in neighbouring countries: Latvia, Belarus and Poland (Andrušaitis 2000, Głowaciński 2001, Kachanovskii et al. 2015). Although historically and recently fat dormouse was recorded in various parts of Latvia, its current distribution is assumed to be restricted to valleys of two rivers – Daugava and Gauja – in central Latvia. The Gauja River valley is currently the most northern part of the range of the fat dormouse (Valdis 2003). In Belarus, 11 localities of the fat dormouse are known

after 2000, and replacement of mature broadleaved forests by other types of forest is the main threat to this species (Kachanovskii et al. 2015). In Poland, most localities of the fat dormouse are situated in the southern part of the country (Atlas Ssaków Polski 2018). The fat dormouse is almost extinct in central and locally extinct in north-western Poland because of very extensive deforestation in the past (Jurczyszyn & Wołk 1998). A reintroduction program of this species was initiated in north-western Poland in 1997 (Jurczyszyn 2001).

In general, fat dormouse is common and abundant in countries, situated to the south from Poland. For example, in Germany its abundance is increasing, and fat dormouse is considered to be a winner in modern forestry policy (Gatter & Schutt 2001). In certain areas of its range where fat dormice are abundant, they sporadically cause damage in silvicultural practice by stripping bark of coniferous trees, may cause damage to orchard fruits or may enter the households and cause some damage. In Slovenia and Croatia, the fat dormouse is a game species: there is a tradition of hunting this species recreationally (Holden-Musser et al. 2016). However, the fat dormouse is red-listed species in Romania (Botnariuc & Tatole 2005).

Summarising, status of the fat dormouse in separate countries in the northern part of its range is similar. Deforestation, and particularly felling of mature oak-dominated forests, is the main threat for this species on the northern periphery of the range.

#### *Forest dormouse (Dryomys nitedula)*

Forest dormouse has very large distribution range which stretches from Switzerland in the west to Mongolia in the east (IUCN 2017). Lithuania is situated in the very north-western corner of this range. Only two populations of this species are known in Lithuania, and they are both situated in large forest tracts. These two populations are considered metapopulations, i.e. a system of local populations living in suitable habitat patches, which interact with one another via individuals moving among these local populations (Hanski & Gilpin 1991). One local population of the forest dormouse, which was investigated for many years (Juškaitis 2015) was on the verge of extinction in 2017. Forest dormouse is included in the Red Data Book of Lithuania (3<sup>rd</sup> category – Rare species; Rašomavičius 2007).

In Latvia, one individual of the forest dormouse was recorded in central part of the country in 1912. Nowadays the single population of the forest dormouse is known in extreme south-east of Latvia, and the

species is also red-listed in this country (Pilāts 1994, Andrušaitis 2000). In Belarus, forest dormice occur only in south-western and south-eastern parts of the country (IUCN 2017), but the species is not included in the national Red Data Book. In Poland, forest dormouse is red-listed species, and its localities are spaced along eastern and southern borders of the country (Głowaciński 2001, Atlas Ssaków Polski 2018).

Distribution range of the forest dormouse does not reach the Atlantic Ocean anywhere, and the western border cannot be explained by simple climatic, topographic or vegetational factors (Kryštufek & Vohralík 1994). Western border of the distribution range of the forest dormouse goes through Latvia, Lithuania, Poland, Czech Republic, Germany, Switzerland and Italy (IUCN 2017), and this species is rare in these countries. According to the Atlas of European mammals, most of the localities of the forest dormouse are situated in Bulgaria, Austria and Slovakia (Mitchel-Jones et al. 1999). However, the density of records may reflect the intensity of small mammal research in separate countries rather than actual frequency (Kryštufek & Vohralík 1994). Forest dormouse is one of two dormouse species together with the hazel dormouse included in the Annex 4 of Habitat directive (IUCN 2017), but it is also one of the least studied dormouse species in Europe.

#### **Conclusions**

Status of three dormouse species – garden, fat and forest dormice – is similar in the countries situated on the northern part of their distribution ranges: they are red-listed (except forest dormouse in Belarus), and garden dormouse is probably extinct. The reasons for the dramatic population and geographical range contraction of the garden dormouse are not known (Bertolino 2017).

Meanwhile status of the hazel dormouse is different in separate countries situated on the northern part of the range. Hazel dormouse is common and widespread in Lithuania and southern Sweden. It could be expected that hazel dormice are more common in southern Latvia and Belarus where forest cover and composition is similar to Lithuania. Insufficient dormouse investigations in Belarus could led to inclusion of the hazel dormouse in the Red Data Book of this country (Kachanovskii et al. 2015).

In some cases, attribution of dormouse species to particular categories of Red Data Books of countries does not match their current status in the country. Some outdated information on distribution and status of some dormouse species is presented in the IUCN red lists.

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