



THE SIBERIAN FLYING SQUIRREL (*PTEROMYS VOLANS*) IN BELARUS: DISTRIBUTION, ABUNDANCE, THREATS, AND CONSERVATION

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Abstract

The Siberian flying squirrel (*Pteromys volans* L.) is one of the most poorly studied mammal species in the Belarusian fauna. In Belarus, the species inhabits the south-western border of its distribution range. Despite a multitude of its high conservation statuses, as well as extremely scarce information on the species' distribution and biology in the country, no special studies on the species have been conducted. The last reliably documented record of the flying squirrel was made more than 20 years ago, in 1996, in Viciebsk District, in the territory of Suražski forestry [Red Data... 2015]. Other information on the state of the population, distribution of the species, or individual registrations in Belarus for the last 20 years (1996–2017) lacks in the literature. We found more than 100 territorial sites of the Syberian flying squirrel in Viciebsk and Haradok districts in 2017–2020. Potential habitats of the species in other districts of the Viciebsk and Minsk regions were also surveyed. This allowed us to establish the borders of the modern distribution area of the species in Belarus, to estimate its current population, and to study some aspects of ecology of the species. At present, the species inhabits less than 1% of the territory of Belarus, but its density in optimal habitats is relatively high. A number of publications, as far back as the last century, indicate a much wider distribution of the species in the country. Therefore, it is possible to indicate a substantial shrinkage of the species' distribution area during the last 50–100 years. Taking into account the insignificant area of the modern distribution of the species along with the key threats and current forest management tendencies, it is possible to assert with certainty that in the absence of special protection measures, the flying squirrel might soon be gone extinct in Belarus. Some of the habitats we have identified are currently protected by land users. In addition, we have proposed a number of activities within the framework of Management Plan development necessary for its conservation, as well as those aimed at further studying, including the possible restoration of its historical range.

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Політуха сибірська (*Pteromys volans*) в Білорусі: поширення, чисельність, загрози й охорона

Андрій В. Абрамчук

Резюме. Політуха сибірська (*Pteromys volans* L.) — один із найменш вивчених видів ссавців у фауні Білорусі. У Білорусі вид існує на південно-західній межі ареалу свого поширення. Незважаючи на наявність низки високих природоохоронних статусів, а також вкрай убогу інформацію про поширення виду та його біологію в країні, якихось спеціальних досліджень з його вивчення не проводили. Остання достовірно задокументована реєстрація політухи була зроблена 20 років тому, 1996 р., у Вітебському районі на території Суражського лісгоспу (Червона книга Білорусі 2015). Інша інформація про стан популяції, поширення виду, або окремі зустрічі з ним на території Білорусі за останні 20 років (1996–2017) у літературі відсутня. Нами у 2017–2020 роках на території Вітебського та Городоцького районів знайдено понад 100 територіальних ділянок політухи. Також обстежено потенційні місця існування виду в інших районах Вітебської та Мінської областей. Усе це дозволило встановити межі сучасного ареалу поширення виду в Білорусі, оцінити його сучасну чисельність, і навіть вивчити деякі аспекти екології цього виду. В даний час вид населяє менше 1% території Білорусі, проте його щільність в оптимальних місцях існування відносно висока. У низці публікацій, ще в минулому столітті, вказується на значно ширше поширення виду в країні. У зв'язку з цим, можна говорити про суттєве скорочення ареалу поширення виду за останні 50–100 років. Враховуючи дуже незначну площу сучасного поширення виду, а також ключові загрози та сучасні тенденції ведення лісового господарства, можна з упевненістю стверджувати, що за відсутності спеціальних заходів щодо охорони виду політуха незабаром може повністю зникнути з території Білорусі. Частина виявлених нами місць існування виду нині вже передана під охорону землекористувачам. Крім того, у рамках розробки Плану управління для цього виду нами запропоновано низку заходів, необхідних для його збереження, а також спрямованих на подальше вивчення, включаючи можливе відновлення історичного ареалу поширення.

Ключові слова: політуха, раритетна фауна, поширення, охорона, Білорусь.

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Introduction

The Siberian flying squirrel (*Pteromys volans* L.) is one of the most poorly studied mammal species in Belarus. The species has a multitude of high conservation statuses: it is included into Appendix II and Resolution No. 6 of the Bern Convention, the Red Data Book of Belarus, Red Data Books of a number of regions of north-west Russia, including Karelia [Red Data... 2007], Murmansk and Leningrad Regions [Ayrapetyants & Fokin 2002; Kataev 2003], has a status of vulnerable species in Finland [Rassi *et al.* 2001], endangered status in Estonia, and extinct in Latvia [Timm & Remm 2011; Shar *et al.* 2016].

In Belarus, the species inhabits the south-western border of its distribution range. The last reliably documented record of the species was made more than 20 years ago, in Vitebsk District, in the territory of Surazhski forestry in 1996 [Red Book... 2015]. There is no information on the species' population status, distribution, or individual observations in Belarus for the last 20 years (1996–2017) in the literature.

In 2017–2020, we found more than 100 territorial sites of the Siberian flying squirrel in Viciebsk and Haradok districts, we surveyed potential habitats of the species in other districts of the Viciebsk and Minsk regions. All this allowed to establish the limits of the modern area of distribution of the species in Belarus, to estimate its current population, and to study some aspects of its ecology. The obtained data are not exhaustive; however, it allows us to draw some conclusions on the current status and dynamics of the species population in our country, the requirements of the species for habitat conditions and main threats. Currently the species inhabits less than 1% of the

territory of Belarus, although its density in optimal habitats is relatively high. Taking into account the very small current distribution area of the species, especially compared to the area inhabited by the species previously, as well as key threats and current trends in forestry management, in absence of special protection measures the species might soon be gone extinct in Belarus.

The aim of this study was to establish the boundaries of the current distribution range of the Siberian flying squirrel (*Pteromys volans*) in Belarus. Additionally, we estimated the species' population and identified possibly favourable habitats in order to designate Areas of Special Conservation Importance (ASCI) and ensure protection of habitats in line with national regulations as well as to prepare a national action plan to protect the species.

Material and Methods

Despite its secretive way of life and scarcity of reliable and up-to-date information on the species' distribution and ecology in Belarus, the Siberian flying squirrel is a relatively easy to record target. The species' presence in the area can be established by the presence of characteristic excrements. The methodology proposed by Skarén [Skarén 1978], is generally accepted and has been used by different researchers [e.g. Skarén 1978; Reunanen *et al.* 2002]. The methodology consists of searching for the squirrel's characteristic droppings shaped as of dirty yellow or light yellow pellets of about 0.5 x 0.2 cm in size (Fig. 1).

The pellets are searched for near the largest trees in the area (at least 30 cm), mainly aspen, but also birch, spruce, and alder. The best fieldwork period (under conditions of northern Belarus) is from late March, after the snow cover melts, to early May.



Fig. 1. The Siberian flying squirrel at the hollow (night photo), characteristic faeces of the flying squirrel, Horodoksky and Vitebsk districts, March–April 2018–2020; *a–b*, photo by Denis Kitel; *c–d*, photo by the author.

Рис. 1. Політуха сибірська біля дупла (нічна зйомка) та характерний послід летяги, Городоцький та Вітебський райони, березень–квітень 2018–2020 рр.; *a–b*, фото Денис Китель; *c–d*, фото автора.

This is the period when litter granules are sufficiently visible and persist for a long time. In the earlier period, the presence of snow cover makes it difficult to move and find the pellets. In the later period, including summer, finding pellets is also difficult for a number of reasons. Firstly, the presence of a developed ground cover in most cases, and, secondly, the darker and greenish colour of the droppings and their rapid decomposition. In autumn, the search for pellets is additionally hampered by falling leaves. These observations were also confirmed by our research. Thus, the optimal period to search for signs of the species' presence in an area is rather short, lasting about 1–1.5 months under conditions of northern Belarus.

The presence of the species in the studied area was detected by inspecting the stumps of the largest aspens, alders, birches, and spruces along a pre-planned route. The routes were planned taking into account the biology and ecology of the species and using forest plantation maps. Photo and video trapping was used to confirm the presence of the species in the identified areas. After defining the core of the range (within Belarus), surveys were concentrated on the peripheral parts in order to delineate the current range boundaries.

Results and Discussion

Habitats

Our observations indicate the presence of three key determinants of the species' habitat in the forest ecosystem under conditions of Belarus: stand age, tree species composition and completeness. In Belarus, the flying squirrel has been observed most often in old-growth mature and ripening forests (Fig. 2). The age of the stand as one of the key factors influencing the presence of the species in an ecosystem is also evidenced in the literature [e.g. Reunanen *et al.* 2002a; Timm & Kiristaja 2002; Airapetyants & Fokin 2003; Tõnisson 1975; and others]. The second, equally important ecological determinant of the species' inhabiting an ecosystem is the species composition of the stand.

According to our observations, the flying squirrel has a clear preference for deciduous stands, primarily aspen, but also alder and birch. These may include coniferous forests (spruce and pine forests) with aspen and birch, mixed deciduous forests of aspen, birch, alder, and other deciduous species with spruce and/or pine, or mixed coniferous and deciduous forests.

The key importance of deciduous stands, in particular aspen, alder and birch, in the ecology and biology of the species has been pointed out in several studies [Hanski 1998; Reunanen *et al.* 2002a; Airapetyants & Fokin 2003; and others]. In Finland, the flying squirrel predominantly inhabits old-growth spruce forests with aspen, birch, and alder [Reunanen *et al.* 2002a; and others]. In Russia and Estonia, the typical habitats of the flying squirrel are mature coniferous forests with aspen, alder, birch, and willow species [Timm & Kiristaja 2002; Airapetyants & Fokin 2003]. The third important factor is stand completeness (the degree of tree canopy density). In sparse forests with tree cover of less than 0.6, we did not observe any occurrence of the flying squirrel (Fig. 3).

Thus, the optimal habitats for the flying squirrel in Belarus are old-growth, highly complete deciduous birch-aspen forests with spruce, mixed coniferous-leaved and coniferous forests with aspen and birch. The key species in the stand determining the presence of the species in the biotope is aspen, to a lesser extent spruce and birch.

Distribution and abundance

The current geographic range of the species in Eurasia is confined to the boreal forest zone of the Palaearctic stretching from Finland to Chukotka (Fig. 4).

In Europe, besides European Russia, it occurs in Finland, Estonia, and Belarus.

In Finland, although relatively common, the species is declining everywhere [Hanski *et al.* 2001; Hanski 2006]. Detailed population studies of the species in Finland show a decline of 20–58% over 10–20 years [Hanski *et al.* 2001; Hanski 2006]. Population declines have been noted in all parts of Finland and it is predicted that the decline will continue in the future [Hanski 2006].



Fig. 2. Typical habitats of the Siberian flying squirrel in Belarus, Horodoksky and Vitebsk districts, March–April 2017–2020. Details: *a*, mossy spruce forest; *b*, goutweed aspen forest; *c*, wood sorrel birch forest; *d–e*, wood sorrel aspen forest; *f*, mossy pine forest. Photo by the author.

Рис. 2. Типові місця існування політухи в Білорусі, березень–квітень, Городоцький та Вітебський райони, 2017–2020. Деталі: *a*, ялиник моховий (склад за породами — 6Я2Б2ОС); *b*, осичник яглицевий (склад за породами — 6ОС2Б2Я+КЛ); *c*, березняк квасеницевий (склад за породами — 6БЗОС1Я); *d*, осичник квасеницевий (склад за породами — 7ОС2Б1Я); *e*, осичник квасеницевий (склад за породами — 4ОС4Я2Б); *f*, сосняк моховий (склад за породами — 4С2Я2ОС2Б). Фото автора.

Based on a three-year-long survey, the population of the species in Finland was estimated at 140 000 females [Hanski 2006]. In Latvia, the species is presumably extinct [Shar *et al.* 2016]. In Estonia, 62 habitats are known and during 1980–2001 the numbers decreased by almost 50% [Timm & Kiristaja 2002]. According to other data, there are 111 known habitats of the species in Estonia today [Flying ... 2021]. The abundance of the species' population in Russia is unknown. Decreasing

trends in numbers have been recorded in both Estonia and Karelia. This is mainly due to the logging of old-growth spruce and mixed forests.

Earlier, in the 19th century, the flying squirrel was almost ubiquitous in the territory of modern Belarus [Semenov-Tyan-Shansky 1905]. However, yet at the beginning of the 20th century, the flying squirrel was recorded in several districts of the Viciebsk region and in the north of the Mahiloŭ region [Fedyushin 1929]. By the 1960s, the species' range had reduced to a part of the territory of Viciebsk region (Haradok, Viciebsk, Lozna, Vorša, Połack, and Rasony) [Dorofeev 2003]. In the last editions of the Red Data Book of Belarus [Red Data... 2004; 2015], it is specified only for Viciebsk district [Red Data... 2004; 2015]. At present, the distribution range includes part of the territory of two administrative districts of Viciebsk region—Viciebsk and Haradok. In general, the southwestern border of the species' range is located in Belarus.

The southern border of the current distribution of the species in Belarus does not cross the Kaspla River and further (downstream from the mouth of the Kaspla River)—the Western Dźvina River. In the west, the border of the species' range can be tentatively drawn along the M8 (E95) motorway and along the eastern slopes of the Haradokskaja Upland. To the west of the M8 (E95) motorway, the species was found only in one place (vicinity of the village of Tryhubcy, Viciebsk region). However, the species is not recorded further west of Tryhubcy.



Fig. 3. Examples of biotopes where we have not recorded the species: *a*, pine monocultures, April 2017; *b–d*, thin deciduous forests (birch mires and black alder forests), Horodoksky and Vitebsk districts, April 2017; *c*, thin medium-aged coniferous forests, April 2017. Photo by the author.

Рис. 3. Приклади біотопів, де ми не зареєстрували політуху: *a* — соснові монокультури, квітень 2017 р.; *b–d* — розріджені листяні ліси (березові болота та ліси з чорної вільхи), Городоцький та Вітебський райони, квітень 2017 р.; *c* — розріджені середньовікові хвойні ліси, квітень 2017 р. Фото автора.

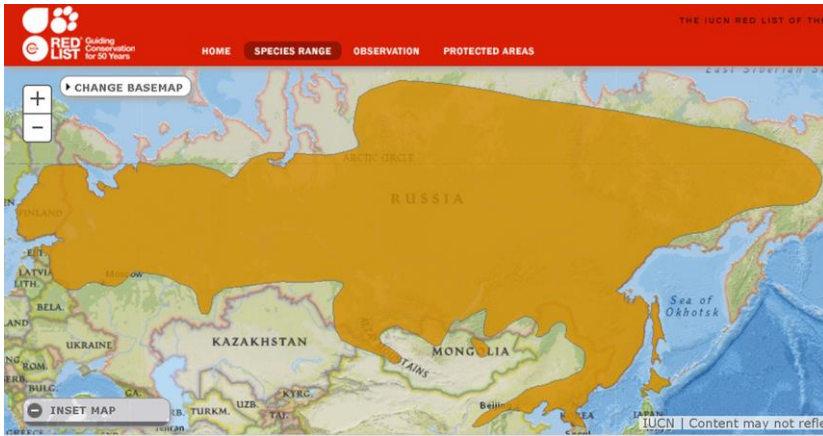


Fig. 4. The geographic range of the Siberian flying squirrel [Siberian ... 2016].

Рис. 4. Ареал поширення політухи сибірської [Siberian ... 2016].

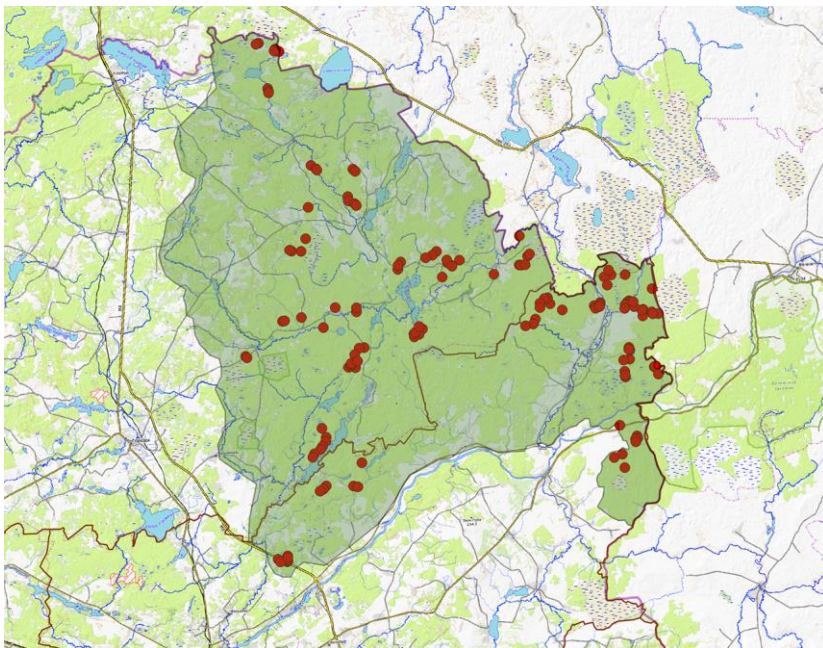


Fig. 5. The modern range of the Siberian flying squirrel in Belarus: top right—overview within the boundaries of Belarus, bottom—species' range. Notes: red dots—territorial areas identified in 2017–2020; red outline with green fill—the modern range of the species in Belarus (as of 2020).

Рис. 5. Сучасний ареал розповсюдження політухи сибірської у Білорусі: праворуч угорі — огляд у межах контуру Білорусі, внизу — ареал розповсюдження крупним планом. Позначення: червоні точки — територіальні ділянки, виявлені у 2017–2020 рр.; червоний контур та зелена заливка — сучасний ареал поширення виду в Білорусі (на 2020 р.).

The results of the studies allow us to conclude that the core of the modern range of the flying squirrel in Belarus is confined to a large, semi-intact forest area in the interfluvium of the Western Dzvina and Aŭsianka rivers. The species is also found in the Lovač River basin and in the interfluviums of the Kaspla and Western Dzvina rivers (Fig. 5).

To estimate the species' abundance, the modern area of its habitat was determined by the convex polygon method, by connecting the extreme points where the presence of the species was recorded, taking into account the contour of the state border between Belarus and the Russian Federation, as well as the contours of forested areas. Thus, the total area of modern habitat of the flying squirrel in Belarus has been estimated at about 145 000 hectares. Afterwards, in order to estimate the number of the species, human settlements with large non-forested plots, lakes, open bogs and large pine forests on bogs, and other territories (more than 100 ha in area) unsuitable in their biotic conditions for the species' ecology have been excluded from the range. As a result, the total area suitable for the species' existence within the allocated range was about 122 000 ha.

In total, more than 120 territorial areas of the species have been identified. As a separate territorial area, we took an area where the presence of the species was confirmed by finding manure pellets in at least 3–5 localities. Individual territorial areas were defined as those located within a radius of at least 450 m from each other. A circle with a radius of 450 m equals an area slightly larger than the average male territory. Individual plots with a radius of 450 m within 500 m of each other were combined into polygons, for which the total area was determined using the convex polygon method.

The species density for each polygon was then determined, as well as the density for the entire surveyed area. The species density for the different polygons varied and ranged from 1.1 individuals per 100 ha to 2.6 individuals per 100 ha, with an average of 1.6 individuals per 100 ha. Thus, the minimal total population of the species can be estimated at 1350 to 1900 territorial individuals. However, taking into account that the territorial areas of females are much smaller (about 8 ha) and overlap with those of males, the actual number and density of the species may be much higher.

The main contemporary threats to the species in Belarus

Based on the author's research, as well as on literature data on the biology and ecology of the Siberian flying squirrel, the main threats to the species in Belarus under modern conditions have been identified. The main current threats to the species in Belarus are as follows:

Habitat destruction. One of the main threats to the species is the direct destruction of natural habitats through clear-cutting. As a result, the area becomes uninhabitable for many decades. In addition, clear-cuts also contribute to the direct mortality of the animals.

Habitat degradation. Simplification of the stand structure as a result of selective logging as well as regeneration and shaping logging, resulting in thinning, rejuvenation of the stand, removal of deciduous (birch, aspen) and hollow trees also ultimately results in the loss of habitat for many years. Removal of aspen as an undesirable species and so-called undesirable trees (including deadwood, snow-broken trees, dying trees with trunk damage, hollows, cracks, etc.), which are important stand elements for the species in the biotope, occurring during selective sanitary felling and so-called rubbish clearance, also leads to a decrease in quality or loss of habitat for many years.

Habitat fragmentation. Construction of linear infrastructure such as power lines, roads, gas pipelines (stripes of 100 metres or more in width) and clear-cuts of 100 metres or more in width create unattainable barriers to the species' spread and communication and as a result fragment the population and impede the spread and dispersal of the species.

Insufficient regulations in existing protected areas. In a number of cases, within the current distribution range of the species in Belarus, there already exist protected areas (PAs), overlapping with the identified flying squirrel habitats. In particular, these are the nature reserve of local significance 'Vierchavaja Lovac', reserves 'Zapolski' and prospective reserve 'Suražski.' The protection regime for the above listed existing reserves is set out in accordance with existing legislation, with the weakest restrictions possible. These restrictions, in particular the prohibition of clear-cutting only, do not fully ensure the preservation of the species' habitat within these protected areas.

The modern range of the species is relatively small. The modern range of the species occupies less than 1% of the area of Belarus. Taking into account literature data showing that the species used to be distributed in the entire area of the country, we may indicate the catastrophic shrinkage of the distribution range for the last 100 years. Taking into account a significant decrease of the species population (at least for the last several decades) in other countries and regions of Europe (e.g. Finland, Estonia, and Karelia) it is possible to assume similar tendencies in our country.

Conservation measures for the species in Belarus

With the management-planning framework, a set of conservation measures was proposed to raise the conservation status of the species, both to ensure more effective protection within the existing protected areas and to implement more effective protection of habitats outside the protected areas, as well as the protection of the country's population of flying squirrels as a whole. The most important activities include the following:

Raising of the national conservation status of the species. Taking into account the catastrophic reduction of the species' range in Belarus over the last 100 years as well as the significant population decline of the species (at least for the last few decades) in other countries and regions of Europe (Finland, Estonia, and Karelia) it is recommended to revise the species' status by raising it to Category II (EN). Category II (EN) includes taxa that are not currently directly threatened by extinction within the country, but they have an unfavourable international or European conservation status, low population number, a trend towards a steady decline in population and/or range, and a predicted status deterioration in the near future.

Adjustment of the protection regime of existing and/or proposed protected areas, as well as their boundaries. As discussed above, the current protection regime of the existing PAs in which the squirrel occurs does not ensure that the habitats of the species are conserved. At the same time, the current legislation makes it possible to adapt the existing protected area regime to the necessary requirements for the protection of the species that inhabit these protected areas. This is a logical and necessary condition for the effective fulfilment of the conservation objectives of such areas. In a number of cases, species habitats have been identified in the vicinity of existing or prospective PAs and/or ASCIs. It is appropriate to adjust the boundaries of these PAs/ASCIs to include squirrels' habitats currently adjoining their boundaries. These include, for example, Zapolski reserve, prospective Surazski ASCI and others.

Update and clarification of the habitat protection requirements for the squirrels (TCP 17.07-01-2014 (02120)). The current protection regime set out in the TCP for flying squirrels' habitats cannot fully ensure effective conservation of the species. The protection regime needs to be adjusted. In particular, restrictions should be revised on logging of key stand elements in the habitats of the species: establishing logging restrictions for aspen and birch, establishing seasonal restrictions for permitted cuttings, preservation of fullness of the stand of at least 0.6–0.7, etc.

Conservation designation of identified habitats. Despite some limitations in the habitat protection requirements of the TCP, protection of identified habitats outside the protected areas is a necessary and important measure for the conservation of the species' population in the country. To date, about 70 territorial sites of the species are protected on an area of about 1500 ha, which is certainly not sufficient for the conservation of the population of the species in the country as a whole.

Preparation of key management plans for the conservation of the flying squirrel population in the protected areas. One of the most effective mechanisms for nature conservation, in the PAs, are their Management Plans stipulated by the national legislation. In this regard, development of Management Plans for key conservation areas is a necessary measure, including those required under the current legislation of Belarus.

Development of a local ecological network scheme. The modern range of the species in Belarus covers an area of about 145 000 ha, which is equal to the area of a large forestry unit or administrative district. Obviously, it is not feasible to introduce restrictions necessary for the conservation of the species over such a large area. On the other hand, it is also clear that preservation of isolated habitats or even larger populations of the species within PAs without the necessary ecological corridors would not be effective in preserving the population as a whole. It is therefore necessary to develop and implement a local ecological network to ensure that large populations of the species (e.g. within the protected areas) are linked to each other and to individual habitats or habitat concentrations outside the protected areas, and to enable communication and dispersal of the species both within and outside of Belarus.

Installation of artificial nesting boxes. The literature indicates that flying squirrels are quite active in using artificial nesting sites, both for temporary shelter and for breeding [Hanski 1998; Selonen & Mäkeläinen 2017]. The making and hanging of artificial nesting sites is therefore relevant, both to improve the ecological conditions of known habitats and to create opportunities for the spread and dispersal of the species. This activity is especially relevant due to the fact that hundreds of artificial nesting boxes are made and hung each year by forestry units according to their

own plans. However, mostly for common species. The re-orientation of the forestry units to making artificial nesting boxes for flying squirrels will require minimal additional funding and, at the same time, may have a significant ecological impact.

In spite of the fact that due to our research in recent years it was possible to quite accurately establish the borders of modern distribution of the species in Belarus, as well as to study some features of its biotopic distribution, a number of research activities focusing on the state of population and biology of the species is still required, including:

Clarification of the distribution range of the species in Belarus. Additional research is needed to clarify the boundaries of the species' distribution, particularly in the north-west and north-east of the country.

Conducting a census of the species to provide a more accurate estimate of the population size. The population size presented in this publication is a preliminary estimate. Therefore, it is important to conduct population surveys according to a standard methodology, with an estimate of occurrence (based on findings of excrement) on 9 ha sampling plots. [Hanski 2006].

Studying the ecology and biology at the range boundary. It is of great interest to study the ecology and biology of the flying squirrel in Belarus, at the border of its range. These studies are actual and necessary not only for successful planning and implementation of conservation activities in Belarus, but also for the sake of successful preservation of the European population of the species in general. It is also of interest to investigate the possibility of using artificial nesting sites (such as birdhouses, hutches) to improve the condition of habitats and manage the population of the species.

Study of the experience and possibility of restoring the range of the species. Given the literature evidence that the species had a much wider distribution previously, it is appropriate to investigate the possibility of dispersing the species and creating new stable population groups in suitable habitats. Active reintroduction of the species is also relevant given its very low dispersion. An example of suitable areas for species dispersal is a large forest area with predominance of deciduous (birch, aspen) or mixed (deciduous-spruce) forests with significant presence of aspen and birch at the border of Vorša and Lozna forestries. These are the territories of Asintorf and Babinavičy forestries, respectively. At present, flying squirrels have not been detected in these forestry units (surveys were conducted in 2016 and 2020). At the same time, the structure and condition of the forests in these areas (based on the current level of knowledge) are quite consistent with the requirements of the species. In addition, a large proportion of these forest areas, including the forests most suitable for the flying squirrels' habitat, already have various nature protection statuses. Firstly, it guarantees the preservation of the environment favourable to the species. Secondly, it will not lead to additional restrictions on forest management in the designated forest areas. Besides, suitable habitats for the species, where the species was not detected by us in 2016–2020, exist in the Tałačynski and Viciebski forestries in the north-east of Belarus, as well as in the north-west (Vierchniadžvinski, Rasonski, Połacki, Dretuński, and Šumilinski forestries).

Development of a monitoring scheme, including monitoring aimed at assessing the status of the species' population groups and the effectiveness of conservation measures, including verification of habitat status and control of compliance with established forest management restrictions in habitats transferred to land users for protection.

Conclusion

At present, the distribution range of the Siberian flying squirrel in Belarus includes, partly, the territory of two administrative districts—Viciebsk and Haradok, Viciebsk region. The southern border of the modern range of the species does not cross the river Kaspla and further (downstream from the mouth of the river Kaspla) the river Western Džvina. In the west, the border of the range can be tentatively drawn along the M8 (E95) motorway, west of which the occurrence of the species is found only in one place (vicinity of the village Tryhubcy, Viciebsk region). However, the species is not recorded further westwards (from Tryhubcy) (see: Fig. 5).

Habitats of the species are also found in the adjacent territories of the Smalensk region, in particular in the vicinity of the village Isačenki, Veliž district, Smalensk region. The total minimum number of the species can be estimated at 1350–1900 territorial individuals.

The most significant threats to the species are forestry activities. For successful conservation of the Belarusian population group of the species it is necessary to implement a number of measures to ensure conservation of all identified habitats with a complete ban on forestry activities, to identify and ensure conservation of unknown habitats, etc. In addition, to ensure the long-term conservation of the species and the possibility of its dispersal it is necessary to develop and create a local ecological network within the current range of the species in Belarus, as well as its integration into the national ecological network. This local ecological network should combine core areas—areas with the highest concentration of habitats of the species and with a complete ban on forestry activities, and ecological corridors with appropriate parameters and a sparing regime of forest use, providing connection with the network cores, as well as opportunities for external (outside the current distribution range) migration and dispersal of the species.

It is important to further study the biology and ecology of the species in more detail and to plan measures to restore the species' distribution range by first creating 3–5 local population groups in the most suitable habitats in northern Belarus, and also to develop measures to monitor the population status and the effectiveness of conservation measures.

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