

Rustic Bunting *Emberiza rustica* abundance in the Kostomuksha Nature Reserve and Kalevala National Park (NW Russia) during the years 2015–2021

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Abstract

In the late 20th–early 21st centuries, the Rustic Bunting *Emberiza rustica* population declined worldwide, including Karelia, NW Russia, the northern periphery of its breeding range. At the onset of the 21st century the Rustic Bunting disappeared from the southern parts of Karelia and turned from common to rare species in its northern parts. However, surveys carried out in 2015–2021 in the Kostomuksha Nature Reserve and Kalevala National Park – large neighbouring protected areas in NW Karelia – revealed a quite steady, although relatively low, breeding densities of the species (2.9–5.6 ind./km²). Such stable parameters of the abundance make this species common in the area in question. Furthermore, the species occurrence along survey routes seems to be slightly rising over the said time period, giving us hopes for a recovery of Rustic Bunting numbers, at least in protected areas containing extensive pristine boreal forests with habitats favourable for the species.

Keywords: Rustic Bunting, *Emberiza rustica*, abundance, population dynamics, northern taiga, pristine forests, red-listed species, nature protection

Introduction

Rustic Bunting, *Emberiza rustica* is a widespread species in the Palearctic boreal zone (Naumkin et al. 2020, Rymkevich and Noskov 2020). Russian Karelia is the western periphery of the breeding range for this species (Yakovleva and Khokhlova 2020). In the 20th and 21st centuries the species numbers and the western boundary of its distribution fluctuated widely (Yakovleva and Khokhlova 2020). In Karelia, the Rustic Bunting has been known to occur since the second half of the 19th century (Sievers 1878). In the late 19th–early 20th centuries the species expanded westwards to Nordic countries (Merikallio 1958, Malchevsky and Pukinsky 1983, Dale and Hansen 2013, Naumkin et al. 2020).

Since the 1940s, however, the species in Finland has been declining and eventually stopped breeding in its southern parts (Valkalama et al. 2014, Rymkevich and Noskov 2020). Since the late 1990s, the limit of its distribu-

tion has been regressing north-eastwards (Dale and Hansen 2013, Edenius et al. 2017). Since the late 20th century, a decline in the species numbers has been reported also in other Nordic countries (Dale and Hansen 2013) and in North-West Russia (Khokhlova et al. 2001, Hokhlova and Artemiev 2007, Sazonov 2011, Rykova 2013, Yakovleva and Sukhov 2017, 2020, Rymkevich and Noskov 2020). In the last two decades this process has covered virtually all of the species' distribution range (Edenius et al. 2017), and the Rustic Bunting is now considered a rare species almost everywhere (Naumkin and Preobrazhenskaya 2020, Rymkevich and Noskov 2020). In the western parts of the distribution range, including Karelia, the numbers of Rustic Bunting have decreased dramatically, and by the beginning of the 21st century the species entirely disappeared from its suboptimal habitats (Khokhlova and Artemiev 2007, Lindström et al. 2010, Sazonov 2011, Dale and Hansen 2013, Väisänen and Lehikoinen 2013, Mishchenko 2017, Naum-

kin and Preobrazhenskaya 2020, Rymkevich and Noskov 2020, Yakovleva and Khokhlova 2020, Yakovleva and Sukhov 2020).

Thus, the Rustic Bunting population declined worldwide. Possible factors include increased logging in the breeding range (BirdLife International 2021). Most researchers, however, consider this decline in the abundance is due to challenges along flyways and wintering grounds, such as large-scale trapping together with agricultural intensification and shrinking of foraging areas (Valkama et al. 2011, Dale and Hansen 2013, Edenius et al. 2017, Naumkin et al. 2020, Yakovleva and Khokhlova 2020, BirdLife International 2021). According to the IUCN threat taxonomy (Battisti et al. 2016), main threats affecting this bunting can be classified as threats 5.1 “Hunting and collecting terrestrial animals” and 5.3 “Logging and wood harvesting”.

In view of the global population decline, the species has been uplisted to the IUCN Vulnerable (VU) status (BirdLife International 2021). The same status was given to this species in the Red Data Book of the Russian Federation (2001). The status of Rustic Bunting in the Red Data Book of the Republic of Karelia (2020) is near threatened (3, NT), i.e. a rare species that may be vulnerable to endangerment in the near future.

Therefore, it is necessary to continue monitoring the species' abundance and distribution, and to conserve its current habitats. Such monitoring in Karelia is implemented, e.g. in the Kivach Nature Reserve (Figure 1). However, this nature reserve is situated in the southern part of the Republic, where Rustic Bunting numbers are at a low level now (Yakovleva and Sukhov 2020). The current situation with the Rustic Bunting in central and northern Karelia has been studied much less, and in the past decade the species has been known as a common breeder only in the Paanajärvi National Park (Figure 1), the very north of Karelia (Yakovleva and Khokhlova 2020).

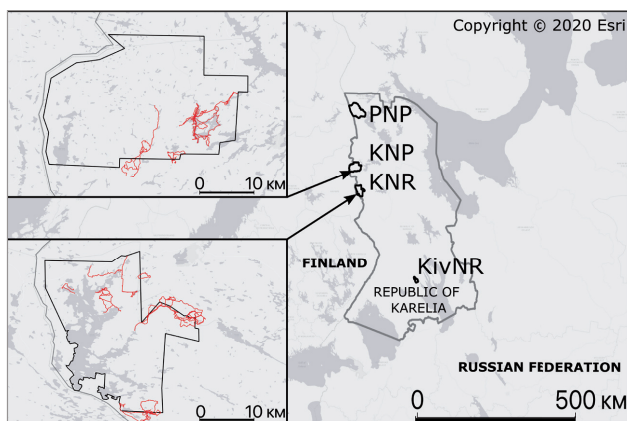


Figure 1. Locations of the above-mentioned protected areas of the Republic of Karelia, NW Russia, and Europe: KNP – Kalevala National Park; KNR – Kostomuksha Nature Reserve; PNP – Paanajärvi National Park; KivNR – Kivach Nature Reserve, and our transects in the KNP and KNR

Our communication reports 2015–2021 data on the occurrence of the Rustic Bunting in the neighbouring Kostomuksha Nature Reserve (KNR) and Kalevala National Park (KNP) – two of Karelian key protected areas (PAs) occupying extensive areas in the north-west of the Republic (Figure 1). These PAs feature large expanses of pristine boreal forests, numerous wetlands, and ramified lake-river systems. This is a combination favourable for the habitation of the Rustic Bunting, a typical north-boreal species, which favours wet and sparse forests of different tree species compositions, often situated along waterbodies (Naumkin et al. 2020, Rymkevich and Noskov 2020, Yakovleva and Khokhlova 2020). The aim of our report is to demonstrate current parameters of the Rustic Bunting abundance in the western part of Karelia, namely in the KNP and KNR (Figure 1).

Material and methods

We surveyed for Rustic Bunting adults and breeding pairs in 2015–2019 and 2021 on 39 transects in the KNR (64°28' N, 30°16' E) and 19 transects in the KNP (64°59' N, 30°12' E) (Figure 1), including buffer zones of these PAs (Figure 1). Sampling was done using the transect method, establishing the 25 + 25 m belt with geotagging of every bird. We provided surveys in June, July and early August. We did not have the possibility to conduct our study at the same time every year, so we had to thoroughly recognize adult individuals and exclude juvenile birds in the latest period of observation. Therefore, we registered birds not only by their songs but by their other voice signals as well, which was especially topical in July and August. We also mapped broods, registering adult individuals. All registrations were obligatory proofed by visual observations and photography in most cases.

We started travelling along all routes under the same weather conditions (no precipitation, partly cloudy or clear weather, wind speed is in the range of 1–3 m/s) in morning hours (since 5–6 a.m.). The length of the routes varied from 5 to 10 km. To ensure proper navigation, we used GPS tracker devices with Android OS and navigation software (Vazquez 2020). Our average speed varied in different biotopes from 1 to 2 km/h. The transects covered all types of biotopes within the studied area (Figure 1).

Statistical treatments of data obtained were performed in the *R* environment (Posit 2021).

Results

We found that the most densely populated habitats in the KNR and KNP were wet pine and mixed forests along waterbodies and in mire margins, where Rustic Bunting median numbers reached 4.08 ind./km² (interquartile range, IQR = 6.06 ind./km²) and median breed-

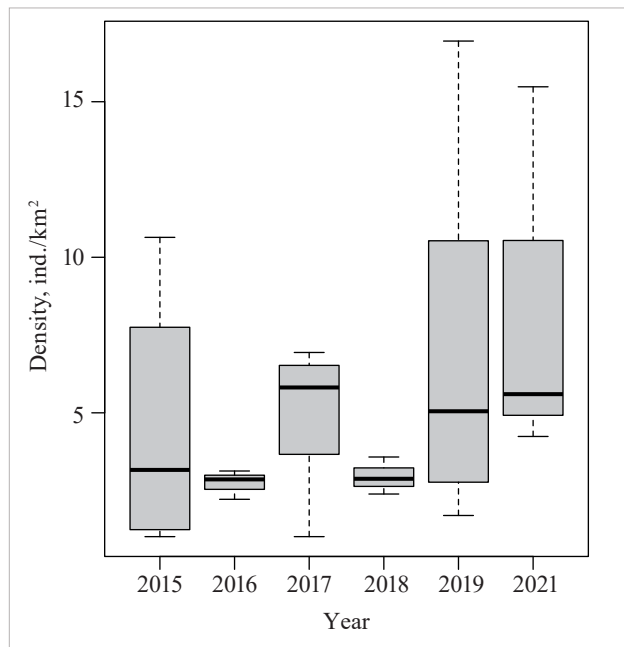


Figure 2. Shifts in the Rustic Bunting relative density revealed along the transects surveyed in the Kostomuksha Nature Reserve and Kalevala National Park during the years 2015–2021

ing density was 1.87 pairs/km² (IQR = 2.12 ind./km²). Rustic Buntings occurred also in central parts of pine and pine-dominated mixed forests (median number = 1.23 ind./km², IQR = 3.09 ind./km², and median breeding density = 0.49 pairs/km², IQR = 1.62 ind./km²) and in spruce-dominated mixed forests (median number = 0.91 ind./km², IQR = 0.71 ind./km², with only 1 breeding attempt in this habitat).

The Rustic Bunting median number in the KNP along all transects where the species was encountered (with non-zero occurrence) was 4.86 ind./km² (IQR = 3.57 ind./km²), and the median breeding density was 2.77 pairs/km² (IQR = 3.37 pairs/km²). The median number along the transects with non-zero occurrence in the KNR was 4.24 ind./km² (IQR = 3.74 ind./km²), and the median breeding density was 2.73 pairs/km² (IQR = 1.82 pairs/km²). The Rustic Bunting median numbers for all transects with non-zero occurrence in both PAs for 6 seasons were 4.83 ind./km² (IQR = 3.56 ind./km²), and the bird abundance in 2015–2021 varied significantly among different habitats (Figure 2). Furthermore, the species occurrence along survey routes seems to be slightly rising over the said time period (Figure 2).

Discussion

As mentioned above regarding 2017, the Rustic Bunting was named a common breeder only in the very north of Karelia, i.e. in the Paanajarvi National Park (Yakovleva and Khokhlova 2020). However, our results indicate that this species regularly bred also in the PAs situated south of Paanajarvi, i.e. in the KNR and KNP (Figure 1),

at least in 2015–2021. Censuses have demonstrated that during this period the Rustic Bunting in the KNR and KNP was a species with relatively stable breeding densities of 0.1–0.7 pairs/km² in the mixed forests of different types. According to the abundance scores (Tsybulin 2009) matched against the scale suggested by A.P. Kuzyakin (1962), the status of this species in the surveyed PAs is changing from rare to common in some sites, especially lately. The species abundance is, of course, still lower than the level recorded in Karelia at its peak, i.e. from the 1960s to the mid-1990s (Yakovleva and Khokhlova 2020), when it was 10–17 pairs/km² in coniferous and deciduous forests (Zimin et al. 1993), and 5 pairs/10 ha in very wet and sparse spruce and mixed forests (Yakovleva and Sukhov 2017). Rustic Bunting numbers in different sites in KNR in the 1990s were between 2.8 and 12.5 pairs/km² (Sazonov 1997). Nonetheless, the species abundance in our surveys was much higher than the current levels reported for more southern parts of Karelia, namely the Kivach Nature Reserve, where breeding pairs have been encountered in the past decades on single occasions not every year (Yakovleva and Sukhov 2020).

We believe the regular breeding of this species, which is considered rare in almost all of Karelia (Yakovleva and Khokhlova 2020) can be attributed to the fact that the KNR and KNP have habitats preferred by this species. The preferred habitats of Rustic Bunting are wet sparse forests with different tree species compositions, wet open woodland along creeks and lakes, margins of Sphagnum bogs and wet meadows, treed transition mires and fens (Naumkin and Preobrazhenskaya 2020, Naumkin et al. 2020, Rymkevich and Noskov 2020, Yakovleva and Khokhlova 2020). In the PAs in question, with their abundant taiga expanses, wetlands, rivers, and lakes, plenty of such habitats are available to the birds.

Considering that despite the population decline the Rustic Bunting remains a regular breeder in most of its distribution range (Naumkin and Preobrazhenskaya 2020, Naumkin et al. 2020), the existence of PAs with a sufficient number of favourable habitats and regular occurrence of the species in the studied areas give hopes for a possible recovery of the population, at least in some parts of the range. Meanwhile, it is also should be noted that a local increase of Rustic Bunting number in the PAs could also be caused by the crowding effect (Schmiegelow et al. 1997, Vallejos et al. 2020). Both PAs surrounded by areas with on-going transformation, including logging and other human activity. Birds from adjacent transformed habitats could move to pristine habitats of the PAs. In this context, it is especially important to maintain PAs with the stable Rustic Bunting breeding in their current state, with strict protection regulations and limitation of visitor numbers, e.g. in view of fire risk, which depends on human visitation frequency. It is the preservation of large pristine taiga expanses that can guarantee the natural recovery and subsequent maintenance of the abundance of this species

provided that the situation along flyways and in wintering grounds is back to normal.

Conclusions

The data collected in the study prove that the Kostumuksha Nature Reserve and Kalevala National Park are areas where Rustic Buntings continued to breed annually, at least in the 2015–2021 period. The optimistic population parameters of this species in the said protected areas is the first sign of the possibility that the Rustic Bunting abundance may recover at least in some areas with preferable conditions since the beginning of its global population decline.

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