# GROUSE NEWS

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# RESEARCH REPORTS

## Fluctuations and trends in tetraonid populations of the "Bryansky Les" Nature Reserve (SW Russia)

**Serguei Kossenko and Julia Medvedko**

The "Bryansky Les" State Nature Reserve (hereafter the Reserve) with an area of 12280 ha is located in the southeast of the Bryansk Oblast (administrative region in the European southwest of Russia) at the altitudes between 135 m and 189 m a.s.l. in the middle of a large forest tract known as the Nerussa-Desna woodland (Figure 1). Forests cover about 80% of the area. Of these, pine forests have the largest proportion. Also birch, oak, spruce, lime, black alder, aspen and ash forests, as well as swamps and meadows are present here (Kossenko & Medvedko 2019).

Three species of tetraonid birds occur in the Reserve: capercaillie (*Tetrao urogallus*), black grouse (*Lyrurus tetrix*) and hazel grouse (*Tetrastes bonasia*). Capercaillie and hazel grouse are here at the southern edge of their range in the European part of Russia (Potapov 1987). All three species are widely considered as the priority monitoring objects in Russia. The reasons for this include their unfavorable population trends that is applicable even to the specially protected natural areas with no forest exploitation (Kurhinen et al. 2018). Here we consider long-term fluctuations and trends in the tetraonid populations of the nature reserve where forest management is minimal (only maintenance of roads and pathways through the forest as well as fire prevention).

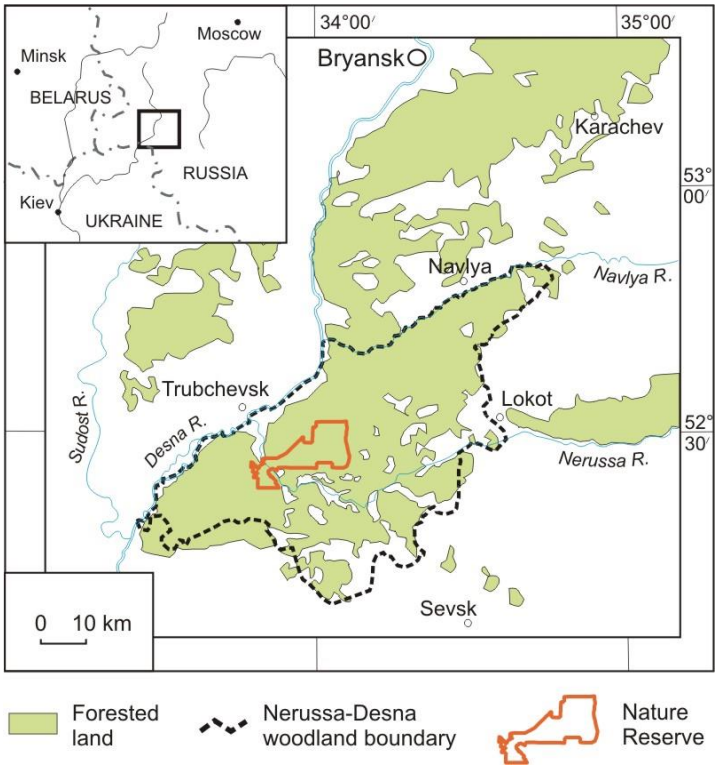


*Figure 1. Geographical location of the "Bryansky Les" State Nature Reserve.*

**Materials and methods**

The annual post-breeding census of tetraonid population in the Reserve is carried out in autumn, usually in mid-October, when leaves fall halfway from trees and shrubs that promotes detection of birds. All tetraonid birds are recorded on permanent routes within a belt of predetermined fixed width to assess the population density of the species in different habitats and then calculate their total population based on the area of habitat in the Reserve (Kossenko 2017). Since 2004, the number of routes (30) and their total length (245 km) have been constant that enables us to directly use the number of counted birds for analysis of fluctuations and trends, without resorting to the total abundance estimates based on the extrapolation of population densities. The advantage of this approach is also that the sample of data for analysis is not limited to the birds recorded within the fixed belt and includes distant records. Totally, from 2004 to 2020, 183 individuals of capercaillie, 93 – black grouse and 442 – hazel grouse were recorded on the routes.

Standard error of the mean (SE) and coefficient of variation (CV) were used as measures of the population fluctuation amplitudes. Population trends were analyzed using models of simple linear regression. The strength and significance of the trends were evaluated by the square of correlation

coefficient R2 and the Fischer F-criterion. Statistical calculations were performed using STATISTICA software package.

**Results**

*Capercaillie*

In total, from 4 to 30 individuals of capercaillie were recorded on the routes in various years (on average, 10.8 ± 2.6 individuals). These figures correspond to the relative population density from 1.6 to 12.3 individuals per 100 km (on average, 4.4 ± 1.1 ind./100 km). The population density of capercaillie undergoes significant annual fluctuations (coefficient of variation 60.9%). Until 2017, there was a close to significant trend towards a population decrease (regression coefficient $a = -0.63$, $R^2 = 0.29$, $F_{(1,11)} = 4.52$, $P = 0.057$). However, in 2017 and 2019 there were pronounced surges of the capercaillie population density (4 to 5 times higher than in previous year), after which it returned to its former low level (Figure 2). The high population density values during the surges were also confirmed by the high frequency of capercaillie records beyond the routes, that is, these extraordinary figures are not wrong. The reason for some recovery of the capercaillie population may be associated with a drastic reduction in the numbers of wild boar (*Sus scrofa*) in the Reserve and surrounding areas since 2015 (Kossenko 2017). Wild boar is known as a predator of ground-nesting birds, their eggs and chicks including capercaillie (Potapov 1987; Romanov 1988).

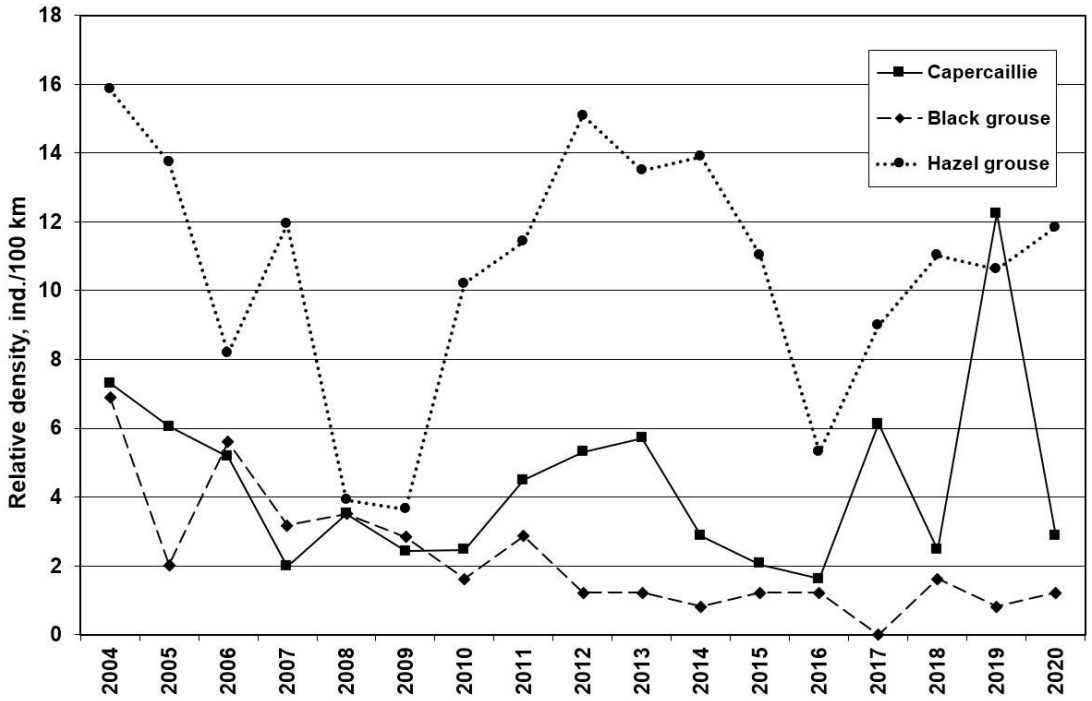


*Figure 2. Relative population density (number of individuals per 100 km) of capercaillie, black grouse and hazel grouse in the "Bryansky Les" State Nature Reserve from 2003 to 2020.*

*Black grouse*

Totally, from 0 to 17 individuals of black grouse were recorded on the routes in various years (on average, 5.5 ± 1.3 individuals) that corresponds to the relative population density from 0 to 6.9 individuals per 100 km (on average, 2.2 ± 0.5 ind./100 km). The population density of black grouse varied over the years with greater amplitude than in capercaillie (coefficient of variation 79.4%). This finding is consistent with the earlier conclusion of Potapov (1987) that the amplitude of fluctuations in the black grouse numbers is significantly higher than in other forest tetraonid species of the Palaearctic. Meanwhile, the black grouse population in the Reserve consistently and significantly decreased (Figure 2): the regression coefficient $a = -0.66$, $R^2 = 0.56$, $F_{(1,15)} = 22.09$, $P < 0.0005$. The most obvious reason for the decline in the black grouse population of the Reserve is the final overgrowing of the former clearings, which makes the habitats unsuitable for black grouse as a species tending to open areas with patches of tree and shrub vegetation (Potapov 1987). In addition, the overgrowing of sphagnum bogs by wild rosemary (*Ledum palustre*) also plays a certain role in shrinking the area of this most preferred

habitat for black grouse in the Reserve (Kossenko & Medvedko 2019). This phenomenon is probably caused by recent changes in hydrological regime of the bogs.

*Hazel grouse*

In all, from 9 to 39 individuals of hazel grouse were recorded on the routes in various years (on average, 26.0 ± 6.3 individuals). Accordingly, the relative population density ranged from 3.6 to 15.9 individuals per 100 km (on average, 10.6 ± 2.6 ind./100 km). The hazel grouse population density varied markedly over the years (coefficient of variation 34.3%), although not so strongly as in capercaillie and black grouse. There was no clear trend in population density of hazel grouse: the regression coefficient $a$ = –0.10, $R^2$ = 0.003, $F_{(1,15)}$ = 0.04, $P$ = 0.84). Upsurges in population density occurred in 2004–2007 and 2010–2015, another one has been observed since 2017 (Figure 2). Probably, the observed pattern is due to the population cyclicity, which is generally characteristic of hazel grouse (Potapov 1987; Linden 1989).

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# Evaluation of the durability and longevity of lesser prairie-chicken fence tags in Kansas and Colorado

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Anthropogenic development, such as buildings, roads, power lines, and fences, have had widespread negative consequences for many species of wildlife (Jennings et al. 2008, Brittain and Craft 2012, Leblond et al 2013, Thompson et al 2015). In addition to disturbance and habitat fragmentation caused by anthropogenic development, it also poses a direct mortality risk of collisions for wildlife (Loss et al. 2015, Hill et al. 2019). In the United States and Canada alone, collisions with buildings are estimated to cause up to 1 billion avian deaths annually (Machtans et al. 2013, Loss et al. 2014, Elmore et al. 2020).

Grouse species in particular are sensitive to changes on the landscape and therefore threatened by anthropogenic development. Oil and gas infrastructure, buildings, power lines, roads, and fences have well documented negative effects on grouse population demography, behaviors, and demographics at varying degrees of severity (Braun 1998, Pruett et al. 2009, Gillan et al. 2013, Hovick et al. 2014, Plumb et al. 2019, Patten et al. 2021). While all forms of anthropogenic development should be carefully evaluated when conserving and managing grouse species, fence lines in particular remain an issue of concern due to their high frequency on the landscape, vicinity to important demographic sites (i.e., leks), and relative ease of mitigating negative effects. In Europe, fences have been identified as a significant source of mortality for black grouse (*Lyrurus tetrix*), red grouse (*Lagopus lagopus scotica*), and capercaillie (*Tetrao urogallus*) in both woodland and open habitats (Catt et al. 1994, Baines and Andrew 2003). In North America, while little evidence exists for fence collisions to be a major source of mortality for greater sage-grouse populations (*Centrocercus urophasianus*; Connelly et al. 2000, Blomberg et al. 2013), fence collisions have been identified as a possible threat for the species (USFWS 2013). Direct mortalities from fence collisions have been observed since the 1940s (Scott 1942); more recent studies in