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Retrospective analysis of the wolf's impact on the number of wild ungulates in the Voronežhsky reserve

Key words: Wolf, *Canis lupus*, nutrition, Voronezksky Reserve, Russia, ungulates

The Voronezhsky reserve was founded in 1923 as a beaver reserve. At that time the number of wild ungulates on the territory of the reserve was minimal. There were a few roe deer and about 30 red deer in 1927. The Voronezhsky reserve red deer are descendants of the animals that were delivered from Germany in the 70–80 years of the 19th century (Barabash-Nikiforov, Pavlovsky 1947).

Significant changes in the composition of local large mammal's fauna took place during the existence of the Voronezhsky reserve. On the territory of the reserve there was formed a multispecies community of ungulates which comprised four species: European red deer (*Cervus elaphus elaphus*),

European roe deer (*Capreolus capreolus*), moose (*Alces alces*) and wild boar (*Sus scrofa*). The wolf (*Canis lupus*) is the largest predator in the reserve.

The Voronezhsky State Nature Biosphere Reserve is located in the Voronezh and Lipetsk Regions, 450 km south-south-east of Moscow (51°55′ N, 39°38′ E) (Fig. 1). The reserve is located in the forest-steppe steppe nature zone and it covers 31,053 hectares of the northern part of a large forest island surrounded by agricultural landscapes (fields and meadows) and settlements. Two small rivers, the Usman and the Ivnitsa, flow though the reserve. The south-west corner of the reserve borders the large River Voronezh. The climate is moderately continental with moderately cold winters and warm summers (Lavrov et al. 1989). The most common types of forest in the reserve are pine woods (34 %) and oak woods (32 %). A smaller part of the territory is occupied with aspen woods (17 %), while floodplains are occupied with alder forests (6 %). Other tree species (birch, maple and linden) account for 11 % of the forested area.

The territory of the Voronezhsky reserve and its surrounding territory have long been inhabited by wolves. Prior to the creation of the reserve, up to 6 packs of wolves concentrated there every year. In the 1930s the reserve began to reduce the predator population, killing 331 wolves (246 of them – on the territory of the reserve) in 1920–1950. After 1939 wolves stopped breeding on the territory of the reserve and after 1950 there had been registered only isolated cases of wolves entering the territory. At that time wolves primarily fed on domestic animals, hares, beavers, and, in some years, micromammals (table 1). The predators hunted for deer mostly in winter, when domestic animals were kept indoors and were hard to reach (Mertz 1953).

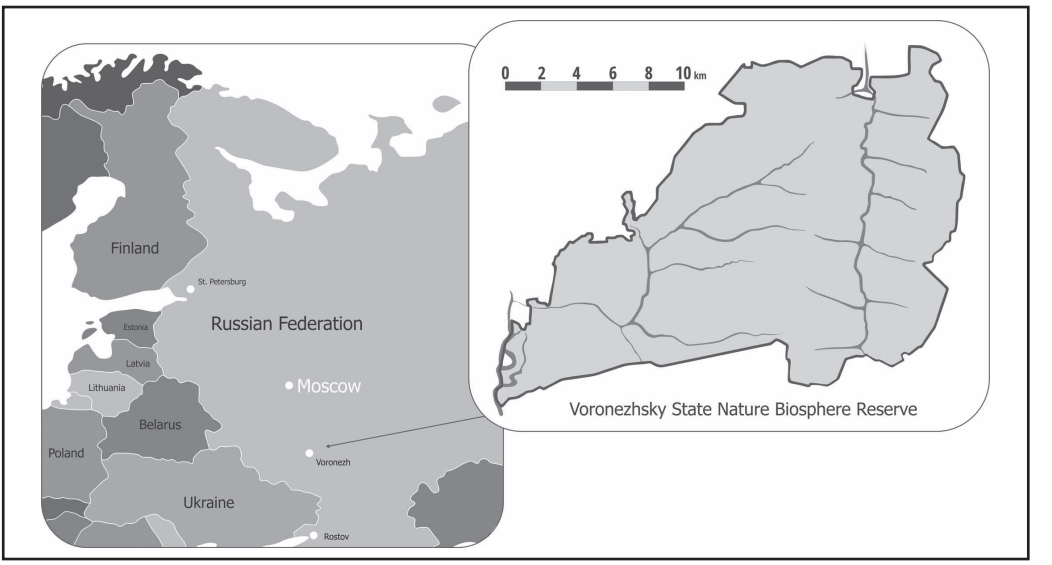

Fig. 1 Location of the Voronezhsky State Nature Biosphere Reserve

Table 1 Species composition of wolf's nutrition (%, frequency of encountering the species' remains in wolves' stomach contents and excrement) in 1933–1950 (Mertz 1953)

Species	Winter period	Summer period
Red deer	21.2	5.3
Beaver	15.3	5.3
Hare	19.3	17.9
Micromammals	8.0	8.9
Raccoon dog	4.0	1.8
Domesticated dog	11.4	37.5
Sheep	4.0	12.5
Pig	2.2	1.8
Poultry	2.2	5.4
Carrion and bait	9.6	-
Plant remains	2.8	3.6

In the early years of the existence of the reserve the number of deer grew rather slowly. By 1938 there had been registered about 55 deer. What curbed the growth of deer population was hunting and wolves' predation (Kaznevsky 1963). Before 1934 the territory of the reserve occupied 2,700 hectares along the Usman River and did not extend to main deer habitats. However, after enlarging the protected area up to its nowadays size and the reduction of the wolf population the reserve witnessed a rapid growth in the number of red deer (fig. 2). Plentiful forage and absence of interspecific competition also contributed to the progress of deer population. In the first decades of the existence of the reserve young growth trees prevailed on its territory, the average age of the trees being no more than 30 years. Open stands and exposed places occupied vast areas. There had hardly been any encounters of roe deer in the reserve.

From 1936 to 1950 deer loss equalled 3.1 % of the total number, 0.8 % being caused by wolf's predation. In the period given 27.6 % of the perished deer were killed by wolves, 28.35 % died because of exhaustion, 20.5 % – due to the injuries received during the rut, and 23.6 % – due to other reasons (Likhatsky 1997).

In view of this, at the first stage the red deer were few and wolf's predation was one of the factors that curbed the growth of their population. After wolf populations were actively influenced by man and main deer habitats were taken under protection, the wolf no longer had any substantial influence on the deer population dynamics.

The development of the nature protection system in the region allowed to increase the number of other ungulate species and expand

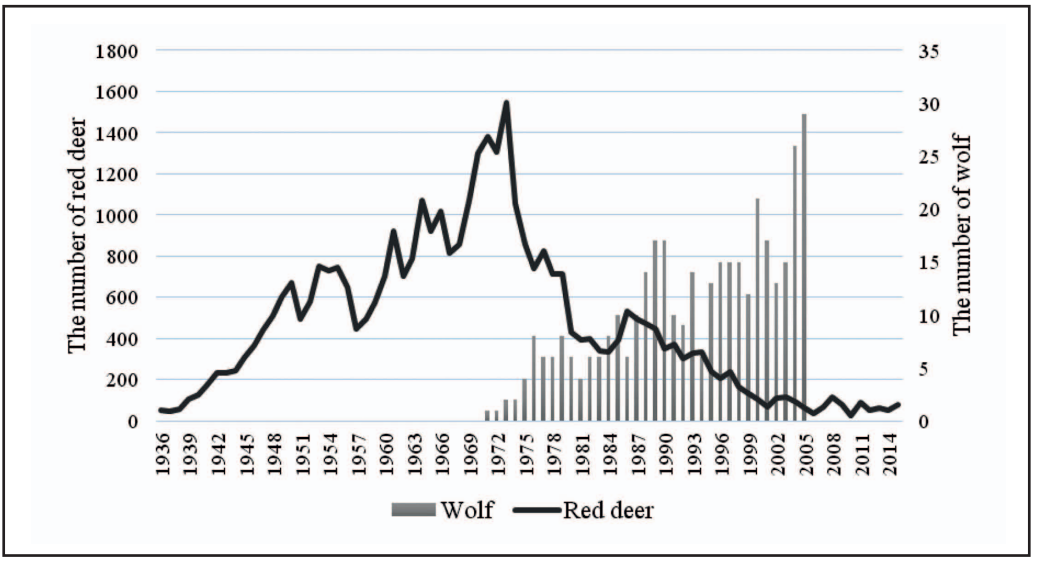

Fig. 2 The number of red deer and wolf

their habitat. In 1950–1951 wild boars and mooses appeared on the territory of the reserve (Nikolaev, Nikitin 1997). The enlargement of ungulates community and gradual depletion of natural food resources increased interspecific and intraspecific competition. By the end of 1960 the number of moose and wild boar which had settled on the territory reached 69 and 300 respectively (fig. 3, 4). At the same time the number of red deer continued to grow despite the large loss of the population from starvation during severe winters.

In order to prevent the death of animals in the 1960s wide-ranging biotechnical measures were introduced. They included setting up feeding stations and salt licks, clearing the roads and forestry aisles from snow in order to ease the movements of animals. Apart from supplementary feeding there was introduced the animals' population control by means of trapping and shooting. During the population control (1951–1999) was withdrawn 5252 individuals of red deer (fig. 6) and 4787 wild boars (fig. 7). In the absence of the wolf stray dogs appeared in the reserve. In 1958–1970 the average annual loss of the deer population from stray dogs' predation was 0.3 %. They mainly hunted for young animals (Likhatskiy 1997). In winter the weakened deer could become the prey even for wild boars (Solomatin 1974).

In the early 70s of the last century there was a repopulation of the wolf in the Voronezhsky reserve because of the increase in the number of this predator in the Central Black Earth region. Wolves had the first litter in 1976. The process of wolves' settling in the reserve can be divided into three periods:

1) The beginning of the reserve's territory development (1971–1975).
2) The emergence of a regularly breeding wolf pack, growth of their population and forming the territorial structure of the group (1976–1988).
3) Free development of the pack without direct human interference (1989-present moment).

The local wolf pack formation was carried out under a weak human control. From 1971 to 1989 twelve individuals of predators were withdrawn (Nikolaev 2002). The appearance of the wolf in the reserve coincided with the crisis of the red deer overpopulation. In 1973 their number reached a maximum – 1544 individuals. During this period on average 70.2 individuals of red deer died from starvation. Moreover, there were a lot of weakened animals. These circumstances determined the trophic preferences of wolf based on the prey of red deer in the Voronezhsky Reserve.

By 1979 the wolves had got used to the territory of the reserve and must have continued to

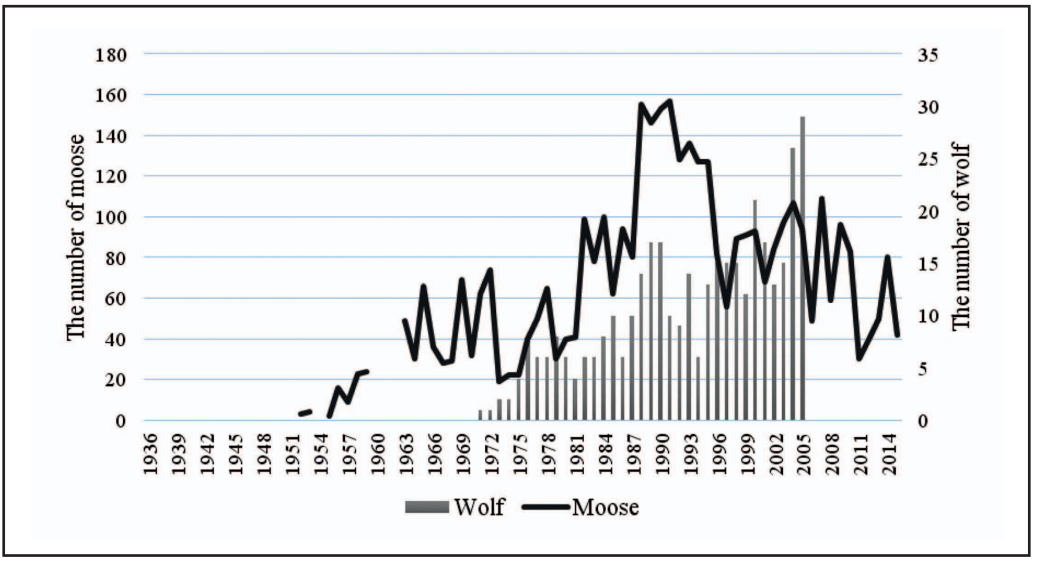

Fig. 3 The number of moose and wolf

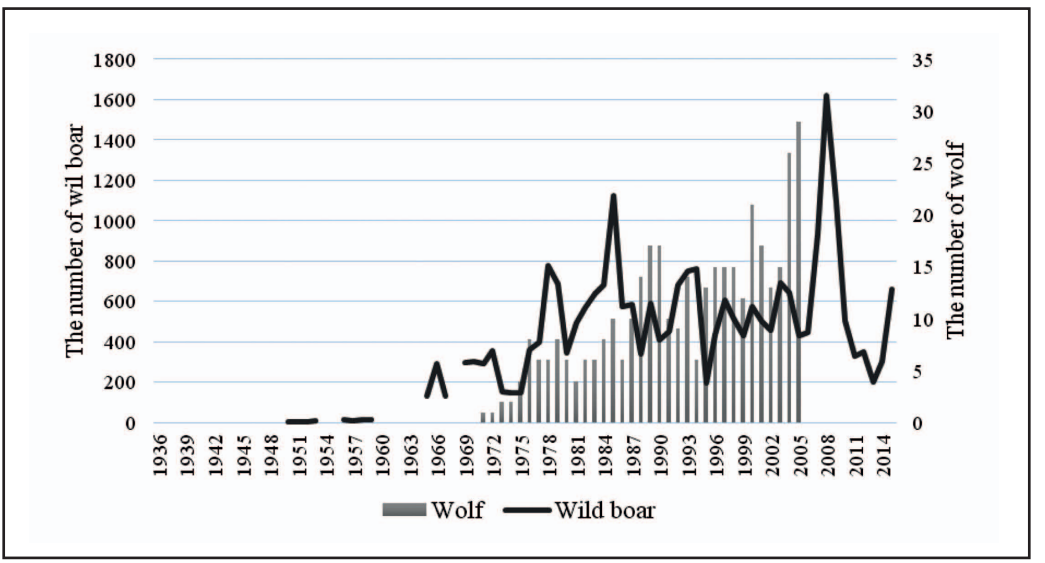

Fig. 4 The number of wild boar and wolf

live as a pack of eight (Ryabov 1993). There has been no interference in wolves' life within the reserve since 1989; organized predator chases on its surrounding territory have been abandoned as well. The number of wolves has increased considerably as a result of which two and later three packs began occupying the reserve (Nikolaev 2007).

Wild ungulate community structure changed significantly between 2000 and 2005. The predatoriness of the wolf and the red deer population control led to the decrease in the number of red deer. The red deer population shrank to 100 individuals. By contrast, the number of roe deer (fig. 5) and wild boar (fig. 4) increased substantially despite their population control. How-

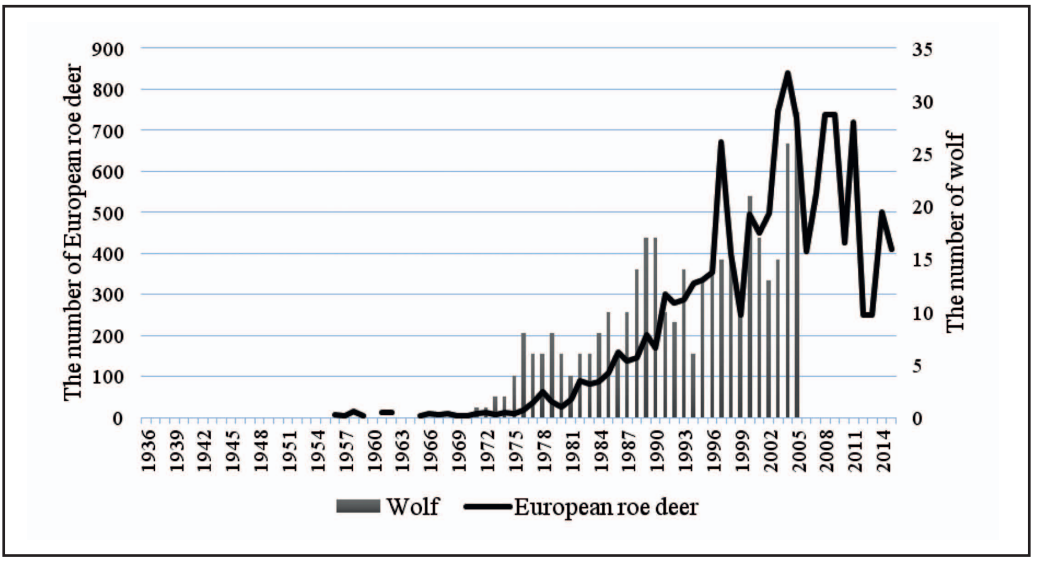

Fig. 5 The number of European roe deer and wolf

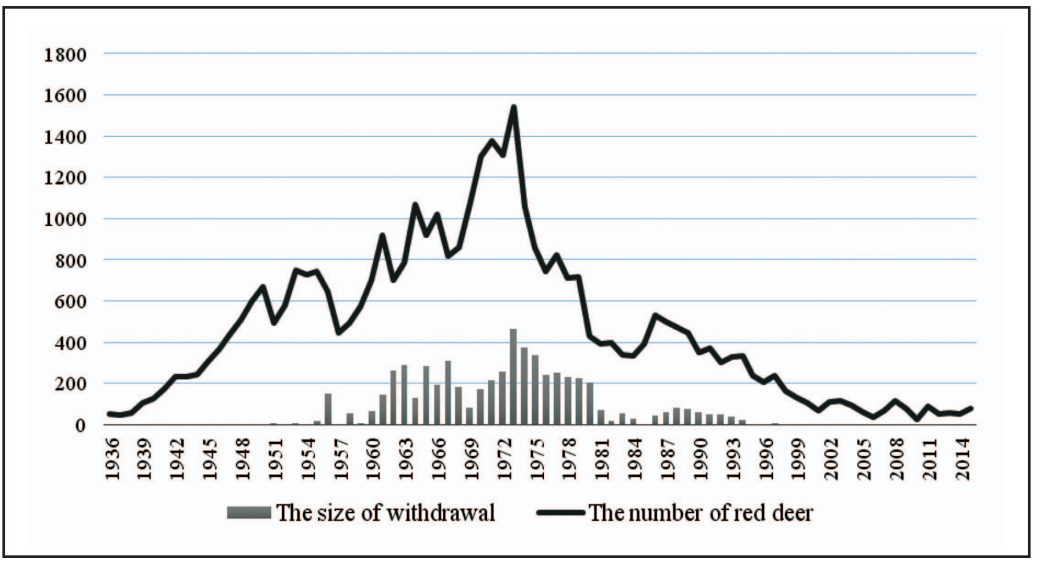

Fig. 6 The size of withdrawal of red deer

ever, wolves continued to selectively prey on red deer. From an analysis of 372 cases of wolf prey ungulate in autumn and winter red deer percentage was 40.9 %, roe deer – 39.8 %, wild boar – 14.8 % and moose – 4.5 % (Nikolaev 2007). During the spring/summer season wild boar played the central role in the nutrition of wolves (50.9 %), red deer was the wolf's prey in 13.8 % of cases. Withdrawal of young wild boar in the spring and summer only partially compensated of the mortality rate, normal for the winter. The sizes of withdrawal of moose are insignificant in all seasons. Among all the species of wild ungulates within the Voronezh-sky reserve red deer appeared to be the most vulnerable species to wolf, since red deer was

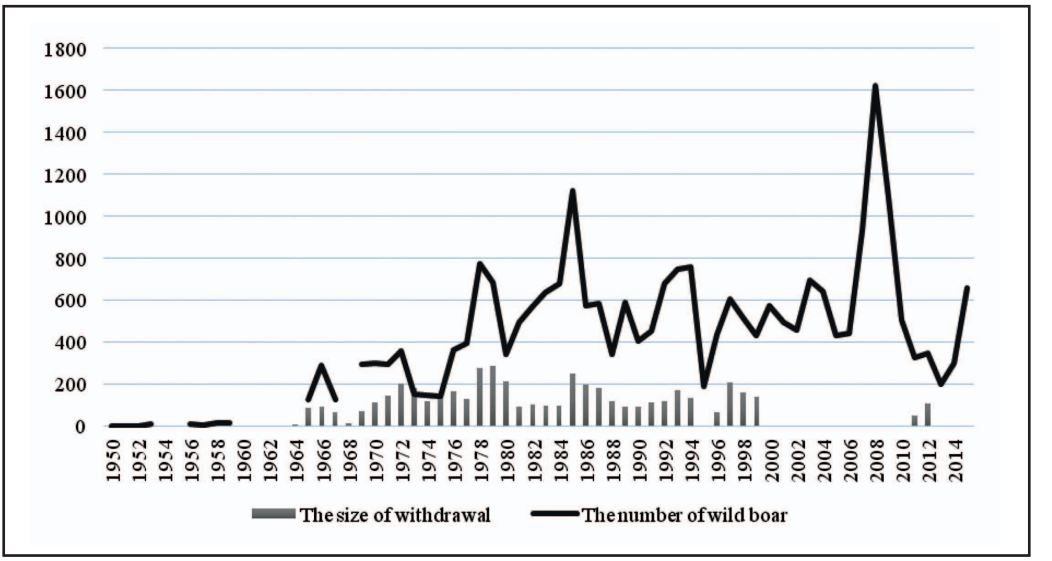

Fig. 7 The size of withdrawal of wild boar

the wolf's prey in 58.1 % of cases (roe deer – in 27.8 % of cases and moose – in 13.8 % of cases). The red deer has a lower running speed, it is less maneuverable than roe deer; red deer is not able to defend itself as heavily as moose or wild boar. Such cases in which red deer actively defended itself did not arise. A couple of wolves manage even with the biggest males; the males cannot manage to escape (Nikolaev 2007). Extraction of domestic animals doesn't exceed 3 %. Wolves of the Voronezhsky Reserve almost exclusively existed at the expense of wild ungulates (Ryabov 1993).

Summary

The predation by wolves was a major factor in reducing the deer population in the Voronezhsky Reserve. Removal of trophic competition between red deer and roe deer contributed to the growth of its number, despite the active pursuit by predators. Presently there is no evident wolf's impact on the dynamics of wild boar and moose.

Zusammenfassung

Retrospektive Analyse des Einflusses vom Wolf auf die wilden Ungulaten im Voronezher Reservat

Der Wolf ist der Hauptfaktor in der Reduzierung der Rotwildpopulation im Voronezher Biosphärenreservat in Russland. Gegenwärtig zeichnet sich kein Einfluss auf die Populationen von Elch und Schwarzwild ab.

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Buchrezension

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Historische und aktuelle Daten zum Wolf in der Mongolei.

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In der konträren Diskussion um den Wolf in Mitteleuropa sind Daten aus anderen Regionen des Wolfareals von besonderem Wert. Insofern wird mit Nachdruck auf oben ausgewiesene Publikation verwiesen. Erstmals werden Passagen und außerordentlich wichtige statistische Unterlagen aus einer mongolischen Wolfsmonographie übersetzt und durch neue Erkenntnisse und Fotodokumente beträchtlich erweitert.

Die Mongolei beherbergt trotz intensiver Verfolgung einen der besten Wolfsbestände Eurasiens. Der Wolf kommt als wertvoller Großsäuger in allen Vegetationszonen der Mongolei vor. Bereits zahlreiche Steinzeichnungen künden von Mensch-, Haus- und Wildtierkonflikten mit dem wehrhaften Beutegreifer Wolf. Er ist und bleibt ein Konkurrent des Nomaden und andererseits ein wertvoller Pelzlieferant und Regulator in Nahrungsnetzen. Die geringe menschliche Besiedlung und die in freier Weidewirtschaft gehaltenen Haustiere sowie eine reiche Fauna an kleinen und großen Wildsäugetieren bereiten der Wolfspopulation optimale nahrungsökologische Bedingungen. Seit geraumer Zeit hat die Haustierhaltung in der Mongolei die 50 Millionengrenze überschritten.

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