ANTHROPOGENIC EFFECTS ON MOOSE POPULATIONS IN THE SOUTHERN TAIGA

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ABSTRACT: This article focuses on variations in moose population densities and sex ratios, autoregulation of its population density, and related effects on the forest since a moose outbreak in 2 central parts of the East–European Plain due to the appearance of early successional tree species, resulting from felling in the course of World War II.

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Investigation of the population dynamics of moose was conducted in 1949–1986 on the left bank of the Oka River in the Prioksko–Terrasny Reserve and surrounding forests. The left–bank south–facing slopes of the Oka River have a varied vegetation. Mixed and coniferous forests of various types predominate. By the early 1950s over 30% of the Oka forests were young stands of aspen, birch, pine, and oak. Young stands up to the age of 20 years covered over 14,000 ha; pine accounted for about 3,000 ha in old pine forests. The pine regenerated on a large scale, and there was a well–developed regrowth of juniper, mountain ash, and other trees. The flood plain of the Oka and its tributaries had abundant willow thickets, and a rapid increase in moose numbers started there between 1950 and 1952, 8–10 years after mass felling (1942–1943). In 1960, moose density reached 97.7 animals per 1,000 ha (Fig. 1).

The rapid growth of moose populations was promoted by the abundance of winter forage, the low harvest of this species in Russia over many years (no more that 2–3% of the population), and migration of moose from more northern regions (Zhirnov 1967). Over the decade of 1950–1960, moose density increased 18–fold. After the peak of 1960, the population began to decline (Zablotskaya 1964) until the 1980s. The wave of high density lasted 18–20 years (Fig. 1), its highest level persisting for 9–10 years. In 1952–1955, when the population density of moose exceeded 25–30 moose/ 1,000 ha, the heavy injury by moose of early successional trees and shrubs became noticeable. In 1959, moose winter forage in the Oka forest averaged only 256 kg per ha (Koryakin 1961). In 1961, young pines, aspens, junipers, and willows injured by moose began to dry and perish. The reserves of primary winter forage for moose in the forests were practically destroyed (Fig. 1). During these years moose appeared starved, and calves born late were weakened and died.

The severe damage to trees and shrubs inflicted by moose led to a sharp increase in moose harvest. Intensive harvest (up to 40% of the moose population) started during the 1966 season and continued for 4 years. Harvesting moose in the reserve area was also permitted because of the vast destruction of pine. Since autumn 1961 in the Reserve (4,945 ha) and neighboring game management units, 230 – 370 animals were

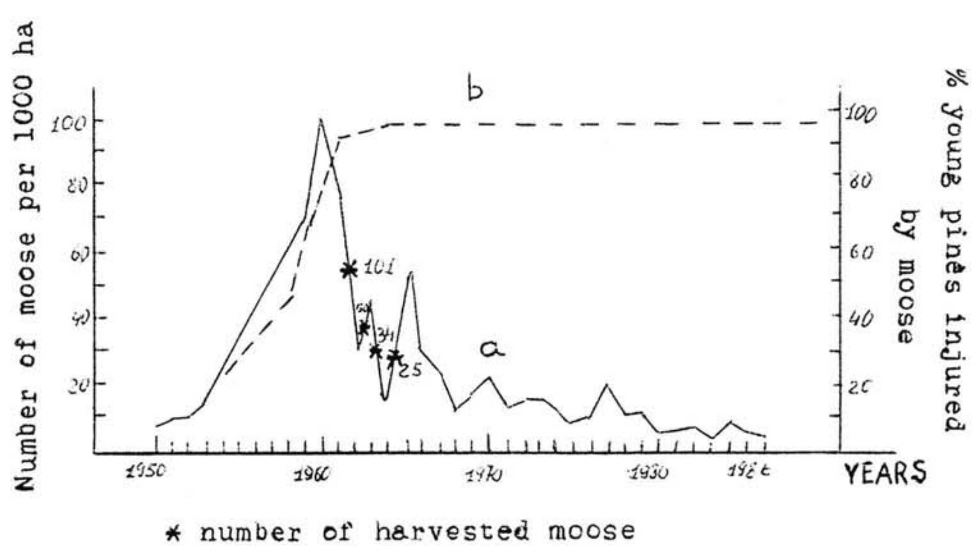

Fig. 1. Population dynamics of moose in the Prioksko–Terrasny Reserve based on (a) the results of census during winter and (b) dynamics of injury of pine regrowth by moose.

harvested annually over 4 years. Mass harvest of moose and related migrations caused sharp fluctuations of their populations in the Reserve during these years (Fig. 1).

METHODS

The study of fecundity and population structure of moose during the years of high numbers in the European USSR was based on population samples ($n = 242$) obtained through the removal of moose in 1961–1964 in the Reserve, data on moose autopsies by specialists during the same years in different geographical regions ($n = 600$ moose), and information from the state game inspections regarding approximately 15,500 moose taken in 1964 within that region.

RESULTS

The sex ratio in moose populations in different regions during the period under consideration was dissimilar. In some of them it was close to 1:1 (central regions, the Pechora taiga), and in others for a number of years male dominance persisted (53–60%). Among the latter were the regions with high moose population density (the Leningrad Region, Novgorod, Kalinin, and Kaluga Regions) and also mostly southern regions where most migrating moose from the north (the Saratov, Orenburg, Kursk, and Penza) congregated. In 1964 males generally accounted for 57.6% of all the animals taken (Zablotskaya 1975). Processing of data regarding 5,276 females from 32 regions has revealed that the average number of embryos per adult female was lower in western and north European regions (0.7–0.8) and higher in south–European regions (up to 1.1). Within each of the geographic regions studied, the indices of cow fecundity varied considerably depending on the state of winter forage and moose numbers. The lowest indices of fecundity (0.6–0.7) were recorded in areas with high population densities of moose and great deficiencies of winter forage. During the peak moose populations and the onset of decline, the average indices of fecundity of females were lower than the potential (2 embryos per female) by 30–50% (Yazan 1964, Chervonnyi 1967, Zablotskaya 1975). The decline of moose fecundity was due to a sharp decrease in the number of cows with twins and an increase in the number of barren females.

During the greatest rise in moose numbers in the central region, the population was characterized by a large number of old animals. In this region 20–26% of moose were 9–10 years and older (Fig. 2), but with over 4 years of intensive harvest, the percentage of old animals dropped to 8–10%. The percentage of calves 6 – 9 months old varied between 20 and 28%. The most variable in the Oka forests was the number of moose 1.5 years old. Their percentage depended on the flow of animals migrating south through the Oka River and occasionally composed up to 30% of the entire wintering herd. The group of sexually mature animals 2.5 – 9 years old composed 45 – 64% of the population in their winter habitats (Zablotskaya 1975).

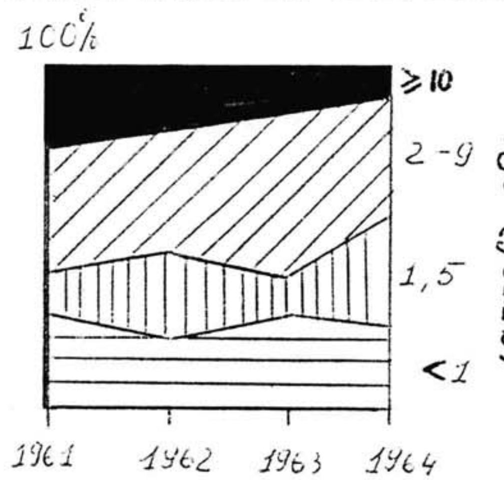

Fig. 2. The age composition of a moose population in the temperate zone of European Russia.

DISCUSSION

The decline of moose density started before the intensification of commercial harvest. The reason was depletion of the reserves of winter forage, which triggered the mechanism of self–regulation of the species numbers; the appearance of mass seasonal migrations and extension of moose range essentially into the southern and southwestern regions of Russia, a sharp decline in the breeding capacity of females, and mortality of young during the first wintering, reaching up to 50% including the late weakened calves. The delayed increase in harvest, mortality of wounded animals, poaching, and other causes somewhat accelerated the process of self–regulation of moose numbers. In the central regions of Russia, predators did not play an important role in

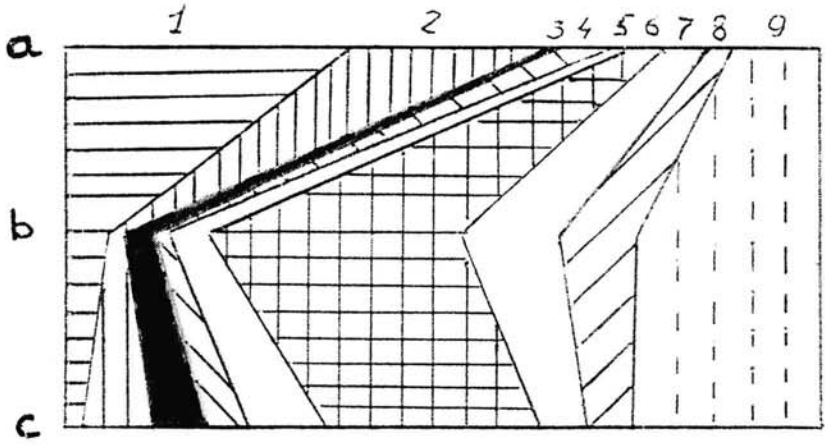

Fig. 3. The main causes of moose mortality during the years of high numbers of the population (1962–1963). 1 – mortality from predators; 2 – drowned animals; 3 – mortality from wounding during the rut; 4 – mortality of calves without mothers; 5 – mortality from disease and poisoning; 6 – mortality from hunting; 7-9 – mortality from other, including unknown reasons (% of the total number of moose that perished). a – North–European Region. b – Central European Region. c – Southern–European Region.

the reduction of moose (Fig. 3). In a number of regions, e.g., in Mordovia (according to M. N. Borodina, personal communication), the rise in the numbers of moose and the increase in wolf populations proceeded concurrently.

Mass breeding of moose strongly affected the regeneration and composition of forests. In the area of the Oka forests at cutovers, dry pines were replaced by abundant regrowth of birch. In pine forests with herbs, the pine regrowth that died due to disturbance by moose was replaced by spruce regrowth. In pine forests with green moss, pine regrowth turned into shrubs because of constant browsing, this form persisting for over 30 years. Despite the low numbers of moose, the Oka forests can perish due to a lack of reliable regrowth. Due to loss of winter forage, moose immediately browsed all young pines rising over the snow cover. We expect long–lasting effects of this moose foraging behavior on the regeneration of pine and juniper. Destruction of the ancient Oka forests can be prevented only by eliminating moose from their winter habitats in pine forests for at least 2 decades.

The exceptional rise in numbers and expansion of range of such large mammals as moose is only possible in unbalanced forest habitats in the absence of appropriate harvest, handicapping the growth of moose populations as was the case in the 1940s and 1950s. In primary climax ecosystems no such reproduction of big ungulates in large areas can exist. Not infrequently, local short–term rises in moose numbers are common natural components of succession and are delayed 8 – 10 years following regeneration of forest on cutovers and burns without substantial detriment to sylviculture. Taking into account the imbalance of forest formations in Russia over large areas, it is necessary to plan hunting of moose and other ungulates in order not to destroy forest ecosystems. In nonregulated moose hunting, there may be much stronger effects on forest ecosystems than the effects of felling. Due to the lasting pattern of the effects of high waves of mass breeding of moose, these animals, through affecting vegetation, can influence the evolution of soils.

The relationship between the dynamics of moose populations and human activity is of ancient origin. In fact, the paleo– and mesolithic camps of humans discovered in the northern half of the forest zone of Eastern Europe were commonly associated with sand pine forest terraces (Bader 1970) in areas of latitudinal flow of rivers, due to massive, stable accumulations of moose in winter. As far back as the Stone Age to the felling of trees during World War II and to our current organized harvesting of game, we affect our ecosystems for the future.

REFERENCES

BADER, N. O. 1970. Mesolith. Pages 90–104 *in* Stone Age in the USSR Territory. (In Russian).

CHERVONNYI, V. V. 1967. On the ecology, silvicultural significance and harvest of moose in Karelia. Pages 177–188 *in* Biology and harvest of moose. (In Russian).

KORYAKIN, D. A. 1961. The effect of moose on forest regeneration. Proceedings of the Prioksko–Terrasny Reserve 3:29–54. (In Russian).

YAZAN, Y. P. 1964. Population density and indices of moose fecundity of the Pechora taiga. Pages 101–111 *in* Biology and harvest of moose. (In Russian).

ZABLOTSKAYA, L. V. 1964. The experience of the regulation of moose in the Prioksko–Terrasny Reserve and in the surrounding area. Pages 156–173 *in* Biology and harvest of moose. (In Russian).

_______. 1975. The cause of mortality of moose in different geographical regions. Pages 105–129 *in* Biology and harvest of moose. (In Russian).

ZHIRNOV, L. V. 1967. Migrations of moose in the European USSR. Pages 80–104 *in* Biology and harvest of moose. (In Russian).