# THE HISTORY OF MOOSE IN THE BALTIC COUNTRIES

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ABSTRACT: This paper presents a first analysis of the development of the moose (*Alces alces alces L.)* population in Estonia, Latvia, and Lithuania prior to 1997. Archeological and documentary materials prove that moose had been living in the present Baltic countries in the second half of the early Holocene. Until the 1960's, the population numbers were relatively small. From 1961 to 1971, the moose population for all of Estonia was surveyed. The work was continued from 1972 to 1974 and again in 1979. In 1987, investigations into population numbers, composition, and growth were initiated in all 3 countries. Maximum populations probably occurred in the 1970's and 1980's. In Lithuania there were 15,000; Latvia, 45,000; and in Estonia, up to 20,000. The 4 to 5 fold decrease in the 1990's has been the result of poaching and predation (bears and wolves). In 1996 and 1997 the population levels in Estonia were on the level of 6,000 to 7,000, in Latvia about 7,000, and in Lithuania 3,800 individuals. The future of moose in the Baltic states is greatly dependent on human influences. Cooperative research work is required in order to preserve the population composition and genetic diversity. A continuous population management program, fixed harvest quotas, and habitat preservation are of prime importance.

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The finding of fossil bones confirms that moose were abundant in Estonia, Latvia, and Lithuania in the second half of the early Holocene (about 8,000 to 9,000 years ago). They were common in the Eastern Baltics and were the main game species in the region (Paaver 1965). Population changes in the Baltics were dependent primarily on climatic changes and habitat conditions up to the beginning of the second millennium A. D. Later on, population numbers were influenced primarily by anthropogenic factors, primarily hunting, but also outbreaks of anthrax in the second half of the 18th and 19th centuries, as well as immigration from Russia (Grevé 1909, Ivanauskas 1929). Humans actively hunted moose in the 18th century resulting in extirpation of moose on the islands of Saaremaa and Hiiumaa (Ling 1960). On the other hand, Rootsi (1987) suggested that moose could have survived in the 18th century at least in Saaremaa. At the end of the 19th century in Courland (Kurland), Livonia, and Estonia there were about 3,000 moose (Martenson 1899). Rootsi (1987) has based his supposition on the descriptions of hunting and relevant data, and concluded that the population might in reality have been even larger. In Lithuania there were about 1,000 to 1,200 individuals at the beginning of the 20th century (Ivanauskas 1929).

Moose suffered a sharp population decline during World War I. In 1920, Lithuania had about 25 moose, in 1922, Estonia had about 15 to 20, and in 1923, Latvia had 86 moose (Ivanauskas 1929, Ling 1981). After the war, populations began to slowly increase. In 1939 according to the official estimates, there were 880 moose in Latvia, 350 in Estonia, and 287 in Lithuania. Populations decreased again during World

War II. In 1945 there were about 300 moose in Estonia (Mäting 1963), 107 in Latvia in 1947, and 91 in Lithuania in 1948. Following this period, there were sharp population increases. Official estimates in Latvia show that the maximum population in 1972 was about 21,000, 10,000 in Lithuania in 1973, and 13,000 in Estonia in 1982 (Fig. 1). Estimates at the end of the 1970's were as follows: at least 15,000 to 17,000 (Tônisson, *pers. comm.*), or up to 20,000 (Randveer, *pers. comm.*) in Estonia, at least 45,000 in Latvia in 1975, and about 15,000 moose in Lithuania in 1987 (Bluzma and Baleishis 1989). It is concluded that in the 1970's moose population estimates in the Baltics were the highest for the last 200 years. Similar increases occurred at the same time in the Scandinavian countries and in Russia. Supposedly the main reasons for such a rapid increase in the Baltics were no hunting, predator (wolf) control, and habitat enhancement through clear cutting and forest plantations. There may also have been an immigration of moose from the neighbouring Russian territories (Ling 1967). In spite of intensive use, the numbers of moose in the Baltic republics was quite high up to the 1990's, but there was a dramatic decline after this. In the last 5 years in all the Baltic countries, population numbers have dropped 2-fold. At present, in all 3 countries, there are about 15,000 moose. This is a 5-fold decrease compared to the maximum populations of the 1970's. The decline is attributed to uncontrolled hunting and poaching as a result of the social and economic changes which have occurred. Moose numbers may also have been impacted in western Latvia and Lithuania by the increasing red deer (*Cervus elaphus)* population, which can more readily cope with the conditions in an anthropogenic environment compared to moose.

## DENSITY AND DISTRIBUTION

The 1996 population estimates for moose reveal a mean density of 2.08 moose/1,000 ha of suitable moose habitat or 0.90 moose/1,000 ha for all 3 countries (Table 1). In all

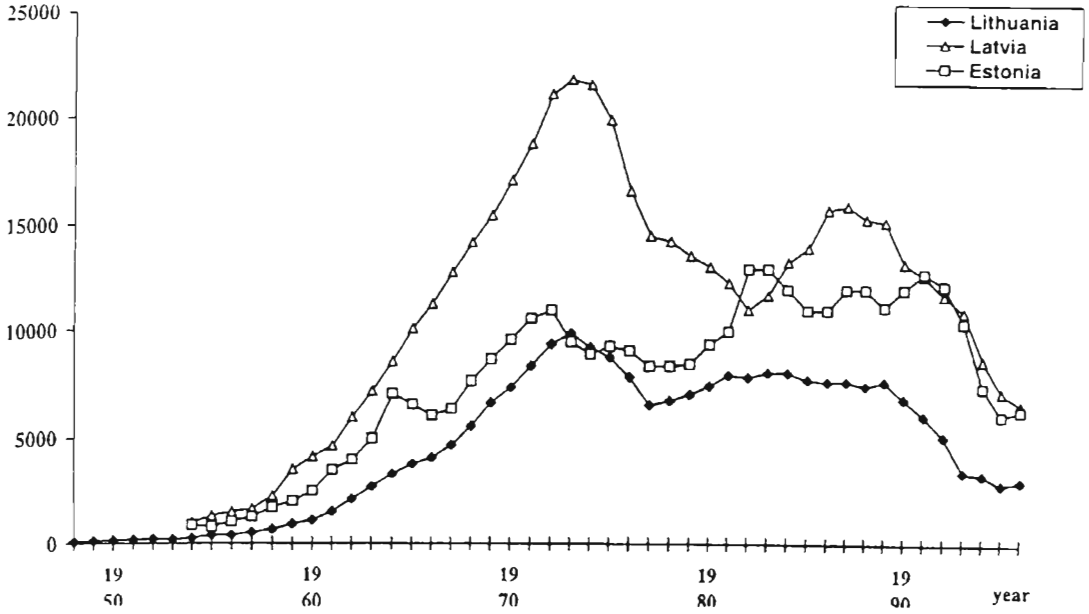


Fig. 1. The dynamics of the moose population number in Estonia, Latvia, and Lithuania from 1948 to 1996 according to the census of game fauna.

Table 1. The density of the moose population in the Baltic republics based on the game census of 1996.

| *Republic* | *Area (ha x 1,000)* | *Percent Moose Habitat* | *Population (x 1,000)* | *Moose Density (Moose/1,000 ha)* | | |
|---|---|---|---|---|---|---|
| | | | | *Total Area* | *Suitable Habitat*[1] | *Variation*[2] |
| Latvia | 6,459 | 50.0 | 6.5 | 1.01 | 2.03 | 0.2 - 3.0 |
| Lithuania | 6,530 | 30.2 | 3.0 | 0.46 | 1.54 | 0.3 - 4.3 |
| Estonia | 4,521 | 53.5 | 6.3 | 1.39 | 2.60 | 1.5 - 3.4 |
| Total | 17,510 | | 15.8 | | | 0.2 - 4.3 |
| Average | | 43.5 | | 0.90 | 2.08 | |

[1] In the case of Estonia the population density has been calculated on the basis of forests, forest meadows, and mires. Pure woodlands in the case of Latvia and Lithuania.

[2] For Estonia and Latvia the population density has been given in administrative districts, in Lithuania, it is the main areas of forestry.

cases, the density was highest in Estonia and lowest in Lithuania. The difference is most likely caused by the differences in various structures of the biotype, which in turn are the result of man's activities on the landscape. This has resulted in quite different habitat qualities for moose in all 3 countries. In Estonia, moose habitat covers more than half of the territory and is rich in mires and park meadows, favourite locations for moose. These habitats and forest areas are relatively large offering security for moose and abundant forage.

The Lithuanian landscape, when compared to the 2 other Baltic republics, has been more influenced by man's activities and the area suitable for moose habitat is only one third of the countries' land mass. The forest area is very patchy with both small and large forested areas. Most often they are separated from each other by land that is in agricultural production. The best moose habitat in Lithuania is on unproductive lands and flat sandy areas, where human activities are minimal. The pine forests in these areas are large and comprise a high percentage of the land mass (Bluzma 1990, Bluzma and Baleishis 1993). In spite of a sharp decrease in the moose population in the last few years we can conclude that, on the whole, its distribution in the 3 countries has remained almost the same as it was during peak populations. In 1996, moose were found in all administrative districts and forest areas. However, the density of moose in these areas was quite variable. A zone of relatively high density (2.1 to 4.3 moose/ 1,000 ha of habitat) was observed almost everywhere in Estonia, in the eastern part of Latvia and northeastern part of Lithuania. A zone with relatively low densities (0.3 to 2.0 moose/1,000 ha of habitat) was observed in some areas of eastern Estonia, in the western part of Latvia and the greater part of Lithuania (Fig. 2). In Latvia and Lithuania the zones coincided to a great degree with the zone where the population density of red deer (*Cervus elaphus)* was the highest. This leads one to speculate that there may be some competition between the 2 species. The negative impact on moose by red deer in Lithuania has been suggested by Bluzma and Baleishis (1993). In areas of high density of red deer, moose will be entirely displaced by these deer. The decrease in moose populations in

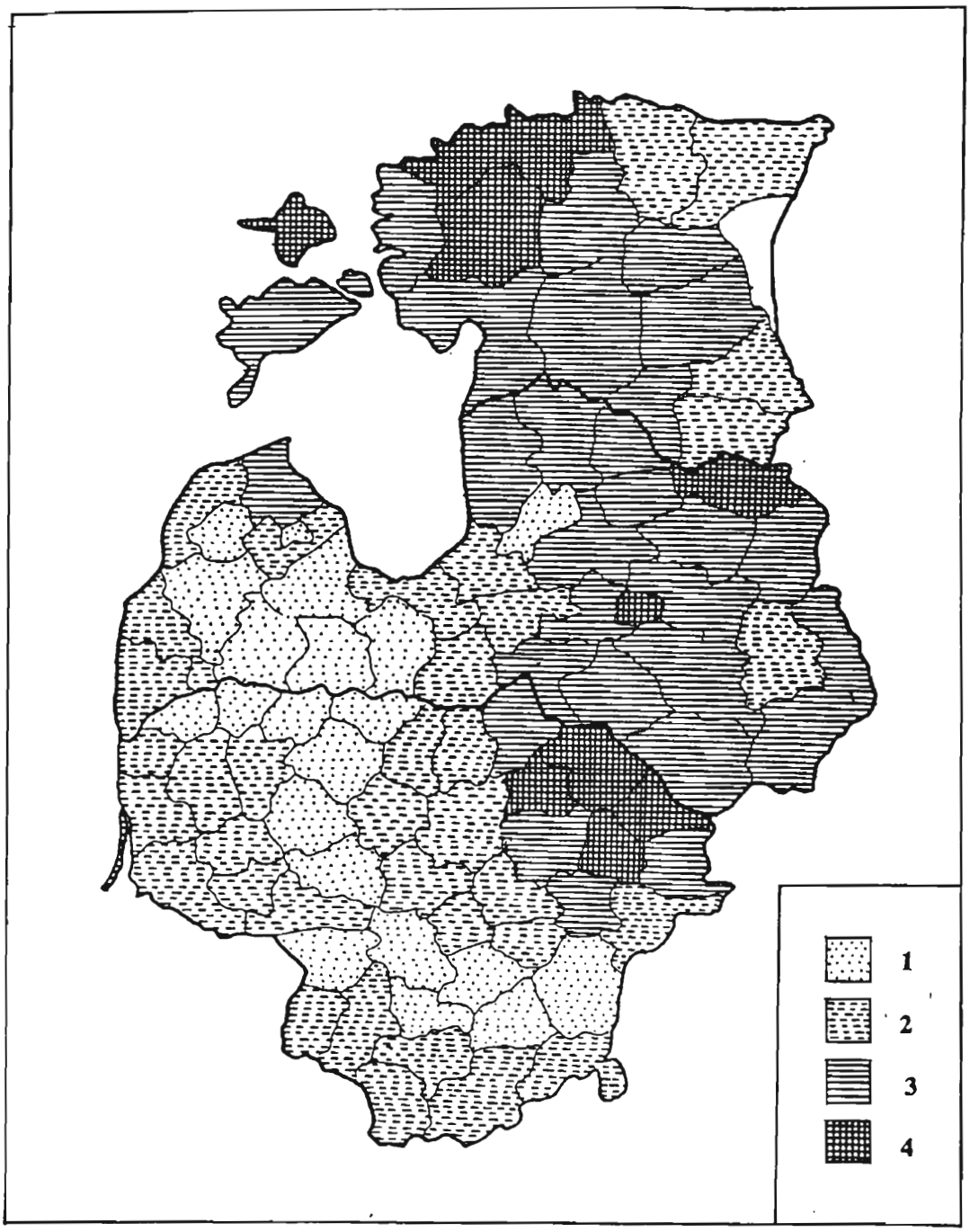


Fig. 2. The density (moose/1,000 ha: 1 - <1.1; 2 - 1.1-2.0; 3 - 2.1-3.0; 4 - >3.0) of the moose population in Estonia, Latvia, and Lithuania in 1996.

the last few years has changed their distribution pattern within a single area. For example, moose have entirely or partly abandoned unsuitable habitats, e.g. small forest areas that are separated by agricultural land, shrubby areas, and mires. The distribution of moose in these habitats has become uneven.

The decrease in the number of moose resulted in a considerable change in the number of wintering habitats. This can be illustrated on the basis of moose distribution in the Lahemaa National Park of Estonia from 1994 to 1996. During this period in wintering habitats encompassing 3,000 ha there was a 3.4-fold decrease in the mean population (from 56.1 to 16.6 ind./1,000 ha). At the same time in all other habitats the decrease was only 1.8 times (from 3.7 to 2.1 ind./1,000 ha) ( Tõnisson, *pers. comm.*). A complicated picture of the distribution of moose in habitats has also been caused by the preferences for various biotypes, by their diversity, and by landscape patterns (Baleishis *et al.* 1990). For example, in Lithuania the most preferable winter habitats were reforested areas and plantations (pine in particular), logged areas (aspen in particular) and mires (boglands). The use of these areas by moose varied from 1.5 to 11 times higher than the corresponding mean number for all other habitats. In addition, the preferences for single habitats in the different landscapes differed as well.

## POPULATION COMPOSITION

The population composition is dependent upon the reproduction rate, mortality and migration. In all Baltic countries females predominate in the adult moose population. In Estonia from 1961 to 1993 the proportion of males to females was on average 1:1.21 (Tõnisson, *pers. comm.*), but in recent years the number of females has grown noticeably compared to the number of males. In 1996 the proportion was 1:1.60. In Latvia in 1963 the ratio of males to females was 1:1.5 to 1.7; in 1975,1:1; in 1989, 1:1.3; in 1992, 1:1 (Gaross 1996). In Lithuania in 1971-1975 the proportion of males and females was 1:1.2-1.3 (Baleishis and Prusaite 1976). The data given by Padaiga (*pers. comm.*) show that in 1992 the proportion remained almost the same although there were some minor changes due to other ecological factors impacting moose habitat. The smallest difference in number of males and females (1:1.2) was found in spruce-pine forests and the biggest in pine forests (1:1.7).

Real growth in the moose population can be estimated only in autumn because, in the first months following parturition, the mortality rate of calves is high. The percentage of calves in autumn in Estonia ranged from 15.7% in 1966 to 28.8% in 1970 (mean = 27% of the population). In 1987 to 1993 the percentage averaged 27.6% and in 1996, 28.3% (Tõnisson, *pers. comm.*). In Lithuania the percentage of calves from 1971 to 1975 changed little (26% versus 27.9%) but in 1992 it was 29% of the total moose population (Baleishis and Prusaite 1976, Padaiga, *pers. comm.*). When compared with the Scandinavian countries the growth rate in the moose population in the Baltic countries is significantly lower. For example, in Finland the percentage of calves in 1990 was 34.9% and 35.6% in 1991, while in the Älvsborg administrative district of Sweden in 1990 it was 39% (Älgobsinventering 1991, Nygrén *et al.* 1991). This suggests a higher mortality rate following parturition in the Baltics, although the growth potential for the population is almost the same. In Estonia from 1993-1995 there were about 100 (91.4-104.1) embryos per 100 females. This is almost the same level as in Finland in the 1980's. In autumn in Estonia there were 60 to 70 calves/100 cows whereas in Finland there were 88 calves /100 cows (Nygrén and Pesonen 1993, Kirk and Tõnisson 1996). In Lithuania there were 64 to 69 calves/100 cows from 1971-1975.

In recent years in Estonia there has been a trend to less twinning. In 1990-1992 the percentage of all cows with calves having twins ranged from 31.8% to 35.5%. The maximum was 49.1% in 1962 and a

minimum of 21% in 1987. In Lithuania from 1971 to 1975 cows with twins comprised 22.9% to 25.6% of all cows with calves. As can be seen, the growth rate and the composition of the moose population of the eastern Baltic countries has been steady. It also suggests that such a great decrease in the moose population in these countries is associated with overuse of the moose population.

## POPULATION MANAGEMENT

The current situation of low moose populations in the Baltic states suggests a need for radical management measures to protect the populations and enhance calf survival. The objective should be to support optimal populations commensurate with the overall quantitative and qualitative aspects of habitat. It is necessary to examine the population dynamics (number, sex/age composition, reproduction, and mortality factors) and habitat, namely the structure, land use, and interspecific competition. The application of the information to various regions and landscape types of all 3 countries needs to be evaluated.

It is our opinion that 2 management goals must be set to support population growth. The first is to support rapid growth in the population. An important management requirement is to curtail poaching and enforce strict habitat protection measures in wintering areas. A ban on moose hunting should be imposed in areas with low population densities, initiate a selective harvest program to protect cows, and maintain suitable bull/cow ratios which will enhance population growth. The goal should not be to achieve previous historic population densities as, with changes in habitat, this would be inappropriate. In many areas the population density has exceeded the carrying capacity resulting in significant damage to commercially valuable trees (Padaiga 1984). One must also consider interspecific competition between moose and red deer.

In the Baltic republics hunting has traditionally been a sport with special emphasis on trophy (antler and meat) quality. This should be one of the main focal points of future management programs. Hunter education must be improved and the principles of selective harvest strictly followed. A management system focusing on population numbers, composition, and trophy quality must be understood and appreciated by hunters. The overall goal in the 3 Baltic countries is to achieve growth in the moose populations. This will require a significant amount of time and a united effort from hunters, conservation organizations, and the general public. The goals will be achieved more quickly through cooperation between all 3 countries as well as with neighbouring countries. The primary goal of the cooperative work should be management of the population and regulation of numbers so that the preservation of genetic variation is accomplished, forest damage maintained at an acceptable level, and biological data required for management purposes collected. Moose are an interesting and valuable component of the Baltic ecosystems and management data on the species and their habitats is axiomatic if populations are to remain viable in the face of contemporary development activities.

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