

REGIONAL POPULATIONS AND MIGRATION OF MOOSE IN NORTHERN YAKUTIA, RUSSIA

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ABSTRACT: Following an overall population decline of moose (*Alces alces*) after the 1970s, extensive aerial and ground surveys conducted since 1985 indicated that there were 7 distinct populations in northern Yakutia. They are isolated geographically by mountain ridges and major rivers, and are named the Leno-Olenek, Predverkhoyansk, Yana, Chondon, Momo-Selenyakh, Indigirka, and Kolyma populations. Although most occupy forest habitat associated with major rivers, some are migratory (40-200 km) moving both N-S and E-W, and certain populations overlap on winter range. Population densities generally range from 1-2 moose/10 km², with higher and lower local densities. The northernmost Chondon population is unique by occupying sub-tundra forests and ridges. Because protective regulations did not produce measurable population recovery and were abandoned in 2004, management strategies must be adopted to address the ecological differences of these separate populations. Effective moose management in Yakutia will require further identification of range and habitat use, habitat structure and availability, and population estimates and dynamics of regional populations.

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The moose (*Alces alces*) population in Yakutia increased about 15% annually in the 1960s. It was expected to increase fourfold during the subsequent decade, from 60- to 240,000 (Tavrovsky et al. 1971). However, this projected increase was unrealized as the population was only about 78,000 by the mid-1970s. Population growth was curbed by overhunting, predation by wolves (*Canis lupus*), increased disturbance, and extrusion to less favorable winter range. The Yakutian moose population did not reach its maximum at the time when the majority of moose populations thrived and reached maximum density in the European part of Russia (Filonov 1983).

In 1997-2000 there was a moratorium on moose hunting in parts of Yakutia that was subsequently extended to 5 years along with a geographic extension of protection. Due to its futility, the moratorium was canceled in January 2004. Management of moose in Yakutia should not occur under a single administrative

district rather, it needs to recognize and address regional populations characterized by different size, habitat, and reproductive capacity.

Even initial aerial censuses in the mid-1960s showed uneven distribution of moose in Yakutia. Several areas with relatively high moose density were in northeastern Yakutia, including Western Predverkhoyanie (0.55 animals/10 km²), the Yukagirskoe Upland (0.5), the Kolymskoe and Abyiskoe Lowlands (0.5), and some areas in the Yana basin (0.55). The rest of the northeastern territory and the northwestern area were characterized by low moose density (Tavrovsky et al. 1971). However, identifying separate populations was hindered due to short-term aerial censuses and narrow coverage of survey strips. More recent aerial censuses have confirmed that regional populations of variable density occur in Yakutia.

Extensive aerial (250 hr and 37,500 km) and ground surveys undertaken in 1985-2001

identified 7 relatively isolated moose populations. The Leno-Olenek population is the largest in northwestern Yakutia at 1.8-2 moose/10 km² at its core, and inhabits the basins of the Siligir, Muna, Severnaya, Motorchuna, Molodo, and Olenek Rivers (Fig. 1); the average population density was 0.5/10 km². The winter range in the north includes the Nekekit River, the lower course of the Merchimden River, and upstream of the Molodo River. In the south, the winter range borders upstream of the Tyung and Linde Rivers, and adjoins the Lena River to the east.

The Leno-Olenek population is probably in transient contact with the Predverkhoyanskaya population to the south (Fig. 1). However, the frequency of contact is probably low due to their different migration routes. The migration route of the Leno-Olenek population is oriented north-south, whereas the Predverkhoyansk population moves east-west. The Leno-Olenek and Leno-Viluy populations

overlapped in the 1960s at the watershed of the Viluy and Linde Rivers where their density reached 1.2 moose/10 km². Subsequent development of gas fields in this area caused the southern range of the Leno-Olenek population to shift northward, and the northern range of the Leno-Viluy population southward; consequently, contact between these populations has become rare.

Prior to our surveys, it was believed that Yakutian moose were not migratory (Belyk 1948). However, the Leno-Olenek population migrates annually through the lower course of the Muna River in September-October and returns north in May; the migration is 120-200 km long (Yazan 1972). The basic winter range includes the basins of the Siligir, Muna, Severnaya, and Motorchuna Rivers that provide plentiful winter forage. The average snow depth is 40-50 cm which is less than in the north (60-70 cm). The spring migration is probably associated with increasing energy

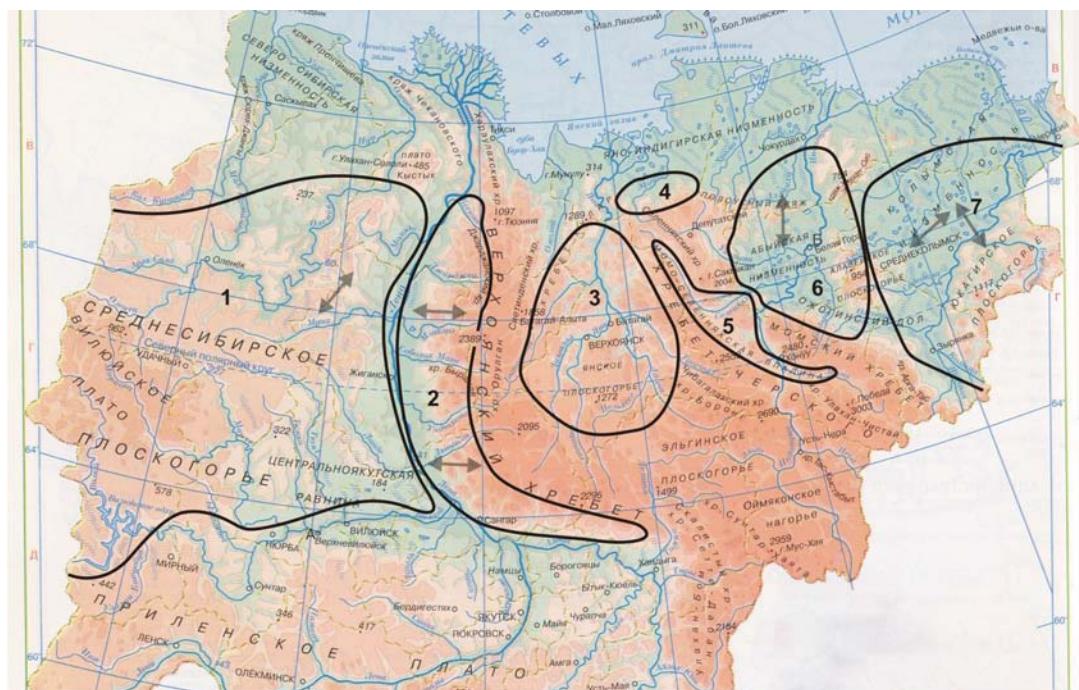


Fig. 1. The location of 7 distinct moose populations found in northern Yakutia, Russia; the 7 populations were the Leno-Olenek (1), the Predverkhoyansk (2), the Yana (3), the Chondon (4), the Momo-Selenyakh (5), the Indigirka (6), and the Kolyma (7). Arrows depict the general direction of seasonal migrations.

demands and the timing of availability of grass that increases northward in this part of Yakutia.

The western Predverkhoyanie region has a moose population occupying the Prilensko-Aldanskaya Plain and Verkhoyanie foothills, separated by the Verkhoyanskij Ridge to the east (Fig. 1). The average population density in the northern Prilenskaya area was 1.6 animals/10 km² ranging locally from 0.5-3.3, and in floodplains was as high as 5.2-6.8 animals/10 km². In September-early October moose migrate to mountain taiga forests from the Lena River floodplains and its tributaries; in November-December they return to the floodplains. The direct-line migration distance is no less than 40 km.

The Yana population found in the Yana River basin is separated west of the Predverkhoyansk population by the Cherskij Ridge (Fig. 1). This population occasionally migrates to the Momo-Selenyakh Depression. Single animals occur near the upper timberline of the Burkhat and the Selenyakhskij Ridges. In the northern part of the Yana-Indigirkoe upland adjacent to foothills of the Cherskij Ridge, moose inhabit watersheds and valleys of the Oldgo, Abyrabyt, and Djanky Rivers with an average density of 1.2 animals/10 km². Northward they occur to the Kular Ridge and are found only in riparian forest along the Kazachka and Ulakhan-Kyuegelir Rivers.

The Chondon population is the northernmost in Yakutia. It inhabits the Upper Chondon River mostly along the valleys of its tributaries the Dodoma, Ygannya, Nagdakha, and Nem-kuchan Rivers, as well as the northern Nem-kuchanskij, Selenyakhskij, and Irgichyanskij slopes on the Kyun-Tas Ridge (Fig. 1). This region spreads from the sub-tundra plain zone to mountain forests bordering tundra to the north and mountain tundra to the south; these varying habitat features dictate the specific habitat conditions and isolation of the population. The average density of moose in this area was 3.2 animals/10 km² in October 1986

and 1.3 per 10 km² in 1988.

The Momo-Selenyakh population occupies the Momo-Selenyakh Depression (Fig. 1) with an average density of 0.3 moose/10 km². Density was higher (1.6) in the extended central part of the depression between the Indigirka and Selenyakh Rivers. Moose ascended mountains along the forested river valleys but were rarely found in unforested areas; some (0.5 animals/10 km²) grazed near herds of snow sheep (*Ovis nivicola*) at 668 m elevation in the upper Pechatnaya and the Berezovka Rivers in the northeastern part of the Momskij Ridge. They easily migrated beyond the limits of the Momo-Selenyakh Depression northeast along the Selenyakh River valley and lower slopes of the Andrey-Tas Mountain ridge to the Abyiskoe Lowland and Ozhoginskij Dale where they come in contact with the Indigirka and Kolyma populations (Fig. 1).

The large Indigirka population is widespread inhabiting the basin of the middle and lower region of the Indigirka River (Fig. 1). The population density in autumn-winter was 0.4-0.6 moose/10 km² in the Abyiskaya and Yana-Indigirska lowlands. The Uyandina-Selenyakh interfluve where moose are rarely found separates the Indigirka and Moma-Selenyakh populations. Moose occur west of the Indigirka River north to the Kondakovskij Plateau (0.4 animals/10 km²). Contact with the Kolyma population to the west is rare except in the Ozhogino Dale, and the basin of the Badyarikha and the Ozhogino Rivers where density ranges from 1.1-1.3 moose/10 km². The Indigirska population moves north for spring-summer grazing in tundra 50-60 km from the forest line near Lake Djukarskoe; in October-November they occupy forested areas only.

The most eastern population of moose in Yakutia is the Kolyma that occupies the basin of the Kolyma River and Yukagirkoe Plateau, stretching to the Verkhoyankoe Plateau (Fig. 1). The average population density varied from 0.8-1.1 moose/10 km² depending on the

landscape. Here moose regularly migrate during fall-winter from the Kolymskaya lowland to the Alazeyskoe and Yukagirskoe Plateaus; this migration was initially documented by Egorov (1965).

Identification of separate, regional populations of moose in Yakutia was only possible after conducting extensive aerial and ground surveys at the end of the 1900s in the wake of an overall population decline. Despite protective regulations, stability and recovery of the population was not realized; management strategies must be adapted relative to the regional differences in seasonal habitat use, migratory behavior, and relative isolation. Effective moose management in Yakutia will require further identification of range and habitat use, habitat structure and availability, and population estimates and dynamics of regional populations to develop effective measures for the continued protection and recruitment of moose in Yakutia.

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