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## **Genetic characteristics of wild and domestic reindeer based on the analysis of mtDNA cytb gene**

**Veronika Kharzinova<sup>1\*</sup>, Arsen Dotsev<sup>1</sup>, Nikolay Bardukov<sup>1</sup>, Maulik Upadhyay<sup>2</sup>,  
Stefan Krebs<sup>2</sup>, Elisabeth Kunz<sup>2</sup>, Ivica Medugorac I<sup>2</sup>, Natalia Zinovieva<sup>1</sup>.**

<sup>1</sup> L.K. Ernst Federal Research Center for Animal Husbandry, Russia;

<sup>2</sup> Ludwig Maximilian University of Munich, Germany;

\* Corresponding author: [veronika0784@mail.ru](mailto:veronika0784@mail.ru)



Federal Research Center for Animal Husbandry named after Academy Member L.K. Ernst

L.K. Ernst Federal Research Center for Animal Husbandry



## **Abstract:**

Reindeer (*Rangifer tarandus*) in Russia is presented by a number of wild and domestic populations. Both wild and domestic reindeer play an important role in lives of indigenous people. Investigation of biodiversity of this species is very important for developing conservation and breeding programs. Our research was aimed at determining haplotype variability and genetic diversity of the wild and domestic reindeer. MtDNA cytb gene (1,140 bp) of the wild reindeer from the Taimyr region (WLD, n=16) and domestic reindeer from the Nenets-Autonomous district (NEN, n=15) and Tuva Republic (TUVA, n=5) were sequenced. It was shown that the number of variable sites was higher in WLD – 35, than in NEN and TUVA – 17 and 5, respectively. Haplotype diversity was  $0.958 \pm 0.036$  in WLD,  $0.762 \pm 0.096$  in NEN and  $0.900 \pm 0.161$  in TUVA. Average number of nucleotide differences was 7.942 in WLD, 4.324 in NEN and 2.800 in TUVA. The median-joining network revealed that WLD and NEN had shared haplotypes with each other, while TUVA had private haplotypes. Thus, the obtained results of the current study demonstrated that the wild reindeer were characterized by higher genetic diversity than both domestic groups. Tuva reindeer clustered separately from the other populations and were characterized by higher haplotype diversity than the Nenets conspecifics that had a higher average number of nucleotide differences.

**Keywords:** *Rangifer tarandus*, cytochrome b, mitochondrial DNA, genetic diversity

# Introduction

Reindeer is an essential element of the Russian Northeast area ecosystem



Wild population

Domestic population



16 indigenous minorities of the northern regions  
> 130 000 people



one of the most important hunting species of hoofed animals of the country

Two largest populations in Eurasia:  
Yakut and Taimyr

wild reindeer populations  
= 950 000

deeply integrated into life and culture of indigenous northern people

-meat

-transport

-leather production

domestic reindeer populations  
=1 583 000

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# Introduction



Several genetic studies have been conducted for reindeer, using different genetic methods such as:

## The GEL ELECTROPHORESIS



The extremely important data were obtained from the study of blood serum  
*(Storset et al. (1978); Baccus et al. (1983); Røed (1985); Røed et al. (1991); Cronin (1995). Shubin, Efimtseva (1988).*

## NUCLEAR GENOME MARKERS STR, SNP

The generally high level of differences was determined among the domestic and wild reindeer groups

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(SEL'SKOKHOZYAISTVENNAYA BIOLOGIYA)

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**DEVELOPMENT OF METHODS FOR THE PARENTAGE VERIFICATION OF REINDEER**  
V.R. KHARZINOVA<sup>1</sup>, E.A. DENISKOVA<sup>1</sup>, A.S. SOLovieva<sup>1</sup>, K.A. LAYSHEV<sup>2</sup>, T.M. OKHLOPKOV<sup>3</sup>, K.WIMMER<sup>4</sup>, N.ZINOVIEVA<sup>1\*</sup>

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RESEARCH ARTICLE

Genetic diversity and population structure of domestic and wild reindeer (*Rangifer tarandus* L. 1758): A novel approach using a BeadChip

Veronika Ruslanovna Kharzinova<sup>1,\*</sup>, Evgenievna Deniskova<sup>1</sup>, Anastasiya Kasim Anverovich Layshev<sup>2</sup>, Tatiana Michailovich Okhlopkov<sup>3</sup>, Klaus Wimmer<sup>4</sup>, Anatolievna Zinovieva<sup>1\*</sup>

1 L.K. Ernst Federal Science Center for Animal Husbandry, 60, Settl. Dubrovitsy, Podolsk Municipality, Moscow Region, Moscow Province, Russia  
2 Yakut Scientific Research Institute of the Agricultural Sciences, 677000, Mirnyy, Republic of the North-West Center of Interdisciplinary Research, St. Petersburg, Russia  
3 Scientific Organizations, St. Petersburg, Russia  
4 Institute of Farm Animal Science, University of Veterinary Medicine, 18119, Dummerstorf, Mecklenburg-Vorpommern, Germany  
5 Institut für Tierzucht und Genetik, University of Veterinary Medicine, 10559, Berlin, Germany

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Insight into the Current Genetic Diversity and Population Structure of Domestic Reindeer (*Rangifer tarandus*) in Russia

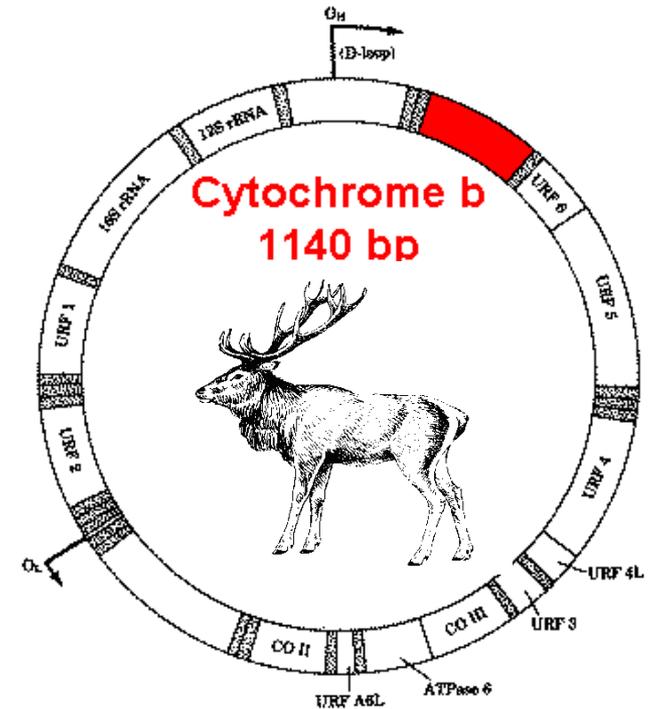
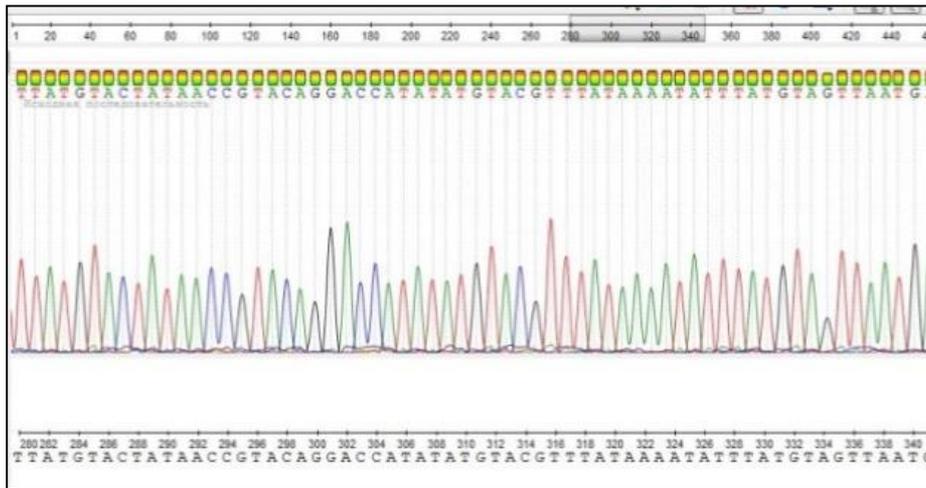
by Veronika Kharzinova<sup>1,\*</sup>, Arsen Dotsev<sup>1</sup>, Anastasiya Solovieva<sup>1</sup>, Olga Sergeeva<sup>2</sup>, Georgiy Bryzgalov<sup>3</sup>, Henry Reyer<sup>4</sup>, Klaus Wimmer<sup>4</sup>, Gottfried Brem<sup>1,5</sup> and Natalia Zinovieva<sup>1,\*</sup>





Based on contemporary and ancient mtDNA the past extinction and range expansions on near-present evolutionary time were described

(Flagstad, Røed, 2003; Cronin et al. 2005; Kvie et al., 2016).



The current information on the genetic variation of the reindeer based on sequences of the mtDNA cytochrome b gene is still lacking.

### AIM

The determining haplotype variability and genetic diversity of the wild and domestic reindeer based on the analysis of mitochondrial cytochrome b gene sequences MtDNA cyt b gene.

# Results and Discussion



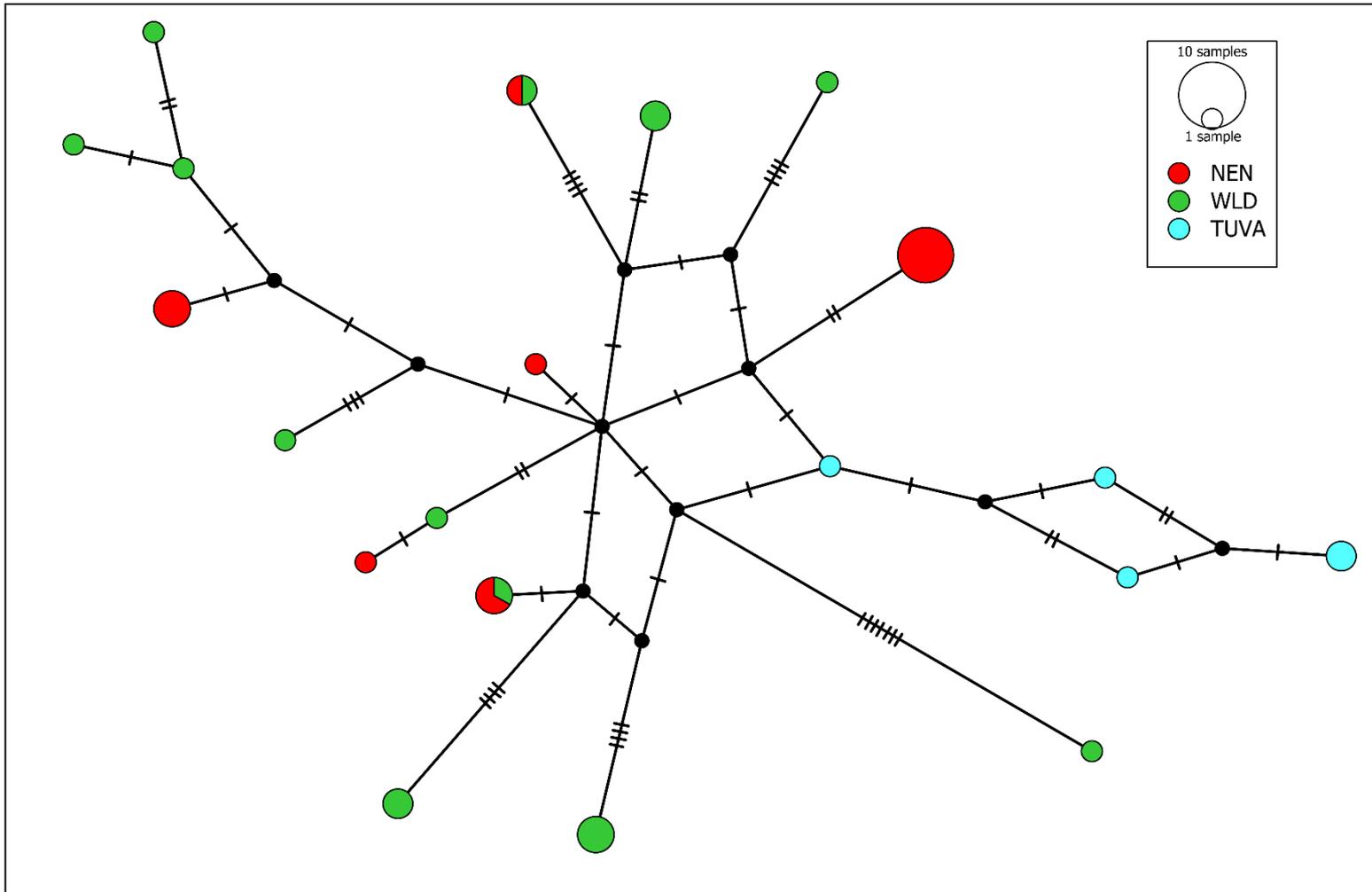
MtDNA cytb gene (1,140 bp) of the wild reindeer from the Taimyr region (WLD, n=16) and domestic reindeer from the Nenets-Autonomous district (NEN, n=15) and Tuva Republic (TUVA, n=5) were sequenced.

**Table 1.** Genetic diversity indices of reindeer populations calculated from nucleotide sequence of mitochondrial cytb gene

Breed/Population	Code	n	S	H	HD	K	$\pi$
Nenets domestic	NEN	15	17	6	0.762 ± 0.096	4.324	0.00379 ± 0.0006
Taimyr wild	WLD	16	35	12	0.958 ± 0.036	7.942	0.00697 ± 0.00052
Tuva domestic	TUVA	5	5	4	0.900 ± 0.161	2.800	0.00246 ± 0.00054

n—sample number; S—number of variable sites; H—number of haplotypes; HD—haplotype diversity; k—average number of nucleotide differences;  $\pi$ —nucleotide diversity.

# Results and Discussion



**Figure 1.** Median joining network of reindeer populations based on the analysis of mtDNA cytb gene polymorphism.

# Conclusions



The obtained results of the current study, based on the analysis of mitochondrial cytochrome b gene sequences, demonstrated that the wild reindeer were characterized by higher genetic diversity than both domestic groups. Tuva reindeer clustered separately from the other populations and were characterized by higher haplotype diversity than the Nenets conspecifics that had a higher average number of nucleotide differences. Our findings will assist in the programs of biodiversity conservation of this essential element of Russia's Far North.

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**THANK YOU  
FOR  
YOUR  
ATTENTION!**

