Dynamics of interethnic mixing in Yamal Nenets people
(according to data on the marriage structure and the surname database)

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Abstract. The article discusses the results of the mixation study of Yamal Tundra Nenets people from 1980 to 2019 within the context of their inclusion in inter-ethnic contacts with allochthonous ethnic groups, mechanisms of miscegenation and changes in population genetic structure. Two generations (the 1980s and 2010s) of Tundra Nenets from Yar-Sale rural settlement, Yamal district, YNAD were studied - a total of 8346 Nenets. Dynamics of structure of marriages and surnames were analyzed. Obtained data demonstrates a relatively low level of genetic and demographic transformations accumulated during the studied period. This can be traced, in part, when looking at the frequency of ethnically mixed marriages and the percentage of the new (“alien”) surnames integrated into the Nenets surname structure. We predict a gradual positive dynamic (i.e., increase) of these figures.

1. Introduction

Intensification of interethnic contacts: cultural and demographic interaction between ethnic groups around the Globe, is one of the most notable contemporary trends. The aforementioned trend often threatens the identity and prognosticates cultural and biological assimilation for indigenous peoples of the Arctic and subarctic regions, who often live in relatively small communities. The vector of cultural assimilation gradually leads to deactualisation of group identity foundations and transformation of ethnic consciousness. This, in turn, leads to a decrease in statistical number of indigenous peoples, which can already be seen in comparisons of censuses conducted in northern regions of the Russian Federation. Moreover, the decline in population of indigenous peoples is sometimes predetermined, to a greater extent, by changing self-identification of citizens, rather than by negative tendencies in reproductive processes.

Assimilation at biological level - penetration of autochthonous populations, “foreign genes” into the gene pool as a result of interethnic marriages, is, too, a very significant factor from the point of view of impact on indigenous communities of the Arctic. The transformation of gene pools of peoples inhabiting certain territories has mixed consequences. On the one hand, destruction of evolutionarily developed adaptive gene complexes has a negative effect on the fitness of peoples to natural and climatic factors of their habitat. On the other hand, it can contribute to adaptation in the context of yet another global trend - the westernization of lifestyle, including the dietary specifics [1].

Nenets are indigenous peoples inhabiting the Eurasian coast of the Arctic Ocean. The geographic range of Nenets populations is immense — from the Kola Peninsula to Taymyr. Primary places of the
most numerous groups of Nenets compact settlements are located on administrative borders of several federal subjects of the Russian Federation: Tyumen oblast, Arkhangelsk oblast, and Krasnoyarsk Krai. Modern ethnography in predominant places of residence and dialects distinguishes forest and Tundra Nenets. Forest Nenets are a small group with a range of populations residing in forest-tundra and taiga zones of the Tyumen oblast: four in the Purovsky district of the Yamalo-Nenets Autonomous Okrug (YNAO) and three in the Beloyarsky, Nizhnevartovsky and Surgut districts of the Khanty-Mansi Autonomous Okrug (KMAO). Tundra Nenets are more numerous and administratively organized. The main territories of their settlement are the Nenets Autonomous Okrug of Arkhangelsk oblast (7504 people), YNAO of Tyumen oblast (29772 people) and the Taymyr Dolgano-Nenets Autonomous Okrug of Krasnoyarsk Krai (3054 people) [2].

It is characteristic for Nenets, as for most indigenous peoples of the world, to consistently integrate into structure of a modern society with all the consequences for traditional communities, including changes in social structure, demographic transition, language, and cultural and ethno-economic transformations, change in ethnic identity, increase in share of ethnically mixed marriages, changes in morbidity structure, etc. Issues of ethnogenesis, history, and modern development of Nenets have long been under the scrutiny of researchers. Analysis of ethnosocial and ethnocultural processes [3], [4], along with demographics, is carried out [5-8], results of ethnological expert assessments [9] and gene pool studies [10] are published. Researchers are particularly interested in the ongoing assimilation of Nenets peoples, including cultural and biological consequences of this phenomenon [11], [12], [13], [14].

The article discusses results of a study on Yamal Tundra Nenets interethnic mixing based on data collected from the period of 1980 to 2019, in context of their involvement in interethnic contacts with allochthonous ethnic groups. Choice of this particular population was determined by two key factors: its significant geographical isolation and intensive industrial development of those territories, which causes an influx of non-indigenous populations into the region and thus creates conditions for launching interethnic mixing processes. Although a significant part of the Yamal Nenets (according to our data, more than a third) still maintains the tradition of nomadic deer breeding, interethnic mixing and, in particular, an increase in mixed marriages, is a factor affecting the community as a whole: its lifestyle, cultural practices, demographic and social structure, morbidity and other characteristics.

2. Materials and methods
We studied the characteristics of Nenets mixing and its consequent effects on the population's gene pool through analysis of the marriage structure and the surname database. A chosen time frame allowed us to identify two disjoined generations, giving us the means to analyze the key trends in development of this process. Materials for this research were obtained during field studies on territories of Yar-Sale population of Yamal Tundra Nenets in August, 2019. Geographically, this population is located within the administrative boundaries of the Yamalsky District of the YNAO of the Tyumen Region (Fig. 1). As a source of information, we used non-personalized data from household accounting books of Yar-Sale rural settlement population (Yar-Sale village, Sunay-Sale village, Yamal tundra) for a time period from 1980 to 2019 (two time intervals: the 1980s and 2010s, which correspond to two disjoined generations). Data for the indicated period was collected and analyzed frontally, in an array of the entire population. In total, the survey covered 12,523 people, including 8,346 Nenets. The total Nenets surname database, consisting of names taken from the studied period, amounted to 286 variants.

Based on the collected information, the ethnic composition of the Yar-Sale rural settlement population was analyzed; dynamics of the Nenets population were estimated; marriage structure along with spectrum and frequency of surnames were studied. In addition to that, according to the data on the share of interethnic marriages, the miscegenation index (t) was calculated [15]. This indicator allows to predict the number of generations in which, with the identified frequency of interethnic marriages, the population will reach a given level of interethnic mixing (M), that is, the frequency of individuals carrying “alien” genes will reach, for example, 50%. To illustrate the effect of migrations and interethnic marriages on the gene pool by M. Ney's method [16], matrices of genetic distances (d) between two
generations of the Yar-Sale Tundra Nenets were calculated. Data on surname frequency, gathered from Nenets in the 1980s and 2010s, was used as a primary source for this part of the analysis.

![Map of Tundra Nenets surveyed population.](image)

**Figure 1.** Map of Tundra Nenets surveyed population.

### 3. Results and discussion

With the exception of extreme isolation, any population in nature is not a closed biological system: it interacts with other populations through the exchange of migrants. In context of marriage, migration is considered a pivotal factor in population dynamics, and migration of new genes into the population is considered the genetic basis of miscegenation and biological assimilation processes. From the moment of their formation and throughout subsequent history, indigenous peoples of Russian Arctic, Siberia, and the Far East, either exchanged marriage migrants with neighboring ethnic groups or assimilated them. Nenets are no exception to that. Studying the modern structure of ethnically mixed marriages of YNAO Nenets, E.V. Volzhanina [8], [11] notes that the Nenets dual-phratrial system, which suggests the establishment of marriage following exogamous customs, did not exclude the possibility of mixed marriages. In a historical retrospective, the Nenets quite widely practiced marriages with the Enets, Evenks, Selkups, Ob-Ugrics (Khanty and Mansi) and Komi. This resulted in the appearance of lineage groups of Khanty, Enets origin in Tundra Nenets.

It is generally accepted that an increase in prevalence of interethnic marriages (especially with newly-arrived Russian-speaking groups) is associated with transition of northern indigenous peoples and nationalities to a settled lifestyle, moving to multinational villages, and joint education of children of different nationalities in boarding schools. All this is also characteristic of Nenets, and beginning of these processes dates back to the first half of the twentieth century.

#### 3.1. The structure of nationalities of Yar-Sale rural settlement and the Nenets population
The northern territories of Russia are usually multinational in population composition. According to analyzed data, we have established that during the studied period from 1980 to 2019, the total population of Yar-Sale rural settlement increased from 3717 to 8667 people, including the growing number of Nenets ethnic group, which has proportionally grown from 2,500 to 5,825. It should be noted that, despite the increased migration, which is indirectly confirmed by expansion of the spectrum of nationalities registered in the settlement (from 30 in the 1980s to 41 in the 2010s) and the number of newcomers (from 1146 to 2712 people), the share of Nenets in the overall structure of population remained unchanged for two generations and amounted to more than 67%. Table 1 shows the absolute and relative numbers of the five most common nationalities (Top-5), as well as indigenous northern peoples, in the Yar-Sale settlement.

**Table 1.** List of nationalities of the Yar-Sale settlement of the Yamal district of YNAO in 1980-2019 (Top 5 and Arctic peoples)

| Nationality | 1980s | 2010s |
|-------------|-------|-------|
|             | n     | %     | n     | %     |
| Nenets      | 2500  | 67.25 | 5846  | 67.69 |
| Russians    | 801   | 21.55 | 1737  | 20.11 |
| Ukrainians  | 128   | 3.44  | 142   | 1.64  |
| Tatars      | 125   | 3.36  | 263   | 3.05  |
| Belorussians| 27    | 0.73  | 19    | 0.22  |
| Kyrgyz      | 0     | 0     | 83    | 1.35  |
| Komi        | 31    | 0.83  | 36    | 0.45  |
| Khanty      | 28    | 0.75  | 47    | 0.54  |
| Mansi       | 8     | 0.22  | 25    | 0.29  |
| Selkups     | 1     | 0.03  | 5     | 0.06  |
| Evenks / Evens | 1 | 0.03 | 1 | 0.01 |

A study of structure of nationalities in the Yar-Sale rural settlement in the 1980s and 2010s revealed a total of more than 50 nationalities in population structure (with Nenets, Russians, Ukrainians, and Tatars leading in headcount in both the 1980s and 2010s). The second-largest ethnic group after the Nenets were Russians in both analyzed periods. Their share in the 1980s and 2010s exceeded 20%. The decrease of Ukrainians and Belarussians in population structure of Yar-Sale settlement in the 2010s is, most likely, due to the collapse of the Soviet Union, whereas an increase in the share of Asian peoples (Kyrgyz, Tajiks, Uzbeks, Azerbaijanis, etc.), as well as the peoples of the Caucasus (Armenians, Georgians, Ossetians, Karachais, etc.) is in line with the current socio-economic situation in these regions. As for other autochthonous ethnic groups of northern peoples (Khanty, Mansi, Komi, Selkups, Evens and Evenks), their total contribution to the structure of the population was considered insignificant (1.86 in the 1980s and 1.36 in the 2010s).

3.2. **Marriage structure and inter-ethnic mixation**

Despite the rather diverse ethnic population structure of Yar-Sale rural settlement, where Yamal Tundra Nenets concisely reside, they still have a high frequency of single-ethnic marriages (more than 85%), but with an increasing tendency towards interethnic mixing (Table 2). Share of interethnic marriages from 1980 to 2019 increased from 9.54% to 13.80%. The marriages of Nenets with East Slavic peoples (Russians, Ukrainians, and Belarussians) dominate the whole inter-ethnic marriage structure in the region. A slight decrease in the proportion of mixed families of the Nenets with other Arctic peoples in 2010 caught our attention, with an increase in frequency of marriages with Tatars, Moldavians, Kyrgyz, and the peoples of the Caucasus as well.

As a result of increased interethnic mixing, the share of Nenets descending from mixed marriages increased (from 2.76% in the 1980s to 5.08% in the 2010s). The miscegenation index calculated on the
basis of interethnic marriages ($t$) is insignificant. With a given value of $M = 50\%$, it amounted to 6.98 generations in the 1980s and 4.67 in 2010s. This means that provided the current level of interethnic mixing is maintained, the frequency of Nenets carrying “alien” genes in their genotype will reach 50% in more than 150 years. However, a change in the miscegenation index over the generation is, in itself, evidence of its intensification. The total frequency of mixed marriages in two disjointed Nenets generations exceeds 23%, and the proportion of descendants from such marriages is 7.84%. The cumulative effect of Nenets miscegenation from generation to generation, suggests that their population’s gene pool is undergoing a transformation that is not too strong at this stage. To examine this assumption, we researched the surname database of Nenets covering two generations.

### Table 2. Marriage structure of Yamal Nenets (1980 - 2019), %.

| Generation | Nenets | Mixed marriages |
|------------|--------|-----------------|
|            |        | Nenets — Russians a | Nenets — Peoples of the North | Nenets — another b |
| 1980s      | 90.46  | 5.38            | 2.20                | 1.96               |
| 2010s      | 86.20  | 7.94            | 1.34                | 4.52               |

a - Russians, Ukrainians, Belarusians.
b - other nationalities.

### 3.3. Nenets surname database and genetic distances between generations

Surnames in population genetics are considered an analog of genetic markers, similar to the polyallelic gene system. Research results confirming the informative value of surnames for studying demographic processes and the genetic structure of populations, including dynamics, are widely published in Russian and foreign literature. The main criterion for applicability of surnames for these purposes is the time of their inception. Nenets surnames correspond with this criterion. According to ethnography, the formation of Tundra Nenets surnames is based on the names of phratries (Kharyuchi and Vanuito), lineage groups (Lapsuy, Nyaruy, Puiko, etc.) and patronymies (Evay, Susoy, etc.). Some of them date back to 17th century (Yar, Yaptic). Others stood out relatively recently (Evay, Susoy - early twentieth century) [17]. Nevertheless, the practice of transferring surnames along the male line in the Nenets during the period we studied can be characterized as established.

The total Nenets surname database, consisting of names taken from the studied period, amounted to 286 variants in 8346 carriers. Between the 1980s and 2010s, variety of surname variants increased from 80 (2457 carriers) to 269 (5844 carriers) due to the penetration of “alien” surnames. This process is well illustrated by the spectrum and frequency indicators of rare surname variants, recorded in 1 to 4 carriers (Table 3). For the 1980s generation of Nenets, contribution of rare variants to the surname database already exceeded 50%, however, the frequency of their carriers was less than 4%. In the 2010s, these figures increased - the share of rare surnames approached 75%, but the frequency of their carriers, despite almost doubling metric, remained low - less than 8%. The fate of such surnames, as well as “alien” genes that entered the Nenets gene pool, depends on characteristics of the reproduction of carrier families. In the future, being subject to predominantly endogamous monoethnic marriages, they may disappear, “dissolve” in the Nenets gene pool and surname database. However, the tendency we identified allows us to predict their further accumulation.

### Table 3. Some characteristics of rare surnames in the Yamal Tundra Nenets (1986 - 2019)

| Generation | Rare surnames | Carriers of rare surnames |
|------------|---------------|----------------------------|
|            | n  | %   | n  | %   |
| 1980s      | 42 | 52.50 | 95 | 3.80 |
| 2010s      | 201 | 74.72 | 431 | 7.38 |
As for the surnames of the ethno-forming bloc - the most common variants in the Nenets surname database (Top-5), their spectrum has not changed in the two studied generations (Table 4). Three of them - Khud, Serotetto and Yaptik belong to the "Haruchi" phratry and two — Vanuito and Salinder - to the "Vanuito" phratry. Note that surname Salinder is Khanty in origin, as are Paranguy and Nyadangee surnames, also found in Yamal Nenets. The frequency of carriers of “Top-5” surnames in a generation decreased by 3.8%, while remaining high (over 60%). This testifies to preservation of both the Nenets surname database and the gene pool of this population.

Our data is consistent with results of the study carried out by S.L. Avrusina and her co-authors [18], who used a different approach to collecting data on the Nenets surname database, specifically they examined children living in villages and tundra of the Yamal district of the YNAO. According to data collected by these authors, surnames Khudi and Salinder are the most common in Yamalsky District.

Table 4. "Top 5" Nenets surnames in generations of the 1980s and 2010s

| surnames | 1980s % carriers | surnames | 2010s % carriers |
|----------|-----------------|----------|-----------------|
| Khudi    | 25.63           | Khudi    | 23.92           |
| Serotetto| 13.46           | Serotetto| 15.18           |
| Vanuito  | 11.33           | Vanuito  | 10.01           |
| Salinder | 9.53            | Salinder | 7.19            |
| Yaptic   | 5.89            | Yaptic   | 5.68            |
| total    | 65.84           | total    | 61.98           |

Speaking of the diversity of Yamal Nenets surname database, it should be noted that we also registered the names of the Forest Nenets (genera Vello and Pyak) along with European Nenets family (Pyrirko) in their composition.

In conclusion, let’s take a look at the data on the severity of changes over the life of one Yamal Nenets gene pool generation according to study of the surname database. Using the M. Ney's method, matrices of genetic distances (d) between the 1980s and 2010s generations of Nenets were constructed. The obtained results indicate small genetic distances between generations (d = 0.007), which confirms the assumption that the transformation of Yamal’s Tundra Nenets unique gene pool is insignificant at the present stage. In comparison, according to our data [19], over the same period of time, the surname database of many indigenous peoples, for example, of Western and Southern Siberia, underwent much more pronounced changes (Shors - 0.111, Khakass-Sagais - 0.212, Altai-Tubalars - 0.313).

On the whole, the study of Yamal Nenets modern mixing processes along the lines of their involvement in interethic interaction with allochthonous groups, miscegenation mechanisms, and changes in the population-genetic structure of Yamal Tundra Nenets shows a relatively low level of transformation accumulated over the previous periods. This can be seen both in relation to frequency of ethnically mixed marriages and in proportion of new (“alien”) surnames integrated into the structure. At the same time, there is every reason to predict a gradual (although not explosive in pace, but, rather, smooth) increase in these indicators in the future. Not only is this suggested by logic of further development of Yamal Nenets population, but also by the socio-economic context existing within the region.

Acknowledgements
The study was carried out with the financial support of the RFBR, project 18-09-00487. The authors express their sincere gratitude to the government of the Tyumen District, Yamal-Nenets Autonomous Okrug, administration of the Yamal District and the Yar-Sale rural settlement for the organizational support of the expedition to Yamal.
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