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Are there any relics of variable stress patterns in the Forest Nenets language?

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***Summary*:** This article aims to answer the following questions: Is there a phonological accent in the Forest Nenets language? Which vowels are prosodically distinguished? Why do Y. N. Popova, T. Salminen, and S. A. Burkova define the place of stress differently, and is this related to stress in other Samoyedic languages? To address these questions, the length and intensity of vowels in field recordings made in 2012 in the village of Khalyasavey were analyzed. The analysis revealed that length and intensity sometimes mark different syllables, indicating that there is no stress in the classical sense in modern Forest Nenets. However, the Proto-Samoyedic stress placement, which is preserved in Tundra Nenets and the southern and central Selkup dialects, is also represented as a relic in the Forest Nenets language.

Keywords: Forest Nenets, field research, stress, experimental phonetics.

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I. Introduction

In the search for Uralic languages with variable phonological stress placement, which were described in [Normanskaja 2018], the Forest Nenets (or Neshan) language was among the first to catch our attention. Popova's dictionary [Popova 1978] notes variable stress placement in this language, while in Lehtisalo's dictionary [Lehtisalo 1956] the vowel length is noted instead. Interestingly, the vowel length in Lehtisalo's dictionary does not coincide with the stress positions indicated by Popova.

The aim of this work is to answer the following questions: which vowels are prosodically distinguished? What is the nature of this distinction, and does the Forest Nenets language retain the Proto-Samoyedic variable stress pattern reconstructed in [Normanskaja 2018]? This pattern is preserved in the Southern and Central Selkup and Tundra Nenets dialects. We will briefly describe the reconstruction of stress in the Proto-Samoyedic language. In Proto-Samoyedic, roots are reconstructed into two types based on their prosodic features.

1. Proto-Samoyedic "plus" roots: These roots have a fixed stress placement on the stem in all forms (with positive accent marking according to [Zaliznyak 2002; Dybo 2000]). Their reflexes are:
- Long Proto-Nenets (Tundra) vowels in the first syllable as per [Lehtisalo 1956] or *a, æ, e, o, í, ú* according to [Salminen 2007].
- Positive accent marking in Selkup dialects, where the stress remains fixed on the root in all derived forms.

2. Proto-Samoyedic "minus" roots: These roots may have stress on the affix in some forms, indicating a negative accent marking. Their reflexes are:
- Short Proto-Nenets (Tundra) vowels according to [Lehtisalo 1956] or *ə, i, u* as noted by [Salminen 2007].
- Roots with negative marking in Selkup language, where the stress falls on non-initial syllables in some derived forms, cf. [Normanskaja 2018: 285].

In the articles by M.K. Amelina [Amelina 2016, 2018], it is demonstrated that in Tundra Nenets dialects the reflexes of the first type of Proto-Samoyedic roots exhibit not only vowel length as indicated by [Lehtisalo 1956]

and specific vowel quality (as noted by Salminen), but also stress, similar to Selkup dialects. This stress is expiratory-quantitative. The primary acoustic features of this stress in the Yamal dialect are greater duration (temporal prominence) and greater intensity (expiratory prominence). In the Gydan dialect, the stressed vowel also has a higher pitch (tonal prominence) compared to an unstressed vowel.

Phonetic analysis of Forest Nenets data on LingvoDoc, using the Phonology option, reveals that in the Khalyasavey dialect, intensity and length often mark different syllables of the same word. However, in most cases, intensity marks the vowel of the first syllable (see examples below). This indicates that Forest Nenets does not display Proto-Samoyedic stress placement, unlike Tundra Nenets. We will now examine whether there is any correlation between Proto-Samoyedic stress placement and length and/or intensity in Forest Nenets for words with Proto-Samoyedic etymology.

As mentioned earlier, it is impossible to determine this from existing dictionaries due to conflicting data on the vowel length and the placement of stress. Specifically, Y.N. Popova notes that stress can be placed on any syllable, whether open or closed (see examples below). In the monograph [Sammallahti 1974: 29-31], it is stated that stress and intonation have not been systematically studied, but generally, "the main stress usually falls on the first syllable of a word. However, if the first syllable is short and the second is long, the stress shifts to the second syllable. Secondary stress falls on the third, fifth, and subsequent syllables; if the second syllable is closed, it receives secondary stress." In [Salminen 2007], it is also noted that the vowel system should be described separately for stressed and unstressed syllables, but the rules for stress placement are not described. In the section of a collective monograph dedicated to Nenets languages [Burkova 2022: 681], it is stated that in Nenets languages the stress is usually placed on the first syllable or a non-initial closed syllable.

Clearly, even from this brief overview of stress placement rules, contradictions are evident between P. Sammallahti and S.I. Burkova. For example, in words with a short vowel in the first syllable and a long vowel in the second open syllable, such as *pîja* ‘nose’, according to [Sammallahti 1974: 29-31], the main stress should fall on the second syllable, whereas [Burkova 2022: 681] states it should be on the first. [Popova 1978] also marks the stress on the first syllable in this word, *'pʁiha* ‘nose’, but there is no full correlation with S.I. Burkova’s rule, since in the example *(ŋ)a'pa* ‘elder sister’ in [Popova 1978], the stress is placed on the second syllable, although according to P. Sammallahti and S.I. Burkova, it should be on the first.

Researchers also do not have a unified opinion regarding the number of vowel phonemes and the distinction between long and short vowels, Authors such as [Lehtisalo 1956, Popova 1978, Verbov 1973, Sammallahti 1974, Ackerman, Salminen 2006, Salminen 2007] agree that vowels have different lengths but interpret them differently.

Y.N. Popova believed that there are long and short vowels and proposed the following phonological system for the Forest Nenets language, see Table 1.

Table 1: The vowel system of the Purovsky dialect of the Forest Nenets language according to Y.N. Popova [Popova 1978]

Row	Frontal		Middle		Rear	
Raise	unrounded	rounded	unrounded	rounded	unrounded	rounded
Upper	*i (ĭ, ī)*		*ʁɪ (ʁĭ, ʁī)*			*u (ŭ, ū)*
Middle	*ɛ (ɛ̆, ɛ̄)*		*ə (ə̆, ə̄)*			*o (ŏ, ō)*
Lower					*a (ă, ā)*	
Diphthong	*ɛœ*					

Three years later, G.D. Verbov proposed a phoneme system that also includes neutral and long vowels, see Table 2.

Table 2: The vowel system of the Forest Nenets language according to G.D. Verbov [Verbov 1973]

Row	Front		Middle		Rear	
Raise	unrounded	rounded	unrounded	rounded	unrounded	rounded
Upper	*i (ī)*		*ь (ь̄)*			*u (ū)*
Middle	*e (ē), ɛ*		*ə (ə̄)*			*o (ō)*
Lower	*a (ā)*					
Diphthong	*aɛ*					

In 1974, P. Sammallahti proposed a system with five long vowels: *ā, ē, ō, ū,* ī, and five short vowels: *a, e, o, u, i*, as well as two diphthongs: *ae, aɛ* (see [Sammallahti 1974: 13] for details). However, P. Sammallahti noted that the phonological status of the short vowels *e, o*, and the diphthongs is not reliable.
Later, in [Ackerman, Salminen 2006], a vowel system for stressed syllables was proposed, in which the authors postulate neutral vowels in terms of length: *a, ä, e, i, o, u*, and short vowels: *ă, ǎ, ĭ, ŭ*. In a subsequent work [Salminen 2007], this system was slightly modified to include *ĕ, ŏ*, which the author notes have a marginal status. See Table 3.

Table 3: The vowel system of the Forest Nenets language according to [Salminen 2007]

Row	Front		Middle		Rear	
Raise	unrounded	rounded	unrounded	rounded	unrounded	rounded
Upper	*i ĭ*		-			*u ŭ*
Middle	*e (ĕ)*		*ə*			*o (ŏ)*
Lower	*a ă*		*ä ǎ*			

In light of these contradictions, to address the question of whether there are traces of Proto-Samoyedic stress in Forest Nenets, we decided to conduct an experimental phonetic analysis of contemporary audio recordings of speech from the last speakers of the Forest Nenets language

II. Materials and methods

These recordings were collected by M.K. Amelina in the village of Khalyasavey, Purovsky District, Yamalo-Nenets Autonomous Okrug, in 2012. They were transcribed and processed in the phonetic program Praat by Polina Igorevna Li in 2020. Currently, they are available online on the LingvoDoc platform https://lingvodoc.ispras.ru/dictionary/3104/11/perspective/3104/12/view. We etymologized them by adding information about the Samoyedic proto-forms from the dictionary [Janhunen 1978] and linking cognates from other dictionaries of Uralic languages. In this article, we will examine the relationship between the duration and intensity of vowels in those lexemes that have Proto-Samoyedic etymology, indicated in the first column of the dictionary. We propose to consider for each vowel of the Forest Nenets language all disyllabic, trisyllabic, and polysyllabic words of Proto-Samoyedic origin in which it is fixed in the first syllable. If there are very few such words for any vowel, we will also include monosyllabic words in the analysis. Below are the considered lexemes recorded in the village of Khalyasavey transcribed by P.I. Li. They are ordered by the duration of the first vowel of the word (first the shortest, then the longer ones), for each word the duration and intensity of the vowels of the first, second, and third syllables are also indicated. For the first syllable, the table also indicates in bold font the relative duration of the vowel, which is automatically calculated on LingvoDoc depending on the duration of the entire word and the number of sounds in it. In the audio dictionary on the LingvoDoc platform, most words have two or three pronunciations, which were analyzed in Praat. In the tables below, we provide one pronunciation to save space in those cases where in the other pronunciations, the maximum duration and intensity mark the same syllable as in the one provided. In cases where they mark a different syllable than in the first pronunciation, we provide data on the duration and intensity of the vowels in the second and third pronounciation. The translation of the Forest Nenets syllable is given, and its transcription in Tundra and Forest Nenets accord-

ing to T. Salminen is also provided. This information (transcription not only of Tundra Nenets but also of Forest Nenets forms, the dictionary of which T. Salminen, as far as we know, is only preparing for publication) was kindly provided by T. Salminen in 2020 as an unpublished file, so it is cited as [Salminen manuscript]. Also, in the tables, for words containing *a* and *ă* in the first syllable, parallels from the dictionary [Popova 1978] are given. In the other tables, references to transcription according to [Popova 1978] are no longer given since the stress and duration in them do not correspond to either the experimental phonetic data obtained from the analysis of modern audio recordings, or the transcription of T. Salminen, or the materials of the dictionaries [Lehtisalo 1956; Sammallahti 1974]. Whereas the transcription of T. Salminen, which usually correlates with with the dictionaries [Lehtisalo 1956; Sammallahti 1974] in terms of duration, as can be seen from the examples below, corresponds very accurately to the results of the experimental phonetic analysis of modern audio recordings. Next, to test the hypothesis of the presence versus absence of any reflexes of Proto-Samoyedic stress in the Forest Nenets language, the material will be organized as follows. We will consider two groups of Forest Nenets roots: Group I - These are reflexes of "plus" Proto-Samoyedic roots, the reflexes of which in Tundra Nenets have *a, æ, e, o, í, ú* in the first syllable according to [Salminen 2007], long vowels according to [Lehtisalo 1956], and stressed vowels according to [Amelina 2016a, 2016b, 2017, 2018].
Group II - These are reflexes of "minus" Proto-Samoyedic roots, the reflexes of which in Tundra Nenets have *ə, i, u* in the first syllable according to [Salminen 2007], short vowels according to [Lehtisalo 1956], and unstressed vowels according to [Amelina 2016a, 2016b, 2017, 2018].

III. Results

Group I. Reflexes of "plus" Proto-Samoyedic roots.

PS ***å, *åə, *ä*** **> Forest Nenets *a***

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**	**[Popova 1978]**
PS **årə*	*ŋałka*	a 0.052 81.864 **(51.72%)**, a 0.092 80.238	big	f. *ŋałka*, t. *ŋarka*	*ŋāłka*
PS **jåptå*	*dʲaʔta*	a 0.099 84.490 **(92.78%)**, a 0.174 82.500; a 0.172 80.324 **(171.04%)**, a 0.135 81.041	thin	f. *japta*, t. *yabta*	*ħăptă*
PS **kåəså*	*kasa*	a 0.116 82.525 **(75.78%)**, a 0.230 77.520	man	f. *kasama*, t. *xasawa*	*kāšāma*
PS **kåptə*	*kăp͡tɛĕʔe*	a 0.118 80.867 **(121.69%)**, e 0.044 82.240	adult neutered deer	f. *kapt° / kaptyeqj°*, t. *xabt° / xabtyeq°*	*kāpt*
PS **kåmpå*	*kampa*	a 0.12 82.613 **(76.51%)**, a 0.25 76.237	wave	f. *kampa*, t. *xampa*	*'kāmpa*

PS **jälä*	*dʲaɬʲa*	a 0.137 82.169 **(102.68%)**, a 0.174 81.055 a 0.142 82.169 **(109.94%)**, a 0.163 81.349	day, sun	f. *jałya,* t. *yalya*	*ħ′al′a*
PS **cämcəjə*	*t͡ɕamtɨ*	a 0.139 82.495 (**97.24%**), ɨ 0.162 81.470	frog	t. *tyamteq*	*t′am'təʔ*
PS **mät*	*mʲata (măχa)*	a 0.14 82.66 **(143.66%)**, a 0.03 84.89	(roof) of a house	t. *mat°*	*m′āʔ*
PS **wåtɜ*	*wat͡ɕɨʃat*	a 0.14 83.07 **(71.76%)** ɨ 0.10 83.11	left hand	f. *watyisyat°*, t. *wadyisyey° / wadyeko*	*ßat′i'š′at*
PS **äpå*	*apa*	a 0.140 81.286 **(106.55%)**, a 0.152 78.550	elder sister	f. *apa*	*(ŋ)a'pa*
PS **jäckə*	*dʲakɨ*	a 0.143 80.776 **(91.9%)**, ɨ 0.179 75.515	smoke	f. *jaqkyï*, t. *yake*	*ħакьī*
PS **kålä*	*kaɬʲa*	a 0.163 82.004 **(106.84%)**, a 0.192 76.958	fish	f. *kałya*, t. *xalya*	*kāł′a*
PS **ńäp*	*ɲapɨ*	a 0.167 81.348, ɨ 0.194 76.748	duck	f. *nyapï*, t. *nyabi°*	*n′āpəj*
PS **kåtå*	*kata*	a 0.180 82.391 **(127.21%)**, a 0.152 79.768	grandmother, aunt – the older sister of the father or mother	f. *kata*, t. *xada*	*kātā*
PS **jåə*	*dʲała*	a 0.188 82.367 **(113.2%)**, a 0.197 78.550	sand	f. *jała*, t. *yara*	*tāp*
PS **wåncɜ*	*wanu*	a 0.189 82.709 **(113.8%)**, u 0.177 82.836	root	f. *wanu*, t. *wano*	*ßānu*

PS **wåptå*	*wapta*	a 0.206 77.888 **(146.9%)**, a 0.194 75.150	to spill (3SG)	t. *wabta-*	*ßaptă(š´)*
PS **wåətå*	*wata*	a 0.230 81.099 **(147.59%)**, a 0.172 80.882	word	f. *wata*, t. *wada*	*'ßā̯tā*
PS **jɐ̨kcä*	*dʲat͡ɕi*	a 0.237 82.288 **(133.6%)**, i 0.110 78.137	female domestic deer	f. *jâ°tyi* < *jâx°tyi*, t. *yəx°dyey°*	*ħaxt´i*
PS **kåtå*	*kata*	a 0.284 79.969 **(137.5%)**, a 0.396 77.227	to kill	f. *kata*, t. *xada-*	*ka'ta(š´)*

We observe that in this group of words, the maximum intensity usually marks the first syllable, but there are exceptions:

- *kăpt͡ɕĕʔe* 'adult neutered deer'
- *mʲata* (*măχa*) '(roof) of the house'
- *wat͡ɕiʃat* 'left hand'
- *wanu* 'root'.

However, the average relative duration of the vowel in the first syllable is 112%, meaning it is, on average, longer than other sounds in the word. Presumably, due to this, to a Russian speaker, the vowel of the first syllable in all the mentioned words would appear stressed. However, the transcription in the dictionary [Popova 1978] does not correspond to either the results of the experimental phonetic analysis or the transcription by T. Salminen. Y.N. Popova indicates that in the words *t´am'təʔ* 'frog', *ßat´i'š´at* 'left hand', *(ŋ)a'pa* 'older sister', *ka'ta(š´)* 'to kill', the vowel of the second syllable is stressed. However, in reality, in these words (except for *ßat´i'š´at* 'left hand'), the vowel of the first syllable is marked by duration and intensity, and in *ßat´i'š´at* 'left hand', it also has maximum duration, with the intensity of the second syllable being only 0.03 dB higher than the first, which is imperceptible to the human ear.

PS **ôj, *åj* > Forest Nenets *æ*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **wôj* ~ (**woj*)	*wæjma*	æ 0.081 84.509 **(73.32%)**, a 0.146 80.854	bad	f. *wãma*, t. *wæwa / wæ-*
, PS **såjtəjn*	*χæjtoŋʔ*	æ 0.082 82.733 **(71.68%)**, o 0.183 82.115	seam	f. *xãtuŋ*, t. *sædoh*
PS **åjwå*	*ŋæ̆iwa*	æ 0.084 83.062 **(88.2%)**, a 0.243 81.674	head	f. *ŋãwa / ŋyiwi*, t. *ŋæwa / ŋæwey° / nyemey°*

PS **kåjmå*	*kæjma*	æ 0.088 83.224 **(91.03%)**, a 0.115 81.547	bone marrow	f. *kãma*, t. *xæwa*
PS **t^{1}åjwå*	*tæjwa*	æ 0.093 84.759 **(119.4%)**, a 0.116 81.165	tail	f. *tãwa*, t. *tæwa*
PS **pə̊j*	*pæj*	æ 0.096 83.763 **(61.1%)**	stone	f. *pã*, t. *pæ*
PS **kåj*	*kæwχi*	æ 0.152 82.272 **(115.14%)**, i 0.174 73.492	side	f. *käw°*, t. *xæw°*
PS **kåjwətə*	*kæwtɨ*	*æ* 0.204 82.927 **(143.07%)**, ɨ 0.144 83.639 *æ* 0.245 82.539 **(145.77%)**, ɨ 0.221 79.253	rib	f. *käw°tï*, t. *xæw°di°*
PS **sə̊jmä*	*χæm*	æ 0.229 83.316 **(132.72%)**	eye	f. *xäm°*, t. *sæw°*
PS **åj*	*ŋæj*	æ 0.338 82.698 **(161.3%)**	leg	f. *ŋã*, t. *ŋæ*

In Table 3, in addition to disyllabic words, due to their insignificant quantity, monosyllabic words are also considered. In all cases, the maximum intensity always marks the first syllable. The relative average duration of the vowel *æ* in the first syllable is 130%, which coincides with the average duration of other sounds. It's worth noting that in T. Salminen's transcription, *æ* corresponds to two different sounds: the short *ã* and the long *ä*. However, as seen from Table 3, *ã* in Salminen's transcription does not always correspond to the shorter vowel. For instance, *ŋæj* corresponds to duration of 0.338 and 161.3%, which Salminen transcribes as *ã*. Based on the audio materials collected from the village of Halesavey, in our view, there isn't enough material to posit two distinct *ä* sounds differing in duration.

PS *o > Forest Nenets *o*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **wotɜ*	*ŋo͡tɛa*	o 0.098 81.883 **(75.91%)**, a 0.146 81.865; o 0.146 83.204 **(82.19%)**, a 0.192 81.801	berry	f. *ŋotya*, t. *ŋodya*
PS **nöjkå*	*nʲoχo*	o 0.114 82.446 **(84.1%)**, o 0.204 81.529	sweat	f. *nyoxa*, t. *nyoxa*
PS **korå*	*koła*	o 0.123 80.773 **(110.71%)**, a 0.104 81.254; o 0.151 84.512 **(116.96%)**, a 0.177 83.477	male deer	f. *koła*, t. *xora*

PS **topå*	*topa*	o 0.141 81.821 **(147.1%)**, a 0.127 79.544	hoof	f. *topa*, t. *toba*
PS **jorä*	*dʲoɬʲa*	o 0.170 84.415 **(116.37%)**, a 0.216 82.204	deep	f. *joɬya*, t. *yorya*
PS **poŋkå*	*poŋka*	o 0.174 83.261 **(122.37%)**, a 0.203 81.997	seine	f. *poŋka*, t. *poŋka*
PS **kopå*	*kopa*	o 0.194 80.552 **(139.25%)**, a 0.201 82.661	skin	f. *kopa*, t. *xoba*
PS **poə̂j*	*po*	o 0.299 81.796 **(174.95%)**	year	f. *pô*, t. *po*

In all examples of disyllabic words with *o* in the first syllable in the village of Halesavey, the maximum intensity marks the first syllable, except for the word *koła* 'male deer', where there is a doublet with maximum intensity on the second syllable. The relative average duration of the vowel *o* in the first syllable is 140%. T. Salminen distinguishes two phonemes: *o* (regular) and *ô* (short). In the audio dictionary of the village of Halesavey, there is only one example of a word with Proto-Samoyedic etymology and *ô* according to T. Salminen. However, this example is a monosyllabic word, so the vowels are quite long both in absolute (0.299) and relative duration (174.95%). Therefore, based on our material, there is no basis for positing two levels of duration for *o*, but it's evident that this issue requires further investigation.

PS **e, *ę* > Forest Nenets *e*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **merkä*	*mʲéɬʲɛa*	e 0.094 82.372 **(69.08%)**, a 0.196 77.618	wind	f. *myeɬsya*, t. *myercya*
PS **lę̨mpårå*	*łempała*	e 0.095 81.504 **(75.03%)**, a 0.111 79.838 , a 0.201 82.458	chest	f. *łempała*, t. *lempara*
PS **pelä*	*pʲeɬɨt͡ɕì*	e 0.134 82.612 **(86.13%)**, ɨ 0.120 80.024, i 0.239 76.762	uninhabited half of the chum	f. *pyeɬya*, t. *pyelya*
PS **tetɜsɜ*	*t͡ɕɛ́ɛna*	e 0.137 82.109 **(105.85%)**, a 0.092 81.214	cold	f. *tyeqsy°ta*, t. *tyecy°da*
PS **ejsä*	*ɲéɛa*	e 0.140 82.956 **(85.61%)**, a 0.147 80.690 e 0.149 81.634 **(95.93%)**, a 0.183 82.738	father	f. *nyesya*, t. *nyísya*
PS **wesä*	*wʲéɛa*	e 0.149 82.280 **(100.55%)**, a 0.172 80.334	money	f. *wyesya*, t. *yesya*

PS *enå	*ɲéniʃå*	e 0.153 83.331 **(104.75%)**, ɨ 0.082 83.048, a 0.248 77.312	truth	f. *nyenäj*°, t. *nyeney*°
PS *jäpä	*wʲépa*	e 0.174 83.233 **(104.45%)**, a 0.229 82.312	leaf	f. *wyepa*, t. *weba*
PS *emä	*némʲa*	e 0.245 81.750 **(128.63%)**, a 0.244 81.341 e 0.218 82.919 **(134.87%)**, a 0.193 81.120	mother	f. *nyemya*, t. *nye-bya / nyewya / nyeya : nyeyaw*°

In only one word, *łempała* 'chest', does the maximum intensity in all forms mark the non-initial syllable (in the word *ɲéɛa* 'father', the intensity fluctuates). It's noteworthy that in this word, *e* < Proto-Samoyedic *ę*. The relative average duration of the vowel *e* in the first syllable is 99%.

PS **o, *oə, *uə* > Forest Nenets *u*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS *koəj	*kujku*	u 0.047 87.062 **(50.63%)**, u 0.114 77.034	birch	f. *kô*, t. *xo*
PS *otkå	*ŋuhka*	u 0.06 83.44 **(60.10%)**, a 0.14 81.99	many	f. *ŋûqka,* t. *ŋoka*
PS *nokå	*nuχo, noχo*	o 0.076 83.611 **(62.61%)**, o 0.157 80.218	arctic fox	t. *noχò*
PS *puəj-	*punłi*	u 0.116 83.969 **(95.72%)** ɨ 0.181 82.722	knee	f. *punłï*, t. *púli*°

In words of this group, the maximum intensity often marks the first syllable. The relative average duration of the vowel *u* in the first syllable is 68%**.**

PS **i, *iə, *e, *ä* > Forest Nenets *i*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS *kimä	*ɕimʲa*	i 0.075 82.756 **(44.15%)**, a 0.230 80.317	ash	t. *síw*°
PS *tiə	*t͡ɕiɬiŋu*	i 0.142 82.842 **(114.29%)**, i 0.049 79.125	cloud	f. *tyiɬ*°, t. *tyír*°

PS **merəjəj*	*mʲiłu*	i 0.158 82.482 **(102.41%)**	sore, wound	f. *myiłyu*, t. *myeryo*
PS **tiə*	*t͡ɕit͡ɕ*	i 0.164 81.155 **(84.34%)**	shadow, re- flection	f. *tyity°*, t. *tyíd°*
PS **äŋ*	*ɲiŋuŋiłi*	i 0.17 82.27 **(66.96%)** u 0.103 81.536	jaw	f. *nyiŋu*, t. *nyaŋu*
PS **pi, *pij*	*pʲikt͡ɕa*	i 0.179 84.328 **(115.26%)** a 0.211 82.674	thumb	f. *pyiqk°qsya*, t. *pyík°cya*

In these words, the maximum intensity marks the first syllable. The relative average duration of the vowel *i* in the first syllable is 96%.

PS **iə̂, *å, *ę* > Forest Nenets *ɨ*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **siə̂sɜ*	*ɕiɕ*	ɨ 0.125 80.764 **(69.99%)**	Foam	f. *syisy°*, t. *syísyo*
PS **kåsə*	*kɨswi*	ɨ 0.128 82.571 **(85.34%)**, i 0.211 81.135	dry	f. *xiłuj°*, t. *seluy° / sel°h / sel°*
PS **ęsə̂jn*	*ŋɨsuŋ*	ɨ 0.149 82.846 **(93.13%)**, u 0.14 81.82	joint	f. *ŋisuŋ*, t. *ŋesoh*

The maximum intensity marks the first syllable. In the two disyllabic words, in one case, the maximum intensity marks the first syllable, and in the other case, it marks the second. The relative average duration of the vowel *ɨ* in the first syllable is 83%.

II Group. Reflexes of Proto-Samoyedic "minus" roots

PS **ə* > Forest Nenets *ă*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manu-script]**	**[Popova 1978]**
PS **kə̂lə̂jə̂*	*kăłæw*	ă 0.025 84.102 **(22.19%)**, æ 0.214 81.915	seagull	t. *xølew°*	*ka'łæb*

PS **lâmtɜ*	*łămtu*	ă 0.045 83.805 **(43.66%)**, u 0.147 81.548	short	f. *łâmtu*. t. *ləmto*	*łam'tʹik*
PS **kâtå*	*katt*	ă 0.046 70.336 **(41.27%)**	claw, nail	f. *kâta*. t. *xəda*	*'ka̯ta*
PS **sâmpâ*	*χămpłaŋkh*	ă 0.046 82.433 **(50.06%)**, a 0.146 82.113	five	t. *səmp°lyaŋk°*	*xāmp'lʹāŋk*
PS **mârå*	*măła*	ă 0.056 81.906 **(36.82%)** a 0.156 77.809	sandy beach	f. *mâła*. t. *məra*	
PS **jâcå*	*dʲătaʔ*	ă 0.057 82.3 **(49.20%)** a 0.314 77.2	to shoot (3SG)	t. *yəda*	*ʱătă'łašʹ*
PS **ântâj*	*ŋănu*	ă 0.065 83.141 **(53.58%)** u 0.162 81.823	boat	f. *ŋânu*. t. *ŋəno*	*ŋanu*
PS **wâtå*	*wăta*	ă 0.069 71.744 **(51.06%)** a 0.139 77.549	fishing rod	f. *wâta*, t. *wəda*	*ßota*
PS **jâptå*	*dʲăpta*	ă 0.08 84.9 **(65.74%)** a 0.217 81.9	dew	f. *jâpta*, t. *yəbta*	*ʱapta*
PS **kârâ*	*kătʲu*	ă 0.081 81.184 **(47.15%)** u 0.252 78.396	crane	f. *kâłyu*, t. *xəryo*	*kałʹu*
PS **mâkå*	*măχa*	ă 0.092 83.171 **(56.14%)** a 0.068 83.156	back	f. *mâxa*, t. *məxa*	*ma'xa*
PS **lâptå*	*łăpta*	ă 0.095 81.109 **(62.98%)** a 0.181 80.454	plain	f. *łâpta*, t. *ləbta*	*łapta*
PS **jâkå*	*dʲăχa*	ă 0.099 82.2 **(93.87%)** a 0.150 74.89	middle-sized river	f. *jâxa*, t. *yəxa*	*ʱa'xa*
PS **lâpɜ*	*łăʔpʲa*	ă 0.142 79.720 **(106.52%)** a 0.190 80.812	oar	f. *łâpya*, t. *ləbya*	*łapʹa*

In this group of words, the maximum intensity also typically marks the vowel of the first syllable, with exceptions like *wăta* 'fishing rod, hook' and *łăʔpʲa* 'paddle'. However, the average relative duration of the vowel *ă* in the first syllable is only 56%, which is exactly half of the duration of the Forest Nenets vowel *a* in the previous group. It is entirely correct to denote *ă* as short, as Salminen does, because it is indeed almost half the length of the average sound in the word form. However, Y.N. Popova does not note this phenomenon. Conversely, in the

word *'xāmp'ɬ'āŋk* 'five', she even indicates a long vowel, and in most cases postulates stress on the first syllable, although phonetically, the second syllable is significantly more prominent in terms of duration.

PS **u* > Forest Nenets *ŭ*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **kuləjə*	*kŭɬi*	u 0.047 81.342 **(44.92%)**, ɨ 0.124 81.663	crow	f. *kûɬi*, t. *xuli*
PS **utå*	*ŋŭta*	u 0.086 83.65 **(63.31%)**, a 0.19 84.129	hand	f. *ŋûta*, t. *ŋuda*
PS **kurkəj*	*kŭɬku*	u 0.101 81.655 **(42.84%)**, u 0.210 81.899; u 0.082 82.735 **(60.25%)**, u 0.193 80.546	rope tied to a sledge	f. *kûɬku*, t. *xurko*

In the words of this group, the maximum intensity typically marks the non-initial syllable, except for the word *kułku* 'rope tied to a sledge', where there is a variant with intensity emphasis on the first syllable. The average relative duration of the vowel *u* in the first syllable is 53%, meaning the vowel is almost half as long as the other sounds in the word.

PS **i* > Forest Nenets *ĭ*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**[Salminen manuscript]**
PS **wiŋkəncä*	*wʲiŋkŋi*	i 0.070 84.721 **(80.9%)**, i 0.040 87.119	Wolverine	f. *wyîŋk°nyi*, t. *yiŋk°nyey°*
PS **timä*	*tɕimej wanuʔ*	i 0.082 73.634 **(53.98%)**, e 0.112 74.818	root of my tooth	f. *tyîm°*, t. *tyibya*
PS **kitä*	*ɕĭtɕa*	i 0.100 76.434 **(69.51%)**, a 0.143 78.214	two	t. *syitya*
PS **irɜ*	*ŋĭɬʲi*	i 0.111 82.463 **(62.35%)**, i 0.244 83.679	grandfather	f. *îlyi*

In this group of words, the maximum intensity marks the non-initial syllable. The average relative duration of the vowel *ĭ* in the first syllable is 66%.

PS **į* > Forest Nenets *ĭ*

Protoform	**Form in Halesavey village**	**Vowel duration and intensity**	**Translation**	**Translation**	**[Lehtisalo 1956]**
PS **sɨ̯rå*	*χɬa, χɨ̆ɬa*	i 0.021 69.778 **(13.38%)**, a 0.179 75.472	winter	f. *xîlï*, t. *sirey°*	t. *sɨ̯ŕŕʊ*
PS **pɨ̯rä, *purä*	*pɨ̆ʔɬʲa*	i 0.064 82.078 **(47.87%)**, a 0.270 80.352	pike		t. *pùrì*
PS **tɨ̯təjəŋ*	*tɨ̆tɨŋ*	i 0.072 83.771 **(58.09%)**, i 0.184 83.215 i 0.120 81.732 (**86,6%**), i 0.186 83.677	cedar	f. *tîtiŋ*, t. *tideh*	t. *tɨ̯dɔ̄'(n)*
PS **ɨ̯lə*	*(χǽm) ŋɨ̆ɬɨ*	i 0.087 81.981 **(58.84%)**, i 0.199 84.028	lower eyelid		t. *ŋɨ̯l̀''ᵻ*
PS **pɨjå, *pujå*	*pɨ̆tʲa*	i 0.135 83.521 **(98.91%)**, a 0.22 81.98 i 0.106 77.928 **(111.76%)**, a 0.163 78.966	nose	f. *pîja*, t. *piya*	t. *puǰje*

In this group of words, the maximum intensity sometimes marks the non-initial syllable as a doublet in all lexemes except for *pɨ̆ʔɬʲa* meaning 'pike', where a glottal stop is present in the first syllable. The relative average duration of the vowel *ɨ̆* in the initial syllable is 68%**.**

IV. Conclusion

Summing up the findings of this research, it can be concluded that there is no distinctive stress in the Forest Nenets language. As evidenced by numerous examples, the maximum intensity and duration often mark different syllables within a word form. However this reflects the state of the language in the early 21st century, with only a small number of elderly native speakers who do not use it fluently in everyday life. It's possible that forty years ago, when materials were collected, for example, by P. Sammallahti, the situation was different, and dynamic stress still existed. However, discrepancies in the rules for its placement between P. Sammallahti and S. I. Burkova indicate that even in an earlier period, speakers may have had variations in speech when placing stress in words with short vowels in the first syllable. Currently, for example, in the word *pɨ̆tʲa* meaning 'nose', the *a* in the second syllable is longer than the *ɨ̆* in the first syllable in all pronunciations, but the maximum intensity may mark either *a* or *ɨ̆* for the same speaker. Thus, based on this example, it's impossible to determine whose rule is more correct; it can only be noted that doublets are observed in such words.

However, despite the absence of phonologically significant stress, certain relics of Proto-Samoyedic word stress are observed in the Forest Nenets language at the level of greater or lesser vowel duration and intensity in word forms. Moreover, similar to the Tundra Nenets language, as described by [Amelina 2016a, 2016b, 2017, 2018], the realization of prosodic prominence for low and middle vowels differs from that of high vowels.

Low and middle vowels in Proto-Samoyedic "plus" roots in the first syllable are usually quite long, with their relative average duration ranging from 99% (for *e*) to 140% (for *o*). The other vowels also exceed 100% in relative duration. Conversely, in Proto-Samoyedic "minus" roots, the relative average duration of *ă* is 56%. The

maximum intensity in the vast majority of words with low and middle vowels in the first syllable marks this vowel, but there are a few exceptions, occurring both in "plus" and "minus" roots. Thus, similar to the Tundra Nenets language, the main reflex of Proto-Samoyedic stress for words with vlow and middle vowels in Forest Nenets is prosodic duration.

High vowels in Proto-Samoyedic "plus" roots have a relative average duration ranging from 68% (*i*) to 96% (*u*), which is only slightly higher than in "minus" roots, ranging from 53% (*ŭ*) to 68% (*ĭ*). However, the old stress pattern is very clearly preserved as a contrast in maximum intensity. In reflexes of "plus" roots, it marks the first syllable, while in reflexes of "minus" roots, it marks the non-initial syllable.

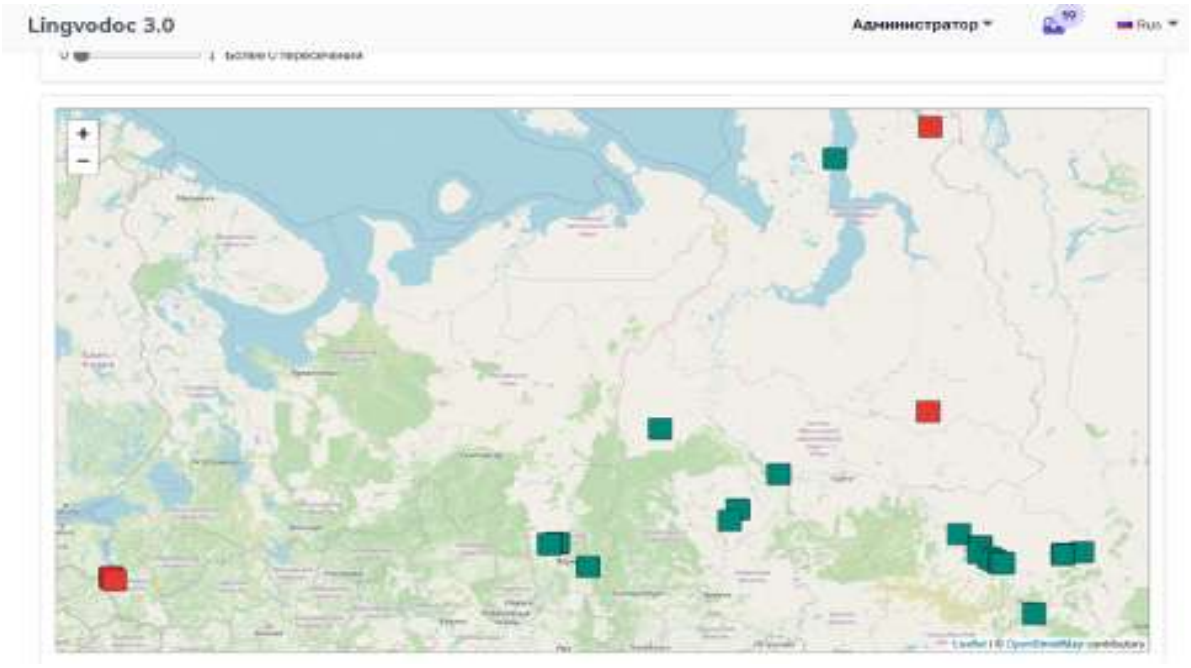
Interestingly, a similar prosodic system is described by M. K. Amelina for the Gydan dialect of the Tundra Nenets language. She notes that in words with vowels of the upper row, the primary acoustic correlate of stress on the first syllable is the greater intensity (expiratory prominence) of the stressed vowel, while temporal prominence takes a secondary role. The unstressed vowel of the second open syllable is, in most cases, longer, as observed in the Forest Nenets language. For low and middle vowels, maximum duration is the main stress parameter, while maximum intensity typically marks the first syllable regardless of stress placement, cf. [Amelina 2017]

It is noteworthy that a similar system is also found in the Seto language, spoken in the Pechory and Obinitsa village in Estonia. In Seto, the stressed low or middle vowel is longer than the unstressed one, while high vowels are always shorter than low or middle ones. The acoustic correlate of stress on the first syllable in words with high vowels is a greater intensity (expiratory prominence) of the stressed vowel, as detailed in [Normanskaja 2023].

As demonstrated in [Normanskaja 2018] research based on expedition data in Nizhnein'ven dialect of the Komi-Permyak language, in Kondinsky and Sosvinsky (v. Hulimsut) Mansi dialects, in the Nizam dialect of Khanty, in the southern and central Selkup dialects and in the Yamal dialect of the Tundra Nenets language Proto-Uralic stress patterns have been preserved. In these dialects, maximal duration and intensity consistently mark the same syllable of the word form.

Map 1 depicts languages and dialects where the Proto-language stress pattern is preserved. Red squares are the areas where stress on low and middle vowels is expressed by quantitative prominence (maximum duration), while on high vowels, it's expressed by expiratory prominence (maximum intensity). Green squares are the areas where stress on all vowels is quantitatively-expiratory.

On Map 1, we can see that the stress pattern typical for the Forest Nenets language does not form a



Map 1. Languages and dialects where the Proto-language stress pattern is preserved

single area but is found in Siberia, in the northwest of Russia, in the Pechory region, and in Estonia. However, overall, it seems that this gradual disappearance of the paradigmatic stress pattern, as we observe, is typical for northern territories.

List of abbreviations

PS — Proto Samoyed
f. — Forest Nenets
t. — Tundra Nenets

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