Syllable Structures and Stress Patterns in Kildin Saami

Magisterarbeit

zur Erlangung des akademischen Grades

Magister Artium

an der Universität Leipzig

Philologische Fakultät

Institut für Linguistik

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Abbreviations

1	first person
2	second person
3	third person
ABESS	abessive
CONNEG	connegative
DIM	diminutive
GEN	genitive
IMP	imperative
INCH	inchoative
INF	infinitive
LOC	locative
NOM	nominative
PRS	present
PL	plural
PRED	predicative
SG	singular

Acknowledgements

1. Introduction

The main objective of this thesis is to present the results of my field work on Kildin Saami and related research done in coming to terms with the field data. This field work was carried out within the realms of and with partial financial support from the Kola Saami Documentation Project (KSDP), one of the Volkswagen Foundation's DOBES projects. The main purpose of the project is to document the Kildin Saami language as well as other Saami languages spoken on the Kola Peninsula for the endangered language archive at the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands. I had the opportunity to do my research on site while collecting recordings and data for the archive in my capacity as a research assistant on the project. Further data was collected in Leipzig by Sven Grawunder, Michael Rießler and myself, and by Michael Rießler in Lovozero on my behalf.

Actual recordings from the field provide a plethora of rich linguistic information. Ideally, the researcher would be able to thoroughly describe all aspects of the data he or she encounters, but realistically it is best to focus on a few aspects at a time. With this in mind, I have chosen to use my data in order to more closely analyze two aspects of Kildin phonology: syllable structures and stress patterns. By reviewing previous research on both Kildin and neighboring Saami dialects and comparing this to phonetic data collected from Kildin speakers, I hope to be able to create a more thorough picture of syllable structures, stress patterns, and the ways in which syllables and stress interact in contemporary Kildin Saami. While these intentions are well meant, what follows is still of a preliminary nature. A lack of data and time has limited the results of my research, and as a result, the following thesis should be considered a solid reference point for future research but by no means an exhaustive analysis of these two aspects of phonology about which volumes could be written.

The thesis is divided into the following chapters. Chapter 2 deals with Kildin Saami in general by providing a brief discussion of its genealogy and name, an outline of its speakers and geography, the current sociolinguistic situation, and previous work done on the language. Chapter 3 attempts a short linguistic description focusing mostly on Kildin phonology and relevant morphophonology, but also providing some basic morphological and syntactic information; the contact-linguistic situation is also discussed. The fourth chapter focuses on the phenomena of syllables and stress by presenting a general theoretical background. Chapter 5 presents a summary of relevant previous

studies of Kildin Saami as well as the presentation of my data and analyses. The final chapter summarizes my research, puts it in the framework of current linguistic research and poses questions and tasks for future research.

2. Linguistic background

2.1. Genealogy

Kildin Saami is a Uralic language spoken in parts of the Kola Peninsula in the far northwestern part of the Russian Federation. The Saami languages are part of the Finno-Ugric branch of the Uralic family; Figure 1 shows a part of the Uralic family tree and Kildin Saami's position in it.
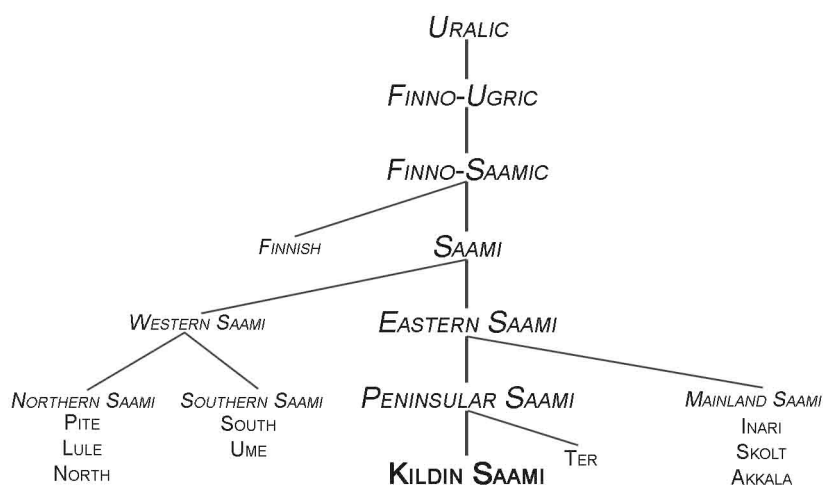
Figure 1: Kildin Saami and the other Saami languages in the Uralic language family (based on Sammallahti 1998: 1-34)

The Saami languages together form a dialect continuum which extends from the mountains of central Sweden and Norway in the southwest (South Saami) across Lapland (North Saami) to the eastern edge of the Kola peninsula in Russia (East Saami). As a result, Saami speakers are generally able to understand directly neighboring dialects with some difficulty, but the farther away from their homes they go, the less mutual comprehension there is. Dialects from opposite ends of the spectrum are not mutually comprehensible (Sammallahti 1998: 1-2). The situation is further complicated by the fact that within the Saami linguistic area there are smaller dialect areas mostly centered around villages and reindeer herding territories which differ slightly, but not enough to impede understanding significantly. However, nowadays these village-dialect differences are no longer geographically bound for Saami languages spoken in the former Soviet Union because speakers of different Kildin dialects frequently live together in the same communities due to their forced relocation and consolidation during the Stalin era (Scheller 2006: 285).

2.2. Names for Kildin Saami

Outside of the Sápmi (the Saami territory stretching from Russia to central Scandinavia), the language is currently known as either *Kildin Saami* or simply *Kildin*. Each different Saami group normally refers to its individual language as *Saami*, adding the local dialect's name to avoid misunderstandings only when necessary. The word *Kildin* comes from the Russian name for an island near present-day Murmansk called Kildin and originally referred only to the Saami from that area. However, it now refers to the four neighboring dialects of Šoŋguj, Teriberka, Luujaavv'r and Aarsjogk (Sammallahti 1998: 33). For most of the past, all Saami languages as well as the ethnicity Saami were frequently referred to using the term *Lapp*, as is still evident in the geographic name *Lapland*[1]. While this geographic name is both common and accepted to a large extent, most Saami speakers consider the ethnonym *Lapp* (sometimes also *Lappish*) as derogatory[2] and prefer the endonym *Saami*. The etymologies of both terms are uncertain: theories about *Lapp* having either a Germanic or a Baltic-Finnic origin exist, while Saami could be of either Germanic origin or from Lithuanian, and thus of Baltic origin (Kulonen et al. 2005: 184, 379). The spelling *Sami* with one *a*, or *Sámi* with the addition of an acute accent, and the spelling *Saam* without a final vowel can also be encountered in the literature.

2.3. Geography

The Saami languages are spoken in an area which covers far northern Europe from central Sweden and Norway, where Southern Saami is spoken, across Norwegian, Swedish and Finnish Lapland, where the Northern Saami languages are spoken, and on into Russia to the east, where Kildin and the other Eastern Saami languages Inari, Skolt, and Ter are spoken and where Akkala was spoken before the last speaker died in 2003 (KSDP 2007; Sammallahti 1998: 1-34). Figure 2 below shows a map of the entire Saami area and its original groups, with Kildin Saami shaded in. Kildin is spoken in the central and northern areas of the Kola Peninsula in the most northwestern part of the Russian Federation. The area includes the modern Russian city of Murmansk and is

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[1] That the term *Lapp* is very old is shown for instance by the fact that it was already in use in Swedish in the 13th century (Kulonen et al. 2005: 184).
[2] According to the *Oxford Dictionary of English Etymology*, the term *Lapp* comes from Swedish *Lapp*, which was "perhaps originally a term of contempt" (Onions 1966: 515).
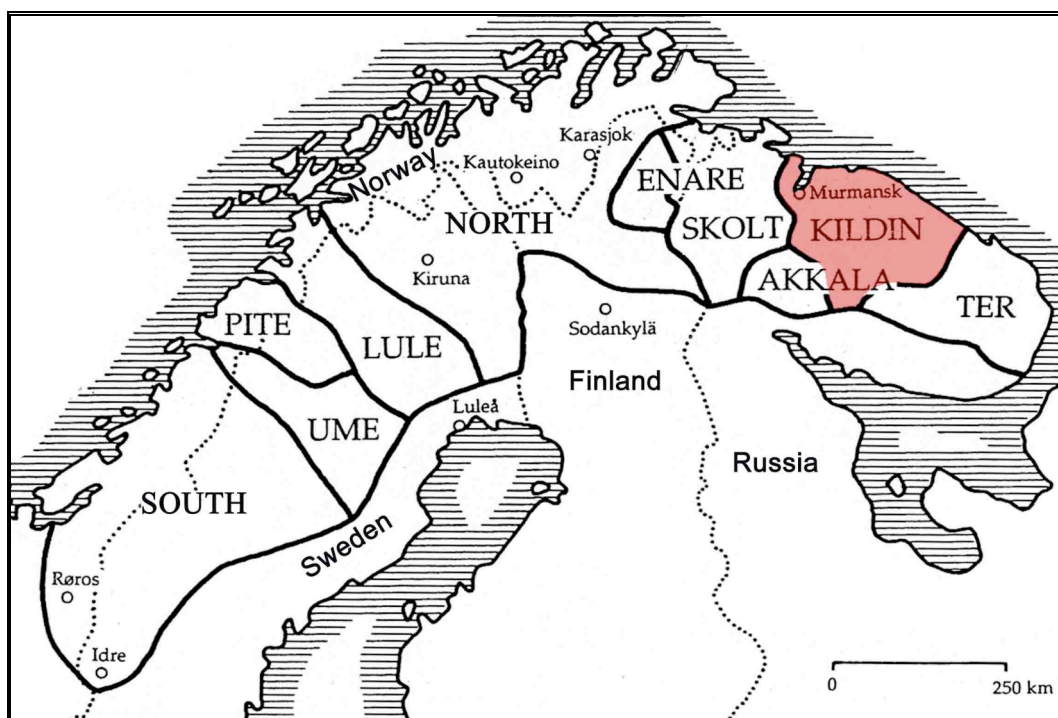
Figure 2: The area where the Saami languages are/were spoken (adapted from Nickel 1994: 7)

entirely part of the Murmansk administration district. Neighboring dialects include Ter Saami to the east and Skolt Saami to the west. The extinct dialect Akkala Saami was spoken to the southwest of the Kildin area.

According to Sammallahti (1998: 33), there are at least four dialects of Kildin. These dialects are based on the varieties spoken by Saami from various former Saami villages and reindeer herding areas as follows (dialect name with its villages in parentheses): Šoŋguj (Šoŋguj, Maaziell'k), Teriberka (Teriberka, Kiillt), Lujaavv'r (Lujaavv'r, Koarrdegk) and Aarsjogk (Aarsjogk, Lejjaavv'r). The approximate location of these villages on the Kola Peninsula can be seen on the map in Figure 3 below.

The Kola Peninsula is in the far north with the Arctic Circle running through the middle of it, and is thus marked by its long, cold, dark winters and short, mild summers. It consists mostly of tundra covered by small trees and bushes; it becomes swampland in the summer, with occasional old erosion-worn mountains rising up to around 1200 meters above sea level. Snow covers the area for 9 months of the year, allowing easy access to almost everywhere as the omnipresent lakes and marshes freeze over and disappear below the snow. But summers, when the marshes, lakes and streams reappear, are mild and full of
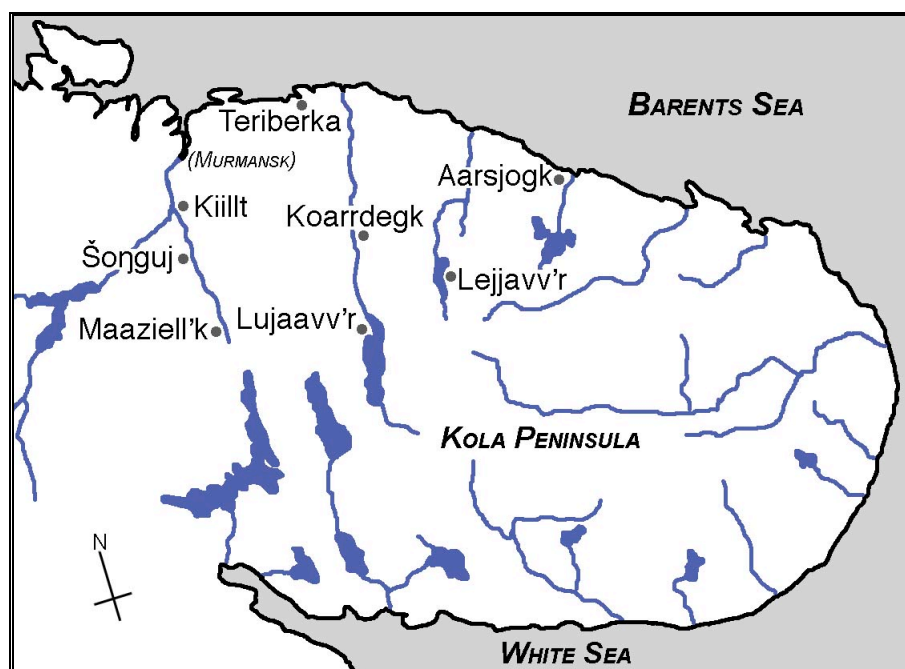
Figure 3: The former villages where Kildin Saami was originally spoken (based on T. Itkonen (1958: xxxviii-xxxix) and Sammallahti (1998: 33-34)).

mosquitoes. Traditionally, the Kildin Saami lived in small settlements both along the coast and inland. The coast inhabitants survived mostly from fishing, while those inland fished and followed herds of reindeer for sustenance[3].

However, the lives of the Kola Saami changed dramatically with the Stalinization of the Peninsula. Beginning in the 1930s, the Russians forced the Saami (along with other indigenous peoples) to move together into modern housing blocks in consolidated villages and towns away from the coast. Coastal Kildin Saami were more affected because Stalin was particularly eager to obtain the land along the northern coast (which is ice-free all year due to the warm waters of the Gulf Stream) for military purposes and essentially stole their land from them in the name of national security. However, inland Saami were affected as well because their traditional lands contained valuable natural resources which the Soviet Union was also very eager to access (Scheller 2006: 280). The current cultural center of the Kildin Saami community is located in Lovozero (*Lujavv'r* in Kildin), a small village of around 3000 inhabitants at the end of the

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[3] This information and much of the following details in the remainder of this chapter are based on several sources: conversations I have had with inhabitants of Lovozero and Murmansk (both Kildin and Russian), discussions with Saami scholar Michael Rießler (who has spent many months on the Kola Peninsula doing field work on the Saami languages spoken there) as well as my own observations.

paved road at the center of the Kola Peninsula. While the village was originally Komi[4], the Stalinist reforms of the 1950s brought an influx of Russians and up-rooted Saami to the village, so that today the village is only about one third Komi, with a third Russians and a third Saami making up equal portions of the rest of the population.

Figure 4: The tundra around Lovozero in mid October 2006

As a result, modern life for the Kildin Saami is not much different from the rest of contemporary Russia. The majority of Russian Saami live in modern apartment buildings in villages, towns and cities full of Russians and other non-Saami ethnicities. Reindeer herding is still practiced by some Saami, but most lead modern Russian lives much different from the lives of the Saami a few generations ago before they were incorporated into the Soviet Union. As a result, many areas where Kildin was traditionally spoken are today either military or industrial areas,[5] and Kildin speakers have been living in various concentrations among the cities, towns and villages of the Kola Peninsula since the 1950s. Nowadays, even though the Saami are indigenous to the area, Kildin speakers are overall one of the smallest minority groups on the peninsula (Scheller 2006:281). Lovozero has the largest concentration of Kildin Saami, but

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[4] The Komi are also a Uralic people of northwestern Russia who speak a language distantly related to Saami.

[5] Or, in the case of the village Koarrdegk, the Saami's former homes are underwater as the entire village was resettled in order to make way for a hydro-electric project.

the families of these speakers are from various former Saami settlements and speak different Kildin dialects; only a part are 'originally' from the Lovozero area.

Figure 5: Lovozero in late October 2006

2.4. Sociolinguistic situation

Kildin Saami is currently an endangered language, mostly due to the far-reaching Russianization and the subsequent modernization which has been taking place since the 1930s. After the Kildin Saami were resettled, children were forced to attend Russian schools, frequently far away from their homes. In general, using anything but the Russian language was consistently looked down upon and frequently severely punished, especially under Stalin. As a result, many children of Kildin Saami ethnicity never learned Kildin proficiently, if they learned Kildin at all. Older generations still speak Kildin but tend to be equally proficient in Russian. Just as during Soviet times, in Russian society today, the Russian language serves as a lingua franca in basically all public spheres, from administration to school to social events and commerce. Fluency in Russian was a necessity for survival in the Soviet Union just as it is in contemporary Russia today. The result of this situation is that knowledge of Kildin is not considered much of an advantage outside of the home. But as most parents and grandparents speak Russian, speaking Kildin is rarely a necessity, even at home. As a result of the Russianization of Kildin speakers and culture, the current body of speakers consists almost exclusively of older generations of Saami (Scheller 2006: 281).

However, since the perestroika movement towards the end of the Soviet era and during westernization since then, a small revival in interest and pride in the Kildin Saami language has been underway. To a great extent this revival has been a side-effect of the open borders to Scandinavian Saami, who now regularly visit their Russian neighbors, supporting the Kildin Saami with both financial resources and by encouraging the kind of self-awareness and pride which has become normal in Scandinavia, where the Saami have special rights as a protected minority group. As a result, Kildin Saami has been introduced as a required subject in one primary school in Lovozero, but only as a second language, and not as the primary language of instruction; Kildin Saami language courses are offered as an elective at the vocational school in Lovozero as well (Scheller 2006: 287-88). There are also occasional radio programs in Kildin, as well as theater groups and choirs which frequently use Saami-language materials, also in Lovozero.

Further support for increasing awareness for the language among Kildin Saami has come from the Volkswagen Foundation in the form of a DOBES (Documentation of Endangered Languages) project aimed at documenting Kildin Saami and the other Saami languages spoken on the Kola Peninsula. Research for this thesis was done within the framework of the Kola Saami Documentation Project. More details can be found at *www2.hu-berlin.de/ksdp/index_engl.html*.

Kildin Saami has an orthography based on Cyrillic, but with several additional characters and diacritics to indicate special Saami sounds which are not present in the Russian Cyrillic alphabet. This is an additional empowerment for the language because literate speakers are able to write in Saami as well, thus there are occasional publications in Saami (Scheller 2006: 282-87). However, the Kildin Saami have not been able to agree on a standard for the writing system, and this lack of consensus has had the unfortunate side effect that two main "orthography camps" within the Saami community seem to have arisen whose members resent members of the respective other group (Michael Rießler, pc).

While some hope may be found in this revival of awareness of the language, the situation remains fairly bleak. Around 1000 ethnic Kildin Saami live in Lovozero, and others live in the Murmansk urban area as well as in other

smaller towns and villages, yet current estimations place the number of actual Kildin Saami speakers at 300 to 700[6] (KSDP 2007; Scheller 2006: 288).

One further factor affecting Kildin Saami today is the strong influence of the Russian language[7]. Historically, the Saami languages have been influenced by contact to North Germanic languages and to Komi, Nenets, Karelian and Finnish. These languages' influence on Saami was almost exclusively limited to lexical borrowings which have now become almost unrecognizably incorporated into Saami (Rießler in preparation). Contemporary Kildin speakers are basically all fluent in Russian and use Russian on a daily basis, frequently more often than they speak Kildin. This has led Kildin to adopt not only lexical items from Russian (frequently for more modern concepts and things), but indeed also grammatical and structural borrowings which have replaced or are slowly replacing their original Saami counterparts (Rießler in preparation).

2.5. Previous studies

The current Kola Saami Documentation Project is hardly the first attempt to study Kildin Saami; indeed the first written studies of Saami date back to more than 150 years ago. Scholars from Germany, England, Hungary, Russia, Scandinavia and particularly Finland have been interested in Kildin Saami over the years.

The very first known recording of an Eastern Saami dialect was undertaken by Ruchard Hakluyt during an English voyage of discovery in 1589; ninety-five words were recorded and partially published in Italy in 1647. But it was not until the early 19th century that interest in the Kola Saami was regularly shown by Europeans from Germany, Scandinavia, Finland and Russia. While much of this work came from expedition accounts, only part was of a linguistic nature. Around the turn of the 20th century, several word lists had been recorded, partially focusing on borrowings between Saami and various neighboring Indo-European languages. The first half of the 20th century was dominated by Finnish scholars working on the phonology and consonant gradation of Eastern Saami dialects, and in 1958, T. Itkonen published a Kola Saami dictionary with German and Finnish translations. But years before this, the Soviets had already started

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[6] The other Kola Peninsula Saami languages are either already extinct (Akkala) or moribund due to the extremely small number of speakers left (less than 20 for Russian Skolt and 6 for Ter Saami) (KSDP 2007).
[7] cf. section 3.4.

influencing the lives and the language of the Kildin Saami and other Russian Saami to a substantial extent (Itkonen, T. 1958: xxiii-xxvii).

While the Soviets certainly did not help promote native languages of indigenous minority groups in the Soviet Union by making Russian the national standard, several thorough studies of Kildin were carried out towards the end of the Soviet era. These include shorter grammar descriptions and one longer grammar monograph by Kert from 1971. Two major dictionaries were also produced in the Soviet Union, the shorter *Slovarj saamsko-russkij i russko-saamskij* by Kert (1986) and the longer and more thorough, but unidirectional *Saamsko-russkij slovarj* by Kuruč et al. (1985); a Russian-Saami dictionary to complement this Saami-Russian volume was planned at one point but has never been published. Unfortunately, these two major dictionaries were written using different orthographic standards, which contributed to the orthography debate dividing the Kildin intellectual community today. It is also rather impractical for the linguist when working with written texts which do not consistently use one or the other spelling standard.

While a significant amount of work has been done on Scandinavian and Finnish Saami languages, particularly on North Saami (also the Saami language with the most speakers), an extensive modern grammatical description of Kildin Saami does not exist to date. Hopefully future research can accomplish this task before it is too late.

3. Linguistic description

3.1. Phonological background

3.1.1. Introduction

The consonant and vowel phoneme inventories of Kildin Saami can be found below. These inventories are based on phonetic and phonological descriptions found in Kert (1971; 1975; 2005). However, in light of my own research, on-going research within the realms of the KSDP project and insights from the slightly different descriptions found in Kuruč et al. (1985) and inspired by discussions with my colleagues in the KDSP project, some additions and alterations have been made where indicated in the descriptions following.

3.1.2. Consonants

The consonant phoneme inventory of Kildin Saami can be found in Table 1 below. The two most striking characteristics of this inventory are the consistent presence of differences in length for plosives, affricates and sonorants on the one hand and phonological palatalization, a characteristic unique to Kola Saami among Saami languages (Rießler in preparation) for nearly all places and manners of articulation on the other.

Table 1: Consonant phoneme inventory

	bilabial	labio-dental	alveolar	post-alveolar	palatal	velar
plosive	p pː pʲ pːʲ b bː bʲ bːʲ		t tː tʲ tːʲ d dː dʲ dːʲ			k kː kʲ kːʲ g gː gʲ gːʲ
affricate			ts tsː tsʲ tsːʲ dz dzː dzʲ dzːʲ	tʃ tʃː dʒ dʒː		
fricative		f fː fʲ fːʲ v vː vʲ vːʲ	s sː sʲ sːʲ z zʲ	ʃ ʃː ʃʲ ʃːʲ ʒ ʒʲ		x xː xʲ xːʲ
nasal	m mː mʲ mːʲ m̥ m̥ː m̥ʲ m̥ːʲ		n nː nʲ nːʲ n̥ n̥ː n̥ʲ n̥ːʲ		ɲ ɲː	ŋ ŋː ŋʲ ŋːʲ
trill			r rː rʲ rːʲ r̥ r̥ː r̥ʲ r̥ːʲ			
approx.					j jː j̥ j̥ː	
lateral approx.			l lː lʲ lːʲ l̥ l̥ː l̥ʲ l̥ːʲ		ʎ ʎː	

Phonemic differences in length are only found in what is known as the *consonant center*, a term common in Finno-Ugric linguistics which refers to the

coda of monosyllabic words or to the consonants bridging odd to even syllables (but not even to odd syllables) in polysyllabic words[8]. Geminate consonants are limited in their occurrence to the consonant center, but contrast phonemically in this position with their shorter singleton counterparts; examples for the phoneme /r/ can be seen below in (1) and (2) for a monosyllabic minimal pair, and in (3) and (4) for a disyllabic near minimal pair.

(1) /seːrrv/   'moose\SG'

(2) /seːrv/   'moose\PL'

(3) /saːrrn-ip/   'speak-1PL'

(4) /saːrn-a/   'speak-1SG'

On the other hand, singleton consonants with geminate correlates are able to occur in syllable onset position anywhere in a word as well as in the consonant center; /r/ for instance can again be seen in (5) in word-initial position and in (6) in word-internal syllable-onset position.

(5) /rannʲt/   [rannʲt]   'chest/SG'

(6) /lujaːvʲr-isʲt/   [lu.jaːvʲ.r-ɪsʲt] 'Lovozero-LOC'   *in Lovozero*

Phonetic analyses of the voiced obstruent geminate phonemes have shown that they are actually only voiced at the beginning and become voiceless towards the end, so that for instance /bː/ is realized as [bp] and /ʣː/ as [dʦ] (Itkonen, T. 1958: xxviii; Kert 2005: 3; Kuruč et al. 1985: 534). This fact is reflected in Kildin's Cyrillic orthography by the graphemes representing obstruent geminates as seen in Table 2 below.

Table 2: Obstruent geminates: phonemes, phones and graphemes

	phoneme	phone	Cyrillic grapheme
a.	/bː/	[bp]	<бп>
b.	/dː/	[dt]	<дт>
c.	/gː/	[gk]	<гк>
d.	/ʣː/	[dʦ]	<дц>
e.	/ʤː/	[dʧ]	<дч>

Even though both the orthography and a phonetic transcription reflecting this loss of voice imply that there are two separate plosive segments, these are in fact single geminate segments and are characterized by a single release of the stop at the end of the segment. Since one could claim that these geminates are unvoiced just as much as they are voiced, their underlying phonological forms could also be represented by unvoiced geminate phonemes such as /p:, t:, k:/. However, truly unvoiced geminate phonemes trigger preaspiration such that for instance /p:/ is realized as [ʰp]. In order to separate these two kinds of geminate phonemes, the voiced geminate phonemes are posited for these geminate forms which lose voiced-ness from left to right but do not cause preaspiration. This can be summed up in the example in Table 3 below, which is representative for all geminate plosives.

Table 3: Plosive geminate phonemes and their realizations

phoneme	phonetic realization
/b:/	[bp]
/p:/	[ʰp]

With the exception of the post-alveolar affricates and the palatal consonants, all manners and places of articulation have both palatalized and non-palatalized phonological counterparts. A near minimal pair exemplifying this difference for /n/ and /nʲ/ can be seen in (7) and (8).

(7) /maːnn/   'month'
(8) /mannʲ/   'daughter-in-law'

This consistent contrast between practically all palatalized and non-palatalized consonant phonemes is very reminiscent of Russian phonology and is unique to the Saami languages spoken on the Kola Peninsula and in close contact to Russian. Kert (1994: 111) claims that phonological palatalization has in fact been borrowed from Russian, but Rießler convincingly refutes this claim using language-internal etymological data to explain the evolution of this phenomenon, while admitting that Russian "might have been a catalyst in the development" (Rießler in preparation).

Modern Russian-language descriptions of Kildin phonology (cf. Kert 1971: 60) also mention, without going into detail, a phenomenon called half-palatalization (Russian: *polumjagkosti*) in connection with the dental consonants

/t, d, n/. Half-palatalization is even referred to in both versions of the Kildin Cyrillic writing system by the letter *yat* <ѣ>, a historical Cyrillic grapheme. However, the KSDP project data show that any difference indicated by the orthographic counterparts <тѣ, дѣ> (half-palatalized) and <ть, дь> (palatalized) for dental obstruents does not exist phonologically or phonetically. The grapheme <нѣ>, on the other hand, appears to consistently coincide with a palatalized dental nasal /nʲ/ in our data; <нь> represents, counterintuitively, a palatal nasal /ɲ/. Literate informants I worked with used <ѣ> inconsistently when writing down examples for me. In addition, early Finnish descriptions of Kildin Saami mention nothing which could be equated with "half-palatalization" (Michael Rießler, pc). Because this seems to be based solely on an orthographic convention, I have thus chosen to leave "half-palatalized" consonants out of the phoneme inventory.

Finally, some variation exists concerning the realization of preaspiration. For one older speaker from Lovozero I worked with, preaspiration varied between [ç], [x] and [h], even within the same word, while another somewhat younger speaker from Koarrdegk consistently pronounced this as [ç]. On the other hand, my Aarsjogk dialect speaker always produced a voiceless glottal fricative [h], as the term aspiration implies. Whether this is a dialectal or generational difference remains unclear based on my data; the current status of preaspiration among Kildin Saami dialects would be an interesting topic for further research.

3.1.3. Vowels

The vowel phoneme inventory of Kildin Saami can be found in Table 4 below. This inventory is modeled on Kert (1971; 2005; 1985: 535) and Kuruč et al. (1985), with additions and changes as mentioned in the descriptions following.

Table 4: Vowel phoneme inventory

	Front	Central	Back
High	i i:	ɨ ɨ:	u u:
Mid	e e:		o o:
Low		a a:	ɑ ɑ:

All places of articulation contrast in length by having both long and short phonological variants. Each place of articulation's pair of long and short vowels is represented by a unique Cyrillic letter, with length represented by the presence of a diacritical macron above the relevant vowel grapheme, with the exception of the length difference between /ɨ/ and /ɨ:/, in which case length is not marked in the orthographic system. The low back vowel phonemes /ɑ/ and /ɑ:/ are indicated in Kildin orthography by a seeming diphthong grapheme <oa>, presumably because the grapheme <a> stands for the low front vowel /a/.

In addition to the monophthongs mentioned above, Kildin Saami also has at least three diphthongs, as mentioned in Kuruč et al. (1985: 531) and found in Table 5 below. On the other hand, Kert (1971: 68-70; 2005: 2) mentions more phonetic diphthongs[9], but these do not appear to be phonemic. The consistent difference in length found in the monophthongs holds equally true for the diphthongs[10].

Table 5: Kildin Saami diphthong phonemes

short	long
o͡a u͡e u͡a	o͡a: u͡e: u͡a:

3.1.4. Quantity in Kildin Saami

As is the case for the other Saami languages and indeed other Finno-Ugric languages such as Finnish and Estonian, quantity plays an important role in Kildin Saami phonology. This should be obvious from the consonant and vowel phoneme inventories (see Table 1, Table 4 and Table 5) in which practically all phoneme positions have both short and long varieties.

While both Kert (1971: 65; 2005: 2) and Kuruč et al. (1985: 531) mention that length is distinctive throughout Kildin phonology, and it is indeed indicated in Cyrillic orthography, no thorough study of the actual parameters involved in quantity besides length (such as pitch or intensity) has ever been done for Kildin Saami. However, the quantity of disyllabic words in Skolt, a neighboring Saami language with a limited number of remaining speakers in Russia and Finland, has

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[9] Kert (1971: 70) also very briefly mentions the existence of triphthongs without going into detail; however, my research findings do not provide any evidence for triphthongs.
[10] Diphthong phonemes are indicated in Kildin Cyrillic orthography by doubled vowel letters, but length is not marked.

been studied thoroughly by McRobbie-Utasi (1999). In her study, she looks at the relationship between segment duration, pitch and intensity, and ultimately claims that quantity oppositions are relevant for disyllabic units (which could be called feet). In other words, it is not only the length of an individual segment which causes quantity oppositions, but the overall patterns of length, pitch and intensity for a disyllabic unit which create such oppositions in Skolt Saami. The extent to which these three factors play a significant role in Kildin Saami phonology has never been studied, but it is worth considering that it is not necessarily length alone (as Kert (1971) and Kuruč et al. (1985) seem to indicate) which factors into quantity in Kildin Saami.

The exact role of compensatory lengthening in providing an overall quantity for the syllable or foot in Kildin is also unknown at this point, although E. Itkonen (1973: 136) and Kert (1964: 45) indicate that Kildin does not show evidence of compensatory lengthening. More recent Russian-language studies of Kildin have focused on the length of consonants in the consonant centers (essentially the coda and onset consonants between odd and even syllables; see section 5.1), while earlier Finnish-language descriptions focused on vowel length as being distinctive (Michael Rießler, pc). As a result it remains unclear whether it is vowel length or consonant center length, or indeed both together, which determine length in Kildin. And, again, how exactly pitch and intensity are involved also needs to be studied. This paper presents some initial impressions of these phenomena by considering these with respect to syllable position and stress, thus providing a starting point for future research.

3.2. Morphology

3.2.1. Concatenative morphology

Lexical stems in Kildin Saami can be complemented by a number of inflectional suffixes indicating case and number for nouns and showing person, tense, number and aspect for verbs. There are also several derivational suffixes which can for instance create nouns, verbs, adjectives and adverbs out of other word classes, as well as diminutive, pejorative and augmentative suffixes[11] for

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[11] However, of these diminutive, pejorative and augmentative suffixes, the vast majority of the speakers interviewed for KSDP seem only to be familiar with the diminutive suffix -a 'DIM:PL:NOM', which thus seems to have replaced other diminutive suffixes for the other cases in both singular and plural. The pejorative and augmentative suffixes were also unfamiliar to a number of speakers, so that expressing pejorative and augmentative meaning through grammatical morphemes may be becoming a thing of the past.

nouns and diminutive suffixes for verbs. Suffixes can be added not only to roots, but onto suffixes as well, resulting in a templatic morpheme structure, as can be seen in (9), (10) and (11) below.

(9) pert-a   'house-PL:DIM'   *little houses*

(10) pert-enʲ   'house-PL:LOC'   *in houses*

(11) pert-a-nʲ   'house-PL:DIM-PL:LOC'   *in little houses*

With the single exception of the recent borrowing of a Russian particle as a prefix[12], suffixes are the only type of affix found in Kildin Saami. There is one proclitic, but it is also a Russian borrowing. There does not seem to be much evidence for productive reduplication processes, although there are a few lexical items which seem to exhibit reduplication[13], and distributive numerals are formed via a process of reduplication (Kuruč et al. 1985: 546-47).

3.2.2. Non-concatenative morphology

3.2.2.1. Consonant gradation

One significant characteristic of the Saami branch of the Uralic languages is the existence of the phenomenon *consonant gradation*. In Kildin Saami consonant gradation, the consonants between the odd and even syllables (called *consonant center*) alternate based on the morphosyntactical context of the word involved. In Kildin Saami this alternation always consists of at least a change in length and frequently a change in consonant quality as well. Furthermore, this process can also take place at the end of a closed odd syllable. This is best understood by looking at some examples:

(12) /se:rrv/   [sɘ:rrv]   'moose\SG'

(13) /se:rv/   [sɘ:rv]   'moose\PL'

In (12), the consonant center consists of /rrv/, i.e. a geminate *r* followed by a short *v*, while in (13), the consonant center consists only of /rv/, i.e. a short *r* followed by a short *v*. The grammatical context of a word determines which of the morphological forms of the stem *serrv* 'moose' occurs (either the longer form /rrv/ or the shorter form /rv/); thus these two forms are termed the *strong stage* and the *weak stage*, respectively, and the consonant gradation pattern can be

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[12] See section 3.4.

[13] One very common word is *oalmolma* 'man', which is remarkable for its seemingly reduplicated *olm* / *oalm* as well as the fact that it thus consists underlyingly of three syllables. The stem *olma* means 'man' or 'human'.

abstracted as in (14), in which the strong stage is listed first, followed by the weak stage.

(14)　　xxy : xy

This alternation is not unique to the word *serrv*, but indeed can be found in many other Kildin words. The stage which a word is in is vital to the word's semantics, as can be seen in examples (12) and (13). In (12), the strong stage indicates that 'moose' is singular, while the weak stage in (13) designates it as plural. Whether the strong or the weak stage is required depends on the case, inflectional class and number of a particular stem.

Synchronically, this is an impressive morphophonological phenomenon[14]. Other consonant gradation patterns in Kildin Saami include xx:x, xx:y and xy:x. The gradation stage of a word is not only used to indicate number as in the examples above, but also correlates with case for noun morphology and with person for verb morphology. There are also some suffixes and adjectives which exhibit consonant gradation.   A short look at the etymology of consonant gradation and previous Kildin Saami syllable structure unravels the mystery quite easily.

Historically speaking, consonant gradation was simply the result of an older purely phonological process of an earlier stage of Saami. At that point, words tended to be disyllabic and to have a more or less a certain overall weight. If a word ended in an open syllable, then this lack of quantity at the end was compensated for by having a long consonant center. For instance, the word *serrv* arose from Proto-Saami *serrve*, with a heavy consonant center to make up for the open final syllable (Lehtiranta 1989: no. 1091). But if a word ended in a closed syllable, this extra weight at the end was balanced out by removing some weight from the middle, thus adding the old genitive marker *-n* to the word *serrve* resulted in *serven*, with a short consonant center and a closed final syllable. This can still be seen in modern South Saami, for instance, as example (15) shows (Hasselbrink 1981: 1117).

(15) /sarve-n/　moose-GEN:SG

In the past, the situation was the same for all nominal and verbal morphology in Kildin Saami. But Kildin has since lost a number of final syllables, and thus has

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[14] The particular examples in (12) and (13) also provide a nice argument against iconicity due to the fact that plural is marked with less phonological material than singular, a case in which less is in fact more.

lost the original triggers for consonant gradation stages, but consonant gradation itself remains as a remnant of this older phonological process. In other words, the historically robust phonological process triggering changes to the consonant center has been morphologized in Kildin.

3.2.2.2. Umlaut

In addition to consonant gradation, umlaut also plays a significant role in Kildin Saami morphology.   Indeed, just as with consonant gradation, allomorphemic variations found in the vowel or vowels of odd stressed syllables (in other words, before a consonant center, but not after it) are determined by the morphological context of the word involved.   One example of this is the umlaut alternation between /ue/ and /ua/, as seen in (16) and (17) below.

    (16) /s͡uejj/   'wing\NOM:SG'
    (17) /s͡uajj-a/   'wing-DAT:SG'

At first glance, this may appear to be a typical case of regressive vowel harmony in which the stem's first syllable vowel adjusts to the height of the suffixed vowel. But in fact this is not synchronically the case, as (18) shows.

    (18) /s͡uej-xa/   'wing-ABESS:SG'

Here, the stem vowel is the same diphthong as in the suffix-less example in (16). This indicates that an open vowel in the suffix does not have an effect on the stem diphthong, because if this were the case, then both (17) and (18) would exhibit vowel harmony.   Instead, the umlaut itself is a non-linear part of the morpheme marking DAT:SG in (17).

Thus, from a synchronic point of view, Kildin Saami is characterized by a morphologically conditioned umlaut.   However, historically speaking, umlaut is the result of the influence of second syllable vowels which have frequently been lost or altered (Sammallahti 1998: 44, 55-6).   But because many of these second syllable vowels have disappeared in modern Kildin Saami, their influence is no longer productive and umlaut determined by a lexeme's inflectional class is the result, just as is the case with consonant gradation (see section 3.2.2.1).

3.2.2.3. Palatalization

Palatalization in Kildin Saami is a non-linear morphosyntactic process which is similar to both consonant gradation and umlaut. This process causes the palatalization or unpalatalization of the consonant center in certain

morphophonological environments. This can be seen in examples (19) through (22) below.

> (19) /jorrt-a/   'think-1SG'
>
> (20) /jorrt/   'think\3SG'
>
> (21) /jurrɈt-e/   'think-INF'
>
> (22) /jurrɈt-ip/   'think-1PL'

 in which the palatalized consonant center of the stem *jurrɈ* 'think' loses its palatalization with the presence of morphemes indicating singular, while palatalization is retained for the infinitive and plural forms.

As with consonant gradation and umlaut, palatalization in Kildin Saami is based on morphological paradigms synchronically speaking, but can be explained quite easily by looking at historical evidence. Here, older second-syllable mid to high front vowels caused the palatalization of the preceding consonant center (Rießler in preparation) in a regressive process of assimilation.

While all three non-concatenative morphosyntactic features of Kildin Saami can be understood rather easily when considering the language's history and the disappearance of trigger material contained in suffixes, it is important to understand that these features are no longer predictable nor productive morphophonemic processes. Instead, they are determined by the inflectional class of the lexemes they belong to. Because they cannot be isolated in a linear way from the stems they modify, these are true non-linear morphemes themselves or non-linear parts of otherwise alienable suffixes.

3.3. Syntax

Kildin Saami lexemes belong to a variety of word classes including nouns, verbs, adjectives, adverbs, numerals, etc. as well as postpositions and a limited number of prepositions. Negation is expressed by a special finite verb meaning negation followed by a special infinitive form of the negated verb called the *connegative*. The standard constituent order in Proto-Saami was Subject-Object-Verb (SOV), but Subject-Verb-Object (SVO) word order has been equally valid, if not even more frequent, for a long time and is now the basic order (Sammallahti 1998: 95). The number of postpositions (most of which indicate location) heavily outweighs the number of prepositions. Attributive adjectives occur before the nouns they modify. Considering the previously strict SOV syntax, the abundance

of postpositions and the location of adjectives before nouns, one may generalize that Kildin Saami is a head-final language, but not strictly so.

3.4. Language contact

Due to the sociolinguistic situation that Kildin speakers have been in since the beginning of Sovietization in the 1920s, modern Kildin Saami has been influenced significantly by the Russian language[15] on more than one level. The Russian influence began in fact much earlier than this[16], as evidenced by such old Russian loan words as *pass·pe* 'thank you' (<Russian *spasíbo*) and *tuell^j* 'table' (<Russian *stol*) which were adapted long ago to a considerable extent to fit Kildin phonological constraints, particularly evident in the lack of word-initial consonant clusters and the relocation of word-level stress. However, the influence which Russian exerts on Kildin Saami (as on other Kola Saami languages) increased in strength significantly after the integration of the Saami into the Soviet Union. Ever since then, nearly all Kildin speakers speak Russian fluently and use Russian on an everyday basis in public life, and frequently at home.

The Russian language's influence is made most obvious by the large number or lexical borrowings in modern Kildin Saami. Many modern world concepts not found in the traditional Kildin word stock have been incorporated from Russian into Kildin without any significant change to their original Russian phonology (Rießler in preparation). This has resulted in changes to Kildin phonotactics such that nowadays consonant clusters are acceptable in syllable-onset position, voiced obstruents are permissible in word-initial position but are banned from word-final position (i.e. word-final devoicing), although these rules only apply to recent loan words.

But the extent of the Russian influence goes beyond lexical borrowings and phonotactics. It has caused changes to the usage of Saami illative case based on Russian dative case semantics, the borrowing of Russian diminutive and augmentative nominal morpheme patterns, the introduction of an analytic future tense and an analytic superlative construction, discourse markers, as well as the borrowing of numerous conjunctions and coordinators. Perhaps most impressive

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[15] Other contact languages have included Komi, Nenets and perhaps Finnish and North Germanic, but none compare in terms of the extent of their influence on Kildin to Russian (Rießler in preparation).

[16] Rießler (in preparation) suggests that Russian has had an influence on Kildin Saami "at least since the end of the Middle Ages."

is the introduction of the sole prefix in Kildin Saami, an otherwise exclusively suffixing language: the Russian negation particle *ni* is used in Kildin as a prefix negating any interrogatives, thus replacing the original Saami negation suffix *-ge* (Rießler in preparation).

4. Studying syllable structure and stress in Kildin Saami

4.1. Goals and purposes of the current study

The phonologies of the two Finno-Ugric languages Finnish and Estonian are frequently mentioned in linguistic literature dealing with syllable weight and stress because of their robust stress patterns as well as impressive consonant gradation processes. Of course these are not the only languages exhibiting such phenomenon, and indeed the Saami languages prove to be equally interesting in these respects, albeit less known. While North Saami is fairly well documented, other Saami languages have not received quite as much attention; in particular, those spoken in the Russian Federation are poorly documented and certainly more in danger of extinction than their Scandinavian counterparts. While the few grammatical descriptions written about Russian Saami languages normally mention stress patterns and at least hint at syllable structures in describing phonotactic distributions and consonant gradation, to my knowledge no thorough, in-depth study of any particular Saami language spoken in Russia has been carried out. Although the study undertaken here could certainly benefit from supplementary information from more speakers, one goal of this thesis is to help fill that gap of knowledge concerning syllable structures and stress patterns in a Russian Saami language, in particular in Kildin Saami.

A further goal is to supplement the information available to typologists doing cross-linguistic comparisons and theoretical linguists alike concerning a variety of phonologically relevant topics such as geminates, syllable structures, stress patterns, consonant gradation and weight by providing empirical evidence and related analyses on such topics from one particular language.

But aside from farther-reaching aims for general linguistics and Saami linguistics, the essential point of the current study is to apply general linguistic knowledge and previous research concerning syllables and stress in order to accurately determine and describe in detail the various syllable structures and stress patterns found in Kildin Saami and to discuss their relationship to one another using empirical data gathered for this purpose from Kildin speakers. In order to do this and for the reader to better understand the results of my research, it should prove helpful to provide a brief theoretical background. This is not at all intended to be an exhaustive description of the respective theories, but rather a sketch of several important concepts and ideas necessary for a better understanding of the context and the details involved in the current study. This can be found below in section 4.2. Furthermore, a description of the methods

and equipment used in collecting and analyzing the data follows in section 4.3, before the remainder of the chapter explores the data and analyses and their implications.

4.2. General theoretical background

4.2.1. The syllable

In order to be able to look successfully at the various manifestations of syllable templates in Kildin Saami, it is necessary to identify what exactly a syllable is. Blevins (1995) defines the syllable from a phonological point of view by claiming that a syllable is a phonological unit consisting of one unique individual sonority peak preceded and succeeded by sonority troughs. She uses the musical term "melody" to refer to the overall up and down movement of sonority, with syllables centered on the high points of sonority and delimited by low points; as a result, the syllable is "the phonological unit which organizes segmental melodies in terms of sonority" (207). From an acoustic-phonetic point of view, sonority is defined as the overall loudness of a particular sound relative to other sounds (Ladefoged 1975: 219-20). From both phonetic and phonological perspectives, there is a sonority hierarchy for segments with open vowels being the most sonorous, followed by (in order of decreasing sonority), closed vowels, glides, laterals, rhotics, nasals, fricatives and plosives (Blevins 1995: 207; Ladefoged 1975: 219-20). Thus vowels, as the most sonorous segments, prototypically form the center of a syllable, while in the absence of a vowel the next most sonorous segment in the sonority hierarchy fulfills this function as the center of a syllable. The farther away a tautosyllabic segment is from the center (or sonority peak), the less sonorous it is relative to the other segments closer to the peak; this phenomenon is referred to as the *Sonority Sequencing Generalization* (Blevins 1995: 211) and helps define the bounds of a particular syllable[17].

There is additional evidence indicating that the syllable can be considered to be a valid element of phonology. Both Blevins (1995) and Nespor and Vogel (1986) argue that evidence for the syllable as a valid element in phonology can be found in a variety of syllable-related phenomena. First of all, the syllable can serve as a domain for phonological processes and phonotactic constraints. Secondly, syllable edges inevitably align with word and utterance edges.

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[17] However, it is important to emphasize that this is only a generalization (often called the Sorority Sequencing Principle as well (cf. Cho and King 2003), and not a law or universal, as it does have its exceptions.

Furthermore, syllables frequently function as stress and tone bearing units. Finally, native speakers often intuit syllable boundaries and refer to syllables naturally (if unconsciously) by treating them as the target of language games.

In this thesis, I agree with both phonetic and phonological evidence discussed above and found in Ladefoged (1975), Blevins (1995) and Nespor and Vogel (1986) and thus assume the existence of the syllable as a legitimate element measurable by acoustic-phonetic analysis and demonstrable by phonological phenomena. As a result, I will not attempt to provide further evidence for the syllable, but take its existence as a given in Kildin Saami and thus as a valid object of linguistic inquiry in attempting to describe possible syllable patterns.

However, a short description of exactly what form syllables can assume should also prove valuable as a background for the study at hand. As mentioned above, syllables are centered on sonority peaks (irrespective as to whether these are defined phonetically or phonologically). While several models have been suggested for describing a syllable's internal structure, I will present the binary branching model as it is described in Blevins (1995). In this, the obligatory sonority peak upon which a syllable is centered is called the nucleus. Any tautosyllabic segments preceding the nucleus are referred to as the onset, while any tautosyllabic segments following the nucleus are together called the coda. In determining syllable weight, both the nucleus and the coda play equally significant roles, while the onset is generally considered to be irrelevant[18]. As a result, the nucleus and the coda are grouped together into a higher unit called the rhyme, which is thus the weight bearing unit in a syllable (Blevins 1995: 212-216)[19]. The resulting general syllable structure thus branches twice, each time into two sub-units, as can be seen in Figure 6 below.
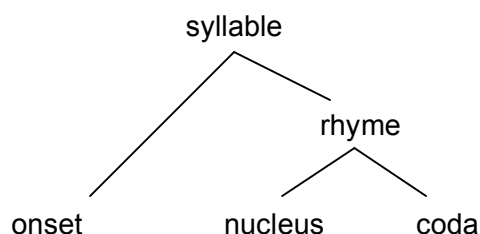
Figure 6: Internal structure of syllables (based on Blevins 1995: section 3)

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[18] As Blevins (1995) puts it, "In all but a very few cases, syllable weight is defined without reference to the prevocalic portion of the syllable" (214), and "arguments for the onset as a constituent are hard to come by" (216).
[19] See section 4.2.2 below for a more detailed discussion of syllable weight.

In my analysis of Kildin Saami syllable structures, I follow Blevins (1995: section 3) in using the terms found in Figure 6. This is a conscious choice, not only because these terms are useful in describing the relative position of segments within a syllable, but also because syllable structures and syllable weight considerations in Kildin Saami support this binary-splitting approach to describing internal syllable structure.

A further concept which is important when considering syllable structure is syllabification. As Blevins (1995) points out, generally "syllable structure is not present in underlying representations" (221), despite the significance of the syllable in phonology. Instead, the construction of syllables occurs post-lexically, once all phonological data from the relevant morphosyntactical constructions are present in the domain within which syllabification takes place[20], as is the case for certain other phonological rules. As a result, while the syllable is a phonological entity, syllabification (or the creation of surface syllables) looks beyond phonology at "nonphonological elements" as well (Nespor and Vogel 1986: 62). In deciding which segments create which syllables, the Maximal Onset Principle is significant because it predicts that a VCV combination will be syllabified as V.CV, with the intervocalic consonant as the onset of the second syllable instead of as VC.V, which would result in an onset-less second syllable. For many languages, including Kildin Saami, this principle thus receives priority over faithfulness constraints. While the Maximal Onset Principle is not without exceptions, it does seem to be a strong tendency[21] (Blevins 1995: 230-31).

4.2.2. Other relevant phonological units

The Prosodic Hierarchy (Nespor and Vogel 1986; Selkirk 1984) attempts to organize prosodic domains into hierarchical levels, and in doing so also posits the existence of the syllable as a potential domain relevant for phonology. While the validity of the various individual levels as well as the way in which they relate to one another remain much debated topics, a basic general version of the prosodic hierarchy can be found in Figure 7 below. Here the syllable's position can be seen nestled between the smallest unit, called *mora* and the next largest unit, known as *foot*.

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[20] The domain for syllabification varies from language to language and can range anywhere from being limited to single morphemes to extending across entire phonological phrases (Blevins 1995: section 5).

[21] For a discussion of such exceptions, see Blevins (1995: 230-232).

U	-	phonological utterance
IP	-	intonational phrase
PhP	-	phonological phrase
ω	-	phonological word
φ	-	foot
σ	-	syllable
μ	-	mora

Figure 7: The Prosodic Hierarchy (based on Hall 2000: 313)

While the syllable is one of the main foci of this study, it is also vital to understand the concepts behind the other neighboring layers of mora, foot and phonological word for two reasons. First, moras are the building blocks of syllables as syllables are of feet and (potentially) phonological words. Second, the domains which moras, syllables, feet and phonological words define are relevant when considering stress in Kildin Saami; this topic is covered in chapter 5.

The lowest unit in the prosodic hierarchy, the mora, is defined as a unit of weight (Hall 2000: 259). Open syllables with a short vowel are commonly considered to contain one mora, while open syllables with a long vowel or diphthong as well as closed syllables in general are considered to contain two moras[22]. Since moras are weight units, monomoraic syllables are viewed as light while bimoraic syllables are heavy[23]. Moraicity often plays a role in determining both syllable structure and stress distribution. While not all phonologists agree on the existence of moras, it seems justified to consider them as a possibility in attempting to describe both stress and syllable structures in Kildin Saami.

While the syllable dominates the mora in the prosodic hierarchy, the foot is the phonological unit directly above the syllable. Traditionally, a foot is defined as a metrical unit of rhythm and is thus based on stress[24]. Repetitions of stress patterns coincide with feet, and for most languages, feet are either trochaic, in which case a foot consists of a stressed syllable followed by an unstressed syllable, or they are iambic, in which case the opposite is true and an unstressed syllable precedes a stressed syllable. Sometimes there is extra phonological

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[22] However, this is very generalized; in a number of languages a closed syllable containing a short vowel is also considered to have only one mora.
[23] Superheavy syllables have also been posited for some languages. Such syllables have three moras due to the large amount of segments found in the rhyme. For superheavy syllables in German, see Hall (2002).
[24] For more information on stress itself as well as the relationship between feet and stress, see section 4.2.3.

material left outside of foot boundaries; this is normally considered to be beyond the realm of the foot and simply does not participate in the foot-based distribution of stress. Such "extra" material is thus considered extrametrical (cf. Gussenhoven and Jacobs 1998: 217; Hayes 1995: 56-60).

The final prosodic unit which is relevant to the current study is the phonological word[25]. Dixon and Aikhenvald (2002: 13) define this term as a phonological unit with "at least one (and generally more than one) phonological defining property" based on segmental features, prosodic features and/or phonological rules. In other words, a phonological word is a phonological unit defined by the domain of segmental and prosodic features and/or phonological rules. Typically, this is used for the domain in which phonological properties apply which cannot be neatly defined by moraic, syllabic or foot-based descriptions.

4.2.3. Stress

In the linguistic literature, the term *stress* has been used to refer to a variety of things, and as such it is difficult to come up with a single unifying definition. Nonetheless, a good point of departure can be found in acoustic phonetics, as this is the hard science which provides the empirical evidence on which phonologists base their work. Cruttendon (1997: 2-5) includes three factors which are clues to the perception of stress: length (the actual temporal duration of a linguistic unit such as a vowel or a syllable), loudness (the amount of physical energy present in a linguistic unit) and pitch (the rate of vibration of the vocal cords for a linguistic unit). However, Ladefoged downplays the role of loudness by claiming that for most languages, "what we hear as stress is more a matter of increasing the pitch and length of the syllables concerned than of increasing their loudness" (2005: 24). Hayes agrees with this, saying that loudness is either subordinate or marginal to the other perceivable clues (1995: 7), yet ultimately abandons the pursuit of a "clear and unambiguous phonetic correlate of stress" because "no such thing exists" cross-linguistically (1995: 5). Cruttendon settles for a rather vague phonetic definition by generally allocating stress to that part of a linguistic unit (be it foot, word, phrase, etc.) which receives prominence relative to the other parts of the unit (1997: 13-14).

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[25] The phonological word is sometimes also referred to as the prosodic word in the literature.

On the other hand, stress can also be considered an element of phonology. According to Hayes' theory of metrical stress (1995), every linguistic utterance has an underlying rhythmic structure which organizes its phonology and phonetics; Hayes terms this phonological construction *stress* (8). This conception of stress is non-linear and rejects the idea of stress as a binary feature of a particular linguistic unit; instead, stress is a hierarchically organized rhythmic structure which gives form to the linguistic information placed upon it (26). A similar approach can be found in Gussenhoven and Jacobs, in which stress is considered to be a strength relation between syllables (1998: 212).

Feet are typically considered the individual repeating rhythmic units which form stress patterns, while a single syllable is either stressed (primarily or secondarily) or unstressed, and is thus the stress bearing unit (even if the rule creating the stress pattern is mora-based). Cross-linguistically, stress (or stress patterns) can take on different forms based on the settings of various parameters: its rhythm can be trochaic or iambic (see section 4.2.2 above) and bounded or unbounded (depending on whether it is determined relative to word boundaries); furthermore, bounded stress can be distributed from left to right or vice versa. In addition, stress is often sensitive to quantity by being limited to heavy syllables (see section 4.2.2) (Gussenhoven and Jacobs 1998; Hayes 1995).

In looking at stress in Kildin Saami, I begin empirically by analyzing the acoustic phonetic data with respect to the various correlates of stress discussed above. Based on this data, I have tried to recognize rhythmic patterns. While my intent is not necessarily to implement the metrical theory put forward by Hayes (1995), his work is certainly influential in conceiving of stress as an underlying structure accessible through phonetic linguistic information and through the notions of moras, syllables, feet and phonological words as described in the preceding sections.

4.3. Data collection and methodology

Data for the current study were collected on several occasions. The initial data were gathered by myself during a field trip to the main Kildin Saami village Lovozero in northwestern Russia in October and early November 2006. The field trip was made possible thanks to financial and technical support from the Kola Saami Documentation Project, a DOBES project funded by the Volkswagen Foundation. During one of many similar field trips to the Kola Peninsula my

colleague Michael Rießler recorded data on my behalf in late April 2007. A final (and rare) opportunity to work with a Kildin speaker was afforded me in mid-May 2007 when I was allowed to do high quality recordings in the sound laboratory at the Max Planck Institute for Evolutionary Anthropology in Leipzig.

During the trips to Russia, video and audio recordings were made on digital video cassettes (DV) using a Sony ECM-MS 907 microphone connected to a Panasonic NV-GS 400 camcorder using a Sennheiser EW 100 ENG G2 wireless system. Michael Rießler used a Sennheiser headset PC 20 microphone with the same Panasonic camcorder and Sennheiser wireless system for recording during his trips to Russia. All resulting linguistic recordings were then transferred from the DV-cassettes to a Macintosh MacBook, on which the audio was then extracted for acoustic phonetic analysis.

All data were gathered in elicitation sessions; no natural speech data from dialogues or similar situations were used. The reason for this was to limit the study to controlled utterances of isolated words consisting of either a sole root or a multimorphemic root-plus-suffix(es) word. This controlled environment allows the desired information to be collected expediently and blocks out any influence phrase-level phonology might have on individual words by standardizing and limiting the context in which the elicited words are produced. Data for this study were collected from two older female speakers representing the neighboring Kildin dialects Aarsjogk and Koarrdegk. Initial data collection in October/November 2006 focused on gaining first impressions of Kildin syllable and stress patterns and testing the overly-simplified descriptions of these phenomena found in previous accounts of Kildin-Saami. Follow-up recordings done in April and May 2007 focused on eliciting material which could aid in answering questions and problems raised in the analyses of the initial data and which could add to the overall amount of data, thus improving statistical reliability.

Acoustic phonetic analyses of the data were done on a Macintosh MacBook using the computer program Praat (version 4.5.17). At the same time, a database was created using the program FileMaker Pro (version 8.5v1) to be able to archive and more easily compare the resulting analyses. A token example of the elicited words (normally the second of three utterances in isolation) was analyzed in Praat, whereby the duration in milliseconds, the intensity in decibels and the pitch in hertz of each vowel as well as the length and intensity of all post-vocalic consonants were ascertained. These measurements were then entered into the database along with an initial phonetic transcription

and information on the number of syllables perceived and morphemes present. Once all data from the initial field trip's recordings were entered, a preliminary analysis was performed in order to prepare for the follow-up recordings. Finally, once all data had been entered into the database, these were then compared and analyzed (the program R was used when statistical analyses were necessary) with respect to syllable structures and stress. The results of these analyses form section 5.2.

5. Syllable structure and stress patterns in Kildin Saami

5.1. Previous studies

It is difficult to refer to syllable structures without referring to stress patterns in Kildin Saami as there is a relationship between the two which is fairly intricate. In this section, I will first focus on previous studies concerning Kildin Saami done on the syllable and then move on to previous work done on stress, but completely separating these two topics is impossible.

Very little information directly concerning individual syllable structures is available for Kildin Saami. Aside from a few phoneme-specific distributional or allophone issues found in phonological descriptions, the syllable is essentially never discussed as a single entity but instead is always portrayed with respect to syllable pairs composed of one odd-numbered syllable and the following even-numbered syllable. E. Itkonen (1973), Kert (1971; 1975) and Kuruč et al. (1985) describe such syllable pairs for Kildin, while Korhonen (1975) and Korhonen (1984) treat syllables in the same way for the neighboring languages of Skolt and Ter Saami, respectively. The main reason for this treatment is the concept of the consonant center. In effect, the consonant center essentially consists of the singleton or geminate consonant or the consonant cluster between the initial syllable of a word and the following syllable, or following the vowel of a monosyllabic word. Three facts validate the existence of this construct: first, the number of possible forms and sizes that consonant center consonants can have is significantly larger and more diverse than in other syllable positions (these being word-initially, between even and odd syllables, and at the end of a word-final even syllable); second, the process of consonant gradation takes place in the consonant center, and not in other consonant positions; finally, umlaut variations only occur in syllables before a consonant center, while vowels occurring after consonant centers are always short.

The onset of word initial syllables is limited in that it either has no onset at all or has a simple, singleton consonant which is either a sonorant or a voiceless obstruent[26]. Indeed, this is illustrated by the way in which E. Itkonen's (1973) inventory of Proto-Saami portrays disyllabic structures: he does not include the initial onset consonant, and the second syllable's coda is only included in brackets. This is due to the fact that the main differences between these structures is found in consonant-center position. E. Itkonen writes that there

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[26] However, some loan words have voiced obstruents or consonant clusters in word-onset position.

were 24 structures possible, presumably phonetic, all of which were possible by applying phonological rules to the three basic underlying structures found in Figure 8 below. Here, vowel length is not considered. Furthermore, E. Itkonen claims that the modern Saami dialects all developed directly from these three forms, and that modern Kildin[27] has eight possible phonetic structures based on these original Proto-Saami forms (Itkonen, Erkki 1973: 133-34).

(C)VCV(C)

(C)VC:V(C)

(C)VCCV(C)

Figure 8: Proto-Saami syllable structures for disyllabic stems (based on Itkonen, Erkki 1973: 133-34). Here, vowel length is not represented; C is a singleton, C: a geminate, and CC a consonant cluster.

Unfortunately, no mention is made about syllabification, which would be interesting for syllable structures, particularly concerning the syllabification of geminates and tautomorphemic consonant clusters.

For modern Kildin Saami, vowel length in the initial vowel is said to be distinctive. Furthermore, it is consistent regardless of the quantity or quality of the following consonant center (Itkonen, Erkki 1973: 136; Kert 1964: 45). The vowel of the second syllable is nearly always short, and even super-short[28] in open syllables (Itkonen, Erkki 1973: 138). As a result, compensatory lengthening of the vowel does not appear to be a process in Kildin Saami. On the other hand, whether the second syllable was historically open or closed influenced the occurrence of a long or short consonant center grade, respectively; this could be seen as compensatory lengthening intended to fulfill constraints on overall foot-level size. However, in modern Kildin Saami consonant gradation is no longer a productive phonological process, but morphologically determined. Thus, compensatory lengthening is not present in Kildin Saami, a characteristic which sets Kildin apart from, for instance, neighboring Skolt Saami language (Itkonen, Erkki 1973).

The fact that Saami scholars consistently consider disyllabic pairs of syllables is certainly no coincidence. However, considering the above characteristics relating to consonant gradation and vowel length as well as the

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[27] In particular, E. Itkonen (1973) describes the Šonguj dialect of Kildin.

[28] *Super-short* is my translation of E. Itkonen's (1973) term *überkurz*.

basic stress pattern[29], it makes more sense to talk about these disyllabic clusters as bound trochaic feet. By doing so, awkward descriptions relating to initial or odd syllables and final or even syllables can eloquently be reformulated based on foot constraints. The above information concerning syllables can thus be rewritten as rules for Kildin feet, each of which consists of two syllables, the first of which is stressed, the second of which is unstressed. These are found in Figure 9 below.

1. Consonant gradation occurs foot-internally;
2. All consonants and consonant clusters are licensed foot-internally;
3. Only singleton consonants at the left edge of a foot;
4. The initial syllable of a foot is stressed;
5. Unstressed vowels are always short;

Figure 9: Foot-based rules for Kildin Saami

To what extent my data support these rules shall be taken up in the following sections of this paper.

Moving on to the related topic of stress, the literature makes stress in Kildin Saami appear consistent and simple. Kert (1971: 122-23; 1975: 218; 2005: 3) states that the initial syllable of a Kildin word receives main stress, while secondary stress falls on any following odd-numbered syllables, excluding the final syllable of the word. As a result, a word-final odd syllable falls outside of the preceding bisyllabic foot. Liberman and Prince (1977) and Hayes (1980; 1995) use the idea of extrametricality to explain this. According to this theoretical assumption, any material left over after feet are created is simply considered to be outside of the domain of the foot, but still within the level of the phonological word. This results in a bound left-to-right trochaic foot structure for Kildin Saami words as mentioned in the preceding paragraphs and visualized in Table 6 below.

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[29] Essentially, the initial syllable receives main stress, while following odd-numbered syllables receive secondary stress when not word-final (see the following paragraphs).

Table 6: Kildin-Saami stress-based foot/word structure[30]

even-numbered polysyllabics	$((\,'\sigma\sigma)_\varphi\,(\,,\sigma\sigma)_\varphi\,(\,,\sigma\sigma)_\varphi\,)_\omega$
odd-numbered polysyllabics	$((\,'\sigma\sigma)_\varphi\,(\,,\sigma\sigma)_\varphi\,\sigma)_\omega$
monosyllabics	$((\,'\sigma)_\varphi\,)_\omega$

(σ = syllable, φ = foot, ω = word, $'$ = main stress, $_,$ = secondary stress)

Korhonen (1984) posits similar word-stress patterns for the neighboring Ter Saami language in which the initial syllable always carries the main stress. However, in Ter the second and third syllables can also carry strong secondary stress[31] if they contain full vowels. The situation is similar for neighboring Skolt Saami (Korhonen 1975); here, main stress also always falls on the first syllable, while the second syllable carries either secondary stress or receives no stress at all.

It is not as clear what exactly the acoustic-phonetic correlates of Kildin stress are. Kert (1971: 122-23) says that evidence for stress can be found in differences in pitch and intensity based on analyses of kimograms, while Kert (1975: 218) adds that stressed vowels are longer than unstressed vowels. E. Itkonen (1973) does not make any concrete claims about stress at all, but mentions in passing that, for his language consultant, "syllable accent at least sometimes has a distinctive function" in monosyllabic words belonging to the *xx* consonant gradation pattern series (144; my translation).

In summary, syllable structure and stress patterns are hardly new territory for scholars of Kildin Saami. Nonetheless, syllable structures are mostly considered only in the context of consonant gradation; descriptions of stress patterns remain fairly impressionistic. In other words, no extensive study has been done focusing specifically on these subjects[32]; the remainder of this paper will hopefully fill part of this gap in Saami linguistic studies.

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[30] On a related note, Kert (1971: 122-23) points out that knowledge of phrasal stress in Kildin Saami is practically nonexistent, aside from the fact that import words somehow receive more stress than less significant words. Unfortunately, this topic is outside the scope of the current study and must remain a subject for future research.

[31] Korhonen (1984: 312-13) classifies Ter Saami stress into four levels: main stress, strong secondary stress, weak secondary stress and unstressed.

[32] A very thorough acoustic study of quantity in disyllabic words for neighboring Skolt Saami can be found in McRobbie-Utasi (1999).

5.2. An empirical study of syllable structures and stress patterns

5.2.1. Methodology

Before discussing the results of this study, it is important to understand the methodology used in arriving at these results. To begin with, acoustic data had to be gathered on which this research was based. Thus, word lists were created that consisted of both monomorphemic standard elicitation forms (essentially the least-marked nominative singular form for nouns and the dictionary-entry infinitive form for verbs) as well as more morphologically complex forms including affixes and the non-linear morphology present in consonant gradation (cf. section 3.2.2.1). The initial word list was somewhat random and consisted of potentially interesting words and minimal pairs, particularly syllable template minimal pairs; this word list allowed me to gain a first impression of potential syllable structures while allowing me to create more informed and goal-oriented word lists for later elicitation sessions. During the course of the study, seven speakers of four Kildin dialects were interviewed and recorded; however, in order to better guarantee statistical significance, only the utterances of the two speakers that I had most of my recordings from were included in the final evaluation of the results. These recordings were made with Maria Medvedeva in Lovozero during my field trip in October 2006 and by Michael Rießler during a trip in April 2007 as well as with Nina Afanasyeva during her visit to Leipzig in May 2007. Maria speaks the Koarrdegk dialect and Nina speaks the Aarsjogk dialect. In the following analyses, I will use the abbreviations *NA* and *MM* to refer to these speakers.

Phonetic realization can of course be significantly influenced by the linguistic context in which a word is realized. Correspondingly, the elicitation form can vary significantly from the way a word is realized in a spoken context. In order to reduce such effects and to improve the comparability of recordings, words from the various word lists were recorded at least twice in isolation and twice within a consistent environment. This also allowed me to record various utterances and not use utterances in which the target word received a "list" intonation[33]. Elicitation of a word was thus based on the following pattern, here using the example *saarnak* 'speak-2SG:PRS' in the carrier sentence *soag *** lii saam' soag* 'the word *** is a Saami word':

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[33] In my impression, lists in Kildin are marked by a rise in pitch at the end of a phrase list-internally and a dramatic fall in pitch at the end of the final element of a list.

Saarnak, [pause], *saarnak*, [pause], *soag saarnak lii saam' soag*, [pause], *soag saarnak lii saam' soag*.

The second utterance of the word in isolation and the first utterance of the word in the frame sentence were used for analyses, with the hope of neutralizing any list-intonation effects.

In order to collect and analyze the data gathered during elicitation sessions more effectively, I designed a database using FileMaker Pro. Each recorded utterance was transcribed phonetically[34] (with the help of the acoustic phonetic computer program Praat) and then entered as a unique entry in the data base which included (among other things) information on the following aspects of the utterance: phonetic form, number of syllables, number of morphemes, morphemic gloss, Kildin orthographic form, source of the recording and speaker. Furthermore, detailed information concerning the syllables and stress was collected for every syllable; this included: the measured duration in milliseconds (ms), intensity in decibels (dB) and pitch in Hertz (Hz) for each vowel and the length and intensity for any post-vocalic consonants, both as an intervocalic group and individually. The database allowed for information on utterances of up to four syllables to be collected in one entry.

A further linked database was created as a definition file to record the various syllable structures encountered and to encode them to allow for easier comparison and summarizing during the analysis stage. These syllable structure definitions classified the syllable structures by vowel length and quality into short/long and monophthong/diphthong as well as by coda consonant length and quality. Deciding where to draw the line between short vowels and long vowels was not easy, but ultimately I decided on an upper limit of 130 ms for short vowels. This conclusion was arrived at after analyzing minimal pairs differing in this respect alone and consulting speakers familiar with the concept of vowel length about whether they considered a vowel to be long or short. In addition, previous descriptions of Kildin have postulated that the second syllable's vowel is at most half-long, but normally short (Itkonen, Erkki 1973: 138), while word final second syllable long vowels have been lost (Sammallahti 1998: 33); my data

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[34] Segmentation of an utterance into individual sounds is hardly a precise science, as is well known. In determining segment boundaries for transcription and measurement, I followed the methodology applied by (McRobbie-Utasi 1999) in her 1999 book on quantity in Skolt Saami (pp 39-47).

supports this claim because the vast majority of second syllable vowels[35] are shorter than 130 ms. In distinguishing between singleton and geminate consonants, the grammatical context of the target word in the utterance was used as a standard since geminates are only found in the strong stage and are thus predictable. Based on these facts, the syllable structure definitions assign each structure a unique numeric code as well as an abstracted syllable template using the abbreviations found in Table 7 below.

Table 7: Syllable template abbreviation key

segment type	abbreviation	
	detailed	macro-types
singleton consonant	C	C
geminate	C:	G
consonant cluster	CC	CC
short vowel	V	S
short diphthong	V͡V	
long vowel	V:	L
long diphthong	V͡V:	

For instance, the syllable [sɛ:rrv] received the abbreviation CV:C:C, while [uⅾt] was coded VC:. In addition, secondary articulation such as palatalization and velarization was also included in the syllable definitions. Finally, each syllable structure was abstracted into a macro-syllable pattern which only represented the fundamental structure of vowel length and the individual coda components (the presence of singletons, geminates and/or consonant clusters), but disregarded the presence of any onset consonants or secondary articulation, thus allowing basic syllable structures to be compared more easily. For instance, [v͡ue:dʦ] was macro-coded as LG for "long-vowel plus geminate" and [juⅾ] as SC for "short vowel plus singleton".

5.2.2. Syllable structures - empirical evidence

In the data gathered as described in section 5.2.1 above, there is evidence for a variety of syllable structures. But before delving into generalized information about Kildin syllables, I shall first portray the individual syllable structures themselves as evidenced by my data. The organization of this description is based on syllable coda structure, and not on vowel features because this seems to me to be the most logical way of looking at syllables in

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[35] Specifically, MM has only one vowel longer than 130 ms in the second syllable (out of 31; 3.2%) and NA has 12 second syllable vowels longer than 130 ms (out of 85; 14.1%), only one of which is not an open syllable.

Kildin Saami as it is the coda which is the site for the most relevant phonological changes within inflectional paradigms. In other words, there are frequently consonant center minimal pairs whose difference in meaning is of a purely grammatical nature and not lexical. On the other hand, minimal pairs differing only in their vowel quality or quantity can also consist of two lexically unrelated words.

The basis for every syllable is a vowel[36]. This vowel may be preceded by a single onset consonant segment, but the consonant material following the vowel nucleus as well as the vowel itself vary greatly in both quantity and quality. These facts help make syllabification in Kildin Saami fairly straightforward because only consonants may participate in resyllabification. All non-initial syllables are required to have an onset consonant, and thus the preceding consonant segment becomes the onset of a non-initial syllable, regardless of its underlying phonological or morphological status. In addition to the theoretical prediction found in the Maximimal Onset Principle which prefers syllables with onsets, there is also empirical evidence in my data supporting this assumption. Word-final plosives are aspirated slightly when utterance final, but lose this aspiration when immediately followed by an onset-less syllable within the same intonation phrase. More convincing evidence can be found in speaker intuition and speaker behavior. When enunciating words at an unnaturally slow and careful pace so that I would better understand them, speakers inevitably broke words into individual units such that all non-initial units have an onset consonant. Yet the fact that word-initially, no onset is required indicates that they are perfectly capable of producing vowel-initial syllables. For instance, *saarrn-eʃku:dt-ix* 'talk-INCH-2SG:PRS' was divided into the following units, despite its morphological boundaries: *saarr* [*pause*] *neʃ* [*pause*] *ku:d* [*pause*] *tix*.[37] For these reasons, non-initial syllables were always analyzed for the database as containing a single onset consisting of the consonant segment directly preceding the syllable's vowel.

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[36] I did not find any indication in my data or in the literature that syllabic consonants exist.

[37] Intervocalic geminates are considered to span the surrounding syllables, but with an indeterminable syllable boundary somewhere within the geminate (cf. Ham 2001: 10). In this example (*saarrn-eʃku:dt-ix*), there is no plosive release between the third and fourth syllables, but instead only after the final pause and before the final vowel.

5.2.2.1. Singleton consonant codas

The first variety of this syllable structure grouping consists of a short vowel and a single consonant coda (abbreviated as SC). Several examples for this syllable structure can be seen in Table 8 below. In this table, as in the following tables in this chapter, syllable borders are indicated by a dot <.> and morpheme borders by a dash <->. Segment duration is indicated in milliseconds, except for geminates which span syllable boundaries because the exact syllable boundary is indeterminable, but exists somewhere within the geminate. In making this theoretical assumption, I follow (Ham 2001: 10), who claims that intervocalic geminates are "doubly-linked" and serve "as both weight-bearing coda and weightless onset" (10). The relevant syllable is in bold type in the phonetic transcription of multisyllabic words.

Table 8: Examples of syllable structure type SC

no.	phonetic transcription	gloss	duration V	C
(23)	[jud]	plate\GEN:SG	83	101
(24)	[ton]	2SG:GEN	71	106
(25)	[vu͡ɛj.v-ɛnʲ]	head-GEN:PL	68	59
(26)	[jɛl.l-ɪp.pɛ]	live-2PL	65	-
(27)	[alʲ.p-ɛsʲt]	butterfly-LOC:SG	87	95
(28)	[jurʲ.t-ak]	think-2SG:PRS	86	90
(29)	[kull.tɛl.l-ɛ]	listen-INF	90	-

The SC structure is rare in monosyllabic words. In my data, there were only four such examples; two of these can be seen in (23) and (24). However, as long as a word has more than one syllable, this syllable type becomes more common in the initial syllable, frequently due to underlyingly heavy codas whose second element or second half is resyllabified to the following syllable. In example (25), the consonant cluster in the tautomorphemic root is split during resyllabification, while example (26) consists of a tautomorphemic geminate which is divided during resyllabification at an indeterminable point into a coda for the initial syllable and the onset of the following syllable; both of these result in SC surface syllables. Example (27) shows that this structure does not require an onset consonant in word-initial position. However, underlying SC syllable

structures without onsets that are not word-initial are resyllabified with a preceding consonant as an onset consonant, thus restricting onset-less SC syllables to word initial-position; such resyllabification can be seen in (28), in which the 2SG:PRS suffix /-ak/ gains the preceding stem's final consonant /t/ during syllabification. Example (28) also shows that SC structure can also be found in even-numbered syllables after a consonant center, while (29) indicates that this syllable type can be found word internally. Finally, returning to the word in (25), there is evidence for a short diphthong (a duration of only 112 ms) in this syllable structure's vowel position. Based on my data, there do not appear to be any phonotactic restrictions for this syllable structure type; in other words, all types of obstruents and sonorants can be found in both onset and coda positions, while all qualities of vowels are legitimate in the nucleus.

The second variety of syllable with a singleton consonant coda is characterized by having a long vowel (type LC). With only thirty occurrences in my data, this syllable structure does not seem to be nearly as common as its sibling with a short vowel, and is nearly restricted to the word-initial syllable position (in twenty-six instances). Some representative examples can be seen in Table 9 below.

Table 9: Examples of syllable structure type LC

no.	phonetic transcription	gloss	duration V	C
(30)	[ʧaːn]	devil\NOM:SG	219	86
(31)	[ʃæːgʲ]	pig\GEN:SG	167	81
(32)	[saːr.n-ɛ]	speak-INF	199	81
(33)	[lu.jaːvʲ.r-ısʲt]	Lujavv'r-LOC:SG	171	73
(34)	[sarr.n-ɛʃ.kuːd.t-ıx]	talk-INCH-2SG:PRS	158	-
(35)	[lo͡aːf.k-ɛnʲ]	bag-LOC:PL	148	70
(36)	[ɛːd]	fat\GEN:SG	190	105

Examples (30) and (31) indicate that this syllable structure type can stand on its own as a monosyllabic word, while (32), (33) and (34) indicate it can also fulfill different syllable positions in multi-syllabic words. While at first glance, the bolded LC syllable in (33) is an even syllable counting from the beginning of the word, it is significant that it is followed by an actively alternating consonant center

(here in the weak form *vi̯*; the strong grade is *vvi̯*), thus indicating that it is positioned at the beginning of a foot and that the first syllable *lu* is most likely extrametrical[38]. Furthermore, (34) also supports this because the LC syllable precedes a consonant center (formed by the geminate /d:/). My data indicates that this syllable type is thus restricted to foot-initial position. The final two examples (35) and (36) indicate that both diphthongs and onset-less syllables are allowed. As with its counterpart syllable type SC, this syllable type does not appear to have any phonotactic restrictions on vowels and consonants it hosts.

When an onset-less syllable is added to a syllable with a singleton consonant coda, as is frequently the case due to suffixation, this coda is resyllabified as the onset of the following syllable. An example for this can be seen in (37); here, the final [z] of the stem becomes the onset of the added vowel-initial suffix.

(37) k͡oaz + a → [k͡oa.z-a]   cat-DIM:PL

This occurs regardless of the quantity and quality of the initial vowel.

5.2.2.2. Geminate consonant codas

The coda of a Kildin Saami syllable can also consist of a geminate consonant preceded by a short vowel. Instances of this type of syllable structure (abbreviated SG) can be seen in Table 10 below.

Table 10: Examples of syllable structure type SG

no.	phonetic transcription	gloss	duration V	duration G
(38)	[mann]	egg\NOM:SG	96	414
(39)	[suvv]	smoke\NOM:SG	97	264
(40)	[udt]	porridge\GEN:SG	74	177
(41)	[jurrʲ.t-ɛ]	think-INF	56	371
(42)	[kullˠ.tɛ.l-ə]	listen-1SG:PRS	84	288
(43)	[sar.n-ɛʃ.k͡uadt]	talk-INCH/3SG:PRS	103	266

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[38] Normally, extrametrical elements in Kildin are only found after a foot; it is unusual that this extrametrical element comes before the foot. This may be acceptable because this is a place name (Saami for *Lovozero*, the main Saami village in Russia), and frequently the phonology and phonotactics of names may deviate from what is otherwise normal for a language.

This syllable structure can stand alone as an isolated lexical item, as can be seen in (38) and (39). It does not require the presence of an onset consonant, as evidenced by (40). On the other hand, it can also be the initial syllable of a multi-morphemic utterance, as in (41) and (42). However, in my data, it only occurs twice in the third and final syllable of a word; one example can be found in (43). Otherwise, this syllable structure does not occur other than in the initial syllable. The example in (43) also shows that diphthongs are acceptable. There do not appear to be any phonotactic constraints concerning this syllable structure type.

The related syllable structure also exhibiting a geminate in the coda but with a long vowel (coded LG) is equally robust in the first syllable. Examples can be seen in Table 11 below.

Table 11: Examples of syllable structure type LG

no.	phonetic transcription	gloss	duration V	G
(44)	[mɑ:nn]	moon\NOM:SG	295	237
(45)	[ʃɘ:ŋŋ]	storm\NOM:SG	185	381
(46)	[vũe͡:dʂ]	snow\NOM:SG	327	270
(47)	[pa:ssʲ.pɛ]	thank_you	148	200
(48)	[ɑ:rɽ.t-ə]	quarrel-INF	143	202
(49)	[vɑfs.xɛ:ss]	northern_lights	153	363

This is a very frequent monosyllabic word syllable structure, as it is a frequent strong stage phonetic structure; three examples can be seen in (44), (45) and (46). In addition, (46) indicates that diphthongs are also valid in this structure. But the structure is not limited to monosyllabic words, as the words in (47), (48) and (49) show. Furthermore, the example in (48) shows two additional characteristics for this syllable structure: an onset is not required and it can also be the result of resyllabification due to a morphological process such as suffixation. With the exception of the word *vafsxe:ss* 'northern lights\NOM:SG ' in (49), this syllable structure type never occurs outside of the initial syllable in my data.

Words with an underlying syllable structure consisting of a geminate in the coda are resyllabified by splitting the geminate when a vowel-initial morpheme follows, such as the suffix *-en^j* in (50) below.

(50) $\textbf{kadt}$ + enʲ   →   [kɑd.t-ɛnʲ]   head-LOC:PL

This results in a syllable boundary found in a indeterminable place within the geminate. Here, the *dt* which represents the geminate, may be a bit misleading. As mentioned in section 3.1.2 above, this is used because plosive geminates in Kildin Saami begin voiced but become voiceless over the duration of their realization; this is the case with the example in (50). While it is possible to determine more or less where voicelessness begins (in this particular case after approximately 90 ms), a release occurs only at the end of the entire segment before the second vowel, and this is indeed a geminate. As such the syllable boundary depicted in the phonetic form between the *d* and the *t* is simply symbolic of an indeterminable syllable boundary somewhere within the geminate, but not necessarily at the point of loss of voice.

5.2.2.3. Consonant cluster codas

Just as fairly heavy geminate codas are licensed for Kildin Saami, consonant clusters can also frequently be found in coda position. Several representative examples with short vowels (type SCC) can be seen in Table 12 below.

Table 12: Examples of syllable structure type SCC

| no. | phonetic transcription | gloss | duration | | |
			V	C	C
(51)	[sɛrv]	moose\GEN:SG	61	86	47
(52)	[ʧʲɛxʧ]	autumn\GEN:SG	88	113	134
(53)	[vu͡ɛjv]	head\GEN:SG	94	99	102
(54)	[urʲm]	gadfly_larva\GEN:SG	87	118	122
(55)	[kɑ:.z-ɛsʲt]	smoke-LOC:SG	88	99	61

This syllable structure type is typically found as a free word form in the weak stage of roots, as seen in (51) and (52), both of which include the non-linear morpheme for genitive singular expressed by the weak stage. Short diphthongs are also possible as found in (53), while onset-less syllables are also valid in the

first syllable, as in (54). This syllable structure is very frequent in non-initial syllables. This is due to suffixes with an underlying onset-less VCC form, such as -esɨ 'LOC:SG', which take on the final consonant from the host morpheme during resyllabification. One example for this can be found in (55).

The counterpart to the previous syllable structure is one with a long vowel followed by a consonant cluster (type LCC). Examples for this structure are limited to the initial syllable of an utterance in my data. Several examples are listed in Table 13 below.

Table 13: Examples of syllable structure type LCC

no.	phonetic transcription	gloss	duration		
			V	C	C
(56)	[sɑːrn]	speak\CONNEG	154	76	138
(57)	[lɑːfʲk]	shop\GEN:SG	137	67	102
(58)	[joːrt]	think\3SG:PRS	164	107	108
(59)	[aːlʲp]	butterfly\GEN:SG	134	100	102
(60)	[vɑːfs.xɛss]	northern_lights	184	67	122

The examples in (56) through (59) show that this syllable structure can compose an entire word. No onset is necessarily required, as seen in (59). In addition, the example in (60) indicates that words with more than one syllable can also demonstrate this syllable type. Although my data do not include any long diphthongs for this syllable type, it seems safe to assume that such syllables exist because all other long vowel syllable types can have long diphthongs.

The final consonant of the coda's consonant cluster for both long and short vowel varieties of this syllable structure can be resyllabified if the following syllable does not provide its own onset. An example is provided in (61).

(61) lɑːfk + enʲ   →   [lɑːf.k-ɛnʲ]   bag-LOC:PL

5.2.2.4. Geminate plus consonant codas

Kildin Saami can have some very heavy syllables as a result of the two largest syllable structure types. These types are marked by not only a geminate in the coda, but by a tautosyllabic consonant following the geminate. One could assume that these are simply longer consonant clusters and thus no different than the consonant cluster coda type. However, there are good reasons for

differentiating between simple consonant cluster codas and geminate-plus-consonant codas. The difference between the two can be seen in more than just the overall duration of the codas. The individual consonants of a consonant cluster are relatively close in their respective durations; while the second consonant member tends to be longer than the first, it is never significantly longer, nor is it ever twice as long as the other. On the other hand, codas consisting of a geminate and a final consonant indicate a different relationship between the respective segment lengths. The geminate consonant is consistently at least twice as long in duration as the following singleton consonant. Furthermore, there are minimal pairs of these two syllable types (VCC and VGC) which differ only in the duration of the initial coda consonant versus the geminate.

The first structure of this type I will consider here has a short vowel (type SGC). Unlike most of the other syllable types discussed so far, instances of this type are restricted to the initial syllable of a word in my data. These can be found in Table 14 below.

Table 14: Examples of syllable structure type SGC

no.	phonetic transcription	gloss	duration		
			V	G	C
(62)	[piŋŋk]	wind\NOM:SG	100	320	134
(63)	[vʲɛrr̥ts]	satchel\NOM:SG	96	240	105
(64)	[jurr̥t]	think\CONNEG	72	250	76
(65)	[urrʲm]	gadfly_larva\NOM:SG	118	172	71

As the examples in (62) through (65) indicate, this syllable template is found in monosyllabic words. These are always the strong stage of consonant gradation and indicate singular nominative for nouns and the third person singular present for verbs. Example (65) further shows that no onset consonant is required.

In my data no examples for multisyllabic words with this structure can be found, nor are there any instances of a short diphthong. However, the affixation of a suffix with an onset consonant (such as -bedte '2PL:PRS') could theoretically allow such a heavy initial syllable to retain its weight in a multisyllabic word, but the two examples that my data contain indicate that an initial underlying geminate is realized as a singleton whose duration hardly differs from the final consonant. One of these examples is found in (66):

(66) /jurrʲt-bedte/ → [jurʲt.-bɛ.tɛ] 'think-2PL:PRS'

Here, the duration of [rʲ], the underlying geminate, at 76 ms is in fact nearly identical to the final consonant [t], with a duration of 75 ms. This could indicate a maximum length constraint for the consonant center or the foot which is adhered to using a process of compensatory shortening. Unfortunately these data are based on only a few instances and are thus very impressionistic; more data are needed to make any robust conclusions and this particular task must be left to future research.

The companion syllable structure type consists of a long vowel and a coda with a geminate and a final consonant (type LGC); examples can be found in Table 15 below.

Table 15: Examples of syllable structure type LGC

no.	phonetic transcription	gloss	duration V	G	C
(67)	[sɛ:rrv]	moose\NOM:SG	223	229	112
(68)	[tɑ:llʲv]	winter\NOM:SG	250	271	82
(69)	[vu͡e:jjv]	head\NOM:SG	147	192	92
(70)	[a:llʲp]	butterfly\NOM:SG	152	162	73
(71)	[ɑ:rr̥t]	quarrel\IMP	158	314	154

As with the previous related syllable structure, this syllable structure is limited to monosyllabic words in my data, all of which are in the strong stage of consonant gradation. Furthermore, (69) shows a long diphthong, while examples (70) and (71) indicate that, again, no onset consonant is required for this syllable structure.

Similar to the structure of the previous syllable type, it is theoretically possible to add a suffix with an onset consonant (such as *-bedte* '2PL:PRS'), thus allowing this syllable structure to exist in a multisyllabic word. But my limited data has but one instance of this, and again, a geminate does not in fact appear to be realized, even though one is present underlyingly. This single example is shown here in (72).

(72) /sa:rrn-bedte/ → [sa:rn.-bɛ.tɛ] 'speak-2PL:PRS'

Here, the geminate /rr/ is realized with a duration of 91 ms and the following /n/ with 65 ms. This duration ratio is closer to the patterns of simple consonant clusters, and not geminate-plus-consonant codas. As mentioned above, more research is required to ascertain more precisely what factors are at work in such instances.

With either a long or a short vowel preceding this coda type, resyllabification consistently follows the same process as with previous syllable structures as the final syllable is resyllabified to an otherwise onset-less following syllable. This can be seen in example (73).

(73) **kullt**el + ak → [**kull**.tɛ.lak] bag-LOC:PL

The original geminate-plus-coda syllable structure is thus resyllabified as a simple geminate coda syllable.

5.2.2.5. Syllable templates lacking a coda

Despite the evident significance of syllables with a coda in Kildin Saami, there are situations in which a syllable may lack a coda. Such a syllable can contain either a short or a long vowel; however, it never composes an entire word itself. In other words, this syllable type is always bound and there are no monomorphemic words lacking a coda. Some examples for short vowel syllables lacking a coda (type S) can be found in Table 16 below.

Table 16: Examples of syllable structure type S

no.	phonetic transcription	gloss	duration V
(74)	[**su**.v-ɛsʲt]	smoke-LOC:SG	68
(75)	[ʃ**æ**.gʲ-ɛsʲt]	pig-LOC:SG	109
(76)	[**u**.t-ɛnʲ]	porridge-LOC:PL	104
(77)	[sunn.**t-ɛ**]	melt-INF	61
(78)	[kull**ɣ**.t**ɛ**.l-a]	listen-1SG:PRS	72 / 77
(79)	[sar.n-ɛʃ.**ku͡ɛ**.**d-a**]	talk-INCH-1SG:PRS	77 / 70

If this syllable structure occurs in the initial syllable, it is nearly always the weak consonant gradation form of the stem whose underlying singleton consonant coda has been resyllabified as the onset for the following syllable; this is the case in examples (74), (75) and (76). The word in (76) [**u**.tɛnʲ] 'in the porridge' is of

particular interest because it contains the smallest possible syllable in Kildin Saami: a syllable which consists solely of a single short vowel. However, this syllable structure never occurs alone, but is always due to resyllabification after the application of morphophonological processes such as suffixation (here the suffixation of -en ^{j} 'LOC:SG' to the weak stage *ut* of the root *udt* 'porridge').

While this syllable structure is rather limited in the first syllable, it is quite frequent in subsequent syllables due to the affixation of the onset-less suffixes found in Kildin (-*e* 'INF', -*a* '1SG.PRS' for instance), which resyllabify with the final consonant of the preceding syllable, as seen in (77), (78) and (79). Furthermore, the penultimate syllables in examples (78) and (79) show that this syllable structure can occur word-internally, also due to the resyllabification of a single tautomorphemic coda consonant. Short diphthongs are also possible in this syllable structure, as is the case in (79).

The related syllable structure type also lacks a coda consonant, but has a long vowel (type L). This syllable type is also limited in its distribution because it never occurs alone as a monosyllabic word, but instead always requires at least a second syllable for the same reasons as the previous syllable structure type with no coda and a short vowel. Examples can be found in Table 17 below.

Table 17: Examples of syllable structure type L

no.	phonetic transcription	gloss	duration V
(80)	[ja:.l-a]	live-1SG:PRS	185
(81)	[ʧa:.n-ɛsʲt]	devil-LOC:SG	151
(82)	[pu͡a:.l-ɛnʲ]	button-LOC:PL	189
(83)	[ɛ:.d-ɛsʲt]	fat-LOC:SG	149
(84)	[vup.-xa:]	father_in_law-ABESS:SG	192
(85)	[ʧɑ:hh.pɛ:]	dark-PRED	189

As examples (80) through (83) indicate, this syllable structure occurs in the first syllable only if the underlying tautomorphemic singleton coda is resyllabified with the following onset-less suffix. A long diphthong is possible for the vowel, as in (82), and no coda is required, as in (83). There is only one context in my data in which a long syllable occurs outside of the first syllable and without a coda consonant: in utterance-final position. As with the other examples of this

structure in a non-initial syllable in my data, the two examples in (84) and (85) were both recorded as the final elements of a sentence after which a significant pause followed. For this reason, I assume that this is in fact lengthening of a short word-final open syllable caused by the word's position at the end of an utterance. While this syllable structure type does exist, it is very restricted in its occurrence.

Resyllabification is not relevant for these last two types of syllable structure because the structure itself does not have any underlying coda which could be resyllabified. Furthermore, these structures never occur alone underlyingly as a stem, but only on the surface as a result of resyllabification of singleton-coda types which have lost their codas due to suffixation. Therefore, the test used to indicate resyllabification in previous structure types with codas, i.e. the introduction of an onset-less suffix, in not applicable here.

5.2.2.6. General syllable templates in Kildin Saami

As the previous sections have shown, an analyses of my data indicates that there are a total of ten various syllable structure types regarding vowel length and coda constituency in Kildin Saami. However, the characteristics of these structures varies from type to type. These variations become clear by considering, for each structure type, whether it:

1. exists on its own as a monosyllabic word;

2. can occur in the initial syllable of a multisyllabic word;

3. can occur in a word-internal syllable of a multisyllabic word;

4. can occur as the word-final syllable of a multisyllabic word;

5. accepts diphthongs;

6. requires a word-initial onset.

A summary of their characteristics can be found in Table 18 below.

Table 18: Characteristics of syllable structure types

		SC	LC	SG	LG	SCC	LCC	SGC	LGC	S	L
1.	monosyllablics	✓	✓	✓	✓	✓	✓	✓	✓	-	-
2.	word-initial	✓	✓	✓	✓	✓	✓	-	-	✓	✓
3.	word-internal	✓	✓	-	-	-	-	-	-	✓	-
4.	word-final	✓	-	✓	✓	✓	-	-	-	✓	✓[39]
5.	diphthong	✓	✓	✓	✓	✓	-	-	✓	✓	✓
6.	word-initial onset required	-	-	-	-	-	-	-	-	-	-

S: short vowel, L: long vowel, C: consonant, G: geminate, CC: consonant cluster

This chart indicates the variety found within the different syllable types. Indeed, the only common characteristic is that word-initial onset consonants are not required by any of the syllable types. Any monosyllabic word must contain at minimum one coda consonant. The larger the coda gets, the less likely it is found outside the initial syllable, while word-internally only lighter syllables of the types SC, LC and S are found. While the information in Table 18 indicates that diphthongs do not occur in the syllable types LCC and SGC, I suspect this is simply due to a lack of data, as both long and short diphthongs occur in the other syllable types.

Taking the characteristics above and the previous discussions into consideration, the skeleton syllable structure in (86) can be posited for unbound monosyllabic words in Kildin Saami.

(86) (C_0) V(:) C(:)$_1$ (C$_2$)

Here, the minimum skeleton consists of a short vowel *V* and a coda consonant C_1. The onset consonant C_0, a long vowel *V:* and long initial coda consonant *C:$_1$* (geminate) as well as a final coda consonant C_2 are all optional. However, the skeleton syllable structure for any bound syllable is lighter, but requires an onset consonant, as represented in (87).

(87) C_0 V(:) (C(:)$_1$) (C$_2$)

In other words, all non-initial syllables are required to have an onset consonant C_0 and at minimum a short vowel *V*. Additional segmental material is optional.

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[39] As mentioned in section 5.2.2.5, open syllables with a long vowel only occur utterance-finally in my data, and are probably simply the result of an utterance final lengthening rule.

The skeleton structure in (86) is valid for an initial syllable and requires a coda consonant, while the second skeleton structure in (87) is reserved for non-initial syllables and requires an onset consonant. Keeping this in mind, these syllable structures help explain why the consonant center is such an important concept in Saami linguistics. If an initial syllable always requires a coda, while all subsequent syllables require an onset, it is inevitably the case that every utterance has at least a consonant at its center, even if the peripheries consist only of vowels. But if one looks at the situation the other way around, then the concept of the consonant center explains why these syllable structures occur in Saami. This leads back to the phonological unit of the foot. Essentially, a foot in Kildin Saami is based on a weighted consonant center, with a vowel at least to the left and possibly to the right. Based on my data, a foot is thus minimally VC and maximally CVC:C for monosyllabic utterances, while it is minimally VCV and maximally CVC:CVC for bisyllabics. Due to these minimal forms, there is a minimality constraint such that a foot consists of at least two moras. Heavy and superheavy consonants are restricted to the consonant center, the center of a foot. At the foot's periphery, heavy and superheavy consonants do not occur. Similarly, long vowels consistently occur preceding a consonant center, while they are rare following a consonant center. Taken all in all, a foot in Kildin Saami centers around weight, both in the initial vowel and coda consonants, while a foot's periphery is light. However, the role that the syllables following the initial foot of a word play is unclear based on my limited data. While my data do not refute the traditional idea of the Saami disyllabic unit, they do not rule out the possibility that the foot in Kildin may refer to more than just the initial two syllables.

Frequently, intonation can also play a role in defining feet for a language; the following section takes a closer look at the phenomenon of intonation in Kildin Saami in order to determine if intonation is a relevant variable in determining Kildin feet.

5.2.3. Stress patterns - empirical evidence

As mentioned in section 5.2.1 above, the database also includes acoustic information which, at least cross-linguistically, has been known to influence and define stress. For this reason, the duration in milliseconds, the average intensity in decibels and the average pitch in hertz was recorded for each vowel. Furthermore, the duration of each consonant center and its individual segments

and the center's average intensity were also measured and entered into the database. In my analyses, the data from each speaker were treated in isolation from the other speaker's data; this is normal linguistic practice since idiolectal features can potentially obscure general tendencies.   This information was recorded in order to test for correlations between the variables of syllable ranking (first, second, third or fourth syllable), intensity and pitch. However, due to the relatively small sample sizes (126 syllables recorded for MM, 235 syllables for NA), these results should only be considered impressionistic.   Hopefully, however, they can serve as a basis for further and more thorough research.

5.2.3.1. Intensity measurements

The average intensity across the duration of each recorded vowel was measured and entered into the database.   These measurements were then averaged together under consideration of the respective syllable's position in a word as the dependent variable in order to determine if syllable position correlates with intensity. The decision to compare initial syllables with non-initial syllables was based on the fact that the literature on Saami consistently claims that main stress in Kildin Saami is placed on the initial syllable of a word (cf. 4.2.3).   Therefore, if intensity plays a role in the perception of stress, then intensity should be different (i.e. higher) in the initial syllable than in non-initial syllables.   The resulting mean vowel intensities for both NA and MM are presented in Table 19 below.

Table 19: Mean vowel intensity (in dB) for NA and MM based on syllable position

	syllable 1			syllable 2			syllable 3			syllable 4		
speaker	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n
NA	71.77	4.33	128	68.42	7.50	85	68.31	7.28	16	67.33	2.16	6
MM	76.94	4.65	77	75.19	3.53	31	74.77	4.69	13	75.00	3.16	5

sd = standard deviation, n = total number of syllables analyzed

These calculations indicate that for both speakers, the vowel of the initial syllable is louder than the vowels of following syllables on average. For NA, the differences in average intensity between the initial vowel and the second, third and fourth vowels are 3.35, 3.46, and 4.44 dB, respectively, while non-initial vowels never differ from one another by more than 1.09 dB. For MM, the pattern is the same, but the differences are less extreme: the differences in average intensity between the initial vowel and the second, third and fourth vowels are

1.75, 2,17, 1.94 dB, respectively, while the difference between any two non-initial vowels is never more than 0.42 dB.

However, this is very impressionistic. It is important to test the difference between the intensity of the initial syllable's vowel and the intensity of non-initial syllables' vowels in order to establish whether there is a statistically significant difference in the distribution of intensity. To do this, I performed two-sample t-tests[40] to determine the probability of the actual distribution of measured intensities correlating with the respective syllable's position as either initial or non-initial. In other words, a two-sample t-test can show whether, from a statistical point of view, the intensities of initial syllables' vowels are significantly different than the intensities of non-initial syllables' vowels. If there is a significant difference, then the probability value (p-value) will be very low (<0.05), indicating that the chance of the actual distribution having arisen purely by coincidence is very small and essentially negligible. On the other hand, if the p-value is not exceptionally low (>0.05), then it cannot be reasonably ruled out that the actual distribution occurred by chance, in which case any seeming correlation between intensities of the initial vowels and those of non-initial syllables is coincidental.

The results of the two-sample t-test on the distribution of intensity between initial and non-initial syllables are summarized in Table 20 below.

Table 20: Results from t-tests on intensity for initial-syllable relevance

speaker	n=	p-value from Welch's 2-sample t-test
NA	236	0.00003
MM	126	0.01446

The p-values of these tests indicate that, for both speakers, the chances are very small that the distribution is coincidental. This supports the initial impressions about the mean intensity values presented in Table 19 which indicated that the intensity of an initial syllable's vowel is higher than the vowels of non-initial syllables. It can thus be concluded that, based on my preliminary data, intensity may be an acoustic correlate of stress in Kildin Saami.

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[40] I used the independent two-sample Welch's t-test here and for all other t-tests because the two samples involved in each test always have unequal variances. However, standard t-tests done on the same samples returned essentially the same results.

5.2.3.2. Duration measurements

Another possible acoustic correlate of stress is vowel duration. In order to determine whether or not there is a correlation between vowel duration and stress at the syllable level, the duration of each vowel was recorded and then the mean for each syllable position was ascertained. Again, the decision to compare vowel duration based on syllable position was made because main stress has been considered present in the initial syllable of a word, and thus, if vowel duration plays a role in the realization of stress, then the initial syllable should have a noticeably different duration than other syllables. The mean syllable duration values for both speakers based on syllable position can be found in Table 21 below.

Table 21: Mean duration (in ms) for NA and MM based on syllable position

	syllable 1			syllable 2			syllable 3			syllable 4		
speaker	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n
NA	139.09	51.61	128	97.41	40.60	85	75.69	19.35	16	71.83	20.15	6
MM	145.16	74.80	77	87.06	23.94	31	109.23	23.46	13	118.80	27.80	5

sd = standard deviation, n = total number of syllables analyzed

A look at these figures suggests that the initial syllable indeed contains on average a longer vowel than non-initial syllables but that the variance here is greater as well. For NA, average vowel length decreases consistently from left to right, with the largest drop (41 ms) between the initial and second vowel length averages, and smaller drops towards later syllables. While MM's initial vowel durations are on average at least 26 ms longer than other syllable's averages, the overall picture of average vowel length throughout a word does not fall consistently from left to right, but indicates a small increase in length after the second syllable.

In sum, it seems that the initial syllable's vowel does tend to be longer, but again, this impression needs to be tested for statistical significance, as was the case for intensity. Two-sample t-tests were applied to these data in order to determine if there is a statistically significant correlation between a vowel's duration and its position in an initial or non-initial syllable. If there is a correlation, then the p-values will be very low (<0.05), and we can assume that the chances of this distribution being coincidental are negligible. If there is no correlation, then the p-values with be above 0.05 and we can assume that the initial impressions concerning the important role of syllable position in vowel length are misleading.

The results of the two-sample t-test on the distribution of duration between initial and non-initial syllables are summarized in Table 22 below.

Table 22: Results from t-tests on duration for initial-syllable relevance

speaker	n=	p-value from Welch's 2-sample t-test
NA	236	0.0000000000001
MM	126	0.0000008

All of the p-values fall below the 0.05 limit. This indicates that there is indeed a significant difference between the average duration of vowels in the initial syllable and those of non-initial syllables.   Therefore, duration may, in addition to intensity, be considered a relevant factor in the distribution of stress patterns.

5.2.3.3. Pitch (F0) measurements

A third potential acoustic correlate of stress is the fundamental frequency (F0) of vowels. The same methodology was used to analyze pitch as was used in the analysis of intonation. In other words, the average F0 for the duration of each recorded vowel was entered into the database in Hertz. These values were then averaged together in groups based on the position of their respective syllable in the recorded word. Again, the decision to compare vowel pitch based on syllable position was made because main stress has been considered present in the initial syllable of a word, and thus, if pitch plays a role in the realization of stress, then the initial syllable should have a noticeably different pitch than other syllables.   The mean syllable F0 values for both speakers based on syllable position can be found in Table 23 below.

Table 23: Mean F0 (in Hz) for NA and MM based on syllable position

	syllable 1			syllable 2			syllable 3			syllable 4		
speaker	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n
NA	244.61	38.54	128	204.20	53.35	85	180.44	38.72	16	154.00	9.53	6
MM	191.49	44.42	77	185.48	43.88	31	209.00	48.94	13	177.20	51.64	5

sd = standard deviation, n = total number of syllables analyzed

First of all, the standard deviations in these measurement are noticeably high, indicating a large amount of variance in pitch within syllable groupings, thereby weakening the meaningfulness of these measurements and indicating the wide range of pitch used by these speakers.   For NA, there is a very noticeable difference in the mean of the initial vowel pitches, indicating that on average, the initial vowel carries a much higher pitch than non-initial vowels.   The

difference between the initial vowel's pitch and any other syllable's pitch is at least 40 Hz, while the difference between the second vowel's average pitch and the third is only 24 Hz, and between the third and fourth syllables there is a difference of 26 Hz. However, the total number of samples measured for the third and fourth syllables is fairly low. Nonetheless, an overall trend of pitch lowering can be seen in NA's data. The average pitch continues to drop from the initial vowel to the final vowel, which is more or less in line with the prediction that the initial syllable receives stress.

On the other hand, the data from MM do not seem to support this prediction because, on average, the third syllable has the vowel with the highest pitch, and not the first. However, the overall changes across these data are much smaller than those from NA (the largest difference here being 32 Hz between the third and final averages). In addition, there does not appear do be a general fall in pitch from left to right.

It is again useful to test these data statistically to see if there is a significant difference between the initial syllable's vowel and non-initial syllables' vowels. I again performed two-sample t-tests. If there is a significant difference, then the probability value (p-value) will be very low (<0.05).

The results of the two-sample t-tests on the distribution of intensity between initial and non-initial syllables are summarized in Table 24 below.

Table 24: Results from t-tests on F0 for initial-syllable relevance

speaker	n=	p-value from Welch's 2-sample t-test
NA	236	0.0000000000005
MM	126	0.941

The two-sample t-tests again confirm the impression that the mean pitch measurements per syllable in Table 23 provide. In the data collected from NA, there is a significant difference between the F0 of the initial syllable's vowel and the F0 of non-initial syllables' vowels, as shown by the very low p-values. On the other hand, the p-values for the data from MM are well above the cutoff p-value of 0.05. This indicates that it cannot be ruled out that any differences between the initial vowel's F0 and non-initial vowel F0 measurements for MM are due to chance; indeed, with p-values at 0.94, the chances are excellent that any differences between the pitch of initial and non-initial syllables are purely coincidental.

This is a surprising difference, particularly because the other measurements and assessments for both speakers indicated that their use of intensity and length is more or less analogous. There are several possible explanations. First of all, the actual recordings with NA were very controlled and done in a sound-proof phonetics laboratory specially made for high-quality recordings, while recordings with MM were done in an office in Lovozero using a video camera and external microphone. That office is in a fairly busy building and the walls are far from being sound-proof. While an external microphone was used and the camera was set to not compress audio data, the actual setting for the recordings with MM could have affected the quality, resulting in poor F0 recording. Intensity, on the other hand, is picked up by any microphone and recording device, as long as it is within the recording range for the particular device, so the office setting did not make a significant difference for measuring intensity as it did for measuring F0. Another possible explanation could be that the sample size used to arrive at these measurements is not sufficiently large to obtain conclusive results, particularly for MM (a total of 126 measured syllables, as opposed to 236 for NA); however, this did not appear to affect measurements on intensity and pitch. Alternatively, this variation in pitch measurements could reflect the difference between two unique idiolects spoken by NA and MM (although any linguistic field research has to assume that individual speakers produce patterns representative of their speech community). A final possibility is that there is a difference in dialects spoken by the two such that pitch level plays a role in differentiating between initial syllables and non-initial syllables in Aarsjogk, NA's dialect, while in Koarrdegk, MM's dialect, pitch is not relevant in this respect.

However, assuming that the recording quality was adequate for recording F0, that the sample size was sufficient for analyses, and that this is not a idiolectal difference, then perhaps pitch is indeed a relevant indicator of an initial syllable and an acoustic correlate to stress for Aarsjogk, while in Koarrdegk Kildin Saami, pitch is either irrelevant, or distributed differently. The third syllable vowels in MM's data have the highest mean F0 measurements, which could indicate that the third syllable is significant for pitch patterning in Koarrdegk. To test this possibility, I applied two-sample t-tests to this hypothesis in order to determine whether the third syllable vowel's F0 is consistently different than non-third-syllable vowels from a statistical point of view. The results are found in Table 25 below.

Table 25: Results from t-tests on F0 for third-syllable relevance (MM only)

speaker	n=	p-value from Welch's 2-sample t-test
MM	126	0.1768

These relatively high p-values indicate that there is no statistically significant correlation between third-syllable F0 values and non-third-syllable F0 values. In summary, it is not clear why the distribution of pitch appears to be relevant only for NA and not for MM. Further research based on larger data collections from more speakers is required to answer this question satisfactorily.

5.2.3.4. Consonant center duration measurements

One final aspect of Kildin Saami acoustics remains to be investigated for its potential role in stress patterns: the consonant center. Typically, vowel acoustic phonetics are the focus when studying influences on stress patterns, but because the consonant center is such an integral part of Saami morphophonology, it seems justified to look for a possible correlation between the duration of any consonant groups and relative position within a word. In order to avoid assuming that consonant centers behave differently than consonants not found in consonant centers, it is important to treat all groups of consonants equally, regardless of their relative position in a word.

As demonstrated in section 5.2.2.6, Kildin Saami syllables frequently have codas; these can consist of one singleton, a consonant cluster, a geminate, or even a geminate and a final consonant. Indeed, all monosyllabic words (lexical stems) have at the very least a simple singleton coda. A consonant group can span two syllables, but when resyllabification is necessary, only the final element (or the latter portion of a geminate, the exact position of which is indeterminable) is syllabified as the following syllable's onset. Once this onset constraint for non-initial syllables has been fulfilled, any extra consonant group material is assigned to the initial syllable. Therefore, superheavy consonant groups (macro-type GC) are more a part of the left syllable than of the right syllable, while lighter consonant groups (macro-types C, G, and CC) are equally split or only part of the right syllable. Because consonant groups are not by default part of a single syllable (except when utterance final), it is best to consider these as a single unit and disregard syllable boundaries when looking at duration. For this reason, consonant center duration measurements were made for the entire consonant center; their average durations were then calculated and grouped into relative syllable position. Because monosyllabic words always have a consonant center

composing their coda by default, they were left out of these calculations because their inclusion would skew the results in favor of initial consonant groups. In other words, only multisyllabic words were considered here. The mean duration of consonant groups regarding their relative position in a word can be found in Table 26 below.

Table 26: Mean consonant group duration (in ms) based on relative position

	spans syllables 1-2			spans syllables 2-3			spans syllables 3-4			end of syllable 4		
speaker	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n
NA	180.66	86.52	85	146.70	73.15	69	134.55	63.45	11	95.33	25.42	3
MM	222.35	91.71	31	179.38	93.64	21	155.78	71.02	9	218	82	2

sd = standard deviation   n = total number of syllables analyzed

First of all, the figures from the last category (end of syllable 4) should be disregarded because of the very small number of consonant groups in this position in the data (3 for NA, 2 for MM). Looking at the first three positions, a situation can be observed which again seems to concentrate more duration in the initial position, as was noticed for vowel intensity and duration, and somewhat for pitch. For both speakers, the differences in average duration between the first category and the second or third category is much larger than the differences between the second and third categories themselves. This would indicate a preference for larger consonant groups between the first and second syllables of a word as compared to other syllable spanning positions farther to a word's right.

These impressions also need statistical testing. The same types of two-sample t-tests were performed on these data to determine if there is a statistically significant difference between initial consonant groups and non-initial consonant groups, or whether any seeming difference is possibly due to chance. Thus, a p-value below 0.05 indicates that a consonant center's duration correlates with its position within a word.

The results of the t-tests on consonant center duration relative to position in a word are found in Table 27 below.

Table 27: Results from t-tests on consonant center duration

speaker	n=	p-value from Welch's 2-sample t-test
NA	168	0.002533
MM	63	0.04601

These p-values demonstrate that there is in fact a statistically significant correlation between consonant group length and its position in the word, although

the p-values for MM have a borderline significance. This corresponds with the discussion on syllable structures which indicates that syllable structures with longer codas (specifically macro-types LCC, SGC and LGC) are not found in word-final position (aside from monosyllables). Furthermore, this supports the claim found in the literature that true phonological consonant centers (exhibiting consonant gradation) only bridge odd and even syllables, but not even and odd syllables. Unfortunately, my data can only show that this is true for the initial odd-even syllable position because there is not enough data to come to any conclusions on further odd-even syllable positions.

5.2.3.5. General stress patterns

In summary, it appears that the initial syllable of a word is significantly more salient in Kildin Saami than non-initial syllables. Measurements of vowel intonation and duration, and to a limited extent vowel pitch, are all observably higher for the initial syllable than for subsequent syllables. Similarly, measurements of consonant group duration are higher for consonant groups between the initial and second syllables than between other syllables. Taken together, this indicates that the initial syllable and the initial consonant center are more prominent than non-initial syllables and non-initial consonant groups. From a semantic point of view, it is certainly no coincidence that the initial syllable receives preferential treatment as it also carries the core lexical information for a word, while non-initial syllables tend to provide grammatical information.

These observations support the claim found in the literature on Kildin Saami that the word initial syllable is stressed, while the second syllable as well as any word-final syllables are unstressed. Furthermore, my data show that intensity and duration are reliable acoustic correlates indicating the phonological phenomenon of stress. Pitch is potentially also a correlate, but the data are ultimately inconclusive on this matter. Unfortunately, my data collection is not large enough to make any substantial claims about the relationship between secondary stress and acoustic phonetic measurements, nor can I make any absolute claims about the structure and stress patterns of third or fourth syllables. Nonetheless, my data indicate that there is a phonological domain which may be defined by both syllable structures and stress patterns. This domain consists of lexical words and their suffixes; these are minimally one heavy syllable (at least bimoraic, syllable type SC), but may include following syllables which may be very light (monomoraic, syllable type S). Main stress is located on the initial syllable, but not on the following syllables. At this point, this domain is defined by

its left edge. Until more data is gathered, the location of the right edge remains uncertain.

$$[\acute{\sigma}_1 \quad (\sigma_2)(\sigma_3)(\sigma_4)...]_{\varphi/\omega}$$

heavy   lighter
stressed   unstressed
syllable   syllables
[stem ± suffix(es)]

Figure 10: Domains for syllable structures and stress patterns

However, it is unclear how to best describe this. On the one hand, it could be a single domain centered around a consonant center with differing limitations on initial versus non-initial syllable structures and with stress on the initial syllable, but not on non-initial syllables. On the other hand, there could be two different domains: a foot domain (based on syllable structure restrictions) and a stress domain (defined by a word-initial stressed syllable and the following unstressed syllables within the same stem-affix word).

Finally, I return to the foot-based rules discussed in section 5.1, summarized there in Figure 9. Based on the current analyses, these rules should be given the following modifications as well as one addition, indicated by italics, in Figure 11 below. These revised and new domain-based rules may be amended as additional data and analyses become available.

1'.   Consonant gradation occurs *word*-internally;
2'.   All consonants and consonant clusters are licensed *word*-internally;
3'.   Only singleton consonants at the left edge of a *word*;
4'.   The initial syllable of a *word* is stressed;
5'.   Unstressed vowels are *normally* short;
6.   *The initial syllable of a word receives main stress*

Figure 11: Revised domain-based rules for Kildin Saami

6. Conclusion

The goals of this thesis were manifold. I first provided an overview of the linguistic situation of Kildin Saami as well as a general linguistic description focusing mainly on phonological aspects. A review of the literature concerning syllables and stress was also given; this treated considerations of a general and cross-linguistic nature as well as those specifically related to Saami studies. Most importantly, I undertook a description of the results of my own research concerning syllable structures and stress patterns in Kildin Saami. In this I presented the field work situation and my data collection methodology before analyzing and interpreting the data.

Ultimately I have shown that the variety of syllable structures and the distribution of stress patterns in Kildin Saami complement one another in focusing on the initial syllable of a word. There is evidence for the occurrence in the initial syllable of every possible syllable structure type when taking monosyllabic and multisyllabic words into consideration; non-initial syllables on the other hand are more restrictive in the syllable structure types they license. In a similar fashion, the initial syllable stands apart from non-initial syllables by hosting louder and longer vowels and being followed by longer consonant groups. Unfortunately, my collection of data is not extensive enough to truly corroborate claims from previous studies on both Kildin specifically and Saami in general about compensatory lengthening, secondary stress or the variety of syllable structures found in non-initial odd-numbered syllables (indications for a trochaic foot structure).

Nonetheless, the current study could be useful not only for Saami scholars as it can provide a reference point for ascertaining stress and syllable structures, but for general linguists as well since it documents another possible variety of stress patterns and syllable structures. Furthermore, this can be used as a starting point for further research into many intriguing questions about Kildin Saami. These include:

- the differences between the various Kildin dialects with respect to syllable structure and stress, particularly concerning the role of pitch patterns;
- the overall distribution of syllable structures and stress patterns in words of four syllables or more;
- whether compensatory lengthening is indeed absent from Kildin Saami
- the relevance of syllable structure distribution and stress patterns in defining foot structure and/or phonological wordhood.

7. References

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19. Juni 2007