The Phonological Representation and Distribution of Vowels in SENĆOŦEN (Saanich)

by

Janet Leonard
B.A, University of Victoria, 2004
M.A, University of Victoria, 2006

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Supervisory Committee

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Abstract

This dissertation provides the first comprehensive analysis of the phonology of vowels in SENĆOŦEN (Salish). Evidence from various phonological and phonetic phenomena are brought together to support a proposal that there are two types of phonological vowels in SENĆOŦEN (full vowels versus schwa). Understanding the phonological representations and distributions of these two types of vowels contributes a unique perspective on how words are built in the language. The study contributes to linguistic theory by showing how the interplay between faithfulness to morphological form and markedness conditions on ideal surface prosodic shape triggers a series of vowel processes, such as deletion, epenthesis, harmony and reduction, which make it difficult to trace back to the original morphological form. In taking steps towards unraveling the complicated interaction between morphology and phonology in the language and providing insights crucial to an understanding of the underlying forms of roots and suffixes, the dissertation contributes to pedagogy by making it easier for language learners to figure out for themselves how words are related to one another.

The dissertation is organized into seven chapters. Chapter 1 provides an overview of the language situating it within the context of research on other Salish

languages. Chapter 2 lays out the theoretical assumptions about SENĆOŦEN that are adopted in this dissertation. Chapter 3 argues for a phonological contrast between two types of vowels in SENĆOŦEN and argues against the notion that consonants bear phonological weight in SENĆOŦEN. Chapter 4 presents a preliminary acoustic analysis of vowel length and quality. Chapter 5 argues that syllables in SENĆOŦEN are basically simple and that the phonological environments when they are not simple are highly constrained and predictable. Chapter 6 argues that patterns of zero-schwa alternations found in complex morphological structures are accounted for by wellformed foot structure. Chapter 7 is a conclusion.

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Dedication

Dedicated to the memory of Late ȾKOLEĆTEN (Ivan Morris Sr.,) and Late W̱IJELEK (Raymond Sam)

Abbreviations and Symbols

Abbreviations[1]

1SGPOSS	....	First-person singular possessive
2OBJ	....	Second-person object, 'you'
ACTL	....	Actual (continuative) aspect
ACTV(ACTL)	....	Structured activity suffix (actual aspect)
BECM	....	Become, mutative
BEN	....	Beneficiary applicative
CAUS	....	Causative
CHAR	....	Characteristic
DEV	....	Developmental
DIM	....	Diminutive
DUR	....	Durative
EMOT	....	Object of emotion transitivizer
EXT	....	Stem extender
FOR	....	Reason, thing, place for, causal
HAB	....	Habitual
IMMED	....	Immediate
IN_LAW	....	In_law
INSTR	....	Instrument lexical suffix
LOC	....	Locative
MDL	....	Middle voice
NCMDL	....	Non-control middle
NCRCPRCL	....	Non-control reciprocal
NCTRNS	....	Non-control transitivizer
PART	....	Part, apart
PERSIST	....	Persistent aspect
PL	....	Collective plural
PSV	....	Passive
PTCAUS	....	Put, locative causative
RCPRCL	....	Reciprocal

[1] The abbreviations list follows Montler (2018).

RFLXV	....	Reflexive
RSLT	....	Resultative
S	....	S[2]
S	....	S-nominalizer
STAT	....	Stative
TRNS	....	Control transitivizer[3]

Symbols[4].

“~”	....	Reduplication
“√”	....	Root
“-”	....	Concatenative morphology
“<>”	....	Noconcatenative morphology[5]
“=”	....	Lexical suffix

[2] This is used when it is unclear what the “s” is expressing.

[3] This is the term used in Montler (1986).

[4] The list of symbols mostly follows the Leizpeg conventions. Note that the Leizpeg use of “=”, is conventionally used to mark clitic boundaries, whereas in this dissertation it is used to mark lexical suffix boundaries. The use of “=” in this way is in-line with the Salish literature. Also note the use of “√” to indicate the root of a word. This is the symbol used most often in the Salish literature to indicate the root of a word in the morphological gloss.

[5] Throughout this dissertation the symbol “<>” is also used to represent an epenthetic schwa in the diagrams representing prosodic structure.

Chapter 1 Introduction

1.0 Goals of Chapter 1

The main goal of this dissertation is to argue that there are two types of phonological vowel in SENĆOŦEN [Saanich, Northern Straits Salish]. The two types of phonological vowels are underlying full vowels, on the one hand, and schwa on the other. In this dissertation, I examine morpho-phonological phenomena which support the proposal these two types of vowels have different abstract representations. A set of underlying full vowels /i, e, a/ are specified for phonological weight features and phonological place features.[6] Schwa has neither mora nor place features.

A secondary goal of this dissertation is to sort out exactly what kinds of segments in SENĆOŦEN have been referred to by the term *schwa.* At least three different types of sounds have been termed *schwa* and are represented with the symbols *ə* and *E* in scholarship concerning SENĆOŦEN linguistics (see among others Caldecott 1999, Kiyota 2008, Leonard 2007, Montler 1986, 2015a, 2018, Turner 2007, 2011a). The first type of vowel represented with the symbols *ə* and *E* is a central vowel which is present at the underlying level of representation. This vowel is called an underlying schwa. The second type of vowel represented with the symbols *ə* and *E*

[6] The underlying vowel /u/ occurs only in borrowed words and will not be discussed in this dissertation.

is a central vowel, sometimes stressed, sometimes not, which is not present at the underlying level of a prosodic word. This type of vowel is called an epenthetic schwa. The third type of vowel represented with the symbols *ə* and *E* is an unstressed vowel derived from an underlying full vowel. This type of vowel is called a reduced vowel.[7]

This dissertation contributes to the literature by offering a detailed description of the behaviour and characteristics of SENĆOŦEN vowels. In particular, this dissertation delves deeper into the behaviour of schwa with respect to prosodic structure. The Salish language family is a language family well known for having schwas of interest (see Czaykowska-Higgins & Kinkade 1998). This dissertation brings together new, as well as previously published, SENĆOŦEN language examples in ways which exemplify specific phonological properties which are used as evidence to argue for the abstract representation of, and the distribution of, two types of phonological vowels in SENĆOŦEN. The phonological description and analysis of SENĆOŦEN vowels is supported by a preliminary acoustic study of stressed versus unstressed vowels. Taken together the descriptions and analyses presented in this dissertation follow claims by van Oostendorp (1999) that there are three types of

[7] SENĆOŦEN also has an excrescent schwa (Leonard 2007). In this dissertation, the focus is on phonological vowels. Issues concerning the phonetic properties of excrescent schwa in SENĆOŦEN are left for future research.

schwa: underlying, epenthetic, and those that arise from unstressed vowel reduction. He draws similar conclusions to previous work on Salish prosodic structure carried out for other Salish languages (for instance Blake (2000b) on *ʔayʔaǰuθəm* [Sliammon], Czaykowska-Higgins (1993) on *Nxaʔamxcín* [Moses Columbian], Dyck (2004) on *S<u>k</u>wx̱wú7mesh*, Urbanczyk (1996, 2001) on *dxʷləšucid*, Shaw et al 1999, Shaw 2008 on *hən̓q̓əm̓in̓əm̓*).

This dissertation builds directly upon the description and analysis of SENĆOŦEN phonology and morphology provided in Montler's (1986) grammatical sketch of SENĆOŦEN titled *The Morphology and Phonology of North Straits Salish*[8]and builds also upon claims in Leonard (2007).[9] Examples from these and other sources are brought together to provide additional description and analyses of the sound patterns of SENĆOŦEN which look more deeply into the distribution and representation of schwa, consonant cluster patterns, sound alternations and the relationship between schwa distribution, syllable shape, and foot structure.[10] An investigation of syllable shape is provided showing that in roots complex onsets and codas are not permitted in SENĆOŦEN and that syllable nuclei can include not only

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[8] This source is also available online at http://saanich.montler.net/Outline/index.htm

[9] This source is also available online at https://www.sfu.ca/nwjl/Articles/V001_N04/Leonard.pdf

[10] Language examples are drawn mostly from the SENĆOŦEN dictionary (Montler 2018) and supplemented, mainly in chapter 4, by my own field work sessions carried out from 2005-2010.

voiced vowels, but also voiceless schwa and syllabic glide consonants. This dissertation goes beyond the analysis of the syllable provided in Leonard (2007) by examining, to a greater degree, the difference between the prosodic behaviour of segments located at the edges of words, as well as roots, and by examining the syllabic parsing of consonants word-internally, presenting new and innovative evidence arguing that 1) weight is only assigned to underlying full vowels and retained by those full vowels only when they are stressed. 2) Schwa is weightless at all levels of representation. 3) Consonants are underlyingly weightless. 4) Weight-By-Position is not active in SENĆOŦEN and thus consonants are never assigned a mora in coda position[11]

This dissertation informs the pedagogy of SENĆOŦEN language learning by explaining why unstressed vowels, no matter their underlying quality, may often be produced, perceived, and written as schwa. Knowing that a sound written as a schwa (or E in the orthography) can be derived from a variety of sources supports language learning because it provides clues for knowing how a vowel will be pronounced in a word, and what the different morphemes are that make up a particular word.

[11] Stonham (1994) and subsequent theoretical research accounting for the Actual aspect in SENĆOŦEN crucially assumes that schwa and coda consonants have a mora (see especially, Bye & Svenonius 2012, Davis & Ueda 2006, Zimmermann 2009 and Zimmermann & Trommer 2013).

The remainder of this chapter is organized as follows: section 1.1 provides a general background of the SENĆOŦEN language. Section 1.2 presents the segmental inventory for SENĆOŦEN. Section 1.3 discusses the study of schwa cross-linguistically. Section 1.4 situates the dissertation within previous literature concerning Salish phonology. Section 1.5 introduces what has been said previously about the pronunciation of schwa in SENĆOŦEN. Section 1.6 is an overview of the rest of the dissertation.

1.1 General background

1.1.1 Language affiliation

SENĆOŦEN [Saanich] is classified as one of 23 languages that make up the Salish language family (see Czaykowska-Higgins & Kinkade 1998). The Salish language family includes languages from various parts of British Columbia, Washington state, Idaho, Montana, and a small area on the coast of Oregon. There are two main linguistic regions, the Interior or Plateau area and the Northwest Coast area (Czaykowska-Higgins and Kinkade 1998, Thompson and Kinkade 1990). SENĆOŦEN itself is a dialect of Northern Straits Salish which is one of the ten languages that make up the Central division of the Northwest Coast branch of the Salish language family (Czaykowska-Higgins and Kinkade 1998:3, Montler 1999:462).

1.1.2 Language location

The traditional territory of Northern Straits Salish extends from the southeastern tip of Vancouver Island in British Columbia, Canada to the northern portion of the Olympic Peninsula in Washington state, USA. The area encompasses the Gulf Islands (Canada) and the San Juan Islands (USA). The SENĆOŦEN dialect is spoken on the southern tip of Vancouver Island (see Elliott & Poth 1990, Gessner et al. 2014, Montler 1986, 1999, 2018, Paul 1995).

(1) SENĆOŦEN map (modified from Nolan 2017 based on Thom 1996)[12]

[12] Special thanks to Tess Nolan for modifying this map from Nolan (2017) so that it highlights the location of the SENĆOŦEN language. See also Saltwater People (Elliott & Poth 1990) and Paul (1995) for maps of the local area with details of various important areas documented in the SENĆOŦEN language.

Northern Straits Salish includes the varieties known in the linguistic literature as Sooke, Songish, Saanich, Lummi, Samish and Semiahoo (Montler 1999: 463). Saanich (divided into two sub groups West Saanich and East Saanich), is the variety which is of interest to this dissertation and is referred to by its speakers, and throughout this dissertation, as SENĆOŦEN. One of the speakers who contributed to this dissertation was from West Saanich (*W̱JOȽEȽP*) and the other speaker was from East Saanich (*SȾÁUTW̱*).

The W̱SÁNEĆ (*Saanich*) area is formed of four territories named BOḰEĆEN [*Pauquachin*], W̱JOȽEȽP [*Tsartlip*], SȾÁUTW̱ [*Tsawout*] and W̱SÍKEM [*Tseycum*]. These four reserves are located at traditional winter village sites, on the northern tip of the Saanich Peninsula on southeastern Vancouver Island. The Northern Straits Salish language is considered among one of the most critically endangered in North America. The *Report on the Status of BC First Nations Languages,* published in 2014 by the First Peoples' Council, confirms this status for BC indigenous languages in general and ranks SENĆOŦEN, as one of the more extreme cases. The First Peoples Culture Council's 2018 report states there are 0.2% fluent speakers and 1.5% semi speakers (Dunlop et al. 2018: 47). Montler (1986) reports fewer than 20 speakers. I have worked with five people who grew up speaking their language. The language examples used in this dissertation were shared with me by two of those fluent speakers. All errors in the representation of the forms that they have shared with me over the years are my own responsibility. The language examples used in this dissertation are the result of various projects. Some were recorded directly for the purpose of understanding the phonological properties of vowels and consonants. Some were recorded in the context of community led documentation projects. Some were recorded in the context of developing language learning materials. Other examples used in this dissertation are sourced directly from the Saanich dictionary (Montler 2018) which itself is primarily sourced from recording with W̱SÁNEĆ elders by Timothy Montler in the 1980s and 1990s, supplemented with recordings from the two speakers that I worked with for this dissertation.

1.1.3 Language revitalization

The language has its own orthography and vibrant language revitalization programs. [13] Currently, there are many community driven projects working on the revival of the SENĆOŦEN language, building, in part, from a community university

[13] For more information see http://wsanecschoolboard.ca/history-of-the-SENĆOŦEN-language and http://www.terralingua.org/voicesoftheearth/saanich/.

research alliance (CURA)[14] project (2004-2009). This project played an important role in assisting with some of the ground work for ongoing research projects and curriculum development on the SENĆOŦEN language (see, Czaykowska-Higgins 2011, Czaykowska-Higgins et al. 2018, Urbanczyk et al. 2006). A dictionary has also been published (Montler 2018) and ongoing story transcription and translation projects, and a grammar are underway. Pedagogically related language materials are being developed by the language revitalization team named SȾÁ,SEN TŦE SENĆOŦEN. Language immersion classes are provided for pre-school through to grade 4 (Dunlop et al. 2018: 17). Community language learners/activists and allies have also recently earned university accreditation from UVic's Indigenous Language Revitalization programs. Many are now teaching and researching the language within their own community. There is a growing body of research which focuses specifically on SENĆOŦEN language revitalization experiences, reflections, methodology and future steps (see particularly Bird & Kell 2017, Claxton 2017, Jim 2016, Sampson

[14] Community-University Research Alliance Projects were funded by a program of the Social Sciences and Humanities Research Council of Canada. Their purpose was to "support the creation of alliances between community organizations and postsecondary institutions which, through a process of ongoing collaboration and mutual learning, [would] foster innovative research, training and the creation of new knowledge in areas of importance for the social, cultural or economic development of Canadian communities.". The Coast Salish language revitalization CURA involved a partnership between the Hul'q'umi'num' Treaty Group, the Saanich Native Heritage Society, the First Peoples' Heritage, Language, and Culture Council, the First Peoples' Cultural Foundation, and the University of Victoria. (Czaykowska-Higgins 2009: 21 ft 7).

2014, Thorburn 2016, Underwood 2017).[15] Second language learning research by linguists focussing on the pronunciation of consonants by SENĆOŦEN language learners includes work by Bird (2016), Bird (2018), Bliss et al. (2016), and Bliss et al. (2018).[16]

1.1.4 Data representation

This section explains the various representations and sources of the SENĆOŦEN language examples used throughout the dissertation. Three alphabets are used to represent the language examples. There is the SENĆOŦEN Alphabet, the North American Phonetic Alphabet and the International Phonetic Alphabet. The language examples used throughout this dissertation are drawn from a combination of secondary sources and from my own fieldwork.

1.1.4.1 SENĆOŦEN Alphabet

Throughout this dissertation all examples are transliterated into the SENĆOŦEN alphabet. The reason for doing this is so that the examples are immediately accessible to speakers and learners of SENĆOŦEN. The SENĆOŦEN

[15] Other scholarship featuring the use of the SENĆOŦEN language include a UVic doctoral dissertation on traditional fishing practices (Claxton 2015) and published poetry about the relationship between the W̱SÁNEĆ people and their land resulting from a UVic Master's degee in Fine Arts (Paul 2003 and Paul 2008).

[16] See also Bird et al. (2016) for similar research on the related Central/Coast Salish language *Hul̓q̓umin̓um̓* (Island Halkomelem).

alphabet is a system which for the most part has a symbol for each contrasting sound in the language.[17] In general, the alphabet represents only unpredictable phonological information. However, in some places it captures a finer phonetic contrast and thus represents phonologically predictable information. For example, a series of A symbols (A, Á, Ⱥ) captures a phonetic variation involving the vowel sound /e/ in the environment of glides, uvular sounds and elsewhere. The SENĆOŦEN symbol Ⱥ is used to represent the sequence of the sounds which the Americanist Phonetic Alphabet represents as /ey/. The IPA transcription is represented within square brackets.

(2) SĆȺ
s-čéy
s-čéy
[sˈʧej]
NOM-work
‘wool’ Leonard Field Notes (2008 #122)

(3) SQȺ ȻNES ĆEĆÁSNEW̱[18]
sk̓ʷéy kʷ nəsčəčésnəxʷ
sk̓ʷéy kʷ nə-s-čə-čés-nəxʷ
[sˈkw’ej]
can’t SUB 1POSS-NOM-RED~chase-NCTRNS
‘Can’t catch up to him’ Leonard Field Notes (2008 #122)

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[17] Montler (2018) provides a discussion comparing and contrasting the phonetic alphabet and the SENĆOŦEN alphabet, providing insights about how each alphabet tracks certain linguistic details of the language.

[18] Speakers and learners of SENĆOŦEN conventionally write the clitics and prefixes in examples like this as one word, whereas linguists often represent them as separate elements in their linguistic glosses. See Huijsmans (2015) for recent research on issues concerning the interface between phonology and syntax in SENĆOŦEN.

(4) ȻȺL
kʷéyl
[ˈkʷejl]
'hide' Leonard Field Notes (2008 #164)

The SENĆOŦEN symbol 'A' is often used to represent the underlying full vowel /e/ when it is stressed and when it occurs before uvular stops and fricatives. The phonetic quality of /e/ in the environment preceding a uvular segment is lower than when it is pronounced in other consonantal environments. In this dissertation, I have represented this sound with the IPA symbol [æ][19].

(5) T̲AK̲T
ƛ̓éqt
[ˈtɬ'æqt]
'long' Leonard Field Notes (2009b #346)

(6) K̲AK̲
qéq
[qæq]
'baby' Leonard Field Notes (2009b# 309)

(7) I, ȻENIN̲ET TŦE SK̲AXE
ʔiʔ kʷəniŋət tθə sqex̣əʔ
[sˈqæχɑʔ]
'The dog is running' Leonard Field Notes (2011 #329)

The SENĆOŦEN alphabet symbol Á is used most often to represent the underlying full vowel /e/ when it is not adjacent to a following uvular a glide. In this phonological

[19] Montler (1986) says that underlying vowel /e/ is rarely pronounced as low as [ɛ].and never as low as [æ]." though in Montler (1999) he says that newer speakers do pronounce /e/ as [æ]. The pronunciation of /e/ by the speakers represented in chapter 4 approximates [æ] preceding a uvular consonant sound. In that environment the vowel is transcribed as [æ] when it is next to a uvular, and [ɛ] when it is not. This is done to reflect that the underlying vowel /e/ is lax in the usual case and slightly lower when next to a uvular. The investigation in this chapter is preliminary and a more exhaustive and extensive phonetic study investigating the coarticulation of stressed and unstressed vowels in all consonantal environments in SENĆOŦEN warrants further study.

environment, the phonetic quality of /e/ approximates the lax-mid vowel, represented in the IPA as [ɛ].

(8) SPÁ,EȾ
spéʔəθ
[sˈpɛʔɛθ]
'bear' Leonard Field Notes (2009b #66)

(9) MÁȾEĆ
méθəč
[ˈmɛθɨʧ]
'shag (Brant's Cormorant)' Leonard Field Notes (2009b #135)

(10) SÁW̱SEW̱
séxʷ~səxʷ
[ˈsɛxʷsʊxʷ]
'The lazy one' Leonard Field Notes (2009b #313)

Each example in the dissertation includes the SENĆOȾEN alphabet and the Americanist Phonetic Alphabet. Where necessary, a phonetic transcription in the International Phonetic Alphabet is included. [20] The three alphabets are compared in the conversion chart presented in (11).

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[20] Any inconsistences reflect my own errors in spelling and/or my own transcription skills.

(11) Alphabet Conversion Chart[21]

SENĆOŦEN	**APA**	**IPA**
A	e	æ/ε
Á	e	e/ε
Ⱥ	ey	e/j
B	p̓	p’
C	k	k
Ć	č	tʃ
Ȼ	kʷ	kʷ
D	t̓	t’
E	ə	ə
H	h	h
I	i	I
Í	ay/əy	aj/əj
J	č̓	t’ʃ
K̲	q	q
Ḱ	qʷ	qʷ
K	q̓	q’
Ꝁ	q̓ʷ	q’ʷ
L	l	l
Ł	ɬ	ɬ
M	m	m
N	n	n
O	a	a/ɑ
P	p	p
Q	k̓ʷ	k’ʷ
S	s	s
Ś	š	ʃ
T	t	t
Ŧ	θ	θ
Ⱦ	t̓ᶿ	t’θ/t’s
T̲	ƛ̓	t’ɬ
U	u/əw	u/əw
W	w	w
W̲	xʷ	xʷ
X	x̣ or x̌	χ
X̲	x̣ʷ or x̌ʷ	χʷ
Y	y	j
,	ʔ	ʔ

[21] Glottalised resonants are represented with a combination of the resonant and a comma. L, = l̓; M, = m̓; N, = n̓; N̲, = ŋ̓; W, = w̓; Y, = y̓.

In this dissertation, words are spelled using the Americanist Phonetic Alphabet (APA) because some SENĆOŦEN language speakers and learners understand the Americanist Phonetic Alphabet, and also because it is the alphabet traditionally used by scholars of Salish linguistics. In addition, the use of this system allows for the marking of stress assignment and the representation of vowel and glide and glide-like sequences as two sounds, something that is useful when representing and describing the morphological process of reduplication where only the vowel, but not the glide of a root is reduplicated. On occasion, when useful, the International Phonetic Alphabet (IPA) is used to represent sounds which are not easily represented with either the SENĆOŦEN alphabet or the Americanist Phonetic Alphabet. In particular, the IPA is used to represent the various qualities perceived when transcribing and interpreted when measuring the acoustic formant structure and length of the SENĆOŦEN unstressed vowels.

1.1.4.2 Source of the SENĆOŦEN Language Examples

The majority of the language examples drawn from the previous literature and used as examples in this dissertation come from the *Morphology and Phonology of Saanich* (Montler 1986), from the online *Northern Straits Salish Classified Word List*

(Montler 2015a) and from the *SENĆOŦEN Dictionary* (Montler 2018). Where applicable, Pidgeon's (1970) thesis, on SENĆOŦEN lexical suffixes, was consulted. In addition, later publications have also been consulted, for example Montler (1989, 1993, 2003), Benner (2006), Bird & Leonard (2009), Bird, Czaykowska-Higgins & Leonard (2012), Caldecott (1999), Huijsmans (2015), Kiyota (2003, 2008), Leonard (2005, 2006, 2007, 2009, 2010, 2011), Leonard and Turner (2010) and Turner (2005, 2007, 2011a, 2011b).[22]

1.1.4.3 Elicited SENĆOŦEN examples

Some of the SENĆOŦEN language examples presented throughout this dissertation, particularly in Chapter 4, are drawn from recordings of elicitation sessions carried out with two SENĆOŦEN speaking elders from 2004-2011. The elicitation sessions were carried out within the context of a variety of collaborative projects. Some were elicited in the context of phonological projects, others as part of the CURA

[22] Two unpublished, sources also exist. The first is titled *How to write the Straits language* (*Saanich dialect*). Unpublished ms., British Columbia Indian Project, Victoria B.C. (Bouchard 1971). The second is titled *Classified word list for B.C Indian languages, Straits* (*Saanich*) *version*. Unpublished ms., British Columbia Indian Language Project, Victoria B.C. (1974).

language revitalization project mentioned above,[23] others in the context of morpho-semantic research.[24]

Documentation of language examples for this dissertation began in 2006, with a focus primarily on investigating aspects of the morphological and phonological structure of SENĆOŦEN with two W̱SÁNEĆ elders. The context for this documentation was often both academic and pedagogical language in nature. In the context of various projects approximately 2230 SENĆOŦEN words and sentences were documented. All those examples were shared with Timothy Montler and many of those examples were later retranscribed and incorporated into the SENĆOŦEN Dictionary (Montler 2018). The language examples are also organized into various Microsoft Excel sheets so that they are in an easily accessible format for sharing with future community projects, and for future investigations into the sound patterns of SENĆOŦEN. A typical entry is presented in (12).

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[23] See Urbanczyk et al. (2006) and Czaykowska-Higgins et al. (2011, 2018) for more details about this project.

[24] This research focussed on the morpho-semantic structure of verbs. A language database using FileMaker Pro of approximately 3000 words and sentences has been compiled based on this research (see Turner 2011b for an example layout database), as well as an online database available through the University of Surrey in the United Kingdom (Turner 2011c).

(12) Example Entry: Leonard Field Notes (2011a # 61)

LABEL	**ENTRY**
Original file location	2010_6_12_a (17.59min)
Edited file name	chqeluskwa_a_2010612
SENĆOŦEN alphabet	ĆKÁL E SW̱ ȻO
Americanist Phonetic Alphabet	č-q̓el ə sxʷ kʷəʔ
International Phonetic Alphabet	ʧˈq’ɛlʌskʷɑʔ
Morpheme by Morpheme Gloss	have-believe question you emphasis
English Translation	Did you believe it?
Speaker	speaker initials

This example is located in an excel sheet called Leonard Fieldnotes 2011a which is a database of words elicited for a candidacy paper project on the syntactic structure of questions in SENĆOŦEN and is entry 61 within that file.[25] The first line of the entry includes the date that the example was recorded and its original location within the original sound file. The second line of the entry indicates the file name for the edited sound bite from the original sound file. The third line of the entry represents the word in the SENĆOŦEN alphabet. The fourth line of the entry is a phonologically abstract transcription in the Americanist Phonetic Alphabet. The fifth line of the entry is a transcription using the International Phonetic Alphabet. The sixth line of the entry is a morphological analysis informed by Montler (2018) and input from the speakers.

[25] Many of these examples were later published in papers examining the syntactic structure of SENĆOŦEN (Czaykowska-Higgins & Leonard 2015) and examining the syntactic structure of Wh-Questions in SENĆOŦEN (Leonard & Huijsmans 2018).

The seventh line of the entry is the English translation given by the speakers. The eighth line of the entry records the speaker's initials. The ninth line of the entry is a place for noting linguistic phenomenon of interest. This dissertation is informed by all the sources discussed in this section. The next section reports on what has been said about the sound system of SENĆOŦEN, with respect to the number of consonants and vowels are in the language.

1.2 The segmental inventory for SENĆOŦEN

According to Montler (1986 section 1.1) SENĆOŦEN has 35 consonants. He reports

> […] five manners of articulation: plain and glottalized voiceless stops, fricatives, and plain and glottalized resonants. There are nine contrasting places of articulation: labial, dental, alveolar, alveo-palatal, lateral, labio-velar, uvular, labio-uvular, and laryngeal [...]

A consonant chart is presented in (13).

(13) SENĆOŦEN Consonant Inventory[26]

	Labial		Coronal				Dorsal			Glottal
Plosive (*plain*)	p/P		t/T		č/Ć	(k C)	k^w Ȼ	q/Ḵ	q^w/Ḱ	
Plosive (*glottalized*)	p̓/B	t̓$^{\theta}$/T̸	t̓/D	ƛ̓T̲	č̓/J		k̓^{w}/Q	q̓/K	q̓^{w}/Ꝁ	ʔ/,
fricative		θ/Ŧ	s/S	ɬ/Ł	š/Ś		x^w/W̱	x̣/X	x̣^{w}/X̱	h/H
plain resonant	m/M		n/N	l/L	y/Y		w/W	ŋ/N̲		
					Y/Y		W/W			
glottalized resonant	m̓/M,		n̓/N,	l̓/L,	y̓/Y,		w̓/W,	ŋ̓/N̲,		
					Y̓,Y,		W̓/W,			

Montler (1986 section 1.2) reports 5 vowels for SENĆOŦEN. Noting that "[i]t is an unusual symmetrical four vowel system in that there are no native rounded vowels." He says that stressed /u/ is only found in borrowed words and that unstressed [u] derives from a glide. A vowel chart is provided below.

[26] The glides y, y̓, w, and w̓ alternate with vowels in unstressed syllables (see Chapter 5 for more discussion). The segments Y, Y̓, W, and W̓ are not included in Montler's (1986) inventory (though they are discussed), but are included in the Saanich dictionary (Montler 2018). These segments enter into a three-way alternation between obstruents, vowels, and glides. These segments are included in and, written with capital letters, in the APA in Montler (2018). Y, Y̓, W, and W̓ are used to indicate that the segments are underspecified with respect to their manner features in their underlying representations. As will be discussed in Chapter 5, these segments usually surface as an obstruent in onset position, a vowel in nuclus position, and a glide in coda position.

(14) SENĆOŦEN Vowel Inventory

	Front	**Central**	**Back**
High	i/I		(u)/U
Mid	e/Á, A, A̸	ə/E	
Low			a/O

As well as being included in the phonemic vowel chart, the vowel schwa is also recognized as serving as an epenthetic vowel (Caldecott 1999, de Lacy 2007, Leonard 2007, Montler 1986, 1989, 2018). In the next section, this dissertation is situated within the context of previous literature on the categorization of schwa in non-Salish languages.

1.3 The study of schwa cross-linguistically: A general overview

The purpose of this general overview is to situate this dissertation study within the context of the broader cross-linguistic literature. The term schwa has its origin in Hebrew where it means "empty" (IAHLP 2003: ll, 905). According to its etymology, the term "epenthetic" should properly be used only for vowels that occupy an empty prosodic position. However, this term has been used to refer to both underlying and non-underlying instances of vowels that have been termed “schwa” (Veloso 2010: 202). [27] Silverman (2011: 1) offers the following definition of a schwa vowel:

> Inspection of the chart of the International Phonetic Alphabet would suggest that schwa is a vowel like any other; a central open-mid/close unrounded vowel, slightly higher than [ɐ], slightly more central open-mid than [ʌ], i.e., [ə]. Indeed, as the IPA chart necessarily provides idealised phonetic description of its symbols, then, articulatory speaking, schwa-qua-schwa is just as the IPA chart indicated as in […]

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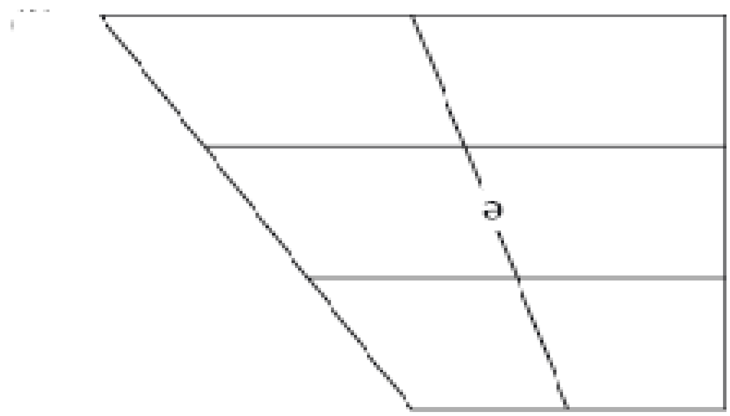
[27] Veloso (2010) reports the following range of terms referring to epenthetic schwa that have been used in the literature. The terms included are Shiftiness, Decaying, Mute, Unstable, Feminine, Dull, Obscure, Middle and Neutral Schwa (Adda-Decker et al. 1999). The terms unmarked vowel (van Oostendorp 1999), targetless vowel (Barry 1998; Van Oostendorp 1999), featureless vowel (Spencer 1996), zero vowel (Miguel 1993, Delgado-Martins 1994), colourless vowel (Polgárdi 1996), cold vowel (Miguel 1993, Delgado-Martins 1994), fugitive vowel (Catford 1988), unstable vowel (Andrade 1996: 303) and obscure vowel (Catford 1988) have also been used. In addition, the choice of transcribing an epenthetic vowel with a [schwa] symbol has been reported to be a matter of convention (see Angoujard (2006) and Veloso (2010). Veleso (2010) reports also that a variety of articulatory descriptions have been proposed for schwa by American phoneticians. It has been defined as a mean-mid central vowel (Bloch and Trager 1942), an upper-mid central vowel (Pike 1947), and a lower-mid central vowel (Smalley 1963). Lastly, Veleso (2010) says that there is also, in some cases, no distinction made between [ə] and [ʌ] which both have been described as mid-central or back (Gleason (1955) and Pullum & Ladusaw (1986)).



In practice however, the label ‘schwa’ has been applied to a phonological value that is especially variable in its phonetic properties. In terms of their quality (place of articulation) vowels labeled ‘schwa’ vary to the extent of encompassing a large portion of the vowel space, while tending to gravitate toward the centre of the vowel’s space (see e.g. Browman & Goldstein 1992 for English schwa). This variability is usually a consequence of schwa’s context: flanking consonants and vowels may have significant coarticulatory influence on schwa’s phonetic starting and ending postures, typically far more coarticulatory influence than on vowels of other qualities. In terms of duration, a phonetic property that the IPA vowel chart does not indicate, schwa is typically quite short, and this duration may co-vary with its tendency to be coarticulated.

Throughout the literature on SENĆOŦEN schwa there are three types of segments which are transcribed as 'ə'/E in SENĆOŦEN. The three types of phonological vowel that are transcribed with the symbols 'ə'/E in SENĆOŦEN are, underlying schwa, epenthetic schwa and full vowels in unstressed position. All these types of vowels also occur in other languages. For example, van Oostendorp (1999) puts forward a similar type of hypothesis regarding Dutch schwa. He proposes that both the term and the symbol schwa [ə] have been used to refer to different types of phonetic and/or phonological entities

In the following sections, I review literature that discusses the representation and distribution of phonological entities which have been termed schwa. They are described with respect to understanding five parameters. 1) Their featural content, 2) their coarticulation properties, 3) their weight and sonority properties, 4) the types of phonotactics and syllable structure they exhibit, and 5) the way they pattern with respect to vowel reduction and foot shape. In this section, the description and analysis of SENĆOŦEN schwa is placed within the context of cross-linguistic issues concerning schwa. Specifically, the discussion of this previous literature is focussed around the major claims in this thesis of what constitutes a schwa. The three types of schwa are as given below.

(15) Three types of Schwa (adapted from Silverman 2011)

SCHWA TYPE	DESCRIPTION
Underlying	A centralised vowel present at the underlying level of representation. This segment is featureless/targetless at the underlying level of representation. This segment is featureless/targetless at the surface level of representation (in both stressed and unstressed position).
Epenthetic	A centralised vowel not present at the underlying level of representation. This segment is inserted to ensure well formed prosodic structure. This segment is featureless/targetless at the surface level of representation (in both stressed and unstressed position).
Reduced	A centralised vowel which is derived from an underlying full vowel. This segment is featureless/targetless at the surface level of representation (only in unstressed position).

Literature reviewed in this section focuses around the representation and distribution of schwa cross-linguistically with respect to phonotactics, weight, syllable structure, and foot shape. The proposals made in this dissertation are situated within the context of van Oostendorp's (1999) three types of schwa. His following quote, along with Silverman's above, serves as a useful starting point for an investigation of the status of schwa in SENĆOŦEN.

> If a language has schwa in its vowel inventory, this segment usually has a special role to play in the phonology of the language. It can only occur in a simple type of syllable; or it

> is invisible for the stress system; or it is epenthetic; or it is the result of reduction; etc. Linguistic theory has to explain this special behaviour of schwa: why is it exactly this segment which behaves in exactly this way in so many languages? (Van Oostendorp 1999: 3)

Section 1.3.1 addresses the differences between an epenthetic schwa and an excrescent schwa in SENĆOŦEN.

1.3.1 Excrescent schwa vs. epenthetic schwa

Hall's (2006) discussion on the differences between excrescent and epenthetic schwa serves as a starting point for this section, which also considers descriptions and analyses of the two types of schwa from other researchers. Hall (2006: 387) argues that there are two kinds of mechanisms that can be referred to as vowel insertion. The first is epenthesis, which is usually described as an insertion of vocalic gestures. The second is excrescence, which is a retiming of existing gestures to produce a vowel element.

The distinction between the phonological and phonetic nature of inserted vowels is also acknowledged throughout the literature. Not all agree on every point, but overall, they make similar two-way categorizations of non-underlying schwas (see for instance Harms 1976, Levin 1987, Warner et al., 2001). Hall (2006) offers diagnostics for excrescent (intrusive) vowels based on a typological survey providing evidence that intrusive vowels are not phonological and do not form syllable nuclei at any level of representation. She offers a characterization of vowel intrusion in terms of abstract articulatory gestures pointing out that inserted vowels vary with respect to their phonetic and phonological characteristics. In some cases, these properties are identical to the phonological and phonetic properties of lexical vowels within a given language. In other cases, epenthetic and excrescent schwa tend to be shorter or of a different quality than the same language's lexical vowels[28].

Hall (2006) provides a list of properties for phonologically invisible (excrescent) versus phonologically visible (epenthetic) inserted vowels. The criteria for intrusive vowels are given in (16).

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[28] A preliminary investigation into vowel duration presented in Chapter 4 shows that when stressed, the lexical full vowels are longer than both the stressed underlying schwa and the stressed epenthetic schwa. Unstressed vowels, derived from underlying full vowels, are approximately 10ms longer than unstressed vowels derived from either underlying schwa or from epenthetic schwa in words involving reduplication. The difference in duration between unstressed vowels is less so for unstressed vowels in words which do not involve reduplication. No significant difference in length between the acoustic duration of an underlying schwa and an epenthetic schwa is observed, in either stressed or unstressed position.

(16) Phonologically invisible inserted vowels (Hall 2006: 391)[29]

PROPERTIES OF INTRUSIVE VOWELS
a. The vowel's quality is either schwa, a copy of a nearby vowel or influenced by the place of the surrounding consonants.
b. If the vowel copies the quality of another vowel over an intervening consonant, that consonant is a sonorant or a guttural.
c. The vowel generally occurs in heterorganic clusters.
d. The vowel is likely to be optional, have a higher variable duration or disappear at fast speech rates.
e. The vowel does not seem to have the function of repairing illicit structures. The consonant clusters in which the vowel occurs may be less marked, in terms of sonority sequencing, then clusters which surface without vowel insertion in the same language. Phonetic schwas are transitional or excrescent elements (Levin 1987, Hall 2006, Davidson (2006a, 2006b, 2007).

Hall (2006) also discusses what has been said about epenthetic vowels cross-linguistically. For example, she reports that Broselow (2000) claims that "[…] epenthetic vowels are rarely stressed, but are not necessarily invisible to the stress system of a language […]". Hall argues that stress assignment depends on syllable count and epenthetic vowels are included in that type of syllable count. She says that the inclusion of epenthetic vowels in stress-related syllable counts has been observed for languages such as Chamicuro (Parker 1994), and Spanish (Garcia-Bellido 1999). Hall's (2006) list of properties for epenthetic vowels is given in (17).

[29] The assumption in this dissertation is that these types of vowels are excrescent vowels.

(17) Phonologically visible inserted vowels (Hall 2006: 391)

PROPERTIES OF EPENTHETIC VOWELS
a. The vowel's quality may be fixed or copied from a neighbouring vowel. A fixed-quality epenthetic vowel does not have to be schwa.
b. If the vowel's quality is copied, there are no restrictions as to which consonants may be copied over.
c. The vowel's presence is not dependent on speech rate.
d. The vowel repairs a structure that is marked, in the sense of being cross-linguistically rare. The same structure is also likely to be avoided by means of other processes within the same language.

The distribution of epenthetic schwa is argued to be conditioned by prosodic requirements on phonological structures such as the syllable (see Hall 2006, Kager 1999, Shaw et al. 1999 among others). This is why the location of epenthetic schwa is often predictable based on a language's allowable syllable shapes. The featural representation of phonological schwa, whether it is epenthetic or whether it is derived from a reduced full vowel, is most often represented abstractly as featureless for place (Andrade 1996 , Barry 1998, Catford 1988, Delgado-Martins 1994, Miguel 1993, van Oostendorp 1999, Polgárdi 1996, Spencer 1996 among others). This is usually analysed as being the reason why schwa undergoes processes of assimilation, such as vowel harmony or coarticulation with surrounding segments. Epenthetic schwa and underlying schwa are the focus of this dissertation and are discussed in further detail in sections 1.3.2 and 1.3.3 respectively. The excrescent schwa is not the focus of this dissertation and is left for future study.

1.3.2 Phonological schwas

van Oostendorp (1999) argues that three types of phonological schwas exist in Dutch and English. Those three types of schwa are called Epenthetic (e-schwa), Reduced (r-schwa) and Stable (s-schwa). Epenthetic schwa is discussed in section 1.3.2.1. Reduced schwa is discussed in section 1.3.2.2. Stable schwa is discussed in 1.3.2.3. The application of van Oostendorp's categories to SENĆOŦEN vowels is discussed in 1.3.2.4.

1.3.2.1 Epenthetic Schwa (e-schwa)

van Oostendorp claims that "e-schwa" is a result of the phonological process of epenthesis. This type of schwa is inserted within marked segmental strings which violate prosodic restrictions active in a language. This kind of segment can exist at an underlying level of grammar or not. If it does not exist at the underlying level then it is prone to processes such as reduction and/or deletion (see for example Padgett & Tabain 2005, Davidson 2006c, Barry & Trouvain 2008). In this dissertation, I provide evidence for the existence of an epenthetic schwa in SENĆOŦEN.

1.3.2.2 Reduced schwa (r-schwa)

van Oostendorp's second schwa type is a result of full vowel reduction. These schwas are also known as “r-schwas”. They are segments which occupy the prosodic slot which is filled by a phonologically fully specified vowel (Veloso 2010). In many cases the vowel is reduced when that slot is not the head of a stress domain. Likewise, cross-linguistically the term schwa is also often used to refer to full vowels which are reduced. Generally, it is argued that vowels are often reduced when they are not the head of a stressed syllable (see for instance Crosswhite 2001, de Lacy 2002, 2007). Caldecott (2009: 55) captures this cross-linguistic tendency with the following quote:

> de Lacy argues that the Dutch data represent an example of positional markedness. In this case, the sonority of vowels is prosodic position dependent. There is pressure to maximise the saliency [of the] head of the foot, and one way to achieve this is to minimise the sonority of the non-head. As a result, schwa is the most marked segment for DTEs[30] […] but the least marked segment for non-DTEs. (Caldecott 2009: 55.)

[30] The alphabetism DTE stands for Designated Terminal Element. This term refers to the most prominent terminal element in a constituent (Caldecott 2009:46).

In other words, if a vowel is not stressed then it is a schwa, because schwas are the least sonorant elements and therefore, they are likely to be non-heads of feet. If a vowel is stressed, and thus the head of a foot, then it is important for it to be more sonorous than a schwa. For this reason, stressed vowels tend not to be reduced. Vowels which are derived from full vowels occurring in unstressed position in SENĆOŦEN are also referred to by the term ‘schwa’ (Montler 1986, Leonard 2007). SENĆOŦEN exhibits vowel reduction patterns which suggest that SENĆOŦEN, like other languages, reduces full vowels to schwa in an effort to decrease the sonority of a syllable for prosodic wellformedness reasons. Chapter 3 provides evidence that some vowels in SENĆOŦEN termed schwa are derived from unstressed underlying full vowels.

1.3.2.3 Stable schwa (s-schwa)[31]

van Oostendorp’s third schwa type, is called a stable schwa. It is also known as “s-schwa”. It is a vocalic segment that is neither the result of epenthesis nor vowel reduction[32]. van Oostendorp (1999) argues that this type of segment is lexically present and that it is an underlying central vowel. Veloso (2010) states that “phonologists

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[31] In this dissertation the term *Stable Schwa* is assumed to be synonymous with the term *Underlying Schwa*.

[32] Blake (2000b: 226) refers to this kind of schwa, in *ʔayʔaǰuθəm* as a *non-alternating schwa*.

acknowledge the presence of a “schwa sous-jacent” in French whenever [schwa] is not the result of epenthesis” citing Dell (1992) and Angoujard (2006). The distribution of stress assignment in SENĆOŦEN, supports a proposal that there is a distinction between stable schwas and epenthetic schwas. Stable schwa exists in SENĆOŦEN, however, in this dissertation, I use the term “underlying schwa” rather than “stable schwa” in an effort to remain consistent with previous literature on Salish phonology and also to contrast with the SENĆOŦEN epenthetic vowel which is never underlying.

1.3.2.4 Applying van Oostendorp’s categories

Schwa in SENĆOŦEN, whether it be epenthetic, reduced or stable (underlying) generally lacks a phonological mora when unstressed. Chapter 3 argues that in SENĆOŦEN words all unstressed vowels lack a mora. Cross-linguistically, phonological elements termed schwa, whether they be lexical (underlying or stable), reduced, or an epenthetic vowel have also been argued to be lighter than non-schwa vowels. This observation is captured in phonological theory by proposing that full vowels such as /i/, /a/ and /u/ have weight, are specified for a mora, and that schwa which does not have weight, is not specified for a mora (van Oostendorp 1999, Silverman 2011). The difference in the weight of full vowels versus the weight of schwa is argued to be the reason why full vowels tend to be stressed over schwa. In other words, vowels which have weight are thought to attract stress from vowels which do not have weight. Stress systems that are sensitive to a weight distinction among syllables are referred to as Quantity Driven Stress Systems (see for instance Hayes 1995, Kager 1999).

1.4 The study of schwa in Salish languages

Various linguistic sources for schwa have been proposed for Salish languages (see Czaykowska-Higgins 1998, Kinkade 1998a). The classification of these sources is similar to the classification of the sources for schwa presented cross-linguistically (see for instance Crosswhite 2001, Hall 2006, 2011, Kager 1999, van Oostendorp 1999, Silverman 2011). An overview of the treatment of schwa is provided by Parker (2011) which brings together the previous descriptive and theoretical work in the areas of phonetics, phonology, and morpho-syntax in the Salish literature. Description of the behaviour of Salish schwa is described and analysed within the context of grammatical sketches (see for instance Montler 1986, Raffo 1971, Efrat 1969, Galloway 1990, Kuipers 1967, 1969, 1974 among others). The sources of schwa are investigated also within the context of theoretically focussed dissertations and academic publications (for instance Bird & Czaykowska-Higgins 2016, Blake 2000b, Czaykowska-Higgins 1993, Dyck 2004, Leonard 2007, Nolan 2017, Urbanczyk 2001 among others).

1.4.1 Excrescent schwa in Salish languages

Although the description and analysis of excrescent schwa for Salish languages and SENĆOŦEN is beyond the scope of this dissertation, it is worth mentioning here literature which discusses excrescence in order to give a broad overview of what it looks like in Salish, before leaving issues of deeper description and analysis of SENĆOŦEN excrescence to future research.

In Salish languages, excrescent schwas are often analysed as vocalic elements which sometimes occur between obstruents and resonants. In *St'át'imcet*s [Lillooet] excrescent schwa is shown to be phonetically shorter in duration than other schwas (Shahin and Blake 2004). Excrescent schwa is not considered to be phonological in the Salish languages (Bagemihl 1991: 600, Bianco 1996: 67, Bird & Czaykowska-Higgins 2016, Czaykowska-Higgins & Willett 1997, Kinkade 1998a, Matthewson 1994: 5). The absence and presence of schwa in two different documentations of the SENĆOŦEN word meaning "ashes" is interpreted to be an excrescent schwa (see Leonard 2007). In example (18a) the schwa is analysed by Montler (1986: Section 2.2.10) as a connecter morpheme, whereas in my own recordings, example (18b) there is no schwa transcribed.

(18)

a. ꝀÍEĆEP
q̓ʷáy̓-ə-čəp
√ q̓ʷáY̓-ə-čəp
√dead-CONNECTOR-fire
'ashes, soot'
(Montler 1986: Section 2.2.10)

b. ꝀÍEĆEP
q̓ʷáy̓-čəp
√q̓ʷáY̓-čəp
√dead-fire
'ashes, soot'
(Leonard 2007: 12)

The absence and presence of excrescent vowels and their relationship to syllable structure, particularly the issue of whether or not syllable onsets are permitted, or not, is an area of interest to Salish scholars (see recently Bird & Czaykowska-Higgins 2016). However, as previously mentioned, excrescent schwa is not the topic of this dissertation. Excrescent schwa is considered to be a non-phonological element. The topic of this dissertation is the representation and distribution of phonological vowels in SENĆOŦEN.

1.4.2 Epenthetic schwa in Salish languages

Discussion of epenthetic schwa in the Salish literature concerns mainly its phonological representation and distribution (see Kinkade 1998a on Salish languages in general, and Bates & Carlson 1989 on Spokane, Bianco 1996 on *Hul'q'umi'num'*, Blake 2000b on *ʔayʔaǰuθəm*, Czaykowska-Higgins 1993 on *Nxaʔamxcín*, Matthewson 1994 on *St'át'imcets*, Shaw et al. 1999 on *hən̓q̓əm̓in̓əm̓*, and Urbanczyk (2001) on *dxʷləšúcid* in particular). These scholars investigate the role of epenthetic schwa with respect to the phonological properties of segmental phonotactics, syllable structure, and stress. The overall conclusions that this research reaches are that 1) schwa, regardless of its source, behaves differently from underlying full vowels with respect to stress assignment and 2) that the distribution of epenthetic schwa is largely predictable in Salish, in the sense that epenthetic schwas are often inserted into illicit clusters, or to serve as a syllable peak for words which have no vowel segments. Epenthetic schwas are visible to the phonology, in the sense that they are visible for stress assignment and are themselves stressed if they occur in the correct prosodic position in the word.

1.4.3 Reduced vowels and their sources in Salish languages

Kinkade (1998a) claims that an unstressed schwa can be derived from an unstressed full vowel.[33] As mentioned above, these kinds of vowels have been reported for both Dutch (van Oostendorp 1999, 2000) and English (Chomsky & Halle 1968: 110). In addition, reduced full vowels are reported to occur across the Salish language family (see for instance Bianco 1996: 70). The example in (19) illustrates a SENĆOŦEN root concatenated with a suffix that does not take stress. The root is

[33] Kinkade also claims that Salish schwa can be derived from a consonant. A schwa derived from the consonant [m] has been proposed to occur in Nxaʔamxcín (Czaykowska-Higgins 1998). No such claim has been made for SENĆOŦEN.

stressed and the vowel that is stressed is the full vowel /e/, which is pronounced as a full vowel.

(19) T̸Á,ȻET
t̓ᶿé?kʷət
√t̓ᶿeẆ[34]-ət
√clean-TRNS
'clean it' (Montler 2018: 710)

The example in (20) illustrates the same root concatenated with a suffix that does take stress. The unstressed vowel /e/ in the root is reduced and is pronounced as a schwa [ə]. The unstressed full vowel /e/ that is pronounced as schwa is presented in bold face.

(20) T̸EȻIḰEṈ
t̓ᶿ**ə**?kʷí?qʷəŋ
√t̓ᶿəẆ-í?qʷ-əŋ
√clean-head-MDL
'clean hair' (Montler 2018 713)

The next section reports on descriptions of schwa in SENĆOŦEN that are found in previous linguistic scholarship on the language.[35]

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[34] Throughout this dissertation /Ẇ/ represents a segment which enters into a three-way alternation between an obstruent, glide, and vowel. This segment is specified only for the phonological place features [+high] and [+back]. In this example the /Ẇ/ in onset position becomes [-sonorant], while in nucleus and coda position it becomes [+sonorant]. The extent to which a unified representation for this and other segments which enter into a three-way alternation can be achieved warrants further investigation.

[35] Schwa is argued to be only epenthetic in some Salish languages (e.g Shaw et al. 1999). In other Salish languages, schwa is argued to be both underlying and epenthetic (e.g Urbanczyk 2001). Salish literature concerning the lexical status of schwa is discussed in Chapter 2.

1.5 Previous descriptions of schwa in SENĆOŦEN

The description and analysis of the representation and distribution of schwa presented in this dissertation builds on previous descriptions of SENĆOŦEN schwa. Montler (1986:19) reports that in SENĆOŦEN:

> […] schwa shows the greatest variation among the vowels. When it is stressed it is usually a mid-central [ə]. Stressed or unstressed, it is lower and further back, approaching [a] when contiguous to a uvular, labio-uvular, or laryngeal. This lowering is particularly marked between two of these consonants. Otherwise, when unstressed its quality, though always lax and central, is largely determined by neighbouring sounds. It varies from [ɨ] following palatals and before the resonants, /ŋ/ and / ŋ̓/ to [ʉ] before the labio-velar and the labio-uvular consonants.

The pronunciation of SENĆOŦEN schwa by the speakers recorded for this dissertation, shows that it is pronounced as a back mid unrounded vowel [ʌ] when stressed within a word.[36] When a schwa was unstressed within a word, they both pronounced the sound in a variety of ways. They produced sounds approximating a

[36] This claim is based on the preliminary acoustic results reported in Chapter 4. In that chapter, although there is some variation in formant structure across tokens of stressed schwa, that variation is shown to be to a much less degree than it is for unstressed schwa.

mid and central [ə], high, front and lax [ɪ], high, back and lax [ʊ], mid, front and lax [ɛ] and low and back [a] depending on the types of consonants and sometimes the other vowels that were in close proximity to the schwa. This type of coarticulation is common in Salish languages. Nolan (2017) found a similar pattern in lək̓ʷəŋiṅəŋ and provides a table in her MA thesis comparing schwa variation in Central Salish languages. I have adapted this table to reflect a SENĆOŦEN perspective.

(21) Pronunciation of unstressed schwa in three Coast Salish languages

V	***SENĆOŦEN* (Montler 1986)**	***hənq̓əmíṅəm* (Suttles 2004)**	***ʔayʔaǰuθəm* (Blake 2000b)**
	[a] uvulars, glottals [ɪ] after palatals, before resonants [ʊ] before labialized consonants [ʌ] elsewhere	[ɪ]~[i] before /x/, /y/ [o] before /w/ and labialized velars	[ʌ] uvulars [ɪ] palato-alveolars, palatals [ɨ~ï] velars [ɑ] laryngeals [ʊ] labialized velars [ɔ] labialized uvulars

Montler's (1986) description of schwa is supported by the description and analysis of various morpho-phonological properties in SENĆOŦEN that is presented in this chapter.

1.6 Overview of the dissertation

Having introduced the purpose and goals of the dissertation in this chapter, Chapter 2 presents an overview of the theoretical assumptions made throughout this dissertation. Chapter 3 lays out the details regarding the proposal that there are three types of phonological vowels in SENĆOŦEN. Chapter 4 provides a preliminary acoustic investigation of the quality and length of stressed vs. unstressed vowels. Chapter 5 investigates the distribution of schwa with respect to the syllable structure. Chapter 6 presents the distribution of schwa with respect to foot structure. Chapter 7 concludes the dissertation with a discussion of its contributions and implications for both the academic and pedagogical context suggesting possible avenues for future research.

Chapter 2 Theoretical Assumptions

2.0 Goals of chapter 2

The goal of Chapter 2 is to introduce aspects of linguistic theory which inform the descriptions and analyses presented in this dissertation. Word shape in SENĆOŦEN is assumed to boil down to an interaction between a set of specific morphological processes, such as prefixation, infixation, suffixation, and stress shift/metathesis and a set of identifiable restrictions on well-formed prosodic word shape. Theoretical assumptions about phonological structure and their role in understanding various sound patterns in SENĆOŦEN are situated within the context of theoretical assumptions from both Feature Theory and Prosodic Theory.

Section 2.1 presents the various morphological processes that are described and analysed in this dissertation. Section 2.2 introduces the theoretical principles of Feature Geometry that inform the representations of vowels adopted throughout this dissertation. Section 2.3 introduces the theoretical notion of the Prosodic Hierarchy and explains its use in describing and analysing the phonological representation and distribution of vowels in SENĆOŦEN. Section 2.4 serves as a conclusion to this chapter.

2.1 Morphological structure

The purpose of this subsection is to introduce the morphological processes which occur in the examples used throughout this dissertation.[37] The basic morphological unit of the SENĆOŦEN word is called the 'root'. Many roots cannot appear in isolation, though many can. An example of a root *√q̓əm̓*, meaning 'break off' that can occur in isolation is given in (1).

(1) KEM¸
q̓ə́m̓
√q̓əm̓
√break_off
'to get broken, cut off, chopped, broken in two.' (Montler 2018: 230)

A morphological process can target a root to form a new stem or a new word. An example of a root with the control transitive suffix *-ət* forming a stem is given in (2).

(2) KEM¸ET
q̓ə́m̓ət
√q̓əm̓-ət
√break_off-TRNS
'to severe, break or cut something off, cut something to length, shorten something (as a piece of string), break something in two' (Montler 2018: 231)

A stem can take yet more morphology to form either a new stem or a new word.

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[37] For a more detailed treatment of SENĆOŦEN morphology see Montler (1986). A grammar of SENĆOŦEN is in progress (Montler forthcoming) which is modeled after the Klallam Grammar (Montler 2015b).

An example of the previous stem, given in (2), with the passive suffix *-əŋ* forming a new stem is given in (3).

(3) KEM¸ETEN̲
q̓ə́m̓ətəŋ
√q̓əm̓-ət-əŋ
√break_off-TRNS-PSV
'To be broken off, cut down by someone or something.'[38] (Montler 2018: 231)

The basic morphological structure for SENĆOŦEN words is given in (4).[39]

(4) Basic Word Shape for SENĆOŦEN (Czaykowska-Higgins and Leonard 2015)
P/NOM-ASP-LOC-RED+√*Root*+RED-PA=LS-TRANS/INTR/CTL-O-S/P-ASP[40]

The morphological processes most relevant to the claims made in this dissertation, presented in this chapter, are prefixation, suffixation, infixation, reduplication, and stress shift/metathesis. Prefixation is discussed in section 2.3.1. Suffixation is discussed in section 2.3.2. Infixation is discussed in section 2.3.3. Reduplication is discussed in section 2.3.4. Stress shift/metathesis is discussed in section 2.3.5.

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[38] This word is also documented with the same gloss and the meaning "Saturday" (Montler 2018: 231).
[39] See also Kiyota (2003) for a similar proposal regarding word shape in SENĆOŦEN.
[40] P = person marker, PA = primary affix, NOM = nominalizer, ASP = aspect, LOC = locative, RED = reduplication, LS = lexical suffix, TRANS = transitive, INTR = intransitive, CTL= control, O = object, S= subject.

2.1.1 Prefixes

In chapter 5, examples are presented which illustrate the different phonological patterns exhibited by prefixes in SENĆOŦEN. Sequences of segments in prefixes often exhibit special phonological patterns associated with phonotactics, syllable structure, and stress assignment. These phonological patterns differ from the phonological patterns exhibited by sequences of segments found in roots.

A prefix is a morpheme that is joined before a root or stem to form a new word or stem. A description of the prefixes that occur throughout this dissertation is provided here. An example of a prefix is: *čə*- 'immed'.[41] This prefix, according to Montler (1986: section 2.1.10), occurs only with two stems.[42] In (5) the root for 'man' is presented.

(5) SWÍ,K̲E,
swə́y̓qəʔ
s-√wə́y̓q̓əʔ
s-√male
'man, male, masculine' (Montler 2018: 584-585)

The prefix and the root together form a word that means 'bachelor', as shown in (6).

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[41] Other prefixes exist in the language and are documented and described in Montler (1986) and Montler (2018).

[42] Montler (1986) labels the prefix *čə* as 'alone'. He also points out that "this definition only vaguely covers the meaning of this prefix. Its use in the words for 'spinster' and 'bachelor' is particulary vague." (Montler 2018: 1072). More uses are documented in the SENĆOŦEN dictionary. Where possible, in this dissertation, the glossing convention follows Montler's (2018).

(6) ĆESWÍ,K̲E,
čəswə́y̓qəʔ
čə-s-√wə́y̓qəʔ
IMMED-s-√male
'a single man, bachelor, widower, an unmarried grown man.'
(Montler 2018: 50)

The prefix *čən̓- 'time'* is a clearly segmentable morpheme meaning time (Montler 1986). In (7) the stem meaning 'cold' is presented.

(7) T̸OŁEN̲
t̓ᶿáɬəŋ
√t̓ᶿáɬ-əŋ
√cold-MDL
'to be cold, cool.' (Montler 2018: 727)

The stem and the prefix together form a word that means 'winter', as illustrated in (8).

(8) ĆEN,T̸OŁEN̲
čən̓t̓ᶿáɬəŋ
čən̓-√t̓ᶿáɬ-əŋ
TIME-√cold-mdl
'winter, cold time' (Montler 2018: 49)

The prefix *ɬ*- 'part of something' is not common (Montler 2018: 1074). In (9) the root meaning 'rip' is presented.

(9) SEK
səq̓
√sq̓
√rip
'to get torn, ripped, split lengthwise.' (Montler 2018: 472)

The root and the prefix together form the new word meaning ‘half’.

(10) ŁSEK
ɬsəq̓
ɬ-√sq̓
PART-√rip
‘half’ (Montler 2018: 331)

The *txʷə-* ‘become’ prefix “[…] converts a noun to a verb adding the ‘become’ meaning.” (Montler 2018: 1086).[43] In (11) the root meaning ‘only’ is presented.

(11) HÍ[44]
háy
√haY
√alone
‘only, completely, always, just’ (Montler 2018: 184-185)

The root and the prefix together form a new word meaning ‘to become alone’, as illustrated in example (12).

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[43] Montler (2018: 1084) terms this morpheme as ‘mutative’.

[44] This word is documented with three types of meanings. I am using meaning 2, which itself has further nuances. For documentation of the other two meanings for this word, and their further nuanced meanings see Montler (2018: 184-185).

(12) TW̱Í
txʷáy
txʷə-√haY[45]
BECM-√finish
'to become alone, only, be left alone' (Montler 2018: 690)

The prefix *šxʷ-* 'for' "[…] forms nouns that usually have one of the possessive affixes." (Montler 2018: 1083). The word meaning 'eating' is presented in (13).

(13) I¸ȽEN,
ʔíʔɬəń
√ʔi‹ʔ›ɬən‹ˀ›
√eat‹ACTL›
'to be eating' (Montler 2018: 197)

The root and the prefix together form a new word meaning 'for eating', as illustrated in (14).

(14) ŚW̱¸I¸ȽEN¸
šxʷʔíʔɬəń
šxʷ-√ʔi‹ʔ›ɬən‹ˀ›
for-√eat‹ACTL›
'a place or time for eating' (Montler 2018: 641)

The prefix *šxʷ-* 'in-law' "[…] occurs on various words referring to family members and indicates a substitute (in-law or step) relation" (Montler 2018: 1083). In (15) the root meaning 'grandparent' is presented.

[45] Note, both the schwa and the /h/ are absent at the surface level of representation. Montler (2018: 690) does not include the schwa in the entry for this word, but he does include it in the entry for prefix (see Montler 2018:1026).

(15) SILE,
síləʔ
√síləʔ
√grandparent
‘grandparent’ (Montler 2018: 490)

The root and the prefix together form the new phrase ‘spouse’s grandparent’, as illustrated in (16).

(16) ŚW̱SILE,
šxʷsíləʔ
šxʷ-√síləʔ
IN_LAW-√grandparent
‘spouse’s grandparent, grandparent in law’ (Montler 2018: 645)

The prefix *xʷ-* ‘location’ “[…] typically makes reference to a location. […]” (Montler 2018: 1089). In (17) the root meaning ‘hit’ is presented.

(17) DEM,
t̓ə́m̓
√t̓m̓
√hit
‘to be bumped, hit (especially with a projectile)’ (Montler 2018: 121)

The root, the lexical suffix meaning ‘face’, and the prefix together form a word meaning ‘I got hit in the face.’, as illustrated in (18).

(18) W̱DEM,ES
x^{w}t̓ə́m̓əs
x^{w}-√t̓<ə>m̓=as
LOC-√hit<ACTL>=face
‘I got hit on the face.’ (Montler 2018: 764)

s- is the ‘nominalizer’ prefix. It is “[…] the most common prefix in the language. It typically forms a noun from a verb […]” (Montler 2018: 1075). The root for ‘eat’ is presented in (19).

(19) IȽEN
ʔíɬən
√ʔiɬən
√eat
‘to eat, consume, dine, have a meal’ (Montler 2018: 196)

The root and the prefix together form a new word meaning ‘food’, as shown in (20).

(20) S¸IȽEN
sʔíɬən
s-√ʔiɬən
s-√eat
‘food, meal’[46] (Montler 2018: 492)

This section has laid out a few examples of prefixes in SENĆOŦEN. Suffixes, in SENĆOŦEN can also often exhibit segmental patterns which differ both from the

[46] Montler (2018: 492) documents two meanings for this word. I have used the first meaning.

segmental patterns of prefixes and of roots. A selection of SENĆOŦEN suffixes are discussed next in section 2.1.2.

2.1.2 Suffixes

A suffix is a morpheme placed after the stem of the word to form a new word or stem. In SENĆOŦEN some suffixes express a noun-like meaning. These types of suffixes are termed 'lexical suffixes' in the Salish literature (see Montler 1986 and Pidgeon 1970 for a list of SENĆOŦEN lexical suffixes). Example words with lexical suffixes occur throughout this dissertation. Determining the morphological status of these suffixes is debated in the Salish literature (see among others Blake 2000a, Czaykowska-Higgins 1996, Czaykowska-Higgins 2004b, Czaykowska-Higgins & Willett 1996, Czaykowski 1982, Gerdts 1981, 1988, 2000, 2003, Gerdts & Hinkson 1996, 2003, Hinkson 1999, Kinkade 1998b). In (21) the root for 'to get hit' is presented.

(21) DEM
t̓ə́m̓
√t̓m̓
√hit
'to be bumped, hit (especially with a projectile)' (Montler 2018: 121)

The root and the lexical suffix *=sən* meaning 'to get hit on the leg or foot' together form a new word meaning 'to get hit on the leg', as shown in (22).

(22) DEM,SEN
t̓ə́m̓sən
√t̓m̓=sən
√hit=foot
'to get hit on the leg or foot' (Montler 2018: 123)

The root and the lexical suffix *=iʔqʷ* meaning 'head' together form a new word meaning 'to get hit on the head', as shown in (23).

(23) DEM,I,Ḱ
t̓əm̓íʔqʷ
√t̓m̓=iʔqʷ
√hit=head
'to get hit, bumped on the head (especially by something thrown)' (Montler 2018: 122)

Montler (2018) lists three suffixes which change the syntactic class or extend the meaning of the root. These suffixes are *-i* 'persistent', *-il* 'developmental'[47], and *-el̓ŋən* 'want'[48]. The *-i* 'persistent' suffix is an aspectual morpheme indicating that the activity of the stem is a state. In (24) the word meaning 'to grab something' is presented. This word is comprised of the root and the control transitive suffix *-ət*.

[47] Montler (1986) calls this suffix "directional".

[48] Montler (1986) calls this suffix "desiderative".

(24) ȻENET
kʷə́nət
√kʷən-ət
√take-TRNS
'to take, grab, reach for, get something' (Montler 2018: 90)

In (25) the root meaning 'to grab' is concatenated with *-i* the persistent suffix and the control transitive suffix *-ət*. The newly formed word means 'to take a hold of something.'

(25) ȻENIT
kʷənít
√kʷən-i-ət[49]
√take-PERSIST-TRNS
'to hold on to, keep, carry something'[50] (Montler 2018: 91)

The *-il* 'developmental' suffix "[…] makes a word that refers to a situation that is developing or has developed from some other situation." (Montler 2018: 1139). In (26) the root meaning 'deep' is presented.

[49] Montler (2018: 91) does not include the schwa with the control transitive in his analysis. In this dissertation, the schwa is included in example (25) because schwa is considered to be part of the underlying representation of the control transitive morpheme. The lack of schwa at the surface respresentation of this word is accounted for by a restriction against vowel hiatus which results in vowel deletion (see Leonard 2007).
[50] There are two meanings documented in Montler (2018: 91) for this word. The first meaning is used in example (25).

(26) ṮEĆ
ƛ̓ə́č
√ƛ̓č
√deep
'to be deep, under' (Montler 2018: 735)

In (27) the direction suffix *-il* along with the control middle suffix *-əŋ* concatenate with the root to give a meaning of 'it sank'.

(27) ṮĆILEṈ
ƛ̓číləŋ
√ƛ̓č-il-əŋ
deep-DEV-MDL
'to sink, go under water' (Montler 2018: 734)

Montler (2018: 1112) says the following about the morpheme *-eli̓ŋən* 'want':

> This desiderative suffix can, apparently, be put on any verb to add the meaning 'want to'. This is like a suffix in that it is stressed, but like an enclitic in that it follows transitive, object and third person subject inflection.

In (28) the root meaning 'to go home' is presented.

(28) DOQ
t̓ák̓ʷ
√t̓ak̓ʷ
√go_home
'to go home' (Montler 2018: 132)

The root and the suffix *-el̓ŋən* meaning ‘to want’ together form a new word meaning ‘to want to go home’.

(29) DEQÁL¸ṈEN
t̓ək̓ʷél̓ŋən
√t̓ak̓ʷ-el̓ŋən
√go_home-WANT
‘to want to go home’ (Montler 2018: 126)

Suffixes can also express the grammatical category of *valence*. In general, the grammatical term *valence* refers to whether or not a predicate is able to licence an argument. Montler (1986: Section 2.5) describes a set of suffixes expressing voice, which are grouped into transitive and intransitive pairs. The transitive suffixes licence both a subject and object and sometimes a third participant in the sentence. The intransitive suffixes licence only a subject which is either a patient or an agent.

There is also a system of control (whether or not the agent of the predicate has conscious control over the action carried out) associated with transitive suffixes in SENĆOŦEN (see Montler 1986: Section 2.5 for SENĆOŦEN). The notion of control as it relates to transitivity is also described and analysed for other Salish languages by among others: Beaumont (1977), Beck (2007), Carlson (1996), Carlson & Thompson (1981), Darnell (1997), Davis & Saunders (1976, 1980, 1986), Gerdts (2008), Gerdts & Hukari (2006a, 2006b, 2006c, 2006d, Gerdts & Kiyosawa (2007), Hess (1967), Jacobs (2007, 2011a), Mattina (1996), Montler (1996), Saunders & Davis (1982), Thompson (1979), Thompson & Thompson (1981).

The root meaning 'to see' is concatenated with the control transitive morpheme *-ət* which licences a subject and an object and provides agency to the subject. The new word now means 'He looked at it.', as illustrated in (30).

(30) QENET[51]
k̓ʷə́n-ət
√k̓ʷən[52]-ət
√see-TRNS
'to look at something' (Montler 2018: 417-418)

The root meaning 'to see' is concatenated with the non-control transitive morpheme -*naxʷ* which licenses a subject and object and removes agency from the subject. The new word now means 'to see something.', as illustrated in (31).

(31) QENNEW̱
k̓ʷə́n-nəxʷ
√k̓ʷən-naxʷ
√see-NCTRNS
'to see something.' (Montler 2018: 421-422)

Montler (1986) also describes suffixes which express person marking. He reports two sets of object markers, a set of subject pronominals and also a third person

[51] Montler (2018: 418) gives two meanings for this word. The example in (30) uses the first meaning.
[52] Montler (2018: 416) reports that no recordings exist of this root being used in a sentence and thus is not considered to be a word by itself in the SENĆOŦEN dictionary.

subject suffix. Examples of this kind of morphology are found throughout the dissertation. In (32) a set of object suffixes which Montler (1986) claims occur only with the control transitive morpheme are presented.

(32) Object Suffixes Set 1 (adapted from Montler 1986)

	Singular		Plural
1st	S *-s*		OL,W̲ *-al̓xʷ*
2nd		SE *-sə*	
3rd		∅	

In (33) a set of object suffixes which occur with all other transitive morphology are presented.

(33) Object Suffixes Set 2 (based on Montler 1986)

	Singular		Plural
1st	ON̲ES *-aŋəs*		OL,W̲ *-al̓xʷ*
2nd		ON̲E *-aŋə*	
3rd		∅	

In (34) the set of subject pronominal suffixes which occur in subordinate clauses is presented.

(34) Subject Pronominal Suffixes (based on Montler 1986)

	Singular		Plural
1st	EN -ən		EȽTE -əɬtə
2nd		EW̲ -əxʷ	
3rd		ES -əs	

The set of morphemes which encode person in main clauses is presented in (35). The first and second person are clitics, with only the third person as a suffix. The subordinate clause suffixes presented above are derived from these forms (Montler 1986).

(35) Subject Main Clause Morphemes (based on Montler (1986)[53]

	Singular		Plural
1st	SEN =s-ən		ȽTE =ɬtə
2nd		SW̱ =s-xʷ	
3rd		ES -əs	

A number of schwa~zero, full vowel~schwa, and full vowel~zero alternations associated with suffixes are described and analysed throughout this dissertation.[54] Next, in section 2.1.3, the morphological properties of infixes are discussed.

2.1.3 Infixes

Montler (1986) reports three grammatical properties of SENĆOŦEN that are expressed using a morphological process called infixation. The morphological process of infixation can be defined as the insertion of a morpheme within the root. Infixation

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[53] SENĆOŦEN has more subject marking (e.g., possessives). Only person marking relevant to the arguments and evidence presented in this dissertation are described here. For a fuller description of the person marking system in SENĆOŦEN see Montler (1986), available at http://saanich.montler.net/Outline/index.htm

[54] Suffixes in SENĆOŦEN appear sometimes to, and sometimes not to, influence the stress assignment pattern of the word that they are in. In some cases, suffixes, as well as roots, pattern as though they are lexically predetermined for whether or not they will attract or repel stress (Montler 1986). Preliminary investigations into the lexical stress properties of morphemes in SENĆOŦEN are offered by Leonard (2005). A more indepth investigation into the lexical stress properties of morphemes in SENĆOŦEN warrants further study.

in SENĆOŦEN is used to express the plural, the actual aspect[55], and the diminutive. Plural infixation in SENĆOŦEN exhibits a degree of variation.[56] If the stem is of the shape CV́CəC, then the infix variant *-əl-* is usually placed after the initial consonant (see Montler 1986, Kioyta 2003). In (36) the stem meaning 'outside' is presented.

(36) SAḴEȽ
séqəɬ
√séq-aɬ
√outside<RSLT>-DUR
'He's outside.'

In (37) an infix variant *-əl-*[57] is placed after the initial consonant of the word 'outside' to express a plural meaning.

(37) SELAḴEȽ
səléqəɬ
√s<əl>eq-aɬ
√outside<PL><RSLT>-DUR
'to be outside.' (Montler 2018: 473)

If the root is of the shape CV́C, then the infix variant *-ʔlə-* is usually placed after the stressed vowel (see Montler 1986, Kioyta 2003). In (42) the root meaning 'road' is presented.

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[55] The *actual aspect* is also referred to as the *Imperfective* (Turner 2007, 2011a, Leonard & Turner 2010).
[56] Description and analysis of the plural is presented in chapter 6, where variation in how this morpheme surfaces is argued to be triggered, in part, by requirements on foot shape in SENĆOŦEN.
[57] The suffix is analysed as having an underlying /a/ following (Montler 2018 437). In cases, like this, as will be shown in Chapter 3, the /a/ is argued to reduce to schwa when it is unstressed.

(38) SOȽ
sáɬ
√saɬ
√door/road
‘road, trail’[58] (Montler 2018: 546-547)

In (39) the variant *-ʔlə-* is placed after the stressed vowel to express the plural meaning.

(39) SO,LEȽ
sá<ʔlə>ɬ
√sa<ʔlə>ɬ
√door/road<PL>
‘several roads or doors’ (Montler 2018: 546)

A glottal stop infix is used to express the actual aspect in SENĆOŦEN.[59] In (40) the root meaning ‘to eat’ is presented.

(40) IȽEN
ʔíɬən
√ʔiɬən
√eat
‘to eat, consume, dine, have a meal’ (Montler 2018: 196)

In (41) the glottal stop infix is placed after the stressed vowel to express the actual aspect.[60]

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[58] Montler (2018: 546) documents two meanings for this word. Example (38) uses the second meaning.
[59] Turner (2007, 2011a) argues that the term for this infix is *imperfective*. This dissertation follows Montler (1986, 2018) in its use of the term *actual*. The *actual* aspect in SENĆOŦEN is also formed using other processes, such as stress shift/metathesis and reduplication, which all have had various theoretical treatments in the linguistic literature (see for example, Davis & Ueda 2006, Kurisu 2001, Leonard & Turner 2010, Montler 1986, 1989, Stonham (1994), Turner 2007, 2011a).

(41) I,ȽEN,
ʔíʔɬəń
√ʔi<ʔ>ɬən
√eat<ACTL>
‘to be eating’ (Montler 2018: 197)

A glottal stop infix is also used to express the diminutive in SENĆOŦEN.[61] In (42) the stem meaning ‘sail’ is presented.

(42) POW̱EN
páxʷən
√p<a>xʷ=ən
√sail<RSLT>=INSTR
‘any sail’ (Monter 2018: 406)

In (43) the glottal stop infix is located after the stressed vowel. Along with the reduplication, the glottal stop infix expresses the diminutive meaning.

(43) PEPO,W̱EN
pəpáʔxʷən
CV~√pa<ʔ>xʷ=ən[62]
DIM~√sail<DIM>=INSTR
‘a small sail’ (Montler 2018: 400)

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[60] The morphophonological patterns associated with this morpheme are described and analysed in chapter 6 where requirements on the ideal shape and alignment of feet are shown to trigger those patterns.
[61] This morpheme is expressed using both a glottal stop and reduplication within the same word.
[62] This analysis differs somewhat from the analysis given in the SENĆOŦEN dictionary (see Montler 2018: 400). Example (43) is analysed as follows: Firstly, the stem is analysed as the resultative form given in (42) meaning “a sail”, which has already undergone ablaut. Secondly, the diminutive is formed on this stem by CV reduplication and glottal infixation. Thirdly, the initial CV of the root is reduplicated and the vowel in the reduplicant is reduced to schwa because it is unstressed (see Chapter 3 for more details on this analysis).

The plural infix is clearly sensitive to the prosodic shape of the stem that it targets. This has been pointed out by Montler (1986) and Kiyota (2003). The glottal stop infix tends to be placed after the stressed vowel in most words and in some cases, there is also a schwa that occurs with this infix. The schwa~zero alternations associated with infixation are described and analysed throughout this dissertation. The morphological process of reduplication is discussed next, in section 2.1.4.

2.1.4 Reduplication

Reduplication is a word formation process which involves the repetition of the whole or a part of the root or stem to form a new word or stem. The kinds of meanings expressed by the morphological process of reduplication in SENĆOŦEN include the actual aspect, the plural, and the characteristic, in addition to the diminutive in (43). In (44) the root meaning 'sing' is presented.

(44) DILEM
t̓íləm
√t̓iləm
√sing
'sing' (Montler 2018: 128)

In (45) the root with reduplication expressing the actual aspect is presented.

(45) DEDI,LEM,
t̓ət̓íl̓əm̓
t̓i~√t̓il<ʔ>əm[63]
ACTL~√sing<ACTL>
‘to be singing’ (Montler 2018: 118)

The processes of CV reduplication and a change in the vowel quality can apply together to form the plural. In (46) the stem meaning ‘pot for cooking’ is presented.

(46) ŚḰEL,S
šqʷə́l̓s
š-√qʷəl̓s
FOR-√boil_cook
‘any container such as a boiler, pot, cauldron, used for boiling’
(Montler 2018: 625)

In (47) CV reduplication and a change in vowel quality from a schwa to an [i] mark the plural.

(47) ŚḰEḰIL,S
šqʷəqʷíl̓s
š-CV~√qʷ<i>l̓s[64]
FOR-PL~√boil_cook
‘pots’ (Montler 2018: 624)

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[63] Montler (2018: 118) includes the glottalization on the final resonant. In this example it is left out of the morphological analysis. Instead, the resonant glottalization is assumed to spread to the final resonant in the reduplicated word. See Montler (1986) for more on the relationship between morphological processes and the spread of glottalization to resonants in SENĆOŦEN.

[64] The stem for this word is *šqʷə́l̓s* “pot” given in example (47). The representation of the analysis for this example differs slightly from that provided in the Saanich dictionary (see Montler 2018: 624).

The plural can also be expressed with CVC reduplication, though this is very rare with only a handful of instances documented. In (48) the stem meaning ‘woman’ is presented.

(48) SȽÁNI,[65]
sɬéniʔ
s-√ɬenY̓
S-√female
‘woman, lady, female, feminine’ (Montler 2018: 526)

CVC reduplication marks the plural, as shown in example (49).

(49) SȽENȽÁNI,[66]
sɬənɬéniʔ
s-CVC~√ɬenY̓[67]
S-PL~√female
‘a group of women’ (Montler 2018: 531)

The characteristic refers to a characteristic trait or tendency of disposition and can also be expressed through the process of CVC reduplication. In (50) the root meaning ‘speak’ is presented.

[65] Montler (2018: 526) documents two meanings for this word. The example in (49) uses the first meaning.
[66] A variant form of this word is documented which has a schwa present in the reduplicant *sɬnɬéniʔ* (see Montler (2018: 531). See chapter 5 of this dissertation for more on complex onsets involving lateral segments in SENĆOŦEN.
[67] This analysis departs from Montler (2018).

(50) ḰÁL
qʷél
√qʷel
√talk
'to talk, speak, say (something)' (Montler 2018: 273-274)

The characteristic CVC reduplication together root meaning 'speak' form a new word meaning 'to be talkative', as illustrated in (51).

(51) ḰELḰEL
qʷə́lqʷəl
CVC~√qʷəl[68]
CHAR~√talk
'to be talkative.' (Montler 2018: 279)

CVC reduplication is also used to express the repetitive. The "[...] 'repetitive' refers to iterations of the action or state expressed in the predicate itself [...]" (Montler 1986). In (52) the stem 'dive' is presented.

(52) NEḴEṈ
nə́qəŋ
√nəq-əŋ
√dive-MDL
'to dive, go down into water' (Montler 2018: 359)

CVC reduplication and the root together form a new word which means 'to be diving repeatedly', as illustrated in (53).

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[68] Montler (2018: 274) says that the form *√qʷel* 'talk' may be a resultative stem and that the root may in fact be *√qʷəl*. He notes that this variant of the root does occur.

(53) NEḴNEḴEṈ
nəqnə́qəŋ
CVC~√nəq-əŋ
REP~dive-MDL
'to be diving repeatedly, diving down and coming up again and again'
(Montler 2018: 359)

Full vowel~schwa, and schwa~zero alternations associated with redupulication are described and analysed throughout this dissertation. Next, in section 2.1.5, the morphological processes called stress shift/metathesis is discussed.

2.1.5 Stress shift/metathesis[69]

Stress shift/metathesis as it relates to SENĆOŦEN is a process which marks the actual aspect in some cluster-initial stems. In (54), the vowelless root meaning 'rip' concatenated with the control transitive together form a word meaning 'rip it'. The stressed schwa is located between the final two consonants of the word.

(54) SKET
sq̓ə́t
√sq̓-ət
√rip-TRNS
'to tear, rip, split something' (Montler 2018: 505)

[69] This process was first termed stress shift/metathesis to describe a similar process in the related Klallam by (Thompson 1979) and subsequently adopted by Montler (1986) to describe the SENĆOŦEN patterns.

In example (55), the vowelless root meaning ‘rip’ and the control transitive together form the word meaning ‘tearing it’. The stressed schwa is located between the initial two consonants of the word.

(55) SEKT[70]
sə́q̓t
√s‹ə›q̓-ət
√rip‹ACTL›-TRNS
‘to be tearing ripping something’ (Montler 2018: 472)

In example (56), the vowelless root meaning ‘fill’ and the control transitive together from a word meaning ‘to fill something’. The stressed schwa is located between the final two consonants of the word.

(56) LEȾET
lət̓ᶿə́t
√l̓t̓ᶿ-ət
√fill-TRNS
‘to fill something’ (Montler 2018: 300)

In example (57), the vowelless root ‘fill’ and the control transitive together form a word meaning ‘to be filling something’. The stressed schwa is located between the initial two consonants of the word.

[70] Montler (2018: 472) documents two meanings for this word. The example in (55) uses the first meaning.

(57) LEȾ́T
lə́t̓ᶿt
√l‹ə›t̓ᶿ-ət
√fill‹ACTL›-TRNS
‘to be filling something’ (Montler 2018: 300)

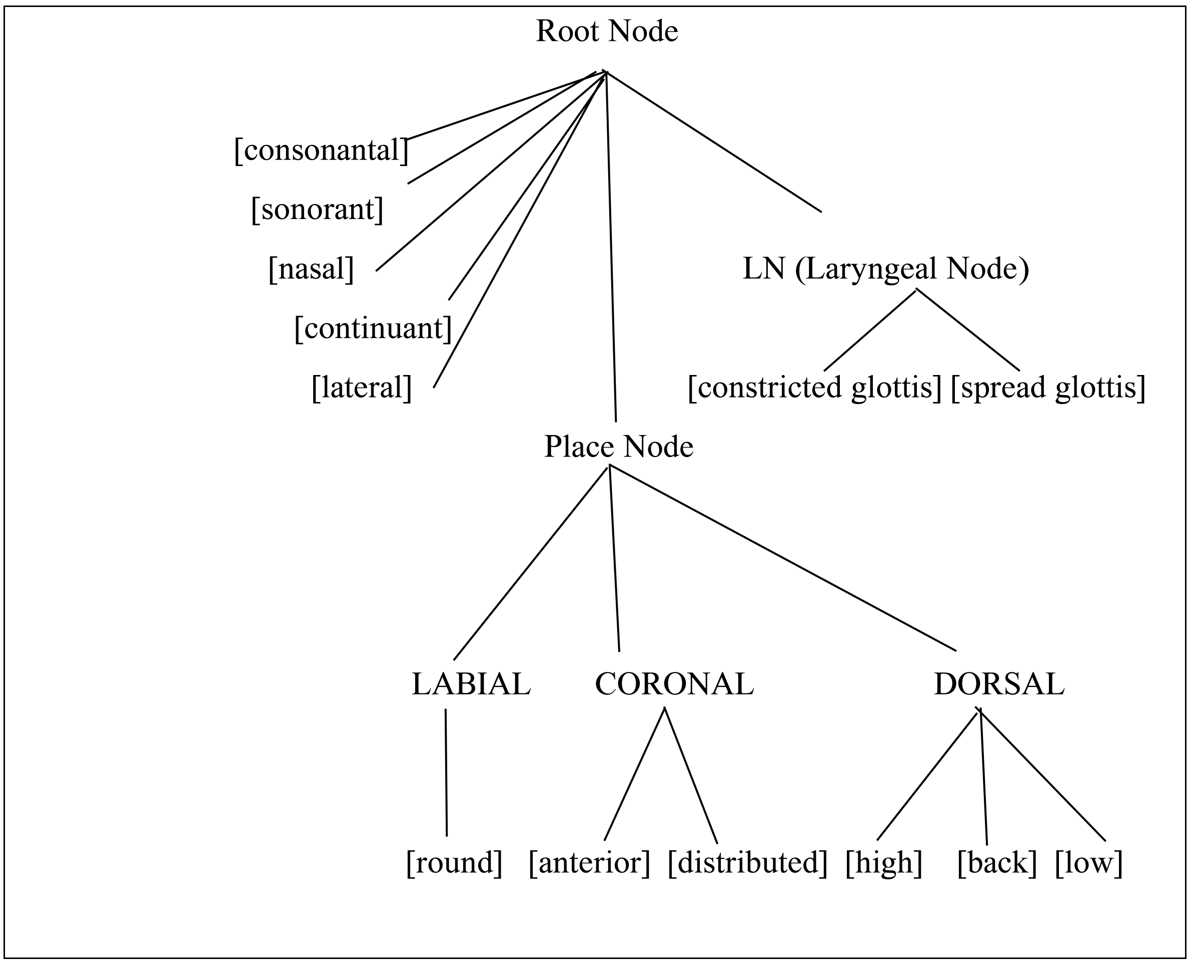
Schwa~zero alternations associated with stress shift/metathesis are described and analysed throughout this dissertation. Section 2.1 has provided the reader with a brief overview of the morphological processes relevant to the descriptions and analyses presented throughout this dissertation. Section 2.2 discusses the theoretical assumptions associated with Feature Geometry that are adopted throughout this dissertation.

2.2 Feature theory and the segmental properties in SENĆOŦEN

The principles of Feature Geometry are adopted throughout this dissertation as a tool for describing the abstract differences in vowel quality. Feature Geometry has its foundation in Distinctive Feature Theory where the sounds of a language are assumed to be made up from a bundle of phonological/phonetic features (see Chomsky & Halle 1968, Fant 1973, Jakobson, Fant & Halle 1952 for foundational literature and see also Mielke 2011 for more current discussion and review). Features are assumed to be represented in a hierarchical relationship and can be represented in a tree-like structure (see for example, Archangeli & Pulleyblank 1994, Halle 1995, McCarthy 1988, Sagey

1986, amongst others). Following Blake (2000b: 55) only aspects of Feature Geometry that are relevant for characterizing the SENĆOŦEN language examples are presented in this dissertation. The kind of feature tree diagram that is assumed in this dissertation is presented in (58).

(58) Feature Geometry Tree (adapted from Blake (2000b)



The place features relevant for describing the phonological place of articulation for the consonants of SENĆOŦEN are presented in (59).

(59) Place Features

SENĆOŦEN	***APA***	**LABIAL**	**CORONAL**		**DORSAL**	
		round	**anterior**	**distributed**	**back**	**high**
P B M M,	p p̓ m m̓	-				
Ⱦ Ŧ	t̓$^{\theta}$ θ		+	+		
T D S N N,	t t̓ s n n̓		+	-		
Ł L L,	ɬ l l̓[71]		+	-		
Ć J Ś, ,	č č̓ š		-	+		
Y Y,	y y̓ Y Y̓[72]		-	+	-	+
(K)	(k)				+	+
Ȼ W̱ W W,	k^w x^w w w̓	+			+	+
Ḵ K X Ṉ Ṉ,	q q̓ x̣ ŋ ŋ̓				+	-
Ḱ Ꝁ X̱	q^w q̓^{w} x̣^{w}	+			+	-
, H	ʔ h[73]					

The vowels have a four way phonological contrast underlyingly which is captured by the three DORSAL place features [high], [low], [back]. [74] The vowel /i/ is

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[71] The lateral segments are differentiated from the coronal segments by the manner feature [lateral]. The coronal laterals are [+lateral] and the coronal non-laterals are [-lateral].

[72] Hall (2007: 324) says that "There is now consensus that palatals are coronal (contra SPE) (Hyman 1973, Clements 1976, Vago 1976, Odden 1978, Lahiri & Blumstein 1984, Hume 1992[4], and Hall 1997). Some linguists see palatal sounds as complex in the sense that they are both coronal and dorsal (Keating 1988:98, Pulleyblank 1989:391, Robinson 2001:107–108). Hall (1997:10ff.) argues that palatal noncontinuants (i.e. stops, nasals, laterals) and palatal glides are noncomplex coronal segments, but that palatal fricatives like /ç, ʝ/ are dorsal and not coronal." However, van der Hulst & Ritter (2012) say that "The Dor part of a palatal has been the standard assumption in feature theory (cf Halle & Clements 1983)." This dissertation follows those arguing that palatal sounds are complex and represent /y/, and /y̓/ (/Y/, and /Y̓/) in SENĆOŦEN phonologically as having both a coronal node, and a dorsal node (see Keating 1988, Pullyblank 1989, Robinson 2001, Halle & Clements 1983, van der Hulst & Ritter 2012).

[73] A placeless approach to the patterning of glottal stop occurs elsewhere in the literature Borroff (2007: 2) cites the following: Steriade 1987, Cohn 1990, Bessell 1992b, Bessell & Czaykowska-Higgins 1991, Duanmu 1994, Sumner 1999, Ola Orie and Bricker 2000, Broselow 2001, and Parker 2001, among others. This view has its opponents and the classification of glottal stop with respect to place features is debated in the literature (see for example Hess 1990, McCarthy 1991a b, Rose 1996, Borrof 2007, Lombardi 1995, 2002.).

characterized by the place features [+high], [-back], [-low]. The vowel /e/ is characterized by the place features [-high], [-back], [-low]. The vowel /a/ is characterized by the place features [-high], [+back], [+low]. The central vowel, schwa, is left abstractly placeless in its underlying representation.[75] The underlying place feature specification for each underlying vowel is given in (60).

(60) Underlying Vowel Place Features

	[high]	**[back]**	**[low]**
/i/	+	-	-
/e/	-	-	-
/a/	-	-	+
/ə/			

Each stressed vowel has a different combination of place features at the surface level of representation, as illustrated in (61).

[74] In an effort to be consistent throughout the dissertation the place features for the borrowed underlying vowel /u/ are not included in the table. The place feature for /u/ are assumed to be [+high], [-low], [+back], and [+round].

[75] Two processes, presented in chapter 3 which support the proposal that schwa is phonologically placeless are 1) vowel reduction, which is analysed as the loss of place features and 2) translayngeal vowel harmony, which is analysed as a process place feature sharing.

(61) Surface Stressed Vowels: Place Features

	[high]	[back]	[low]
[í]	+	-	-
[é]	-	-	-
[á]	-	+	+
[ə́]	-	+	-

The set of underlying full vowels in SENĆOŦEN, lose their place features node when they have been delinked from their mora in unstressed position (see van Oostendorp 1999 for similar arguments for Dutch and English vowels). All schwa vowels in SENĆOŦEN are argued to be placeless in unstressed position, whether they are derived from underlying full vowels, are present at the underlying level of representation, or are epenthesized at the surface level of representation, as illustrated in (62).

(62) Surface Unstressed Vowels: NoPlace Features

	[high]	[back]	[low]
[i]			
[e]			
[a]			
[ə]			

Both the unstressed full vowels and the unstressed schwa coarticulate somewhat with surrounding consonants, and, in some cases, harmonize with nearby vowels. Also, unstressed full vowels and unstressed schwa are all transcribed as schwa and written most often as E suggesting that there might be a loss in phonetic contrast among these vowel types. The acoustic properties of stressed vs. unstressed vowels are investigated further in Chapter 4. Next, in section 2.3 assumptions having to do with Prosodic Theory are discussed.

2.3 Prosodic theory and suprasegmental properties in SENĆOŦEN

Prosodic units which reside above the level of the segment are termed suprasegmental units. The prosodic units are the mora, the syllable, the foot, the prosodic word, the phonological phrase, the intonational phrase, and the utterance. These units increase in size from the mora to the utterance and are organized into a prosodic hierarchy. Blevins (1995 ft 13) noted that some version of the prosodic hierarchy is assumed in all modern phonological frameworks, the labels of which vary from scholar to scholar. This is an observation that is still true today.

In general, the prosodic hierarchy works in the following way: a segment is parsed by the unit above, and that unit, in turn, is parsed by the unit above that, and so on. Some of the Salish scholarship which assumes some type of Prosodic Hierarchy in its analyses include the work of Czaykowska-Higgins (1998) on Nxa?amxcín word structure, Caldecott (2009) on St’át’imcets extrapods, Dyck on Sk̲wx̲wú7mesh word stress, Koch (2008) on the phonological and phonetic correlates of Nlhe7kepmxcin intonation and grammatical focus, Matthewson (1994) on St’át’imcets syllable structure and Urbanczyk (2001) on dxʷɬəšucid reduplication.

The theoretical notion of the Prosodic Hierarchy is adopted also throughout the scholarship on Central Salish phonology. A version of the Prosodic Hierachy is used in studies of Central Salish schwa (see Blake (2000b) on ʔayʔaǰuθəm). The prosodic hierarchy is used in analyses of Central Salish stress assignment patterns (see Bianco 1996 on Hul’q’umi’num’, Dyck (2004) on Sk̲wx̲wú7mesh, Leonard (2007) on SENĆOŦEN, Shaw et al. (1999) on hən̓q̓əm̓in̓əm̓). A version of the Prosodic Hierarchy is used in studies of Central Salish word structure (see Beck (1999), Beck & Bennett (2007) on dxʷɬəšucid, Benner (2006) and Leonard (2011) on SENĆOŦEN). Following from this scholarship, this dissertation also assumes a prosodic hierarchy, presented below in (63).

(63) Selkirk's Prosodic Hierarchy (Selkirk 1978, Selkirk 1995)

Utterance (Utt)
intonation phrase (IP)
phonological phrase (PhP)
prosodic word (PWd)
foot (Ft)

In this dissertation, the prosodic hierarchy is employed as a descriptive organizational tool for describing and analysing the phonological characteristics of vowels in SENĆOŦEN. The assumption is that segments and higher prosodic units are permitted to skip various levels of the prosodic hierarchy for morphological or phonological reasons. For example, as is argued in Chapter 3, only full vowels are parsed by a mora, consonants are sometimes permitted to be unsyllabified, and syllables are sometimes permitted to remain unfooted.

For the remainder of this dissertation, theoretically informed descriptions of segmental and prosodic properties in SENĆOŦEN are provided which refer to the mora, the syllable, and the foot. The mora is a phonological constituent located between the segment and the syllable. The standard assumption in the linguistic literature is that underlying vowels have a mora. This dissertation proposes that underlying schwa does not have a mora. It is considered to be the terminal element in the prosodic hierarchy. A mora is considered to be an abstract unit of phonological weight that measures a syllable's heaviness or lightness. Syllables that are bimoraic are considered heavy, and attract stress normally, and those that are monomoraic are considered light. Moraicity is considered to be a phonological phenomenon, in that a phonological process in a language may be sensitive to this heavy/light distinction between syllables, particularly with respect to stress or accent.[76] In Chapter 3, I provide evidence that rather than a sensitivity to a heavy/light distinction between syllables, stress assignment in SENĆOŦEN is instead sensitive to whether a vowel is underlyingly moraic or not.[77]

A syllable is a phonological unit whereby segments (consonants and vowels) are organized together into a larger prosodic unit. Steriade (2002: 1) offers the following definition of a syllable:

> A syllable is a string of segments grouped around one obligatory vowel or vowel-like (syllabic) element. This segment is the syllable's nucleus; any preceding group of consonants within the syllable is the onset; and any following consonants form the coda. The word *algebra*, if divided as al.ge.bra, contains an initial syllable without onset but ending in a coda, followed by two syllables with onsets but lacking codas.

[76] Hayes (1995) claims that no language assigns moraic values to onset consonants. However, see Topintzi (2006) who proposes that onset consonants can be moraic. In this dissertation, I assume that onsets do not have a mora.

[77] Stress assignment is argued, in chapter 3, to be sensitive to the distinction between having a mora and not having a mora. This argument supports previous literature on Salish languages (see for example Blake 2000b, Czaykowska-Higgins 1993, Dyck 2004 among others). There is no evidence, to date, to suggest that consonants should be considered to be underlyingly moraic in SENĆOŦEN. Likewise, it is explained, in chapter 3, that there is no known evidence, to date, to suggest that consonants are assigned a mora when serving as a coda to a syllable.

A popular theoretical assumption in the literature is that the syllable influences phonological patterns of a language, such as stress assignment and phonotactics (see for instance Itô 1986, 2018 Selkirk 1982, Hoard 1978, Kahn 1976, Venneman 1972). [78] A syllable is most often headed by a vowel. Although, weightless and placeless, a schwa is often inserted as a default peak of a syllable. The proposal that schwa is weightless and placeless in a Salish language has been made before. Shaw et al. (1999) propose a nuclear moraic model of the syllable (Shaw 1992, 1993) where the Nucleus is the head of the syllable. In this model schwa is a weightless and placeless vowel which is dominated by a nuclear node: Its realization as [-cons, +son] follows from its Nuc specification" (Shaw et al. 1999: 134). The comparison of the prosodic representations of full vowels versus schwa, found in Shaw et al. (1999) is illustrated below, in (64).

(64)	a. full Vowels	b. schwa
Nucleus	Nuc	Nuc
Moraic weight	μ	
Root node	o	
Features	[f]	

[78] However, see Hyman (1985, 2011) for a proposal that at least one language Gokana might present itself as a counter example against the notion of universality of the syllable in phonology. See also Blevin's (2003) and Steriade (1999) who, despite recognizing the notion of the syllable in phonology, argue that referring to this prosodic unit is not always necessary when accounting for phonotactic patterns in languages.

Piggott (1995) also argues that syllables can have nuclei, but lack a mora. He, however, does not include the nucleus in his prosodic representations of these syllable types. Having found no evidence to support the presence or absence of a Nuc node, this dissertation follows Piggott's convention in not representing the nucleus node. Leonard (2007) claims that the most usual syllable shapes in SENĆOŦEN are CV and CVC. A description and analysis of schwa distribution supporting this claim, which allows also complexity in special circumstances is presented Chapter 5.

The term *foot* in phonology refers to a prosodic unit which groups together (moras and/or) syllables usually for the purpose of stress assignment (Halle & Vergnaud 1987, Hayes 1995, Liberman and Prince 1977, Prince 1983). Leonard (2007) argues that stress feet are most often bisyllabic and trochaic with a general alignment to the right-edge of a phonological domain in SENĆOŦEN. Monosyllabic degenerate feet are permitted under certain phonological conditions, such as when the syllable contains a full vowel rather than a schwa or when the word is comprised of only one syllable. Evidence supporting these claims is presented in Chapter 6. A number of zero and schwa alternations, as well as full vowel and schwa alternations, are described and analysed showing that the distribution of the vowels is often influenced by prosodic restrictions associated with foot shape in SENĆOŦEN.

2.4 Conclusion

The theoretical assumptions about the morphological and phonological structure of SENĆOŦEN words discussed in this chapter inform the rest of the dissertation. A series of claims on what the phonological representations of place and weight are for vowels in SENĆOŦEN is presented next in Chapter 3. This is followed, in Chapter 4, by a preliminary acoustic investigation of the difference in length and quality between stressed and unstressed vowels with a discussion on how that correlates with the claims put forth in Chapter 3. The distribution of schwa is investigated, first in Chapter 5 where claims concerning the shape of syllables in SENĆOŦEN are presented and second in chapter 6 where claims concerning the shape of metrical feet in SENĆOŦEN are presented.

Chapter 3 Weightless and Placeless Schwa in SENĆOŦEN.

3.0 Introduction

The purpose of Chapter 3 is to argue that schwa, in SENĆOŦEN, is a phonologically weightless vowel, present sometimes at the lexical level of a word, and other times not, and which lacks its own phonological place features. Crucially, this chapter argues that only full vowels have weight (a mora) and that Weight-By-Position is not active in SENĆOŦEN.[79] Throughout this chapter, the phonological processes of stress assignment, vowel harmony, and vowel reduction are used as evidence to support these claims. The case that underlying full vowels have a mora, and that schwa does not is argued in section 3.1. Apparent exceptional cases are discussed in section 3.2, where the phonological behaviour of surface full vowels occurring in unstressed syllables are argued to follow from the claim that only underlying full vowels have a mora. Section 3.3 is a conclusion.

3.1 Underlying full vowels have mora and place, schwa does not.

This section presents evidence from stress assignment patterns to support a claim that underlying full vowels and schwa can be differentiated by their phonological

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[79] The proposal that *Weight-By-Position* is not active in SENĆOŦEN is consistent with Leonard (2007: 8): who says "I found no evidence for a distinction between closed bimoraic and open monomoraic syllables in SENĆOŦEN, and therefore cannot conclude that stress in the language is attracted to bimoraic, heavy syllables as opposed to light monomoraic ones.".

representations. Section 3.1.1 argues that underlying full vowels are moraic, whereas schwa is not. Section 3.1.2 argues that schwa is sometimes present at an underlying level and other times serves as an epenthetic vowel. Section 3.1.3 argues that schwa is phonologically placeless at the underlying level of representation and that unstressed full vowels are also phonologically placeless. Section 3.1.4 argues that there is no evidence to suggest that Weight-By-Position is active in SENĆOŦEN. Crucially, the major claim made in section 3.1 is that the underlying full vowels are the only segments in SENĆOŦEN that have a mora.

3.1.1 Schwa in SENĆOŦEN is weightless: stress in three syllable words

This section argues that schwa is weightless in SENĆOŦEN. This claim is supported by the patterns of stress assignment of three syllable words where a full vowel, a vowel with weight, is assigned stress over a schwa. The notion that there is a weight distinction between underlyingly full vowels versus schwa is widely discussed in the Salish literature (Bianco 1996, Blake 2000b, Czyakowska-Higgins 1993, Dyck 2004, Kinkade 1998a, Matthewson 1994, Urbanczyk 2001 among others). The underlying full vowels which make up the phonemic vowel inventory of SENĆOŦEN are the underlying full vowels /i/, /e/, /a/, and /u/ (Montler 1986). Based on evidence from stress assignment, Section 3.1.1 supports Kiyota's (2003) claim that the underlying full vowels are specified for phonological weight, whereas schwa is not.[80] This claim fits with wider literature reporting that schwa, in other languages, has also been described as phonologically weightless (lacking a mora) (see for example, Kager 1989, Silverman 2011).

Patterns of stress in trisyllabic monomorphemic words are consistent with a proposal that schwa is weightless. This is because in SENĆOŦEN three syllable words, stress tends to be attracted to a full vowel in preference to a schwa. Montler (2018) documents 40 trisyllabic monomorphemic words which have one surface full vowel. In all cases that surface full vowel is stressed. For example, Montler (2018) documents 18 trisyllabic monomorphemic words which have stress on the initial syllable.[81] Examples (1)-(3) illustrate words where an initial full vowel is stressed rather than a schwa.

[80] Specifically, Kiyota (2003: 22) "[...] assumes the moraic status of full vowels and non-moraic status of schwa based on the stress facts in Saanich because the differences in sonority and quality among the full vowels are irrelevant, and different stress behaviors are observed only between full vowels and schwa in this language."

[81] These monomorphemic forms may have frozen morphology which is influencing the alignment of stress in each case. The crucial point to take away from these examples is that in each case it is a full vowel, not a schwa that is stressed. Comparative research across the Central Salish branch of the Salish language family focusing on an investigating of the etymology of seemingly complex mononmorphemic forms is a worthwhile avenue for future linguistic research.

(1) DON¸EY¸E¸
t̓áw̓əy̓əʔ
√t̓aw̓iy̓əʔ
√pitiful
‘to be pitiful’ (Montler 2018: 132)

(2) KOKEȾET[82]
q̓áq̓əθət
√q̓áq̓əθət
√celebration
‘celebration’ (Montler 2018: 236)

(3) LOX̱ENE¸
láx̣ʷənəʔ
√lax̣ʷənəʔ
√goose
‘Canada goose’ (Montler 2018: 303)

Montler (2018) also documents 16 trisyllabic monomorphemic words which have stress on the penultimate syllable. Examples (4) and (5) illustrate words where a full vowel in penultimate position is stressed, rather than a schwa.

[82] Montler (2018: 236) notes that the analysis of ths word is uncertain.

(4) SE¸,Ⱥ¸ĆEN¸
sə?éy̓čən̓
√sə?ey̓čən̓
√younger_sibling
'younger sibling, brother or sister, or cousin' (Montler 2018: 470)

(5) MENÍ¸EŁ
mənáy̓əɬ
√mənay̓əɬ
√doll
'doll' (Montler 2018: 342)

Montler (2018) documents 5 trisyllabic monomorphemic words which have stress on the final syllable.[83] Examples (6) and (7) illustrate words where the full vowel in a word-final syllable is stressed in preference to schwa elsewhere in the word.

(6) EL¸XEU¸Á
?əl̓x̣əw̓é
√?əl̓x̣əw̓e
√pitlamp
'to fish or hunt at night (for crab, duck, flounder, etc.) with a torch and spear in shallow water, pit-lamp' (Montler 2018: 144-145)

(7) JEM¸ȾEYI
č̓əm̓t̓ᶿəyí
√č̓əm̓t̓ᶿəyi
√ant
'ant' (Montler 2018: 214-215)

[83] At least one of these forms is classified as unconfirmed in the Saanich Dictionary (Montler 2018). Entries are classified as unconfirmed when there is no audio documentation for the entry.

Similar to patterns of stress in other Salish languages, the examples above show that in SENĆOŦEN the assignment of stress tends to avoid schwa in the presence of a full vowel. Salish scholars have argued that the fact that stress is attracted to full vowels over schwa is explained by assuming that full vowels and schwa differ in their abstract representations of phonological weight. Underlying full vowels are argued to have a mora, whereas schwa is argued not to have a mora (see for instance Blake 1992, 1999, 2000b, Dyck 2004, Kager 1990; Kinkade 1998a Shaw 1992, 1996, Shaw et al 1999).

The stress assignment patterns for SENĆOŦEN presented in this section are consistent with the proposal that full vowels and schwa differ with respect to their abstract representation for phonological weight. The next section, 3.1.2, turns to a presentation of evidence supporting a claim that schwa is sometimes present at the underlying level, and sometimes is not.

3.1.2 Schwa in SENĆOŦEN can be underlying or epenthetic

Evidence from stress assignment supporting a categorization of schwa in SENĆOŦEN as a vowel which can sometimes be part of the phonemic entry of a word, and other times serve as an epenthetic segment is presented in this section.[84] When schwa is present at the lexical level it is called an underlying schwa. When schwa is absent at the lexical level and inserted later at a post-lexical stage it is called an epenthetic schwa. [85] Schwa is argued to be epenthetic in Nxaʔamxcín. Czaykowska-Higgins (1993: 214) says that:[86]

> [...] the principle difference between strong and weak roots in Cm lies in their underlying representations: strong roots have [i], [u], or [a], vowel which in Cm are unpredictable and therefore underlying, while weak roots have a surface [ə], which in Cm is predictable and epenthetic. [...]

Dyck (2004) claims that for the most-part schwa in Squamish is epenthetic saying that

> [...] the vowel system, again like typical Salishan languages, consists essentially of the three most common vowels and a (mostly predictable) schwa [...]

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[84] Montler (1986, 2015a, 2018) includes schwa in his contrasting vowel inventory. Kiyota (2003: 9) says that "[...] schwas may be epenthetic, lexical, or reduced [...]." de Lacy (2007: 305) assumes that schwa can be underlying.

[85] Montler (1986, 2018) includes schwa in his phonemic vowel chart, and also describes processes of schwa insertion.

[86] See however, Czaykowska-Higgins & Willett (1997: 387) who argue that, although schwa is predictable in its distribution and its quality, it does project a mora.

Based on its predictable distribution, Matthewson (1994: 1) follows Shaw (1993) in proposing that schwa in Lillooet is always epenthetic and that it represented as an empty segment, saying that:[87]

> I argue for syllable structure constraints mainly on the basis of the behaviour of schwa, the epenthetic vowel of the language. I show that the distribution of schwa is completely predictable; it is present only when prosodic constraints require overparsing. The current proposal differs from van Eijk's (1984) analysis of the St'át'imcets vowel system, but provides support for Kinkade's ([1998a]) suggestion that schwas throughout the Salish language family are predictable, and hence not present in underlying forms (Matthewson 1994: 1).

Blake (2000b: 187) also adopts the position that schwa is epenthetic in the following quote:

> There have been a number of recent proposals for other Salish languages which suggest that schwa is not present in underlying/input representation and that its distribution is entirely predictable (cf

[87] van Eijk (1984: 2) includes schwa in the Lillooet underlying inventory.

Matthewson (1994), Roberts and Shaw (1994), Kinkade 1997), Shaw (1996[..])). This is the position which is adopted here as well.

Only epenthetic schwa is considered in an earlier analysis of stress in SENĆOŦEN roots. Leonard (2007: 23) says that "[…] epenthetic schwa surfaces predictably as a strategy to prevent illicit consonant clusters […]" and that "[…] only the full vowels in the language have weight and are considered to have a mora underlyingly. Schwas, even if they take on the features of a glide, are not considered to have weight. […]" (Leonard 2007: 25).

Schwa is argued, on the basis of stress assignment patterns, to be both underlying and epenthetic in SENĆOŦEN. Words with two underlying full vowels tend to exhibit a default head-left stress pattern (see Kiyota 2003, Leonard 2007, de Lacy 2007). The unstressed underlying full vowel in the suffix is reduced to schwa. [88] This pattern is illustrated in example (9)-(11) where a full vowelled CVC root is concatenated with the full vowelled suffix 'nax^{w}'.

[88] The underlying shape of the word is presented to the right of each example.

(9) JIBNEW̱ /CVC-CVC/
čʼípʼnəxʷ
√čʼipʼ-naxʷ
√squeeze-NCTRNS
'to manage to squeeze something' (Montler 2018: 217)

(10) JÁṈ¸NEW̱ /CVC-CVC/
čʼéŋʼnəxʷ
√čʼeŋʼ-naxʷ
√arrive_home-NCTRNS
'manage to take home' (Montler 2018: 209)

(11) HOḰNEW̱ /CVC-CVC/
háqʷnəxʷ
√haqʷ-naxʷ
√smell-NCTRNS
'to get a whiff of something, smell something' (Montler 2018: 189-190)

Similarly, disyllabic words which surface with two schwas often follow this default leftward pattern.

(12) ĆENET[89] /CəCəC/
čə́nət
√čən-ət
√bury-TRNS
'to bury something or someone' (Montler 2018: 47)

[89] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 47). The example in (12) uses the first meaning.

(13) PEW̱ET /CəCəC/
pə́xʷət
√pəxʷ-ət
√blow-TRNS
'to blow on something' (Montler 2018: 401)

(14) NEŁET /CəCəC/
nə́ɬət
√nəɬ-ət
√fold-TRNS
'to fold it, bring it together' (Montler 2018: 361)

This default trochaic pattern, however, is violated in words which surface with two schwas. The explanation for the rightward assignment in the examples (15)-(17) is that schwa in the root is not present at the time of stress assignment.

(15) ṈEXET /CCəC/
ŋəx̣ə́t
√ŋx̣-ət
√discipline-TRNS
'to bawl someone out, discipline someone or something' (Montler 2018: 381)

(16) DEM¸ET /CCəC/
t̓əm̓ə́t
√t̓m̓-ət
√hit-TRNS
'to hit something or someone, throw at someone.' (Montler 2018: 122)

(17) XEL¸ET[90] /CCəC/
x̣əl̓ə́t
√x̣l̓-ət
√mark-TRNS
'to write something, to record something' (Montler 2018: 896-807)

The roots in examples (15)-(17) above are analysed as vowelless (Montler 1986, 2018). The schwa that shows up in vowelless roots, such as these, is analysed as epenthetic. Stress-epenthesis interactions are understood as rule ordering within the SPE framework (Chomsky & Halle 1968). In the SPE framework, if the vowel is inserted before stress is assigned, then it will be stressed. If the vowel is inserted after stress assignment, then it will not be stressed. This is the assumption that is followed by Czaykowska-Higgins (1993), who assumes that schwa is inserted after stress assignment in Nxaʔamxcín.[91] The suffix, unlike the root, has an underlying schwa which is present at the time stress is assigned to the word, and thus has stress assigned to the schwa in the suffix not the schwa in the root. In the next section the alternation between stressed underlying full vowels and unstressed schwa is analysed as a process of vowel reduction.

[90] There are two meanings for this word in the SENĆOŦEN dictionary (Montler 2018: 806-807). The example in (17) uses the first meaning.
[91] Epenthesis is argued to occur prosodically weak positions (see Broselow 2000, 2008, Elfner 2016, Gouskova & Hall 2009, Piggott 1995).

3.1.3 Full vowel and schwa alternations

Underlying full vowels are often reduced and documented with the symbol ‘ə’ by linguists and written as ‘E’ by language speakers and learners when they occur in unstressed syllables.[92] This alternation between a full vowel and a schwa in stressed versus unstressed position suggests that a process of vowel reduction is triggered in unstressed position. In (18) the root vowel /i/ is stressed and is transcribed as [i].

(18) IXET[93]
ʔíx̣ət
√ʔix̣-ət
√scrape-TRNS
‘to scrape something’ (Montler 2018: 203)

The root vowel /i/ is reduced to schwa when the suffix *-iŋəɬ* takes the primary stress and the root vowel itself is unstressed. In (19) the root vowel /i/ is unstressed and is transcribed as schwa.

[92] There are approximately 400 examples reported in Montler (2018) where a full vowel has been transcribed that is not marked for primary word stress. Many of these forms pattern as though they either have secondary stress, are part of a glide vowel alternation, are a result of vowel harmony, or have lexically conditioned stress. Those full vowels having to do with glide vocalisations are discussed in section 3.5, and those full vowels having to do with vowel harmony are discussed in section 3.6. An independent description and analysis into what motivates the other two patterns of full vowel distribution warrants further study.

[93] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 203). The example in (19) uses the first meaning.

(19) EXIṈ,EŁ[94]
ʔəx̣íŋ̓əɬ[95]
√ʔix̣-iŋ<ʔ>əɬ
√scrape-CSTM<ACTL>
'to be scraping a hide' (Montler 2018: 166)

In (20) the root vowel /e/ is stressed and is transcribed as [e].

(20) ŚÁMET
šémət
√šem-ət
√dry_up-TRNS
'to dry something (in the air or sun)' (Montler 2018: 605)

In (21) the root vowel /e/ is unstressed and is transcribed as schwa.

(21) ŚEMIṈEŁ
šəmíŋəɬ
√šem-iŋəɬ
√dry_up-CSTM
'to air or sun dry out something' (Montler 2018: 613)

In (22) the root vowel /a/ is stressed and is transcribed as [a].

(22) MOĆET
máčət
√mač-ət
√aim-TRNS
'to aim at someone or something' (Montler 2018: 350)

[94] The actual form has been selected for this example because the non-actual form, although documented in the SENĆOŦEN dictionary, is not yet audio recorded (see Montler 2018: 166).
[95] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 166). The example in (19) uses the first meaning.

In (23) the root vowel /a/ is unstressed and is transcribed as schwa.

(23) MEĆIṈ¸EŁ
məčíŋ̓əɬ
√mač-iŋ‹ˀ›əɬ
√aim-CSTM‹ACTL›
‘to be aiming at/by something’ (Montler 2018: 336)

Three suffixes which exhibit a full vowel versus schwa alternation conditioned by primary stress assignment are the non-control transitive suffix */-nax^{w}/*, the reflexive suffix */-sat/*, and the reciprocal suffix */-tal/*. In each case the underlying vowel is /a/. Montler (1986) defines the non-control transitive suffix */-nax^{w}/* as follows:

> This suffix is opposed to both the ‘control transitive’ and the ‘causative’. Its presence implies a patient object and an agent subject but the subject does not exert conscious control over the activity expressed in the predicate.

When the underlying vowel /a/ in the */-nax/* suffix is stressed it surfaces as “[a]”, as in (24).

(24) ȻEXNOW̱
kʷəx̣náxʷ
√kʷx̣-naxʷ[96]
√eject-NCTRNS
'to finally manage to kick someone out, eject someone, chase someone or something away (after trying or accidently)' (Montler 2018: 101)

When the underlying vowel /a/ in the */-naxʷ/* suffix is unstressed it surfaces as a schwa, as in (25).

(25) ḴELNEW̱
qə́lnəxʷ
√qəl-naxʷ
√bad-NCTRNS
'to get angry, mad at someone or something' (Montler 2018: 265)

Montler (1986) defines the reflexive suffix */-sat/* as follows:

> This suffix creates formally intransitive stems where a single participant, the subject, is implied and is both agent and patient. It is often translated with English "self".

When the underlying vowel /a/ in the suffix */-sat/* is stressed it surfaces as [a].

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[96] Despite patterning in some words as a schwa-based root, Montler (2018) anaylzes the root in this word as vowelless. Montler (2018: 101) says "the stress on /-naxʷ/ suffix typically occurs only with vowelless roots, but the root in *kʷəx̣ʷnáxʷ* patterns elsewhere as having an underlying /ə/". This dissertation follows Montler by also analysing this root as vowelless.

(26) ĆEḴSOT
čəqsát
√čq-sat
√big-RFLXV
'to get big' (Montler 2018: 36)

When the underlying vowel /a/ in the suffix */-sat/* is unstressed it surfaces as schwa.

(27) XÁṮSET
x̣éƛ̓sət
√x̣eƛ̓-sat
√storm-RFLXV
'to get windy, start to blow up a storm' (Montler 2018: 799)

The suffix*/-tal/* is the control reciprocal and Montler (1986) defines the suffix as follows:

> This suffix creates a formally intransitive stem with two implied participants. Each participant is both agent and patient. It is most often translated into English as "each other". This suffix additionally implies that both participants exert conscious control.

When the underlying vowel /a/ in the suffix /*-tal*/ is stressed it surfaces as [a].

(28) ȻEXTOL
kʷəx̣tál
√kʷx̣-tal
√eject-RCPRCL
'to be kicked out together' (Montler 2018: 102)

When the underlying vowel /a/ in the suffix /*-tal*/ is unstressed it surfaces as a schwa.

(29) ĆIX̱TEL
číx̣ʷtəl
√čix̣ʷ-tal
√demolish-RCPRCL
'to break up with each other (of a marriage or other relationship)'
(Montler 2018: 53-54)

The claim that underlying full vowels are reducing to schwa when unstressed can be formalised by proposing that underlying full vowels are losing their place features when they are unstressed.[97] A placeless vowel is assumed to be akin to a schwa and a common proposal, which is followed in this dissertation, is that schwa-like vowels are phonologically featureless (see for instance, Blake 2000b, Borowsky 1986, Crosswhite 2001, Kager 1990, Kinkade 1998, McCarthy 1988, Piggott 1995, Shaw 1992, 1994, Shaw et al. 1999, van Oostendorp 1995, 1999, 2000, Willett & Czaykowska-Higgins 1995 among others).[98] The proposal that unstressed full vowels are losing their place features fits also with van Oostendorp (1995: 120) who says "Why does an unstressed vowel reduce to schwa? I assume that ideally vocalic features have to be supported by stress and vice versa."

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[97] Urbanczyk (2001: 92]) notes "Itô (personal communication) suggests that schwa cannot be stressed because the head of a foot (the stressed syllable) must be a vowel with a place specification. If schwa is characterized as placeless, and [place] is the head of a segment (as Itô & Mester (1993) propose), then it is ill-formed for the head of a prosodic category to not have a head at the segmental level."

[98] Schwa has also been referred to as a "neutral vowel" (Chomsky & Halle 1968) and as a "targetless vowel" (Browman & Goldstein 1992).

Having established, in this section, phonological evidence that schwa is a weightless and placeless phonological segment in SENĆOŦEN, the next section, section 3.4 presents evidence to support the proposal that only the full vowels in SENĆOŦEN have phonological weight. Crucially, a case is made against the existence of Weight-By-Position in SENĆOŦEN.

3.1.4. SENĆOŦEN does not have Weight-by-Position

Weight-By-Position is a phonological process which assigns a mora to the coda consonant of a syllable. This section provides evidence from the stress patterns of three syllable words that Weight-By-Position is not active in SENĆOŦEN.[99] 453 words in the SENĆOŦEN dictionary are documented with three schwas (Montler 2018). The different shapes of words with three schwas are presented in (30).

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[99] The proposal that Weight-By-Position is not active in SENĆOŦEN may have implications for research which assumes coda moraicity in SENĆOŦEN (see Bye & Svenonius 2012, Davis & Ueda 2006, Stonham 1994, Stonham 2007, Zimmerman 2009 and Zimmerman & Trommer 2013). The combination of 1) the claim that there is no Weight-By-Position in SENĆOŦEN and 2) the claim that some words have only non-moraic vowels implys that there are lexical words in SENĆOŦEN that are completely weightless. This is an interesting implication to be followed up in future research, especially in comparison to Bagemihl's (1998) claim that some words in Nuxalk only have moras but no syllables.

(30) Word Shape of Words with 3 schwas

Word Shape	**#**	**Word Shape**	**#**	**Word Shape**	**#**
C C Cə Cə CəC	5	C CəC C Cə CəC	4	C Cə CəC Cə	1
C C Cə CəC	1	C CəC Cə CəC	16	C Cə CəC CəC	13
C C Cə CəC C CəC	1	C CəC CəC CəC	2	Cə CəC Cə	5
C C Cə CəC CəC	1	Cə Cə Cə	5	Cə CəC CəC	120
C C CəC Cə CəC	1	Cə Cə CəC	117	Cə CəC CəC C C	1
C Cə Cə Cə	2	Cə Cə CəC C	4	CəC C Cə CəC	4
C Cə Cə CəC	34	Cə Cə CəC C C	2	CəC C CəC CəC	3
C Cə Cə CəC C	1	Cə Cə CəCC	1	CəC Cə Cə	2
Cə CəC C CəC	3	Cə CəC C C	1	CəC Cə CəC	61
CəC Cə CəC C	4	CəC CəC Cə	1	CəC CəC CəC C	1
CəC Cə CəC C C	2	CəC CəC CəC	36		
				Total	**453**

In languages, which have Weight-By-Position the assumption is that closed syllables are heavier than open syllables and that stress is attracted to a heavier syllable. The pattern of stress assignment in SENĆOŦEN provides no evidence that Weight-By-Position is active in SENĆOŦEN. From the set of 453 three schwa words, stress falls on an open syllable when both the penultimate and the final syllable are closed. An open syllable headed by a schwa would be lighter than a closed syllable headed by a schwa. The expectation, if Weight-By-Position were active in SENĆOŦEN, would be that stress would fall on the closed syllable. This is because schwa has no mora, but the coda consonant would be assigned a mora. Stress fell on the open syllables 72 out of 120 times. Some examples are given in (31)-(33).

(31) EĆEḴTEṈ
ʔə́čəqtəŋ
√ʔəYəq-ət-əŋ[100]
√out_of_way-TRNS-PSV
'be put out of the way by someone' (Montler 2018: 137)

(32) QELEṈSEN
k̓ʷə́ləŋsən
√k̓ʷə́ləŋsən
√eagle
'bald eagle' (Montler 2018: 414)

[100]The analysis in this example differs from the analysis given in the SENĆOŦEN dictionary (2018: 137). The control transitive morpheme is analysed this dissertation as having an underlying /ə/. Montler does not include the schwa in his analysis in the SENĆOŦEN dictionary.

(33) ĆELEU¸TEṈ
čə́ləẇtəŋ
√čələẇ-ət-əŋ[101]
√turn_over-TRNS-PSV
'to be turned upside down, turned over, folder over, fipped by someone or something' (Montler 2018: 44)

Further evidence suggesting that Weight-by-Position is not active in SENĆOŦEN is that stress falls on an open syllable when both the word initial and word final syllable are closed. This happens in 53 out of 61 such words. Some examples are given in (34)-(36).

(34) DEM¸NEȻEL
ṫəṁnə́kʷəl
√ṫṁ-nəWel
√hit-NCRCPRCL
'to hit, bump each other (especially with something thrown)' (Montler 2018: 123)

(35) KEBSENET
q̓əp̓sə́nət
√q̓ep̓=sən-ət
√bind=foot-TRNS
'to tie the feet of someone or something' (Montler 2018: 225)

[101]Analysis differs from Montler (2018: 44).

(36) DEṈSENEṈ
t̓əŋsə́nəŋ
√t̓əŋsən-əŋ
√braid-MDL
'to braid hair' (Montler 2018: 125)

Given the stress patterns of the examples in this section, the conclusion is that there is no evidence to suggest that Weight-By-Position is active in SENĆOŦEN. This suggests that the only segments which are moraic and which surface with stress in SENĆOŦEN are the full vowels, independent of whether or not they occur in a closed syllable. In this section, then, we have seen that underlying full vowels have place and weight when stressed and that unstressed underlying full vowels reduce to schwa. We have also seen that schwas are placeless, as well as weightless and that there is no weight-by-position to assign a mora to coda consonants in SENĆOŦEN. Since underlying full vowels are the only segments which have place and weight, they are the most optimal segments in SENĆOŦEN for serving as hosts for stress when stress assignment applies.[102] The prediction, then, is that if a full vowel occurs in a word, it should always surface with stress; if it does not get stressed, it should surface as a

[102] This does not mean that schwa is never stressed in SENĆOŦEN. Schwa can be stressed, but only if it is 1) present in the word prior to the assignment of word stress, and 2) there is no underlyingly weighted vowel in a prosodic position that is more optimal to stress assignment than the prosodic position of the schwa. This is because 1) stress is assigned prior to epenthesis in SENĆOŦEN, and 2) all words must have word stress. So, if there is no full vowel or underlying schwa in the word, then a schwa will be epenthesized to host that word stress.

schwa. As we see in the next section, this is not always true: instead we see example where full vowels with place features surface in unstressed position. These full vowels are shown to arise from underlying glides.

3.2 Apparent exceptions: Full vowels in unstressed syllables

In this section apparent exceptional words which involve full vowels in unstressed position are investigated. The unstressed full vowels presented in this section are argued not to be derived from an underlying full vowel. Words involving vowel-glide alternations are investigated in section 3.2.1. Processes of optional vowel harmony are investigated in section 3.2.2.

3.2.1 Unstressed full vowels: Glide and vowel alternations

This section follows Montler's (1986) claim that many full vowels in unstressed syllables derived from underlying glides are their own phonemic segments (see Clements & Keyser 1983, Hayes 1989, Hume 1995, Levi 2004, Padgett 2008, Waksler 1990, for similar proposals crosslinguistically). The proposal is that glides are permitted to retain their place features when they are vocalised because they are underlyingly moraless and that this lack of mora is the reason why a full vowel derived from a glide is not stressed. A standard assumption about the difference between vowels and glides is, that despite having the same place feature specification, vowels have an underlying mora but glides do not (see Rosenthall 1994). Crucially, for SENĆOŦEN, schwa is the only weightless segment that is permitted to head a stressed syllable. The example in (37), shows that the root *√ʔə́ỷ* has a stressed schwa heading the syllable followed by a glottalized glide at the end of the word.

(37) ÍY,[103]
ʔə́ỷ[104]
√ʔəỷ
√good
'to be good, well, nice, okay' (Montler 2018: 205-206)

When this root is unstressed, as in (38)-(39) the glide vocalises, while retaining its place features and a glottal stop surfaces after the vocalization.[105]

[103] This word is documented with two meaning in the SENĆOŦEN dictionary (Montler 2018: 205-206). The example in (37) uses the first meaning.

[104] Montler (2018: 206) says that this root might be vowelless due to the way it patterns in some words. He analyses it however as having an underlying schwa. This dissertation follows Montler in analysing this root as having an underlying schwa.

[105] Montler (1986) assumes that the schwa in the root is deleted. It could also be the case, if the underlying form is a vowelless root, that the schwa in the root was inserted. In this dissertation, I have followed the representations given in the SENĆOŦEN dictionary (Montler 2018).

(38) I,ÁNȻES
?i?énkʷəs
√?əẏ-enkʷəs
√good-abdomen
'to be brave' (Montler 2018: 193)

(39) I,ÍYME,
?i?íymə?
√?əẏ=iy=mə?
√good=ext=appearance
'neat and tidy' (Montler 2018: 194)

When the root √kʷəẏəx̣ is stressed as in (40) the underlying schwa heads the stressed syllable.

(40) ȻÍ,EX
kʷə́ẏəx̣
√kʷəẏəx̣
√move back and forth'
'to move back and forth, vibrate, oscillate' (Montler 2018: 105)

When the root √kʷəẏəx̣ is unstressed the glottalized glide decomposes. The glide portion of the segment vocalises and serves as the peak of the unstressed syllable. The vocalized glide retains its place features. The glottalization surfaces as a glottal stop between the vocalised glide and the following consonant.[106]

[106] There is a word internal consonant cluster in this word. Possible analyses to account for this are provided in Chapter 5. Montler (1986) claims that the underlying vowel in these types of cases deletes. I follow this claim, and argue further, that the underlying schwa is deleted because once the glide has vocalized there is a hiatus violation (*VV) (see Leonard 2007 for a similar claim).

(41) C̸I,XSISEṈ
kʷiʔx̣sísəŋ
√kʷəy̓əx̣=esis-əŋ
√move=hand-MDL
'to work with one's hands, move one's hands, move one's hands around (knitting making baskets etc.)' (Montler 2018: 105)

The following root √*YeY* 'work' is equal to a CVC syllable. This syllable is stressed. It has [*č*] as an onset, full vowel [*e*] as peak of the syllable and [*y*] as coda.[107]

(42) ĆA̸
čéy
√YeY
√work
'to work, make, build, do' (Montler 2018: 28)

In (43) the root √*YeY* has undergone the morphological process of CVC reduplication. Because the vowel in the root is unstressed it surfaces as a vowel [*i*]. The initial consonant is onset to that vowel and surfaces as [*č*].

[107] There is a three-way process of alternation between some segments which are abstractly represented as /Y/, /Ẏ/, /W/ and /Ẇ/. The process involves the alternation between an obstruent, a vowel, and a glide. This alternation is historical and no-longer fully systematic, though some patterns remain (Montler 1986, see also Galloway (1990) for Samish, and Suttles (2004) for Downriver Halkomelem). These patterns are described and analysed in Montler (1986) and are discussed further in chapter 5.

(43) ĆȺĆI[108]
čéyči
CVC~√YeY[109]
CHAR~√work
'to be diligent, busy' (Montler 2018: 28-29)

When the root *√k̓ʷey̓* is stressed the glottalized glide surfaces as a consonant, in coda position.

(44) QȺ,
k̓ʷéy̓
√k̓ʷey̓
√hungry
'to be hungry' (Montler 2018: 412-413)

When the root *√k̓ʷey̓* is unstressed the glide portion of the glottalized glide vocalises, and the glottalized portion surfaces as a glottal stop.[110]

(45) QÁQI,
k̓ʷék̓ʷiʔ
CV~√k̓ʷey̓[111]
ACT~be hungry
'being hungry' (Montler 2018: 411)

Further evidence that unstressed full vowels derived from glides lack an underlying mora comes from the way they interact with the default stress assignment patterns in the language. As discussed earlier in this chapter, the default stress

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[108] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 28-29). The example in (43) uses the first meaning.
[109] The analysis line differs somewhat from the SENĆOŦEN dictionary (see Montler 2018: 28).
[110] The underlying vowel is deleted due to a hiatus violation.
[111] The analysis line differs somewhat from the SENĆOŦEN dictionary (see Montler 2018: 411).

assignment pattern is trochaic. For example, when CVC roots concatenate with the limited control transitive suffix /*-nax^{w}/,* stress is leftward and the full vowel in the suffix is reduced to schwa.

(46) OX̱NEW̱
ʔáx̣^{w}nəx^{w}
√ʔax̣^{w}-nax^{w}
√go_to-NCTRNS
'to manage to go to get someone or something' (Montler 2018: 393-394)

(47) ḰIX̱NEW̱
q^{w}íx̣^{w}nəx^{w}
√q^{w}ix̣^{w}-nax^{w}
√miss-NCTRNS
'to manage to miss something, miss it accidently' (Montler 2018: 286)

(48) ĆOX̱NEW̱
čáx̣^{w}nəx^{w}
√Yax̣^{w}-nax^{w}
√melt-NCTRNS
'to finally manage to melt, thaw something' (Montler 2018: 60)

However, when there are two full vowels in the word, where the initial one is derived from an underlying glide, and the second is derived from a full vowel, stress falls on the underlying full vowel even though it is not the leftmost vowel of the word.

(49) I¸TOW̱[112]
ʔiʔtáxʷ
√ʔəy̓-taxʷ
√good-EMOT
'to enjoy, like, love something, find something delicious, amusing'
(Montler 2018: 202)

As argued in section 3.1, underlying full vowels have a mora, whereas schwa does not. The examples in (50)-(52) have a schwa in the initial syllable and an underlying full vowel in the second syllable. The underlying full vowel is stressed.[113]

(50) NEU¸NOW̱
nəw̓náxʷ
√nəw̓-naxʷ
√in-NCTRNS
'to manage to get something, or something in' (Montler 2018: 368)

(51) ḴESNOW̱
qəsnáxʷ
√qs-naxʷ
√immerse-NCTRNS
'to manage to put something or someone in the water, accidently immerse something' (Montler 2018: 268)

[112] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 202). The example in (49) uses the first meaning.
[113] The underlying full vowel attracts the stress regardless of whether the schwa is underlying or epenthetic.

(52) KEM̧NOW̱
q̓əm̓náxʷ
√q̓əm̓-naxʷ
√break_off-NCTRNS
'to manage to break or cut something off' (Montler 2018: 231)

The example in (53) appears to stress a schwa in favour of a full vowel. However, the full vowel must be derived from an underlying glide and is in fact analysed this way in both Montler (1986) and Montler (2018). The glide is underlyingly glottalized. This dissertation assumes that the glide portion of the segment is vocalized and the glottalized portion surfaces as a glottal stop. Neither the schwa, nor glottalized glide have an underlying mora. The two syllables are analysed as being equal in weight. As previously shown in this chapter, words with two syllables of equal weight tend to assign stress to the left most syllable.

(53) ȾEḴI
θə́qiʔ
√θəqəy̓
√sockeye
'sockeye salmon' (Montler 2018: 697)

Some research posits that glides are allophonic variations of vowels (Steriade 1984, Kaye & Lowenstamm 1984, Levin 1985, Rosenthall 1994, 2013). Evidence that this is not the case for SENĆOŦEN is the presence of the underlying vowels /i/ and /u/

which do not alternate with glides.[114] Instead, underlyingly full vowels, as discussed in section 3.1, are pronounced as a full vowel when stressed and as schwa when unstressed. For example, the high front vowel /i/ is pronounced [i] when stressed as in the word *ɬik̓ʷsən* 'to trip'.

(54) ȽIQSEN
ɬík̓ʷsən.
√ɬik̓ʷ=sən
√hook=foot
'to trip, get hooked on the foot, stumble' (Montler 2018: 324)

The underlying full vowel /i/ of the root is pronounced as schwa when it is unstressed. This happens, for example, in the reduplicated form *ɬiɬək̓ʷsən̓*.

(55) ȽIȽEQSEN¸
ɬíɬək̓ʷsən̓
CV~√ɬik̓ʷ=sən‹ˀ›[115]
ACTL~√hook=foot‹ACTL›
'to be tripping' (Montler 2018: 323)

The proposal that unstressed full vowels are often derived from underlying glide and glide-like consonants occurs throughout the Salish literature. Shaw et al.

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[114] For an overview of the typology of glides and the different representations proposed for glides, see Levi (2011) and references therein. Following Levi, the glides in SENĆOŦEN are anaylized as being phonemic, rather than as being derived, but how exactly SENĆOŦEN glide patterns fit into the typology proposed by Levi and thus what the best representations for SENĆOŦEN glides should be are questions for future research.

[115] The analysis differs somewhat from that provided in the SENĆOŦEN dictionary (Montler 2018: 323).

(1999) posit that an unstressed full vowel, in Musqueam, such as [i] is the result of an unstressed schwa and glide sequence, whereby the schwa takes on place features:

> The essential claim here is that none of the cases of unstressed [i] or [u] in these data is underlyingly a full vowel. In each case, the surface vowel quality derives from an adjacent underlying glide which has vocalised or spread into a syllabic nucleus position which otherwise would be filled by the unmarked (default) vowel schwa. (Shaw et al., 1999: 7)

They posit the following analysis for the "vocalisation" of the glottalized glide:

> "vocalisation" of the glottalized glide is interpreted as gradient realisation of the place features of the glide (being highly optimal nucleus or "peak" features) spreading into the nucleus, while the glottal feature (a significantly less optimal feature) remains in the margin, where it surfaces as a coda if syllable final (*sʔə́ɬqiʔ* snake), or as an onset if followed by a vowel initial suffix (*šq̓ə́tuʔəɬ* bridge) (Shaw et al. 1999: 139).

For the "vocalisation" of the non-glottalized glide Shaw et al. (1999: 9) propose the following:

The vocalisation behaviour of non-glottalized glides differ in ways that are predicted by the high-ranking status of the Onset constraint in the grammar. In such cases, the place features of the glide [y] not only spread onto the nucleus position resulting in an [i] nucleus, but also remain in the margin position to serve as the onset of the following syllable.

Shaw et al.'s (1999) proposal that schwa is serving as the syllable peak and that the features of the glide portion of the consonant are spread to it, is not followed in this dissertation. This is because, given that schwa is a vowel that is eligible to be stressed, there is no explanation of why a stressed schwa does not also take on the place features of an adjacent glide, as in the word *ÍY, ʔə́ẏ* meaning 'good' (Montler 2018: 205).

Czaykowska-Higgins & Kinkade (1998) reported a tendency in the Salish languages for resonant consonants to have syllabic variants. They say that glides alternate with "vowels" but that they can also function as consonants in morphological processes such as reduplication.

Dyck (2004: 17) reports that:

In Thompson /m, n, l, y, w, m̓, n̓, l̓, y̓, w̓/ become syllabic, or vocalised or they are preceded by [ə], when they occur between other consonants and when they are word final after a consonant.

Dyck (2004: 45) also provides the following implication for Squamish resonant behaviour:

> The implication then is that in Squamish resonant consonants already universally ranked high on relative sonority scales, are exceptionally vowel like in nature, so much so, in fact, that they may take the place of a full vowel except under stress [...].

For SENĆOŦEN the facts are similar for underlying glides and glide-like segments. In both cases they are syllabic when they are the head of an unstressed syllable. Montler (1986) proposes the following two rules which capture the facts. The first rule that Montler proposes is y -> i / C_C or #, and the second is y̓ -> iʔ /C_____. Only glide-like consonants vocalise in the peak of a syllable. The nasals, and the lateral resonants are preceded by a schwa.[116] For example, a schwa precedes the /m/ in the word *DEMET t̓əm̓ət* meaning 'hit it' (Montler 2018: 122), and the /l/ in the word

[116] The underlying lateral liquid /l/ can in some special circumstances serve as the second segment of a complex onset. Further explanation is provided in Chapter 5.

LEȾET lət̓ᶿə́t meaning 'fill it' (Montler 2018: 300), whereas the glide portion of the glottalized glide can serve as peak (written as [i]) in the word *I,ÁNȻES ʔiʔénkʷəs* meaning 'brave' (Montler 2018: 193).[117] In the case of the alternation which involves the three way alternation of an obstruent, a "vowel" and a glide, Blake provides the following analysis for ʔayʔaǰuθəm.

> The consonants [ǰ, g] are non-moraic. Their glide counterparts [y, w] are moraic. It is argued that the loss of the feature [-continuant] occurs when any [sonorant] [high] segment is dominated by a mora. (Blake 1992: 68).

As argued so far in this section, the patterns in SENĆOŦEN suggest that a different analysis is required. Namely, that /y/, /ỷ/, /Y/, and /Ỷ/ do not have an underlying mora and that they vocalise only in an unstressed position. SENĆOŦEN does not have Weight-byPosition, so there is no mechanism to assign moras to segments during the course of syllabification. Therefore, while the glides have place features, they do not have a mora and cannot be assigned a mora at a later stage and as such are never stressed. The table in (57) provides a description of segments which illustrates whether or not it is a vowel, whether or not it has an underlying mora,

[117] See Chapter 5 for exceptions.

whether or not it can serve as the peak of stressed syllable, and whether or not it can serve as the peak of an unstressed syllable.

(57) Segment Type, Weight, and Syllable Position

Segment	**Vowel**	**UR mora**	**Peak: Stressed Syllable**	**Peak: Unstressed Syllable**
Full Vowel **/a/, /e/, /i/, /u/**	Yes	Yes	Yes	No
Schwa **/ə/, <ə>**	Yes	No	Yes	Yes
Glide **/y/, /y̓/, /w/, /w̓/** **/Y/, /Y̓/, /W/, /W̓/**	No	No	No	Yes

In summary, the consonants represented as /y/, and /y̓/, /w/, /w̓/ enter into a two-way alternation where the consonant surfaces in non-syllable peak position, and a vowel surfaces as the peak of unstressed syllables. There are also the segments /Y, Y̓/ and /W, W̓/ which enter into a three-way alternation between an obstruent, vowel, and glide. Only underlying full vowels and schwa (underlying or epenthetic) can head a stressed syllable. Vowels are not permitted to retain their place features in unstressed position, whereas vocalised glides are. The reason that a vocalised glide does not reduce to schwa is because it is sourced from a segment that does not have an underlying mora. Only the underlying full vowels which do have an underlying mora reduce to schwa.

An example of the three-way alternation between obstruent, vowel, and glide can be seen in the following pair of words which have an underlying /Y̓/ given in (58)-(60). In example (60) the unstressed full vowel is analysed as being derived from a glottalized glide (Montler 1986, Montler 2018).[118] The segment surfaces as a vowel in syllable peak position, and a glottal stop in word final position.

(60) SȽÁNI,
sɬéniʔ
s-√ɬenY̓[119]
s-√female
'woman, lady, female, feminine' (Montler 2018: 526)

In (61) the underlying glottalized glide surfaces as an obstruent č between an unstressed schwa and the stressed /a/ of the suffix. The glottalization is anchored after the stressed /a/ of the suffix.

[118] Whether or not this segment should be analysed as an underlying glottalized glide, or sequence of a vowel followed by a glottalized glide is a question left for future research.
[119] The final segment is analysed as a glottalized glide. This analysis differs from Montler (2018: 526).

(61) SȽENȽENEĆO,EȽ[120]
sɬənɬənəčáʔəɬ
s-CVC~√ɬenẎ-aʔ=aɬ
S-PL~√female-EXT=child
'girls' (Montler 2018: 528)

Unstressed full vowels also occur in SENĆOŦEN which are not derived from underlying glides. In the following section, I argue that these vowels share place features with a nearby stressed vowel.

3.2.2 Optional unstressed vowel harmony

Another source of unstressed full vowels comes from schwas that share their place features with full vowels. 10/352 examples of stressed V́ʔV sequences are documented in Montler (2018) where the unstressed vowel is transcribed as a full vowel of the same quality as the stressed vowel, and where the remainder 342 vowels are transcribed as schwa. Montler (1986:29) provides the following SENĆOŦEN examples which he explains illustrate an optional process whereby an unstressed

[120] Various alternative documentations of this word appear in the SENĆOŦEN dictionary. (see Montler 2018: 528). I follow Montler (2018) in assuming that the second vowel in the root is not underlying. However, in this form there is an additional schwa which surfaces in the root. In this word the root is equal to a left-headed prosodic foot. Morphological and prosodic identity factors might be the motivation for this vowel insertion. The match between word shape and prosodic foot structure is the subject focus in Chapter 6.

schwa harmonizes with a stressed vowel when the two segments are on either side of a glottal stop segment.[121]

The example in (62) is of the plain root ‘yéʔ’.

(62) YÁ,[122]
yéʔ
√yeʔ
√go
‘to go, leave, depart’ (Montler 2018: 840-841)

The schwa in the 1st person subordinate subject suffix, in example (63) is harmonizing across a glottal stop with the preceding stressed */e/.*

(63) YÁ,EN
yéʔen
√yeʔ-ən
√go-1SUBSBJ
‘I went’ (Montler 1986)

The example in (64) is of the root ‘t̓éʔ’.

(64) DÁ,
t̓éʔ
√t̓eʔ
√try
‘to taste, try’ (Montler 2018: 113)

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[121] A preliminary investigation of the acoustic charactersitics of vowels across glottal stop, in the context of a recorded SENĆOŦEN story, has been carried out by Bird et. al. (2012).

[122] This word is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 840-841). The example in (62) uses the first meaning.

The example in (65) illustrates harmonizing of the schwa in the vowel initial suffix.

(65) . DÁ,ET
t̓éʔet
√t̓eʔ-ət
√try-TRNS
'to try, test, taste, attempt something, check something out'
(Montler 2018: 115)

The example in (66) is of the root 'ƛ̓iʔ'.

(66) ṮI,[123]
ƛ̓íʔ
√ƛ̓iʔ
√want
'want, like' (Montler 1986)

Example (67) illustrates the harmonization of the unstressed vowel in the question particle to the stressed vowel /i/ in the root across a glottal stop.

(67)	ṮI,	I[124]
	ƛ̓íʔ	i
	√ƛ̓iʔ	ə
	√want	QUES

'Do you want, like it?' (Montler 1986):

[123] The examples in (64)-(65) were originally presented in Montler (1986) to illustrate vowel harmony. This root however, is documented with three meanings in the SENĆOŦEN dictionary, none of which mean 'want' (see Montler 2018: 742).

[124] This form is also written as ṮI, E.

The example in (68) is of the root ‘ƛ̓áʔ’.

(68) TO,
ƛ̓áʔ
√ƛ̓aʔ
√comfort
‘comfort’ (Montler 1986)

The example in (69) illustrates the harmonization of the unstressed vowel in the vowel initial suffix to the stressed vowel in the root across a glottal stop.[125]

(69) TO,ET
ƛ̓áʔat
√ƛ̓áʔ-ət
√comfort-TRNS
‘comfort him/her/it’ (Montler 1986)

The forms in (70)-(71) illustrate the harmonization of an unstressed vowel in a root to the stressed vowel /i/ in a vowel-initial suffix across a glottal stop.[126] In this example the unstressed vowel in the root is analysed as an underlying schwa.

[125] The examples in (66)-(67) were originally presented in Montler (1986) to illustrate vowel harmony. The root in (66) is not documented in the SENĆOŦEN dictionary, and the word in (67) is documented but not as having vowel harmony (see Montler 2018: 747).
[126] The examples in (70)-(71) were originally presented in Montler (1986) to illustrate vowel harmony. The word in (70) is documented in the SENĆOŦEN dictionary, but it neither recorded nor confirmed (Montler 2018: 712). The example in (71) is documented in the SENĆOŦEN, but not as having vowel harmony (Montler 2018: 712).

(70) ȾEȻE,
t̓ᶿə́kʷəʔ
√t̓ᶿəkʷəʔ
√left
'left' (Montler 1986)

(71) ȾEȻE,IU,S
t̓ᶿəkʷiʔíw̓s
√t̓ᶿəkʷəʔ=iw̓s
√left=body
'left side' (Montler 1986)

The example in (72) is of the stem 'st̓éqəʔ'

(72) SDAḴE,
st̓éqəʔ
s√t̓eqəʔ
s√bruise
'bruise' (Montler 1986)

The example in (73) illustrates the harmonization of the unstressed vowel in the stem to the stressed vowel /a/ in the vowel initial suffix across a glottal stop. [127]

(73) SDEḴE,OLES
st̓əqaʔáləs
s√t̓eqəʔ=aləs
s√bruise=eye
'black-eye' (Montler 1986)

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[127] The examples in (72)-(73) were originally presented in Montler (1986) to illustrate vowel harmony. The word in (72) is documented with two meanings in the SENĆOŦEN dictionary (Montler 2018: 464). The example in (72) uses the first meaning. The word in (73) is documented in the SENĆOŦEN dictionary, but not as having vowel harmony (see Montler 2018: 607).

This optional process of vowel harmonization across glottal stop resembles a process called Translaryngeal vowel harmony which has been described crosslinguistically, and that has also been termed Trans-guttural harmony and Faucal Harmony (see Rose 1996) and is most often understood to be a process of full assimilation between vowels (or vowel copy/echo vowel) across a laryngeal segment (see for example Rose & Walker 2011, Urbanczyk 1999).

Sound processes of vowel harmony across glottal stop, are reported to occur in a number of other Salish languages. For example, this kind of vowel harmony has been reported to occur in Nxaʔamxcín (Bessell 1992b, 1998, and Bessell & Czaykowska-Higgins 1991), Coeur d'Alene (Doak 1987, 1992), ʔayʔaǰuθəm (Blake, 1992, 2000b), and St'át'imcets (van Eijk 1997). Also, trans-laryngeal harmony has been described for dxʷləšucid (Urbanczyk 2001) and Sk̲wx̲ú7mesh (Dyck 2004, Jacobs 2012). Montler (1998) also describes this process in Nəxʷsƛ̓ay̓əmúcən. Other varieties of Northern Straits also exhibit this type of process (Thompson 1972, Thompson et al 1974).

Glottal stop has been attributed special phonological properties cross-linguistically, with respect to processes of transglottal vowel harmony. Steriade (1987) has shown that a glottal stop consonant often differs from an oral consonant with respect to its transparency in vowel harmony contexts. Cross-linguistically, phonological patterns involving glottal stop have often been attributed to a lack of phonological place features, more specifically, a lack of oral place features as opposed to pharyngeal place features (Bessell 1992a, Bessell & Czaykowska-Higgins 1991, Hess 1990, McCarthy 1991a, 1991b, 1994, Rose 1996).[128] This lack of the superlaryngeal place feature allows the sharing of place from the underlying full vowel across a glottal stop to the unstressed vowel. Also, the patterns of glottal stop have been attributed to the function of its acoustic properties in contrast to the acoustic properties of oral consonants (Borroff 2007). Languages which have been shown to have some form of Translaryngeal Harmony include Acoma (Keres; Miller 1965), Nez Perce (Penutian; (Aoki 1970), Yapese (Austronesian; Jensen 1977), Kekchi (Mayan; Campbell 1974), Tojolabal (Mayan; Furbee-Losee 1976) and Mohawk (Iroquoian; Postal 1969), among others.

These few examples of vowel harmonization observed in SENĆOŦEN further support the claim that unstressed full vowels are never derived from underlying full

[128] These approaches are compatible with Esling's (2005) laryngeal articulator model. In that model glottal stop has a place feature, but that place feature is not in the oral cavity. Instead, the place features for glottal stop are in the laryngeal cavity, whereas the place features for vowels are in the oral cavity. Spreading the oral place feature of one vowel to the other across a segment that only has a laryngeal feature, and lacks its own oral place features does not violate any convention having to do with a ban on spreading across a segment's oral place features. This is why place features from a vowel can spread to another vowel across the glottal stop.

vowels. The unstressed full vowels in these cases are sharing the place features with the stressed vowel. Crucially, the vowel does not have its own underlying place features.

3.3 Conclusion

This chapter has argued that there are two different types of vowels in SENĆOŦEN which can be differentiated by their abstract representations. The first type is a set of underlying full vowels which have their own mora and place features, and the second is a schwa which does not have a mora or place features. The underlying full vowels in SENĆOŦEN are the only segments argued to have a mora in this dissertation. Unstressed full vowels are argued to be derived from glides, which are segments that do have an underlying mora.

All consonants in SENĆOŦEN are argued to be weightless. Weight-by-Position is argued to be in-active in SENĆOŦEN. Full vowels are argued to have both weight and place features. Schwa, is argued to be both phonologically weightless and placeless. Glides and glide-like consonants are argued to be weightless, but to have weight. In support of Montler's (1986) categorization of vowels, evidence was presented showing that schwa is a vowel which can sometimes be part of the phonemic entry and that can other times serve as an epenthetic segment. Crucially, stress assignment is argued to be assigned to SENĆOŦEN words prior to schwa epenthesis. In the next chapter a preliminary investigation into the acoustic characteristics of length and quality of SENĆOŦEN vowels is presented.

Chapter 4 The Acoustic Correlates of Quality and Length in SENĆOŦEN

4.0 Goals of chapter 4

Chapter 4 presents a preliminary acoustic description of stressed versus unstressed vowels offering some phonetic support for the proposal that full vowels reduce to schwa in unstressed position. The symbol 'ə' is used by linguists and the symbol 'E' is used by language learners to represent underlying schwa, epenthetic schwa, and underlying full vowels in unstressed position. This convention suggests that all these vowels are perceived in a similar way. The goal of chapter 4 is to determine what the acoustic correlates of stressed versus unstressed vowels are with respect to quality and length. To that end, the remainder of this chapter presents a preliminary investigation of the acoustic correlates of vowel quality and vowel length in SENĆOŦEN. Although it is not possible to make incontrovertible generalisations or to draw solid conclusions from such a small number of vowel tokens, the patterns observed in this chapter suggest that the following hypotheses would be borne out if more vowel tokens were made available for phonetic analysis. [129] The two hypotheses, tested here, are as follows: Hypothesis 1: Stressed vowels should have a more discrete position in the vowel space than unstressed vowels. Hypothesis 2: Stressed vowels

[129] A study using this design with audio recordings of words from the SENĆOŦEN Dictionary (Montler 2018) is worthwhile.

should be longer than unstressed vowels. The central contribution of this chapter is that it serves as a starting point to those future investigations. [130]

The remainder of this chapter is organized as follows: Section 4.1, situates the phonetic investigation of SENĆOŦEN vowels within Silverman's (2011) claims regarding the general phonological and phonetic characteristics of schwa. Section 4.2 situates the study within the context of a small body of phonetic research. Section 4.3 presents the preliminary acoustic description and analysis of formant structure and vowel duration for SENĆOŦEN vowels in stressed versus unstressed position. Section 4.4 is a conclusion which compares the findings for SENĆOŦEN with the findings reported for four other Central Salish languages.

4.1 The mapping between phonology and phonetics (theoretical assumptions)

The central assumption of this chapter is that abstract phonological structure is mapped to articulatory phonetic properties which are in turn mapped to acoustic phonetic measurements. The abstract phonological place features [high], [low], and [back] correlate to the articulatory properties of tongue height and

[130] Research shows that phonetic work on an endangered language is often affected by the nature of the examples, number of speakers, and age of speakers. Due to these factors it is often difficult to have large numbers of examples from which to draw generalisations (see Bird 2011a, 2011b: 169, 2018). Nevertheless, the results obtained in the research presented here are comparable to those found for other Salish languages, suggesting that even though they are based on relatively small numbers, they are reliable and would be replicable by additional research.

backness/advancement respectively (Chomsky & Halle 1968) and these articulatory properties in turn map to the acoustic properties known as formants. Tongue height maps to F1 and tongue backness and advancement maps to F2 (see Fant 1973, Stevens 2002). The coarticulation of unstressed vowels (schwa) is described by Silverman (2011: 1):

> In terms of their quality, vowels labelled schwa vary to the extent of encompassing a large portion of the vowel space, while tending toward the centre of this space (e.g., Browman & Goldstein 1992). This variability is usually a consequence of schwa's context flanking consonants and vowels may have a significant co-articulatory influence on schwa's phonetic starting and ending postures, typically far more coarticulatory influence than vowels of other qualities.

Stressed and unstressed vowels are also different with respect to their length in SENĆOŦEN. The stressed vowels are longer than unstressed vowels. Silverman (2011: 1) says of schwa, in general, that:

> In terms of duration - a phonetic property that the IPA vowel chart does not indicate - schwa is typically short and this short duration may co-vary with its tendency to be coarticulated.

The next section reports on acoustic studies of vowels in other Central Salish languages.

4.2 The acoustic correlates of quality and length in Central Salish languages

Previous research on the acoustic correlates of quality and length in four Central Salish languages is presented in this section. The languages reported on are Klallam, ʔayʔaǰuθəm, dxʷləšucid, and ləḱʷəŋiṅəŋ.[131] In the case of Klallam, Montler (1998) measured the duration and formant measurements (F1 and F2) of stressed and unstressed vowels. He found that unstressed vowels tend to be more centralised than stressed vowels.[132] Montler minimized the effect of coarticulation by choosing either anterior coronals or bilabial segments as the post-vocalic consonant. Montler reports that, when stressed, schwa and /a/ are indistinguishable based on their formant measurments and that they are better distinguished by comparing their duration measurements. In addition, Montler finds that Klallam schwa is shorter than the full vowel /a/, and that there is no significant difference in length between stressed schwa and unstressed vowels.

[131] Note that Ləḱʷəŋiṅəŋ and SENĆOŦEN are classified by Linguists as varieties of the language called Northern Straits Salish (see Monter 1999).

[132] These measurements were taken within the context of a study on the major phonological patterns affecting Klallam vowels.

Blake & Shahin (2008) investigate ʔayʔaǰuθəm schwa in stressed versus unstressed position, as compared to the underlying full vowels in stressed versus unstressed position. Their aim, by means of an acoustic study, is to determine if there is an acoustic distinction between epenthetic schwa and the reduced variants of the underlying full vowels. Assuming a pan-Salish distinction between full vowels and schwa (see Czaykowska-Higgins & Kinkade 1998, Shaw 1992,), their claim is that ʔayʔaǰuθəm epenthetic schwa will behave differently from the full vowels because it lacks prosodic weight (see Blake 2000b). Blake & Shahin (2008) set out to discover if this phonological weight distinction between schwa and full vowel in ʔayʔaǰuθəm is altered under conditions of underlying full vowel reduction. The data analysed were elicited using carrier sentences. 12 tokens of each vowel were elicited in stressed and unstressed position. Their experiment involves analysing a total of 95 tokens from one speaker. To determine vowel quality the first two formants are measured at the midpoint of each vowel. To determine a difference in weight, duration is measured from the beginning to the end of the vowel.[133]

Blake & Shahin find that unstressed [i] and [a] in ʔayʔaǰuθəm are more centralized along the high/low dimension than their stressed counterparts, but not

[133] Amplitude was also measured.

along the front/back dimension. Blake & Shahin (2008: 42) interpret this to mean that the unstressed vowels are not coarticulating with surrounding consonants. Blake & Shahin conclude that the unstressed vowels are not neutralised with respect to their quality and most importantly do not fully reduce to schwa.

Blake & Shahin find that the duration of unstressed underlying full vowels in ʔayʔaǰuθəm is shorter than the duration of most stressed underlying full vowels. Further, unstressed schwa has a shorter duration than unstressed underlying /i/ and unstressed underlying /u/, but not underlying unstressed /a/. In addition, they find that excrescent schwa has the shortest duration of all the unstressed vowels. The results of Blake & Shahin's study support previous cross-linguistic findings that vowels are shorter when they are unstressed.

Blake & Shahin's conclusion for ʔayʔaǰuθəm is that reduced underlying full vowels retain their phonological place features when unstressed, but no longer retain their mora, whereas, epenthetic schwa lacks weight and can acquire/share place features from surrounding segments.

Barthmaier (1998) presents an acoustic analysis of the quality and duration of vowels in dxʷləšucid. The study consists of 30 tokens drawn from two stories, namely, "Pheasant and Raven" and "Mink and Tetyika" as told by Martha Lamont to Thom

Hess. Barthmaier finds that stressed vowels are always longer than their unstressed counterparts. The vowel /a/ is consistently the longest vowel and the vowel /ə/ is consistently the shortest. To determined vowel quality, he constrained the data by "[…] selecting tokens that maximize the true nature of the vowels and minimize contextual influences" Barthmaier (1998: 2). He finds that vowel quality is greatly affected by stress. Stressed vowels fall into a triangular pattern in their vowel space. Each underlying full vowel in unstressed position maintains a distinct vowel space, but does so to a lesser degree than underlying full vowels in stressed position stressed. Barthmaier concludes from this that underlying full vowels are not fully reducing to schwa in dxʷləšucid.[134]

Barthmaier found that schwa is consistently shorter than the underlying full vowels in stressed and unstressed position. Underlying full vowel /a/ is the longest

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[134] Similar to Blake & Shahin's (2008) findings, Barthmaier (1998) finds that underlying full vowels do tend to centralize somewhat in unstressed position, but that they tend not to coarticulate with surrounding segments. He says that "Unstressed vowels, although they do centralize, maintain some distinctive vowel space and do not simply collapse to "schwa."" (Barthmaier 1998: 1). Silverman (2011) defines a schwa as being shorter in duration, centralised, and vulnerable to coarticulation. In Silverman's sense unstressed vowels in SENĆOŦEN [Saanich] count as schwa, whereas those in ʔayʔaǰuθəm and dxʷləšucid do not. However, a phonetic study with more vowel tokens, which is not specifically controlled for coarticulation affects, as those were in the ʔayʔaǰuθəm and dxʷləšucid studies, might yield different results.

vowel and /i/ and /u/ are shorter than /a/, but longer than schwa.[135] The observation that stressed schwa is shorter than the underlying full vowels fits with some Salish scholars who take the position that stressed schwa is epenthetic (e.g., Bianco 1995, 1996, 1998, Czaykowska-Higgins 1993, Dyck 2004, Matthewson 1994 among others). However, as he points out, there is still the puzzle of why the underlying full vowel /u/ is shorter than both the underlying full vowel /i/ and the underlying full vowel /a/. Barthmaier concludes that the difference between stressed versus unstressed vowels is most clearly observed in dxʷləšucid by differences in duration, rather than by differences in quality.

The effect that stress assignment and adjacent consonant environment on the quality of vowels in ləḱʷəŋiṅəŋ is investigated by Nolan (2017).[136] Nolan investigates a range of phonetic correlates for word level stress and a range of consonantal environments that trigger vowel coarticulation. Relevant to this dissertation are Nolan's general findings that stressed vowels tend to be longer than unstressed vowels,

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[135]Barthmaier (1998: 6) notes that: "These findings are reflective of the cross linguistic observation that low vowels are generally longer than high vowels. Lehiste [(1970)] refers to this phenomenon as "intrinsic duration," (1970:18), which is duration inherent in the vowel. One explanation for this is that the distance required by the tongue to move to a low vowel and back during phonation is greater than the distance necessary for a high vowel (Maddieson 1996)."

[136] ləḱʷəŋiṅəŋ, also called Lekwungen, is a variety of Northern Straits Salish which is closely related to SENĆOŦEN.

that stressed vowels tend to coarticulate to a lesser degree than unstressed vowels, and that the vowel that coarticulates most readily is the unstressed schwa.

From the small sample of languages discussed in this section the generalisation drawn is that stressed vowels tend to be longer than unstressed vowels. Stressed vowels do also tend to have more clearly defined vowel spaces than unstressed vowels, though that is truer of Klallam and ləkʷəŋin̓əŋ than it is for ʔayʔaǰuθəm and dxʷləšucid. Only Nolan (2017) presented clear evidence that unstressed vowels were coarticulating to their surrounding segments. However, it is not clear if unstressed vowels are not coarticulating in the other languages because the tokens were carefully chosen in each case to avoid coarticulatory effects.[137] The remainder of this chapter, presents a preliminary investigation into the acoustic correlates of quality and duration of stressed versus unstressed vowels in SENĆOŦEN.

4.3 Experiment: The acoustic characteristics quality and length in SENĆOŦEN

4.3.1 Introduction

Section 4.3 presents a preliminary investigation of the quality and length of stressed versus unstressed vowels with a goal of determining to what extent it might be possible to test the following two hypotheses. The first hypothesis is that stressed

[137] Note that dxʷləšucid and ʔayʔaǰuθəm both have unstressed full vowels. dxʷləšucid and ʔayʔaǰuθəm also both have a copy vowel with the control transitive morpheme whereas SENĆOŦEN and ləkʷəŋin̓əŋ has a schwa.

vowels have a narrower distribution in the vowel space than unstressed vowels. The second hypothesis is that stressed vowels are longer than unstressed vowels.[138]

4.3.2 Methodology

Recordings of vowel tokens produced by two male native speakers, both W̱SÁNEĆ elders aged approximately 78 years old, were used in this study. These recordings were made over a 6-year period (2004-2010) in the Saanich Native Heritage Society at *W̱JOŁEŁP* [Tsartlip] and in the home of Andy Paul at *W̱JOŁEŁP* [Tsartlip]. SENĆOŦEN words were elicited for a master's thesis project (2004-2006) researching stress assignment, for this doctoral research on sound patterns (2007-2010), and for a community research alliance documentation project (2005-2009) for pedagogical purposes. These recordings were recorded using an MAudio recorder with a unidirectional microphone and edited using Audacity ®. The acoustic analysis of the two experiments was carried out using PRAAT ®. The recordings were organized into three conditions. The first condition, called the epenthetic condition involves words which have an epenthetic vowel. The second condition, called the reduplication condition involves words which have an underlying full vowel and which also undergo the morphological process of reduplication. The third condition, called the non-

[138] The convention of writing most unstressed vowels in SENĆOŦEN as a schwa or an E suggests the possibility that those vowels are perceived, by speakers and learners, as schwa in unstressed position.

reduplication condition involves words which have an underlying full vowel, but which do not undergo the morphological process of reduplication.[139] In each of the three conditions the first two formants (F1 and F2) were measured for each vowel in stressed position and in unstressed position. Following the methodology outlined by Blake & Shahin (2008: 46) for ʔayʔaǰuθəm, each formant was measured at the centre of each SENĆOŦEN vowel token. The acoustic duration of each vowel token was measured from the beginning to the end of the vowel. Acoustic measurements are reported for the stressed versus unstressed vowel tokens from recorded words which the speakers have repeated two or three times.[140] Below, I present the words which were recorded in each condition. Each word in examples (1)-(3) have a stressed epenthetic schwa. [141]

[139] Full vowels were separated into reduplication and non-reduplication conditions to control for any morphological influence that reduplication might have on the pronunciation of unstressed vowels.
[140] A combination of my own auditory perception, the feedback from the speakers at the time of recording, the observation of the acoustic pitch and intensity as they are displayed in PRAAT ©, and the documentation of the same word by Montler (2018) were taken into consideration to determine which was the stressed vowel and which was the unstressed vowel in each recorded word.
[141] The recordings of each word are of the two speakers IM and RS. To ensure consistency of the example representation throughout the dissertation, the linguistic representation for each example in the dissertation is sourced from the SENĆOŦEN dictionary (Montler 2018). Where a difference occurs between the dictionary representation and the transcription from my own fieldnotes that difference is noted with the International Phonetic Alphabet.

(1) TEȻ
tə́kʷ
√tW[142]
√break_long
‘to get broken (of a long object)’ (Montler 2018: 657)

(2) XEL
x̣ə́l̓
√x̣l̓
√mark
‘mark’ (Montler 2018: 805)

(3) LEȾ
lə́t̓ᶿ
√lt̓ᶿ
√fill
‘to be full’ (Montler 2018: 299-300)

The initial vowel in examples (4)-(6) is an unstressed epenthetic schwa.

(4) TEȻNOW̱
təkʷnáxʷ[143]
√tW-naxʷ
√break_long-NCTRNS
‘to manage, succeed in breaking something, break something accidently’
(Montler 2018: 659)

[142]The analysis of this root is uncertain and could possibly be √tkʷ (Montler 2018: 656).

[143] As discussed in Chapter 3, in cases where underlying /W/ occurs in coda position a glide is expected to surface. In this example it is an obstruent that occurs. More research into how exactly segment alternations pattern work in SENĆOŦEN requires future research. In this dissertation, I treat this word as an exceptional form.

(5) XEL¸NOW̱
xə̣l̓náxʷ
√x̣l̓-naxʷ
√mark-NCTRNS
'to manage to write something' (Montler 2018: 808)

(6) LEȾET
lət̓ᶿə́t
√lt̓ᶿ-ət
√fill-TRNS
'to fill something'. (Montler 2018: 300)

(7) STḴÁYE¸
stqéyəʔ[144]
s-√təqeyəʔ
S-√wolf
'wolf' (Montler 2018: 566)

The examples in (8)-(9) contain a stressed underlying schwa and an unstressed underlying schwa.

[144] In the time since carrying out this preliminary experiement, I have come to the conclusion, following Montler (2018), that the schwa in this environment is more likely derived from an unstressed underlying schwa. However, I have opted to include this example, and its phonetic measurements, in this study because it provides an example of an unstressed vowel next to a glottal stop. Unstressed vowels next to glottal stop show a clear difference in pronunciation of an unstressed vowel as compared to the pronunciation of an unstressed vowel in other consonantal environments.

(8) NEĆNEĆETEṈ
nəčnə́čətəŋ[145]
CVC~√nəY-ət-əŋ
REP~√laugh-TRNS-PSV
‘to be laughed at by someone’ (Montler 2018: 355)

(9) SḰEḰEM¸X̱
sqʷəqʷə́m̓x̣ʷ
s-CV~√qʷəm‹ˀ›əx̣ʷ
STAT-DIM~√narrow‹ACTL›
‘to be very skinny’ (Montler 2018: 519)

The examples in (10)-(13) each contain a stressed underlying /i/ and an unstressed underlying /i/.[146]

(10) ȻIU¸EN¸TEL¸
kʷ**í**w̓**ə**n̓təl̓
CV~√W‹ˀ›in‹ˀ›-tal‹ˀ›
ACTL~√fight‹ACTL›-RCPRCL‹ACTL›
‘to be fighting, wrestling’ (Montler 2018: 104)

(11) ŦI¸ŦEŁ
θ**í**ʔθ**ə**ɬ
CV<ʔ>~√θiɬ[147]
ACTL~√high
‘high, sky, top, up’ (Montler 2018: 703-704)

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[145] When /Y/ occurs between two consonants in an unstressed syllable the prediction, in the usual case, is that [i] will surface. The reason why there is an obstruent in this example might be due to a pressure to maintain identity between reduplicant and base.

[146] The relevant vowel in each example is highlighted in bold.

[147] This example looks as though the morphological process of reduplication is being expressed with both reduplication and the glottal stop infix.

(12) MELMILEJ
məlmíləč̓
CVC~√miləč̓
PL~√mix_up
‘to be mixed up, confused’ (Montler 2018: 341)

(13) SȽIȽEȾ
sɬíɬət̓^{θ}
s-CV~√ɬit̓^{θ}
STAT-RSLT~√cut
‘to be cut (already cut)’ (Montler 2018: 329-330)

The examples in (14)-(17) contain a stressed underlying /e/ and an unstressed underlying /e/.

(14) SÁW̱SEW̱
séx^{w}səx^{w}
CVC~√sex^{w}
CHAR~√lazy
‘to be a lazy person’ (Montler 2018: 445)

(15) SPEPÁ¸KEṈ,
spəpéʔq̓əŋ̓
s-CV~√pe‹ʔ›q̓-əŋ‹ˀ›
S-DIM~√flower‹DIM›-MDL‹DIM›
‘a small flower’ (Montler 2018: 552)

(16) ḴAḴEN,
qéqəń
CV~√qeń
ACTL~√rob
‘to be stealing, cheating’ (Montler 2018: 253)

(17) SȻÁȻEL¸
skʷ**é**kʷ**ə**l̓
s-CV~√kʷel‹ˀ›
STAT-RSLT~√hide‹ACTL›
‘to be hidden’ (Montler 2018: 458)

The examples in (18)-(22) contain a stressed underlying /a/ and an unstressed underlying /a/.

(18) STOTEL¸EU¸
st**á**t**ə**l̓əw̓
s-CV~√tal̓əw̓
S-DIM~√river
‘creek, stream’ (Montler 2018: 569)

(19) ȻEȻOṮŚEN
kʷ**ə**kʷ**á**ƛ̓šən
CV~√kʷaƛ̓=šən
DIM~√crab=foot
‘red rock crab’ (Montler 2018: 79)

(20) PEPO¸EL¸
p**ə**p**á**ʔəl̓
CV~√pa‹ʔə›l‹ˀ›
DIM~√ball‹DIM›‹ACTL›
‘small ball player’[148] (Montler 2018: 400)

[148] This word is documented in the SENĆOŦEN dictionary with two meanings (400). The example in (21) uses the first meaning.

(21) SḰELḰOLX̱
sqʷəlqʷ**á**lx̣ʷ
s-CVC~√qʷalx̣ʷ
S-REP~√hail
'hail' (Montler 2018: 520)

(22) QENQENED
k̓ʷ**ə́**nk̓ʷ**ə**nət̓
CVC+√k̓ʷənət̓
CHAR+√porpoise
'dolphin' (Montler 2018: 424)

For the non-reduplication condition, the pair of examples in (23)-(24) involve the same root and the same reflexive suffix. In (23) a schwa surfaces in the suffix and it is stressed.[149]

(23) QEȾESET
kʷ̓**ə**tᶿ**ə́**sət
√kʷ̓ətᶿ-sat
√crooked-RFLXV
'to twist oneself' (Montler 2018: 429)

In (24) the schwa in the root is stressed and the schwa in the control transitive is unstressed. The relevant vowels are presented in bold.

[149] The phonological status of the schwa in this suffix is undetermined. It could be analysed as a connector vowel, as part of the suffix, or as an epenthetic vowel. Montler (2018: 429) does not a provide morphological analysis of this vowel.

(24) QEȾ̸ET
k̓ʷ**ə́**t̓ᶿ**ə**t
√k̓ʷət̓ᶿ-ət
√crooked-TRNS
'to make something crooked, twist something' (Montler 2018: 429)

The pair of examples in (25)-(26) involve the same root. In (25) the /i/ in the root is stressed.

(25) ȽIȾ̸SEN
ɬ**í̓**tᶿsən
√ɬi̓tᶿ=sən
√cut=foot
'to get cut on the foot' (Montler 2018: 325)

In (26) the /i/ in the root is unstressed. The relevant vowel is presented in bold.

(26) ȽEȾ̸ÁL¸S
ɬ**ə**t̓ᶿél̓s
√ɬit̓ᶿ-el̓s
√cut-ACTV(ACTL)
'to be cutting (wood for example)' (Montler 2018: 322)

The pair of words in (27)-(28) also have the same root. In (27) the /i/ in the root is stressed.

(27) T̲IJET
ƛ̓**í**č̓ət
√ƛ̓ič̓-ət
√sneak-TRNS
'stalk it' (Montler 2018: 743)

In (28) the /i/ in the root is unstressed. The relevant vowel is presented in bold.

(28) T̲EJSENEN̲
ƛ̓**ə**č̓sə́nəŋ
√ƛ̓ič̓=sən-əŋ
√sneak=foot-MDL
'to walk softly, sneak around' (Montler 2018: 736)

The example words in (29)-(30) illustrate /e/ when it is stressed and /e/ when it is unstressed. In (29) /e/ in the root is stressed.

(29) PÁȾET
p**é**θət
√peθ-ət
√spread_out-TRNS
'to spread something out (as berries to dry), lay something down (as a blanket)' (Montler 2018: 397)

In (30) /e/ in the root is unstressed.

(30) PEȾSENTEN
p**ə**θsə́ntən
√peθ=sən=tən
√spread_out=foot=INSTR
'floor, mat, rug, carpet, floor tile, linoleum' (Montler 2018: 401)

The examples in (31)-(32) illustrate /a/ when it is stressed and /a/ when it is unstressed.

In (31) the /a/ the suffix is stressed.

(31) XEL¸NOW̱
xə̣l̓náxʷ
√x̣l̓-naxʷ
√mark-NCTRNS
'to manage to write something' (Montler 2018: 808)

In (32) the /a/ in the suffix is unstressed.

(32) HÍNEW̱
háynəxʷ
√haY-naxʷ
√finish-NCTRNS
'to manage to finally finish something' (Montler 2018: 186)

The examples in (33)-(34) also illustrate /a/ when it is stressed and /a/ when it is unstressed. In (33) /a/ in the root is stressed.

(33) W̱I,W̱EYOS[150]
xʷixʷəyás
CVC~√xʷəY=as
CHAR~√wake=face
'early riser' (Montler 2018: 776)

In (34) the /a/ in the suffix is unstressed.

(34) W̱NEĆEṈES
xʷnəčə́ŋəs
xʷ-√nəY-əŋ=as
LOC-√laugh-MDL=face
'to look friendly, have the beginning of a smile on the face'
(Montler 2018: 783)

[150]In my fieldnotes the spelling is documented as W̱I,W̱I,YOS.

4.3.2 Measurements

The formant structures of vowel tokens were measured to determine the extent to which the quality of stressed vowels differs from the quality of unstressed vowels. F1 was measured to determine vowel height and F2 was measured to determine vowel backness. These measurements were taken at the centre of the vowel, following methodology used in similar studies for other Salish languages (see in particular Barthmaier 1998, Blake & Shahin 2008, Montler 1998). The acoustic duration of each vowel was measured. The vowels were measured in three specific conditions. The first condition was stressed vs unstressed epenthetic vowels.[151] The second condition was stressed vs unstressed underlying vowels in reduplicated words. The third condition was stressed vs unstressed underlying vowels in non-reduplicated words.

For IM, 18 tokens of epenthetic schwa were analysed in total. The number of tokens measured by vowel type is given in (35).[152]

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[151] The surrounding consonantal environment for the stressed epenthetic schwa was made as variable as possible (given the small number of example words) to ensure that coarticulatory influence could be observed.

[152] The surrounding consonantal environment for the unstressed epenthetic schwa was made as variable as possible (given the small amount of examples words) to ensure that coarticulatory influence could be observed.

(35) IM's epenthetic vowels

Vowel	Stressed	Unstressed
ə	8	10

For RS, 18 tokens of epenthetic schwa analysed in total. The number of tokens measured by vowel type is given in (36).

(36) RS's epenthetic vowels

Vowel	Stressed	Unstressed
ə	8	10

For IM, 66 tokens of underlying vowels in reduplicated words were analysed in total. The number of tokens measured by vowel type is given in (37).

(37) IM's underlying vowels in the reduplication condition

Vowel	Stressed	Unstressed
ə	5	5
i	9	9
e	10	10
a	9	9

For RS 59 tokens of underlying vowels in reduplicated words were analysed in total. The number of tokens measured by vowel type is given in (38).

(38) RS's underlying vowels in the reduplication condition

Vowel	Stressed	Unstressed
ə	4	3
i	9	9
e	10	10
a	7	7

For IM 28 tokens of underlying vowels in the non-reduplication condition were measured. The number of tokens measured by vowel type is given in (39).

(39) IM's underlying vowel tokens in the non-reduplication condition.

Vowel	**Stressed**	**Unstressed**
ə	4	4
i	4	4
e	2	2
a	4	4

For RS 28 tokens of underlying vowels in the non-reduplication condition were measured. The number of tokens measured by vowel type is given in (40).

(40) RS's underlying vowel tokens in the non-reduplication condition.

Vowel	**Stressed**	**Unstressed**
ə	4	4
i	4	4
e	2	2
a	4	4

4.3.3 Results

The results of the acoustic measurement of the vowel formants and vowel duration for tokens of vowels pronounced by both IM and RS are presented in this section. Section 4.3.3.1 provides the formant measurements for both underlying vowels and epenthetic vowels in stressed and unstressed position. Section 4.3.3.2 provides the duration measurements for both underlying vowels and epenthetic vowels in stressed and unstressed position.

4.3.3.1 Formant Measurements

F1 is measured as a correlate of vowel height and F2 is measured as a correlate of vowel backness. 4.3.3.1.1 reports on stressed epenthetic vowels. 4.3.3.1.2 reports on unstressed epenthetic vowels. 4.3.3.1.3 reports on stressed underlying vowels in the reduplication condition. 4.3.3.1.4 reports on unstressed underlying vowels in the reduplication condition. 4.3.3.1.5 reports on stressed vowels in the non-reduplication condition. 4.3.3.1.6 reports on unstressed vowels in the non-reduplication condition.

4.3.3.1.1 Stressed Epenthetic Vowels

The F1 and F2 measurements for IM's stressed epenthetic vowels are given in (41).[153]

(41)

SENĆOŦEN	**Underlying Form**	**Token <ə́>**	**F1**	**F2**
TEȻ	/tWʷ/	t**ə́**kʷ	547Hz	1370Hz
TEȻ	/tWʷ/	t**ə́**kʷ	593Hz	1236Hz
XEL,	/x̣l̓/	x̣**ə́**l̓	521Hz	1236Hz
XEL,	/x̣l̓/	x̣**ə́**l̓	521Hz	1240Hz
XEL,	/x̣l̓/	x̣**ə́**l̓	557Hz	1236Hz
LEȾ	/lt̓ᶿ/	l**ə́**t̓ᶿ	537Hz	1396Hz
LEȾ	/lt̓ᶿ/	l**ə́**t̓ᶿ	578Hz	1358Hz
LEȾ	/lt̓ᶿ/	l**ə́**t̓ᶿ	537Hz	1396Hz
		AVERAGE	**549Hz**	**1309Hz**

[153]The relevant token is presented in bold for each table.

The F1 and F2 measurements for RS's stressed epenthetic vowels are given in (42).

(42)

SENĆOŦEN	**Underlying Form**	**Token <ə́>**	**F1**	**F2**
TEȻ	/tW/	tə́kʷ	486Hz	1379Hz
TEȻ	/tW/	tə́kʷ	486Hz	1450Hz
XEL,	/x̣l̓/	x̣ə́l̓	486Hz	1236Hz
XEL,	/x̣l̓/	x̣ə́l̓	486Hz	1343Hz
XEL,	/x̣l̓/	x̣ə́l̓	450Hz	1379Hz
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	537Hz	1478Hz
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	537Hz	1478Hz
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	455Hz	1396Hz
		AVERAGE	**490Hz**	**1392Hz**

4.3.3.1.2 Unstressed Epenthetic Vowels

The F1 and F2 measurements for IM's unstressed epenthetic vowels are given in (43).

(43)

SENĆOŦEN	**Underlying Form**	**Token <ə>**	**F1**	**F2**
TEȻNOW̱	/tW-náxʷ/	təkʷnáxʷ	378Hz	1165Hz
TEȻNOW̱	/tW-náxʷ/	təkʷnáxʷ	450Hz	1057Hz
XEL,NOW̱	/x̣l̓-náxʷ/	x̣əl̓náxʷ	450Hz	1307Hz
XEL,NOW̱	/x̣l̓-náxʷ/	x̣əl̓náxʷ	420Hz	1300Hz
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓náxʷ	486Hz	1272Hz
LEȾET	/lt̓ᶿ-ət/	lət̓ᶿə́t	414Hz	1736Hz
LEȾET	/lt̓ᶿət/	lət̓ᶿə́t	415Hz	1700Hz
STKȺYE,	/stq̓eyəʔ/	st̓q̓éeyəʔ	619Hz	1314Hz
STKȺYE,	/stq̓eyəʔ/	st̓q̓éeyəʔ	578Hz	1233Hz
STKȺYE,	/stq̓eyəʔ/	st̓q̓éeyəʔ	610Hz	1293Hz
		AVERAGE	**482Hz**	**1338Hz**

The F1 and F2 measurements for RS’s unstressed epenthetic vowels are given in (44).

(44)

SENĆOŦEN	**Underlying Form**	**Token <ə>**	**F1**	**F2**
TEȻNOW̱	/tW-naxʷ/	təkʷnáxʷ	420Hz	1387Hz
TEȻNOW̱	/tW-naxʷ/	təkʷnáxʷ	387Hz	1387Hz
XEL,NOW̱	/x̣l̓-náxʷ/	x̣əl̓náxʷ	664Hz	1200Hz
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓náxʷ	664Hz	1272Hz
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓náxʷ	593Hz	1307Hz
LEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	486Hz	1700Hz
LEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	450Hz	1629Hz
STKȺYE,	/stq̓eyəʔ/	stq̓éyəʔ	660Hz	1478Hz
STKȺYE,	/stq̓eyəʔ/	stq̓éyəʔ	660Hz	1560Hz
STKȺYE,	/stq̓eyəʔ/	stq̓éyəʔ	619Hz	1601Hz
		AVERAGE	**560Hz**	**1452Hz**

4.3.3.1.3 Stressed Underlying Vowels in the Reduplication Condition

The F1 and F2 measurements for IM’s stressed underlying schwa in the reduplication condition are given in (45).

(45)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**F1**	**F2**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	535Hz	1495Hz
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	537Hz	1437Hz
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	455Hz	1357Hz
SḰEḰEMW̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	619Hz	987Hz
SḰEḰEMW̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	619Hz	1028Hz
		AVERAGE	**553Hz**	**1261Hz**

The F1 and F2 measurements for IM’s stressed underlying /i/ are given in (46).

(46)

SENĆOŦEN	**Underlying Form**	**Token /í/**	**F1**	**F2**
ȽIȽEQSEN	/ɬi~ɬək̓ʷ-sən/	ɬíɬək̓ʷ-sən	332Hz	1969Hz
ȻIW,ENTEL	/Wí~Wən<ʔ>təl/	kʷíw̓ən̓təl̓	435Hz	1801Hz
ȻIW,ENTEL	/Wí~Wən<ʔ>təl/	kʷíw̓ən̓təl̓	435Hz	1825Hz
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θíʔθəɬ	411Hz	1947Hz
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θíʔθəɬ	411Hz	1971Hz
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θíʔθəɬ	411Hz	1947Hz
MELMILEJ	/mil~miləc̓/	məlmíləc̓	435Hz	1849Hz
MELMILEJ	/mil~miləc̓/	məlmíləc̓	459Hz	1849Hz
SȽIȽEX̱	/s-ɬí~ɬit̓ᶿ/	sɬíɬət̓ᶿ	434Hz	1859Hz
SȽIȽEX̱	/s-ɬí~ɬit̓ᶿ/	sɬíɬət̓ᶿ	411Hz	1874Hz
		AVERAGE	**418Hz**	**1889Hz**

The F1 and F2 measurements for IM’s stressed underlying /e/ are given in (47).

(47)

SENĆOŦEN	**Underlying Form**	**Token /é/**	**F1**	**F2**
SÁW̱SEW̱	/séxʷ~sexʷ/	séxʷsəxʷ	533Hz	1679Hz
SÁW̱SEW̱	/séxʷ~sexʷ/	séxʷ-səxʷ	508Hz	1727Hz
SÁW̱SEW̱	/séxʷ~sexʷ/	séxʷ-səxʷ	533Hz	1654Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	508Hz	1435Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	533Hz	1459Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	533Hz	1411Hz
ḴAḴEN,	/qe~qen̓/	qéqən̓	581Hz	1581Hz
ḴAḴEN,	/qe~qen̓/	qéqən̓	581Hz	1606Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	484Hz	1411Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	484Hz	1459Hz
		AVERAGE	**528Hz**	**1542Hz**

The F1 and F2 measurements for IM's stressed underlying /a/ are given in (48).

(48)

SENĆOŦEN	**Underlying Form**	**Token /á/**	**F1**	**F2**
STOTE,LU,	/s-ta~taʔlW̓/	st**á**təʔləw̓	606Hz	1380Hz
STOTE,LU,	/s-ta~taʔlW̓/	st**á**təʔləw̓	581Hz	1289Hz
ȻEȻÁT̲ŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	606Hz	1191Hz
ȻEȻÁT̲ŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	679Hz	1240Hz
ȻEȻÁT̲ŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	679Hz	1216Hz
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	533Hz	971Hz
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	508Hz	996Hz
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	533Hz	1021Hz
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	534Hz	1022Hz
		AVERAGE	**584Hz**	**1147Hz**

The F1 and F2 measurements for RS's stressed underlying schwa are given in (49).

(49)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**F1**	**F2**
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	567Hz	1490Hz
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	578Hz	1478Hz
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	N/A	N/A[154]
SḰEḰEMX̲	/s-qʷə~qʷəmx̣ʷ/	sqʷ**ə́**qʷəmx̣ʷ	566Hz	1115Hz
		AVERAGE	**570Hz**	**1361Hz**

[154]Useful measurements were not able to be obtained due to background noise present on the recording.

The F1 and F2 measurements for RS's stressed underlying /i/ are given in (50).

(50)

SENĆOŦEN	**Underlying Form**	**Token /í/**	**F1**	**F2**
ȻI,WEN,TEL	Wi~Win<?>-təl	/kʷíw̓ən̓təl̓/	416Hz	1846Hz
ȻI,WEN,TEL	Wi~Win<?>-təl	/kʷíw̓ən̓təl̓/	332Hz	1805Hz[155]
ŦI,ŦEȽ	θi~θiɬ<?>	/θíʔθəɬ/	332Hz	2010Hz
ŦI,ŦEȽ	θi~θiɬ<?>	/θíʔθəɬ/	414Hz	2010Hz
ŦI,ŦEȽ	θi~θiɬ<?>	/θíʔθəɬ/	332Hz	2051Hz
MELMILEJ	mil~miləč̓	/məlmíləč̓/	414Hz	2272Hz
MELMILEJ	mil~miləč̓	/məlmíləč̓/	376Hz	2200Hz
SȽIȽEȾ	s-ɬi~ɬət̓ᶿ	/sɬíɬət̓ᶿ/	378Hz	2200Hz
SȽIȽEȾ	s-ɬi~ɬət̓ᶿ	/sɬíɬət̓ᶿ/	414Hz	2129Hz
		AVERAGE	**379Hz**	**2058Hz**

The F1 and F2 measurements for RS's stressed underlying /e/ are given in (51).

(51)

SENĆOŦEN	**Underlying Form**	**Token /é/**	**F1**	**F2**
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷsəxʷ	455Hz	1928Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	455Hz	1887Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	455Hz	2010Hz
SPEPAKEṈ	/s-pə~peq̓əŋ/	spəp**é**q̓əŋ	660Hz	1606Hz
SPEPAKEṈ	/s-pə~peq̓əŋ/	spəp**é**q̓əŋ	660Hz	1601Hz
SPEPAKEṈ	/s-pə~peq̓əŋ/	spəp**é**q̓əŋ	660Hz	1642Hz
ḴAḴEN,	/qe~qen̓/	q**é**qən̓	664Hz	1736Hz
ḴAḴEN,	/qe~qen̓/	q**é**qən̓	557Hz	1700Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷ**é**kʷəl	450Hz	1808Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷ**é**kʷəl	486Hz	1772Hz
		AVERAGE	**550Hz**	**1769Hz**

155 For RS the stressed vowel /i/ preceding /w/ has lower F2 readings, than the other tokens of stressed vowel /i/. F2 is correlated with backness and these measurements suggest that /i/ is pronounced further back in the mouth when it occurs before /w/ as compared to other consonantal environments.

The F1 and F2 measurements for RS's stressed underlying /a/ are given in (52).

(52)

SENĆOŦEN	**Underlying Form**	**Token /á/**	**F1**	**F2**
STOTE,LU,	/s-ta~taʔlẆ̓/	st**á**təʔləẇ̓	557Hz	1450Hz
STOTE,LU,	/s-ta~taʔlẆ̓/	st**á**təʔləẇ̓	557Hz	1379Hz
ȻOȻEṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	619Hz	1192Hz
ȻOȻEṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	660Hz	1233Hz
ȻOȻEṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	619Hz	1192Hz
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	736Hz	1129Hz
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	628Hz	1129Hz
		AVERAGE	**625Hz**	**1243Hz**

4.3.3.1.4 Unstressed Underlying Vowels in the Reduplication Condition

The F1 and F2 measurements for IM's unstressed underlying schwa are given in (53).

(53)

SENĆOŦEN	**Underlying Form**	**Token /ə/**	**F1**	**F2**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	n**ə**čnə́čətəŋ	455Hz	1519Hz
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	n**ə**čnə́čətəŋ	496Hz	1478Hz
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	n**ə**čnə́čətəŋ	455Hz	1357Hz[156]
SḰEḰEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷ**ə**mx̣ʷ	455Hz	946Hz
SḰEḰEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷ**ə**mx̣ʷ	450Hz	905Hz
		Average	**462Hz**	**1241Hz**

[156] The measurements for the unstressed schwa are identical to the measurement for the stressed schwa in this position. IM hesitates after the first syllable, perhaps due to being concerned that he might have already given a third utterance for this word. This hesitation could possible be the reason why stress is on the initial vowel in this word.

The F1 and F2 measurements for IM's unstressed underlying /i/ are given in (54).

(54)

SENĆOŦEN	**Underlying Form**	**Token /i/**	**F1**	**F2**
C̸I,WEN,TEL,	/Wi~Win<ʔ>-tal/	kʷíw̓ən̓təl̓	482Hz	1191Hz
C̸I,WEN,TEL,	/Wi~Win<ʔ>-tal/	kʷíw̓ən̓təl̓	508Hz	1216Hz
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θíʔθəɬ	537Hz	1396Hz
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θíʔθəɬ	537Hz	1390Hz
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θíʔθəɬ	578Hz	1273Hz
MELMILEJ	/mil~miləč̓/	məlmíləč̓	414Hz	1200Hz
MELMILEJ	/mil~miləč̓/	məlmíləč̓	486Hz	1129Hz
SȽIȽEX̸	/s-ɬi~ɬit̓ᶿ/	sɬíɬət̓ᶿ	557Hz	1558Hz
SȽIȽEX̸	/s-ɬi~ɬit̓ᶿ/	sɬíɬət̓ᶿ	450Hz	1486Hz
		AVERAGE	**505Hz**	**1315Hz**

The F1 and F2 measurements for IM's unstressed underlying /e/ are given in (55).

(55)

SENĆOŦEN	**Underlying Form**	**Token /e/**	**F1**	**F2**
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1151Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1110Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1115Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	496Hz	1192Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	455Hz	1192Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	455Hz	1233Hz
ḴAḴEN,	/qe~qen̓/	qéqən̓	557Hz	1435Hz
ḴAḴEN,	/qe~qen̓/	qéqən̓	508Hz	1264Hz
SC̸ÁC̸EL	/s-kʷe~kʷel/	skʷékʷəl	450Hz	1160Hz
SC̸ÁC̸EL	/s-kʷe~kʷel/	skʷékʷəl	450Hz	1165Hz
		AVERAGE	**474Hz**	**1202Hz**

The F1 and F2 measurements for IM's unstressed underlying /a/ are given in (56).

(56)

SENĆOŦEN	**Underlying Form**	**Token /a/**	**F1**	**F2**
STOTE,LU,	/s-ta~taʔlẂ/	státəʔləẁ	414Hz	1236Hz
STOTE,LU,	/s-ta~taʔlẂ/	státəʔləẁ	486Hz	1307Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	323Hz	978Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	414Hz	987Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	414Hz	905Hz
PEPO,EL	/pa~paʔəl/	pəpáʔəl	486Hz	1022Hz
PEPO,EL	/pa~paʔəl/	pəpáʔəl	414Hz	1057Hz
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	486Hz	1307Hz
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	450Hz	1236Hz
		AVERAGE	**432Hz**	**1115Hz**

The F1 and F2 measurements for RS's unstressed underlying schwa are given in (57).

(57)

SENĆOŦEN	**Underlying Form**	**Token /ə/**	**F1**	**F2**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	578Hz	1723Hz
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	579Hz	1728Hz
SḰEḰEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	516Hz	956Hz
		AVERAGE	**558Hz**	**1469Hz**

The F1 and F2 measurements for IM's unstressed underlying /i/ are given in (58).

(58)

SENĆOŦEN	**Underlying Form**	**Token /i/**	**F1**	**F2**
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	496Hz	1355Hz
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	413Hz	1355Hz
ŦI,ŦEŁ	/θi~θiɬ<ʔ>/	θiʔθəɬ	660Hz	1560Hz
ŦI,ŦEŁ	/θi~θiɬ<ʔ>/	θiʔθəɬ	537Hz	1601Hz
ŦI,ŦEŁ	/θi~θiɬ<ʔ>/	θiʔθəɬ	537Hz	1560Hz
MELMILEJ	/mil~miləč̓/	məlmiləč̓	414Hz	1593Hz
MELMILEJ	/mil~miləč̓/	məlmiləč̓	523Hz	1522Hz
SŁIŁEȾ	/s-ɬi~ɬit̓ᶿ/	sɬiɬət̓ᶿ	450Hz	1808Hz
SŁIŁEȾ	/s-ɬi~ɬit̓ᶿ/	sɬiɬət̓ᶿ	450Hz	1700Hz
		AVERAGE	**498Hz**	**1562Hz**

The F1 and F2 measurements for IM's unstressed underlying /e/ are given in (59).

(59)

SENĆOŦEN	**Underlying Form**	**Token /e/**	**F1**	**F2**
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1642Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1682Hz
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	455Hz	1682Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	455Hz	1192Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	455Hz	1192Hz
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	455Hz	1192Hz
ḴAḴEN.	/qe~qen̓/	qéqən̓	557Hz	1532Hz
ḴAḴEN.	/qe~qen̓/	qéqən̓	508Hz	1557Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	450Hz	1236Hz
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	486Hz	1236Hz
		AVERAGE	**473Hz**	**1414Hz**

The F1 and F2 measurements for RS's unstressed underlying /a/ are given in (60).

(60)

SENĆOŦEN	**Underlying Form**	**Token /a/**	**F1**	**F2**
STOTE,LU,	/s-ta~taʔlẆ/	statəʔləẇ	486Hz	1450Hz
STOTE,LU,	/s-ta~taʔlẆ/	statəʔləẇ	521Hz	1379Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	455Hz	905Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	496Hz	1028Hz
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	455Hz	1028Hz
PEPO,EL	/pa~paʔəl/	pəpáʔəl	521Hz	1129Hz
PEPO,EL	/pa~paʔəl/	pəpáʔəl	414Hz	1129Hz
		AVERAGE	**478Hz**	**1150Hz**

4.3.3.1.5 Stressed Underlying Vowels in the Non-reduplication Condition

The F1 and F2 measurements for IM's stressed underlying schwa are given in (61).

(61)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**F1**	**F2**
QEȾETSET	kʷətᶿ-ət-sat	kʷətᶿə́sət	476Hz	1367Hz
QEȾETSET	kʷətᶿ-ət-sat	kʷətᶿə́sət	463Hz	1254Hz
QEȾET	kʷətᶿ-ət	kʷə́tᶿət	471Hz	1292Hz
QEȾET	kʷətᶿ-ət	kʷə́tᶿət	474Hz	1286Hz
		Average	**471Hz**	**1300Hz**

The F1 and F2 measurements for IM's stressed underlying /i/ are given in (62).

(62)

SENĆOŦEN	**Underlying Form**	**Token /í/**	**F1**	**F2**
ŁIȾSEN	ɬitᶿ-sən	ɬítᶿsən	300Hz	2018Hz
ŁIȾSEN	ɬitᶿ-sən	ɬítᶿsən	346Hz	2065Hz
ṮIJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	384Hz	1972Hz
ṮIJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	393Hz	2065Hz
		Average	**356Hz**	**2030Hz**

The F1 and F2 measurements for IM's stressed underlying /e/ are given in (63).

(63)

SENĆOŦEN	Underlying Form	Token /é/	F1	F2
PÁŦET	péθ-ət	**pé**θət	485Hz	1693Hz
PÁŦET [157]	péθ-ət	**pé**θət	485Hz	1647Hz
		Average	**485Hz**	**1670Hz**

The F1 and F2 measurements for IM's stressed underlying /a/ are given in (64).

(64)

SENĆOŦEN	Underlying Form	Token /á/	F1	F2
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	555Hz	1205Hz
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	596Hz	1205Hz
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	578Hz	1322Hz
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	625Hz	1229Hz
		Average	**589Hz**	**1240Hz**

The F1 and F2 measurements for RS's stressed underlying schwa are given in (65).

(65)

SENĆOŦEN	Underlying Form	Token /ə/	F1	F2
QEȾETSET	kʷ̓ətᶿ-ət-sat	kʷ̓ətᶿ**ə́**sət	500Hz	1463Hz
QEȾETSET	kʷ̓ətᶿ-ət-sat	kʷ̓ətᶿ**ə́**sət	506Hz	1463Hz
QEȾET	kʷ̓ətᶿ-ət	kʷ̓**ə́**tᶿət	449Hz	1468Hz
QEȾET	kʷ̓ətᶿ-ət	kʷ̓**ə́**tᶿət	515Hz	1621Hz
		Average	**493Hz**	**1504Hz**

[157] There was only one token of this word recorded for IM.

The F1 and F2 measurements for RS's stressed underlying /i/ are given in (66).

(66)

SENĆOŦEN	Underlying Form	Token /i/	F1	F2
ȽIȾSEN	ɬitᶿ-sən	ɬítᶿsən	439Hz	2024Hz
ȽIȾSEN	ɬitᶿ-sən	ɬítᶿsən	346Hz	2158Hz
T̲IJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	300Hz	2158Hz
T̲IJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	346Hz	2111Hz
		Average	**358Hz**	**2113Hz**

The F1 and F2 measurements for RS's stressed underlying /e/ are given in (67).

(67)

SENĆOŦEN	Underlying Form	Token /e/	F1	F2
PÁŦET	péθ-ət	**pé**θət	485Hz	1972Hz
PÁŦET	péθ-ət	**pé**θət	439Hz	2018Hz
		Average	**462Hz**	**1995Hz**

The F1 and F2 measurements for RS's stressed underlying /a/ are given in (68).

(68)

SENĆOŦEN	Underlying Form	Token /i/	F1	F2
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	555Hz	1286Hz
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	596Hz	1367Hz
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	671Hz	1275Hz
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	578Hz	1122Hz
		Average	**600Hz**	**1263Hz**

4.3.3.1.6 Unstressed Underlying Vowels in the Non-reduplicative Condition

The F1 and F2 measurements for IM's unstressed underlying schwa are given in (69).

(69)

SENĆOŦEN	Underlying Form	Token /ə/	F1	F2
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷ**ə**t̓ᶿə́sət	434Hz	1268Hz
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷ**ə**t̓ᶿə́sət	400Hz	1181Hz
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷə́t̓ᶿ**ə**t	422Hz	1292Hz
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷə́t̓ᶿ**ə**t	418Hz	1202Hz
		Average	**419Hz**	**1236Hz**

The F1 and F2 measurements for IM's unstressed underlying /i/ are given in (70).

(70)

SENĆOŦEN	Underlying Form	Token /i/	F1	F2
ȽEX̱ÁL¸S	ɬit̓ᶿ-el̓s	ɬət̓ᶿél̓s	435Hz	1693Hz
ȽEX̱ÁL¸S	ɬit̓ᶿ-el̓s	ɬət̓ᶿél̓s	485Hz	1647Hz
T̸EJSENEṈ	ƛ̓ič̓=sən-əŋ	ƛ̓əč̓sə́nəŋ	532Hz	1461Hz
T̸EJSENEṈ	ƛ̓ič̓=sən-əŋ	ƛ̓əč̓sə́nəŋ	439Hz	1461Hz
		Average	**473Hz**	**1566Hz**

The F1 and F2 measurements for IM's unstressed underlying /e/ are given in (71).

(71)

SENĆOŦEN	Underlying Form	Token /e/	F1	F2
PEŦSENETEN	peθ-sə́n-tən	pəθsə́ntən	485Hz	1322Hz
PEŦSENETEN	peθ-sə́n-tən	pəθsə́ntən	439Hz	1322Hz
		Average	**462Hz**	**1322Hz**

The F1 and F2 measurements for IM's unstressed underlying /a/ are given in (72).

(72)

SENĆOŦEN	Underlying Form	Token /a/	F1	F2
HOÍNEW̱	háy-nax^w	háynəx^w	434Hz	1610Hz
HOÍNEW̱	háy-nax^w	háynəx^w	437Hz	1542Hz
W̱NE,ĆEṈES	x^w-nəY-əŋ-as	x^wnə́čəŋəs	532Hz	1681Hz
W̱NE,ĆEṈES	x^w-nəY-əŋ-as	x^wnə́čəŋəs	532Hz	1647Hz
		Average	**484Hz**	**1620Hz**

The F1 and F2 measurements for RS’s unstressed underlying schwa are given in (73).

(73)

SENĆOŦEN	**Underlying Form**	**Token /ə/**	**F1**	**F2**
QEȾETSET	k̓ʷətᶿ-ət-sat	k̓ʷ**ə**tᶿə́sət	281Hz	1725Hz
QEȾETSET	k̓ʷətᶿ-ət-sat	k̓ʷ**ə**tᶿə́sət	367Hz	1680Hz
QEȾET	k̓ʷətᶿ-ət	k̓ʷə́tᶿ**ə**t	529Hz	1529Hz
QEȾET	k̓ʷətᶿ-ət	k̓ʷə́tᶿ**ə**t	596Hz	1570Hz
		Average	**443Hz**	**1626Hz**

The F1 and F2 measurements for RS’s unstressed underlying /i/ are given in (74).

(74)

SENĆOŦEN	**Underlying Form**	**Token /i/**	**F1**	**F2**
ŁEȾÁL¸S	ɬit̓ᶿ-el̓s	ɬ**ə**t̓ᶿél̓s	456Hz	1726Hz
ŁEȾÁL¸S	ɬit̓ᶿ-el̓s	ɬ**ə**t̓ᶿél̓s	473Hz	1651Hz
T̲EJSENEN̲	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	485Hz	1647Hz
T̲EJSENEN̲	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	489Hz	1229Hz
		Average	**476Hz**	**1563Hz**

The F1 and F2 measurements for RS’s unstressed underlying /e/ are given in (75).

(75)

SENĆOŦEN	**Underlying Form**	**Token /e/**	**F1**	**F2**
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	485Hz	1275Hz
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	489Hz	1229Hz
		Average	**487Hz**	**1252Hz**

The F1 and F2 measurements for RS's unstressed underlying /a/ are given in (76).

(76)

SENĆOŦEN	**Underlying Form**	**Token /a/**	**F1**	**F2**
HOÍNEW̱	háy-naxʷ	háyn**ə**xʷ	453Hz	1591Hz
HOÍNEW̱	háy-naxʷ	háyn**ə**xʷ	455Hz	1590Hz
W̱NE,ĆEṈES	xʷ-nə́č-əŋ-as	xʷnə́čəŋ**ə**s	532Hz	1610Hz
W̱NE,ĆEṈES	xʷ-nə́č-əŋ-as	xʷnə́čəŋ**ə**s	532Hz	1647Hz
		Average	**493Hz**	**1610Hz**

In this section the acoustic results for the formant measurements of SENĆOŦEN vowels has been presented. The next section presents the acoustic results for the duration measurements of SENĆOŦEN vowels.

4.3.3.2 Duration

The duration measurements for stressed and unstressed vowels are presented in this section. Stressed epenthetic vowels are presented in 4.3.3.2.1. Unstressed epenthetic vowels are presented in 4.3.3.2.2. Stressed underlying vowels in the reduplication condition are presented in 4.3.3.2.3. Unstressed underlying vowels in the reduplication condition are presented in 4.3.3.2.4. Stressed underlying vowels in reduplicated words in the non-reduplication condition are presented in 4.3.3.2.5. Unstressed underlying vowels in the non-reduplication condition presented in 4.3.3.2.6.[158]

[158] The measured token is represented in boldface for each example in this section.

4.3.3.2.1 Stressed Epenthetic Vowels

The duration measurement for IM’s stressed epenthetic schwa are given in (77).

(77)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**Duration**
TEȻ	/tW/	tə́kʷ	115ms
TEȻ	tW/	tə́kʷ	112ms
XEL,	/x̣l̓/	x̣ə́l̓	118ms
XEL,	/x̣l̓/	x̣ə́l̓	118ms
XEL,	/x̣l̓/	x̣ə́l̓	118ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	110ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	114ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	117ms
		AVERAGE	**115ms**

The duration measurement for RS’s stressed epenthetic schwa are given in (78).

(78)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**Duration**
TEȻ	/tW/	tə́kʷ	127ms
TEȻ	/tW/	tə́kʷ	130ms
XEL,	/x̣l̓/	x̣ə́l̓	138ms
XEL,	/x̣l̓/	x̣ə́l̓	130ms
XEL,	/x̣l̓/	x̣ə́l̓	140ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	113ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	118ms
LEȾ	/lt̓ᶿ/	lə́t̓ᶿ	120ms
		AVERAGE	**127ms**

4.3.3.2.2 Unstressed Epenthetic Vowels

The duration measurement for IM’s unstressed epenthetic schwa are given in (79).

(79)

SENĆOŦEN	Underlying Form	Token /ə/	Duration
TEȻNOW̱	/tW-naxʷ/	təkʷ-náxʷ	68ms
TEȻNOW̱	/tW-naxʷ/	təkʷ-náxʷ	67ms
XELNOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	78ms
XELNOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	77ms
XELNOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	79ms
LEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	79ms
LEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	79ms
STḴÁYE,	/stəqeyəʔ/	stqéeyəʔ	80ms
STḴÁYE,	/stəqeyəʔ/	stqéeyəʔ	78ms
STḴÁYE,	/stq̓eyəʔ/	stqéeyəʔ	70ms
		AVERAGE	**76ms**

The duration measurement for RS's unstressed epenthetic schwa are given in (80).

(80)

SENĆOŦEN	Underlying Form	Token /ə/	Duration
TEȻNOW̱	/tW-naxʷ/	təkʷ-náxʷ	47ms
TEȻNOW̱	/tW-naxʷ/	təkʷ-náxʷ	71ms
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	70ms
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	68ms
XEL,NOW̱	/x̣l̓-naxʷ/	x̣əl̓-náxʷ	72ms
ŁEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	82ms
ŁEȾET	/l̓t̓ᶿət/	lət̓ᶿə́t	70ms
STḴÁYE,	/stəqeyəʔ/	stqéeyəʔ	82ms
STḴÁYE,	/stəqeyəʔ/	stqéeyəʔ	93ms
STḴÁYE,	/stəqeyəʔ/	stqéeyəʔ	82ms
		AVERAGE	**74ms**

4.3.3.2.3 Stressed Underlying Vowels in the Reduplication Condition

The duration measurements for IM's stressed underlying schwa are given in (81).

(81)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**Duration**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	139ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	135ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	141ms
SḴEḴEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷ**ə́**qʷəmx̣ʷ	114ms
SḴEḴEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷ**ə́**qʷəmx̣ʷ	129ms
		AVERAGE	**132ms**

The duration measurements for IM’s stressed underlying /i/ are given in (82).

(82)

SENĆOŦEN	**Underlying Form**	**Token /í/**	**Duration**
ȽIȽEQSEN	/ɬi~ɬik̓ʷsən/	ɬ**í**ɬək̓ʷsən	111ms
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷ**í**w̓ən̓təl̓	131ms
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷ**í**w̓ən̓təl̓	131ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θ**i**ʔθəɬ	147ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θ**í**ʔθəɬ	135ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θ**í**ʔθəɬ	141ms
MELMILEJ	/mil~miləč̓/	məlm**í**ləč̓	153ms
MELMILEJ	/mil~miləč̓/	məlm**í**ləč̓	164ms
SȽIȽEȾ	/s-ɬí~ɬət̓ᶿ/	sɬ**í**ɬət̓ᶿ	152ms
SȽIȽEȾ	/s-ɬí~ɬət̓ᶿ/	sɬ**í**ɬət̓ᶿ	134ms
		AVERAGE	**140ms**

The duration measurements for IM’s stressed underlying /e/ are given in (83).

(83)

SENĆOŦEN	**Underlying Form**	**Token /é/**	**Duration**
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷsəxʷ	127ms
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	158ms
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	123ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	147ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	206ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	171ms
ḴAḴEṈ,	/qe~qeṅ/	q**é**qəṅ	137ms
ḴAḴEṈ,	/qe~qeṅ/	q**é**qəṅ	161ms
SȻÁȻEL	/s-kʷe~kʷəl/	skʷ**é**kʷəl	177ms
SȻÁȻEL	/s-kʷe~kʷəl/	skʷ**é**kʷəl	135ms
		AVERAGE	**154ms**

The duration measurement for IM’s stressed underlying /a/ are given in (84).

(84)

SENĆOŦEN	**Underlying Form**	**Token /á/**	**Duration**
STOTE,LU,	/s-ta~taʔlẆ/	st**á**təʔləẇ	162ms
STOTE,LU,	/s-ta~taʔlẆ/	st**á**təʔləẇ	163ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	161ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	198ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	181ms
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	168ms
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	138ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	171ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	182ms
		AVERAGE	**169ms**

The duration measurements for RS’s stressed underlying schwa are given in (85).

(85)

SENĆOŦEN	**Underlying Form**	**Token /ə́/**	**Duration**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	131ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	125ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčn**ə́**čətəŋ	126ms
SḰEḰEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷ**ə́**qʷəmx̣ʷ	137ms
		AVERAGE	**130ms**

The duration measurements for RS’s stressed underlying /i/ are given in (86).

(86)

SENĆOŦEN	**Underlying Form**	**Token /í/**	**Duration**
ȻI,WEN,TEL,	/Wi~W̓in-təl/	kʷ**í**w̓ən̓təl̓	146ms
ȻI,WEN,TEL,	/Wi~W̓in-təl/	kʷ**í**w̓ən̓təl̓	140ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θ**i**ʔθəɬ	181ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θ**í**ʔθəɬ	164ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θ**í**ʔθəɬ	158ms
MELMILEJ	/mil~miləč̓/	məlm**í**ləč̓	147ms
MELMILEJ	/mil~miləč̓/	məlm**í**ləč̓	159ms
SȽIȽEȾ	/s-ɬi~ɬit̓ᶿ/	sɬ**í**ɬət̓ᶿ	150ms
SȽIȽEȾ	/s-ɬi~ɬit̓ᶿ/	sɬ**í**ɬət̓ᶿ	163ms
		AVERAGE	**156ms**

The duration measurements for RS's stressed underlying /e/ are given in (87).

(87)

SENĆOŦEN	**Underlying Form**	**Token /é/**	**Duration**
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷsəxʷ	153ms
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	208ms
SÁW̱SEW̱	/sexʷ~sexʷ/	s**é**xʷ-səxʷ	177ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	199ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	166ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəp**é**q̓əŋ	181ms
ḴAḴEN,	/qe~qeṅ/	q**é**qəṅ	130ms
ḴAḴEN,	/qe~qeṅ/	q**é**qəṅ	118ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷ**é**kʷəl	170ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷ**é**kʷəl	162ms
		AVERAGE	**166ms**

The duration measurements for RS's stressed underlying /a/ are given in (88).

(88)

SENĆOŦEN	**Underlying Form**	**Token /á/**	**Duration**
STOTE,LU,	/s-ta~taʔlẆ/	st**á**təʔləẇ	188ms
STOTE,LU,	/s-ta~taʔlẆ/	st**á**təʔləẇ	215ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	174ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	181ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷ**á**ƛ̓šən	183ms
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	203ms
PEPO,EL	/pa~paʔəl/	pəp**á**ʔəl	191ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	201ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷ**á**nət̓	202ms
		AVERAGE	**193ms**

4.3.3.2.4 Unstressed underlying vowels in the reduplication condition

The duration measurement for IM's unstressed underlying schwa are given in (89).

(89)

SENĆOŦEN	Underlying Form	Token /ə/	Duration
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	62ms
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	80ms
NEĆNEĆETEN̲	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	71ms
SḰEḰEMX̲	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	58ms
SḰEḰEMX̲	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	52ms
		AVERAGE	**65ms**

The duration measurement for IM's unstressed underlying /i/ are given in (90).

(90)

SENĆOŦEN	Underlying Form	Token /i/	Duration
ȽIȽEQSEN	/ɬi~ɬik̓ʷsən/	ɬíɬək̓ʷsən	65ms
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	90ms
ȻI,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	74ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θiʔθəɬ	78ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θiʔθəɬ	88ms
ŦI,ŦEȽ	/θi~θəɬ<ʔ>/	θiʔθəɬ	84ms
MELMILEJ	/mil~miləč̓/	məlmiləč̓	93ms
MELMILEJ	/mil~miləč̓/	məlmiləč̓	120ms
SȽIȽEṮ	/s-ɬi~ɬit̓ᶿ/	s-ɬiɬət̓ᶿ	89ms
SȽIȽEṮ	/s-ɬi~ɬit̓ᶿ/	s-ɬiɬət̓ᶿ	73ms
		AVERAGE	**85ms**

The duration measurement for IM's unstressed underlying /e/ are given in (91).

(91)

SENĆOŦEN	**Underlying Form**	**Token /e/**	**Duration**
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	72ms
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	99ms
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	74ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	82ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	75ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	84ms
ḴAḴEN,	/qe~qeń/	qéqəń	88ms
ḴAḴEN,	/qe~qeń/	qéqəń	78ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	102ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	110ms
		AVERAGE	**86ms**

The duration measurement for IM's unstressed underlying /a/ are given in (92).

(92)

SENĆOŦEN	**Underlying Form**	**Token /a/**	**Duration**
STOTE,LU,	/s-ta~taʔlW̓/	státəʔləw̓	96ms
STOTE,LU,	/s-ta~taʔlW̓/	státəʔləw̓	98ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	88ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	87ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷáƛ̓šən	91ms
PEPO,EL	/pa~paʔəl/	pəpáʔəl	72ms
PEPO,EL	/pa~paʔəl/	pəpáʔəl	74ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	86ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	88ms
		AVERAGE	**87ms**

The duration measurements for RS's unstressed underlying schwa are given in (93).

(93)

SENĆOŦEN	**Underlying Form**	**Token /ə/**	**Duration**
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	90ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	87ms
NEĆNEĆETEṈ	/nəY~nəY-ət-əŋ/	nəčnə́čətəŋ	81ms
SḰEḰEMX̱	/s-qʷə~qʷəmx̣ʷ/	sqʷə́qʷəmx̣ʷ	60ms
		AVERAGE	**80ms**

The duration measurement for RS's unstressed underlying /i/ are given in (94).

(94)

SENĆOŦEN	**Underlying Form**	**Token /i/**	**Duration**
C̸I,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	81ms
C̸I,WEN,TEL,	/Wi~Win<ʔ>-təl/	kʷiw̓ən̓təl̓	85ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θiʔθəɬ	95ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θiʔθəɬ	94ms
ŦI,ŦEȽ	/θi~θiɬ<ʔ>/	θiʔθəɬ	99ms
MELMILEJ	/mil~miləč̓/	məlmiləč̓	87ms
MELMILEJ	/mil~miləč̓/	məlmiləč̓	77ms
SȽIȽET̸	/s-ɬi~ɬit̓ᶿ/	s-ɬiɬət̓ᶿ	92ms
SȽIȽET̸	/s-ɬi~ɬit̓ᶿ/	s-ɬiɬət̓ᶿ	91ms
		AVERAGE	**89ms**

The duration measurement for RS's unstressed underlying /e/ are given in (95).

(95)

SENĆOŦEN	Underlying Form	Token /e/	Duration
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	84ms
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	92ms
SÁW̱SEW̱	/sexʷ~sexʷ/	séxʷsəxʷ	95ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	82ms
SPEPAKEṈ	/s-pe~peq̓əŋ/	spəpéq̓əŋ	74ms
SPEPAKEṈ	/s-pe-peq̓əŋ/	spəpéq̓əŋ	82ms
ḴAḴEN,	/qe~qen̓/	qéqən̓	87ms
ḴAḴEN,	/qe~qen̓/	qéqən̓	94ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	99ms
SȻÁȻEL	/s-kʷe~kʷel/	skʷékʷəl	109ms
		AVERAGE	**90ms**

The duration measurement for RS's unstressed underlying /a/ are given in (96).

(96)

SENĆOŦEN	Underlying Form	Token /a/	Duration
STOTE,LU,	/s-ta~taʔlW̓/	statəʔləw̓	85ms
STOTE,LU,	/s-ta~taʔlW̓/	statəʔləw̓	97ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	72ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	84ms
ȻEȻOṮŚEN	/kʷa~kʷaƛ̓šən/	kʷəkʷaƛ̓šən	89ms
PEPO,EL	/pa~páʔəl/	pəpáʔəl	86ms
PEPO,EL	/pa~páʔəl/	pəpáʔəl	80ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	95ms
QENQONED	/k̓ʷan~k̓ʷanət̓/	k̓ʷənk̓ʷánət̓	97ms
		AVERAGE	**87ms**

4.3.3.2.5 Stressed underlying vowels in the non-reduplication condition

The duration measurements for IM's stressed underlying schwa are given in (97).

(97)

SENĆOŦEN	Underlying Form	Token /ə/	Duration
QEȾETSET	kʷət̓ᶿ-ət-sat	kʷət̓ᶿə́sət	124ms
QEȾETSET	kʷət̓ᶿ-ət-sat	kʷət̓ᶿə́sət	124ms
QEȾET	kʷət̓ᶿ-ət	kʷə́t̓ᶿət	104ms
QEȾET	kʷət̓ᶿ-ət	kʷə́t̓ᶿət	104ms
		Average	**114ms**

The duration measurements for IM's stressed underlying /i/ are given in (98).

(98)

SENĆOŦEN	Underlying Form	Token /i/	Duration
ȽIȾSEN	ɬit̓ᶿ-sən	ɬít̓ᶿsən	118ms
ȽIȾSEN	ɬit̓ᶿ-sən	ɬít̓ᶿsən	91ms
T̲IJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	158ms
T̲IJET	ƛ̓ič̓-ət	ƛ̓íč̓ət	176ms
		Average	**136ms**

The duration measurements for IM's stressed underlying /e/ are given in (99).

(99)

SENĆOŦEN	Underlying Form	Token /e/	Duration
PÁŦET	péθ-ət	péθət	115ms
PÁŦET	péθ-ət	péθət	111ms
		Average	**113ms**

The duration measurements for IM's stressed underlying /a/ are given in (100).

(100)

SENĆOŦEN	Underlying Form	Token /a/	Duration
XEL,NOW̲	x̣l̓-naxʷ	x̣əl̓náxʷ	190ms
XEL,NOW̲	x̣l̓-naxʷ	x̣əl̓náxʷ	202ms
W̲I,W̲I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəyás	162ms
W̲I,W̲I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəyás	157ms
		Average	**178ms**

The duration measurements for RS's stressed underlying schwa are given in (101).

(101)

SENĆOŦEN	Underlying Form	Token /ə́/	Duration
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷət̓ᶿ**ə́**sət	115ms
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷət̓ᶿ**ə́**sət	128ms
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷ**ə́**t̓ᶿət	112ms
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷ**ə́**t̓ᶿət	112ms
		Average	**117ms**

The duration measurements for RS's stressed underlying /i/ are given in (102).

(102)

SENĆOŦEN	Underlying Form	Token /í/	Duration
ŁIȾSEN	ɬiʼtᶿ-sən	ɬ**í**ʼtᶿsən	121ms
ŁIȾSEN	ɬiʼtᶿ-sən	ɬ**í**ʼtᶿsən	115ms
T̲IJET	ƛ̓ič̓-ət	ƛ̓**í**č̓ət	141ms
T̲IJET	ƛ̓ič̓-ət	ƛ̓**í**č̓ət	158ms
		Average	**134ms**

The duration measurements for RS's stressed underlying /e/ are given in (103).

(103)

SENĆOŦEN	Underlying Form	Token /é/	Duration
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	121ms
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	108ms
		Average	**115ms**

The duration measurements for RS's stressed underlying /a/ are given in (104).

(104)

SENĆOŦEN	Underlying Form	Token /á/	Duration
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	156ms
XEL,NOW̱	x̣l̓-naxʷ	x̣əl̓n**á**xʷ	241ms
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	192ms
W̱I,W̱I,YOS	xʷəy~xʷəy-ás	xʷəyxʷəy**á**s	228ms
		Average	**204ms**

4.3.3.2.6 Unstressed underlying vowels in the non-reduplicative condition

The duration measurements for IM's underlying schwa are given in (105).

(105)

SENĆOŦEN	**Underlying Form**	**Token /ə/**	**Duration**
QEȾETSET	kʷətᶿ-ət-sat	kʷətᶿ**ə́**sət	73ms
QEȾETSET	kʷətᶿ-ət-sat	kʷətᶿ**ə́**sət	70ms
QEȾET	kʷətᶿ-ət	kʷ**ə́**tᶿət	73ms
QEȾET	kʷətᶿ-ət	kʷ**ə́**tᶿət	115ms
		Average	**83ms**

The duration measurements for IM's underlying /i/ are given in (106).

(106)

SENĆOŦEN	**Underlying Form**	**Token /i/**	**Duration**
ȽEȾÁL¸S	ɬitᶿ-els	**ɬətᶿ**éls	71ms
ȽEȾÁL¸S	ɬitᶿ-els	**ɬətᶿ**éls	70ms
ṮEJSENEṈ	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	74ms
ṮEJSENEṈ	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	66ms
		Average	**70ms**

The duration measurements for IM's unstressed underlying /e/ are given in (107).

(107)

SENĆOŦEN	**Underlying Form**	**Token /e/**	**Duration**
PÁŦET	péθ-ət	p**é**θət	52ms
PÁŦET	péθ-ət	p**é**θət	54ms
		Average	**53ms**

The duration measurements for IM's unstressed underlying /a/ are given in (108).

(108)

SENĆOŦEN	**Underlying Form**	**Token /a/**	**Duration**
HOÍNEW̱	háy-naxʷ	háyn**ə**xʷ	70ms
HOÍNEW̱	háy-naxʷ	háyn**ə**xʷ	79ms
W̱NE,ĆEṈES	xʷ-nəY-əŋ-as	xʷnə́čəŋ**ə**s	68ms
W̱NE,ĆEṈES	xʷ-nəY-əŋ-as	xʷnə́čəŋ**ə**s	82ms
		Average	**75ms**

The duration measurements for RS's unstressed underlying schwa are given in (109).

(109)

SENĆOŦEN	Underlying Form	Token /ə/	Duration
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷət̓ᶿ**ə́**sət	73ms
QEȾETSET	k̓ʷət̓ᶿ-ət-sat	k̓ʷət̓ᶿ**ə́**sət	76ms
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷ**ə́**t̓ᶿət	109ms
QEȾET	k̓ʷət̓ᶿ-ət	k̓ʷ**ə́**t̓ᶿət	99ms
		Average	**89ms**

The duration measurements for RS's unstressed underlying /i/ are given in (110).

(110)

SENĆOŦEN	Underlying Form	Token /i/	Duration
ȽEȾÁL¸S	ɬit̓ᶿ-el̓s	ɬ**ə**t̓ᶿél̓s	79ms
ȽEȾÁL¸S	ɬit̓ᶿ-el̓s	ɬ**ə**t̓ᶿél̓s	70ms
T̲EJSENEN̲	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	78ms
T̲EJSENEN̲	ƛ̓ič̓-sən-əŋ	ƛ̓**ə**č̓sə́nəŋ	86ms
		Average	**78ms**

The duration measurements for RS's unstressed underlying /e/ are given in (111).

(111)

SENĆOŦEN	Underlying Form	Token /e/	Duration
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	61ms
PEŦSENTEN	peθ-sə́n-tən	p**ə**θsə́ntən	68ms
		Average	**65ms**

The duration measurements for RS's unstressed underlying /a/ are given in (112).

(112)

SENĆOŦEN	Underlying Form	Token /a/	Duration
HOÍNEW̲	háy-naxʷ	háyn**ə**xʷ	93ms
HOÍNEW̲	háy-naxʷ	háyn**ə**xʷ	113ms
W̲NE,ĆEN̲ES	xʷ-nəY-əŋ-as	xʷnə́čəŋ**ə**s	95ms
W̲NE,ĆEN̲ES	xʷ-nəY-əŋ-as	xʷnə́čəŋ**ə**s	96ms
		Average	**99ms**

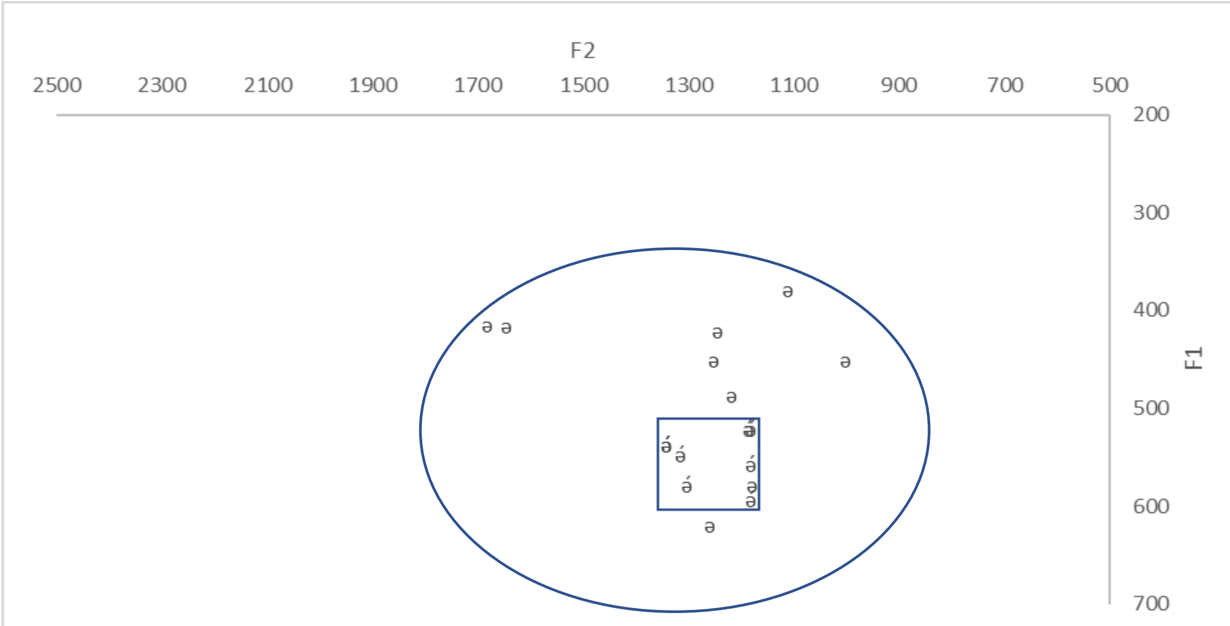
4.3.4 Discussion

In this section, I compare the acoustic results for stressed and unstressed vowels in SENĆOŦEN. Section 4.3.4.1 compares the formant measurements of stressed and unstressed vowels. Section 4.3.4.2 compares the duration measurements for stressed and unstressed vowels.

4.3.4.1 Formants

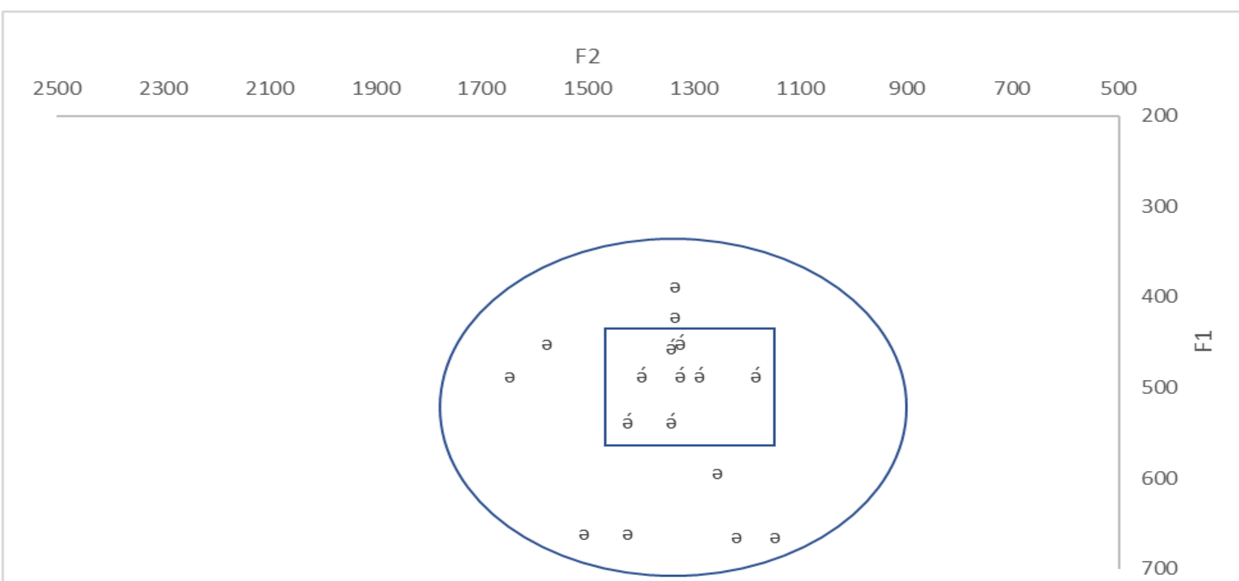
All vowels within a vowel type tend to have a more constrained distribution within the vowel space when stressed than they do when unstressed. In each of the scatter plots below stressed vowels are organized within boxes, and unstressed vowels are organized within circles. The scatter plot in (113) shows that IM's epenthetic schwa occupies a smaller more tightly constrained area within the vowel space when it is stressed versus when it is unstressed schwa.

(113) IM's Stressed and Unstressed Epenthetic Schwa F1 and F2



(114) shows a smaller more constrained vowel space for RS's stressed epenthetic schwa.

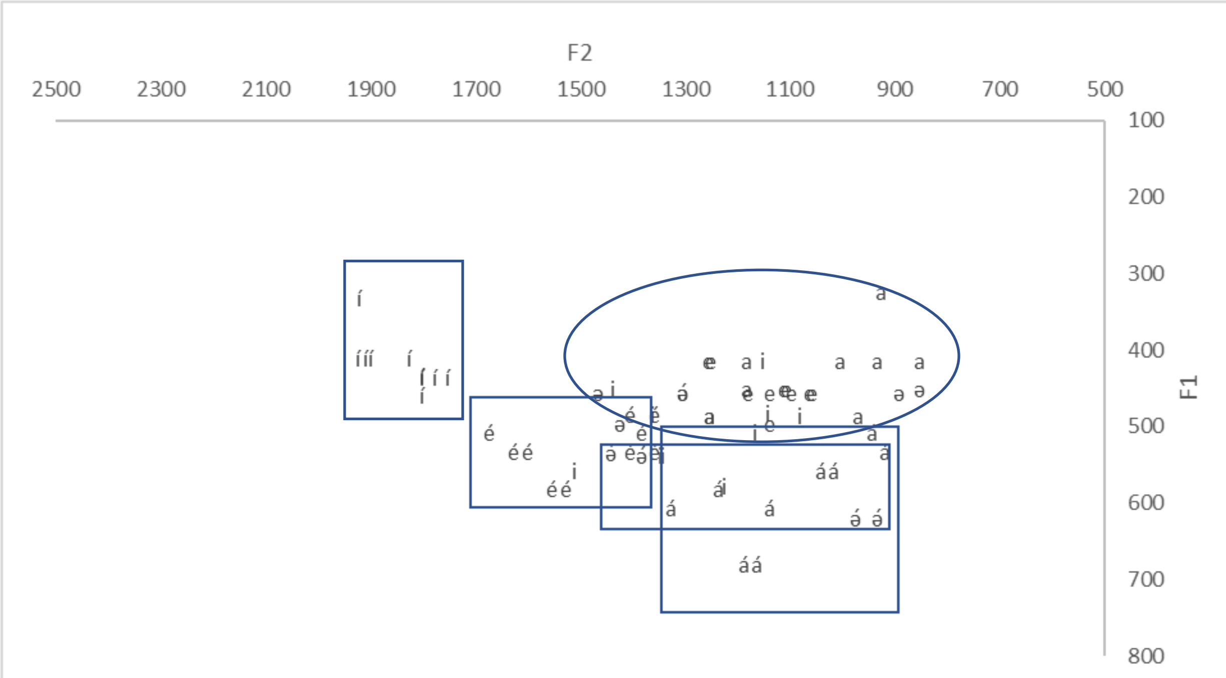
(114) RS's Stressed and Unstressed Epenthetic Schwa F1 and F2



For both speakers, the stressed epenthetic schwa occupies a tighter more constrained position within the vowel space than the unstressed epenthetic schwa.

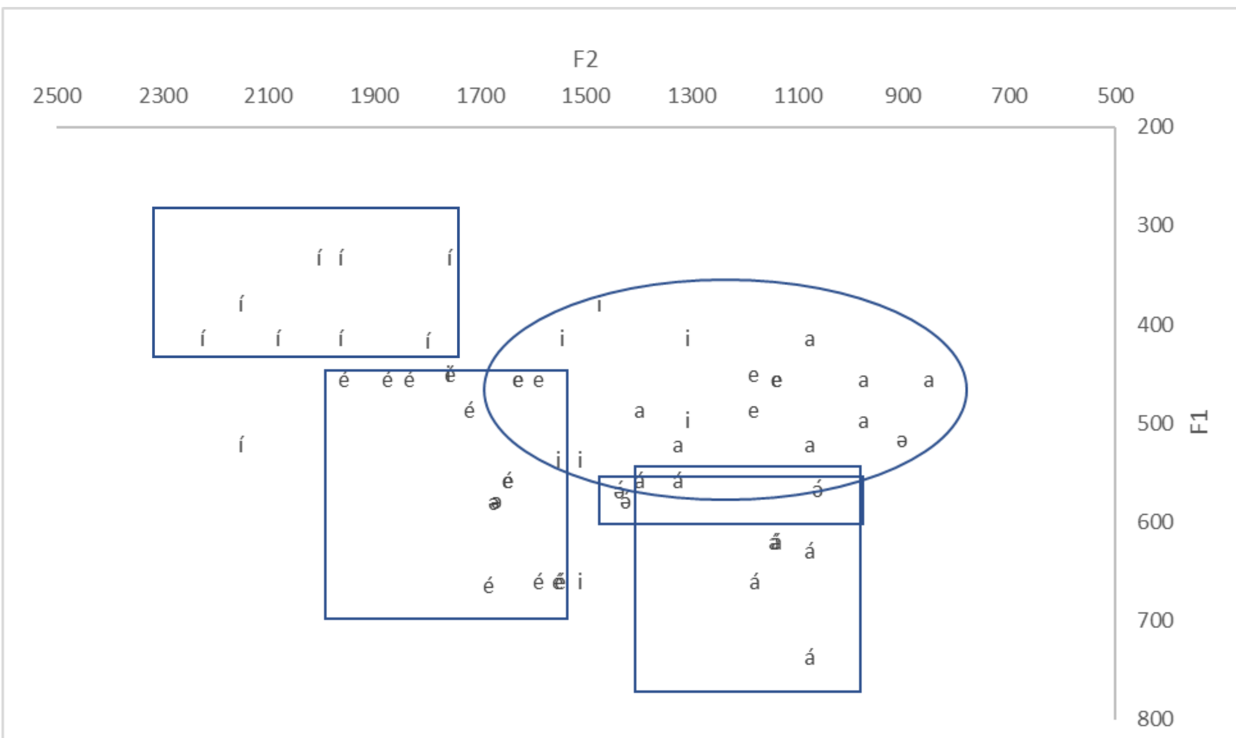
Underlying vowels in the reduplication condition for both IM and RS tend to show a more constrained distribution within the vowels space when they are stressed versus when they are unstressed. However, RS's shows a greater variation of the vowel space occupied within tokens of stressed vowels than IM does. The scatter plot in (115) shows the distribution of IM's vowel tokens, in the reduplication condition, within the vowel space. Underlying vowel /i/, when stressed, occupies a tighter position in the vowel space which is higher and more forward than the space it occupies when it is unstressed. Underlying vowel /e/, when stressed, occupies a tighter position in the vowel space which is lower and more forward than the space it occupies when unstressed. Underlying vowel /a/ occupies a tighter position in the vowel space which is lower and more forward than the space it occupies when it is unstressed. Underlying /ə/ has a smaller more constrained position when it is stressed than it is does when it is unstressed.

(115) IM's underlying vowels F1 and F2 in the reduplication condition.



The scatter plot in (116) shows the distribution of RS's vowel tokens, in the reduplication condition, within the vowel space. Underlying vowel /i/ when stressed occupies a tighter position within the vowel space than it does when it is unstressed. When stressed it is higher and more forward than when it is unstressed. Underlying vowel /e/ when stressed occupies a tighter position within the vowel space than it does when it is unstressed. Underlying vowel /e/ occupies a more varied space with respect to height when it's stressed than it does when unstressed. Underlying vowel /e/ is also more forward in the vowel space when stressed than it is when it is unstressed. Underlying vowel /a/ occupies a tighter position within the vowel space when it is stressed than it does when it is unstressed. Underlying /a/ is lower and more forward when it is stressed as compared to when it is unstressed. Underlying /ə/ occupies a slightly more constrained position within the vowel space when stressed than it does when it unstressed. With respect to height, /ə/ occupies a similar position in the vowel space when unstressed and stressed. With respect to backness, unstressed /ə/ can occur further forward or further back than stressed /ə/ depending on its consonantal context.

(116) RS's Underlying Vowels F1 and F2 in the reduplication condition.

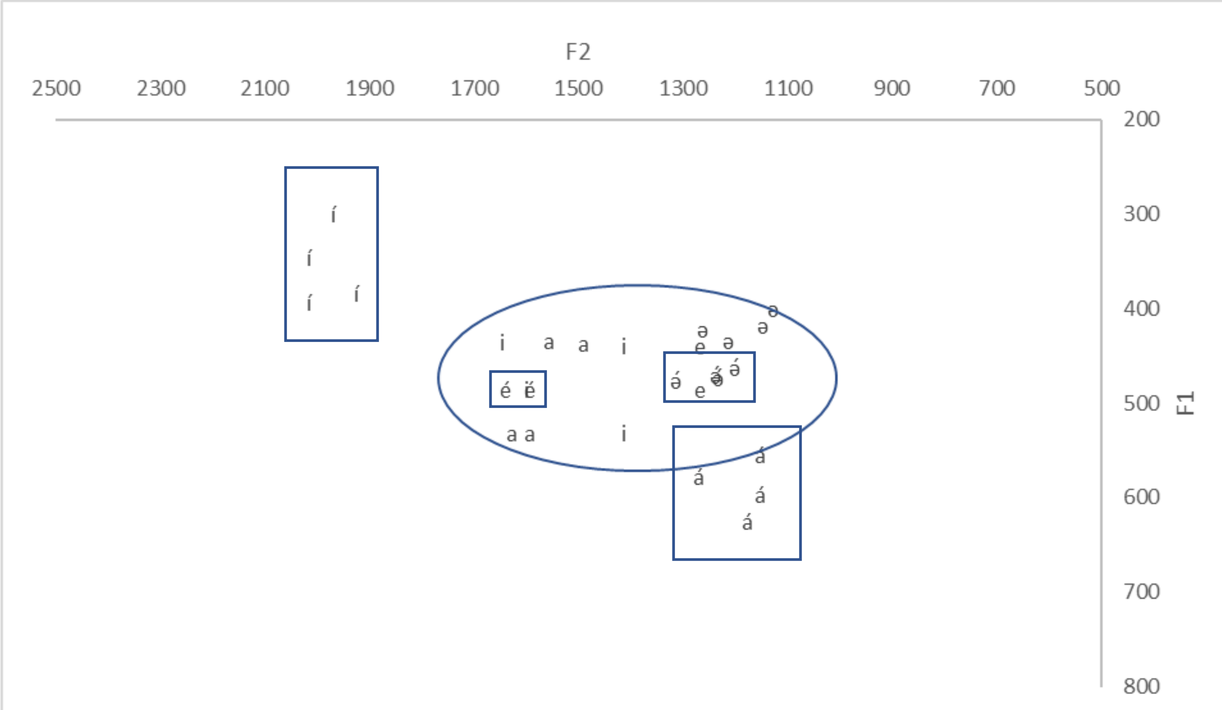


Underlying vowels of the same phonological quality in the reduplication condition for both IM and RS tend to show a more constrained distribution within the vowel space when they are stressed versus when they are unstressed. However, RS's stressed vowels have a wider distribution in the vowel space than IM's.

The scatter plot in (117) shows the distribution of IM's vowel tokens, in the non-reduplication condition, within the vowel space. Underlying vowel /i/ when stressed occupies a tighter position in the vowel space which is higher and more forward than the position it occupies when it is unstressed. Underlying vowel /e/ overlaps in height in stressed and unstressed position. When stressed, /e/ occupies a more forward position in the vowel space than it does when unstressed. Underlying vowel /a/ occupies a tighter position in the vowel space which is lower and further back than the space it occupies when it is unstressed. This is the opposite to the observation made for the reduplication condition.[159] Underlying /ə/ has a more constrained position and is further forward when it stressed than it is when it is unstressed.

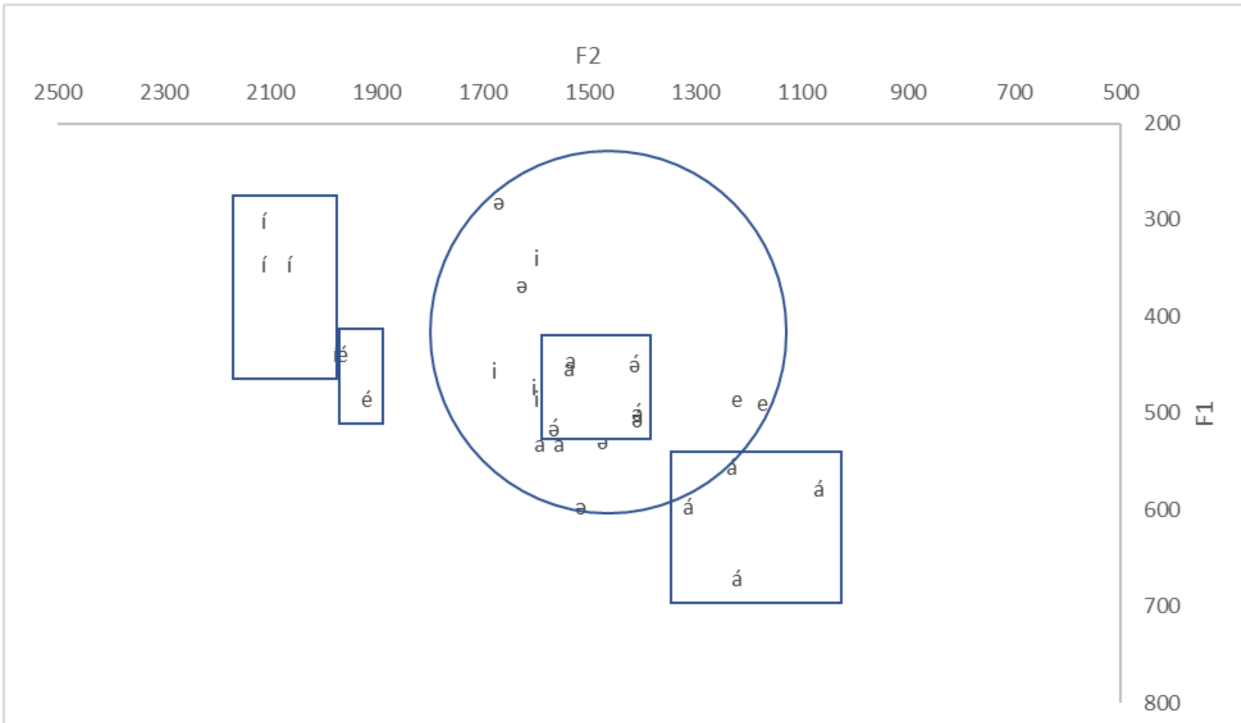
[159] The backing of the unstressed vowels in the reduplication condition is puzzling and interesting. A separate study looking specifically at the difference between vowels in the reduplication condition versus the non-reduplication condition is a worthwhile area of future research and one that would require more recorded examples to be included.

(117) IM’s underlying vowels F1 and F2 in the non-reduplication condition.



The scatter plot in (118) shows the distribution of RS’s vowel tokens, in the non-reduplication condition, within the vowel space. Underlying vowel /i/ when stressed occupies a tighter position in the vowel space which is higher and more forward than the position it occupies when it is unstressed. Underlying vowel /e/ when stressed is further forward than it is when it is unstressed. Stressed underlying vowel /e/ and unstressed underlying vowel /e/ overlap in height. Underlying vowel /a/ occupies a tighter position in the vowel space which is lower and further back than the space it occupies when it is unstressed. This is opposite to the observation made for the reduplication condition. Underlying /ə/ has a more constrained position within the vowel space when it stressed than it is when it is unstressed.

(118) RS's underlying vowels F1 and F2 in the non-reduplication condition.

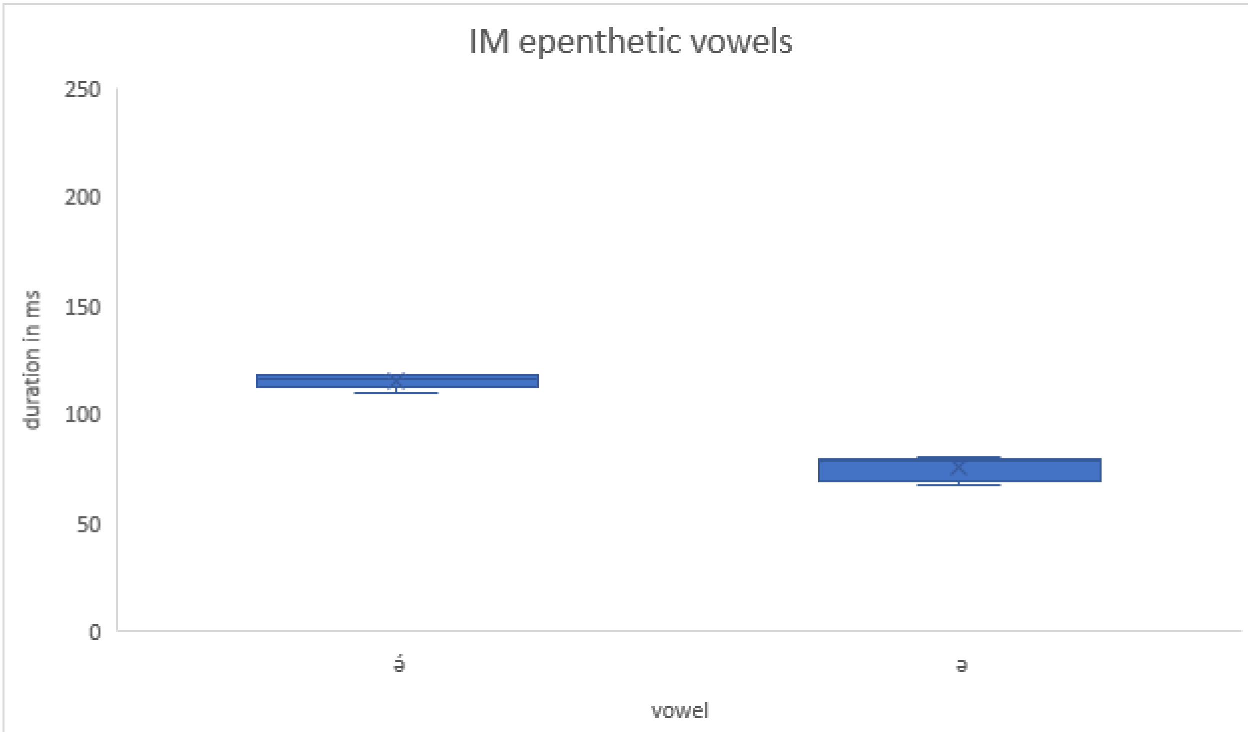


In the next section, the vowel duration measurements are compared and contrasted for both speakers in exactly the same environments.

4.3.3.2 Duration

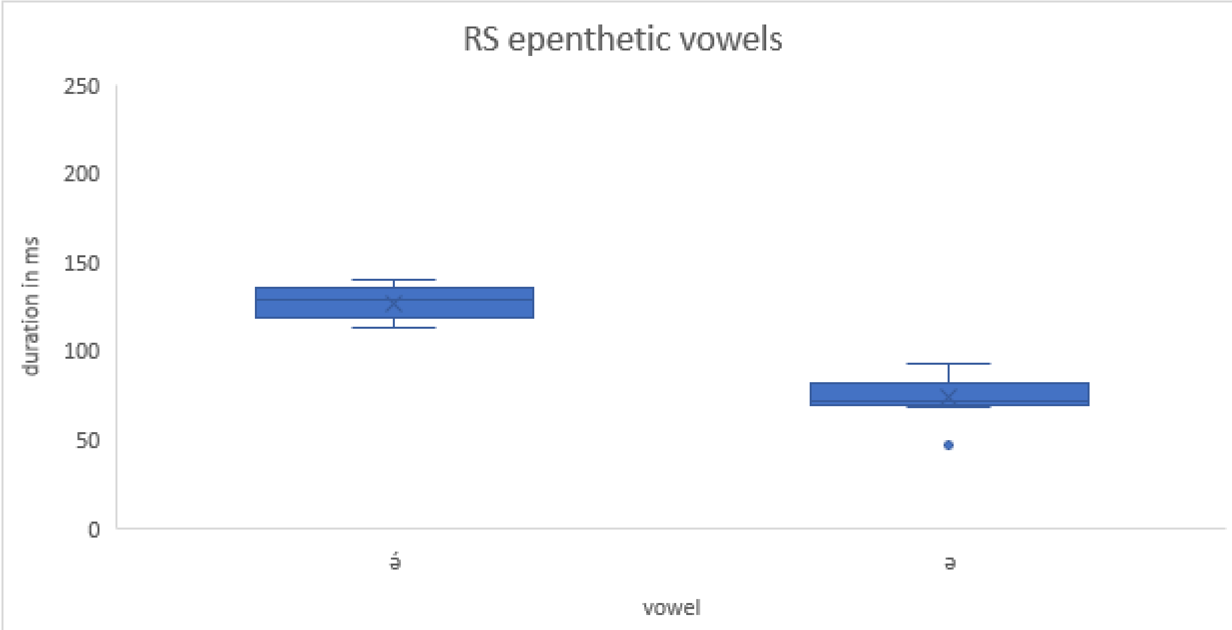
Overall stressed vowels are longer than unstressed vowels in all three conditions. Stressed epenthetic vowels are longer than unstressed epenthetic vowels. Stressed epenthetic vowels tend to be longer than 100ms, whereas unstressed epenthetic vowels tend to be shorter than 100ms, with some exceptions. The duration for epenthetic vowels across speakers is similar. The measurements for IM's epenthetic vowel duration are given in (119).

(119)



Although, the average length of epenthetic vowels is similar for both IM and RS, RS shows more variation for both stressed and unstressed epenthetic vowels than IM. RS's epenthetic vowels are giving in (120).

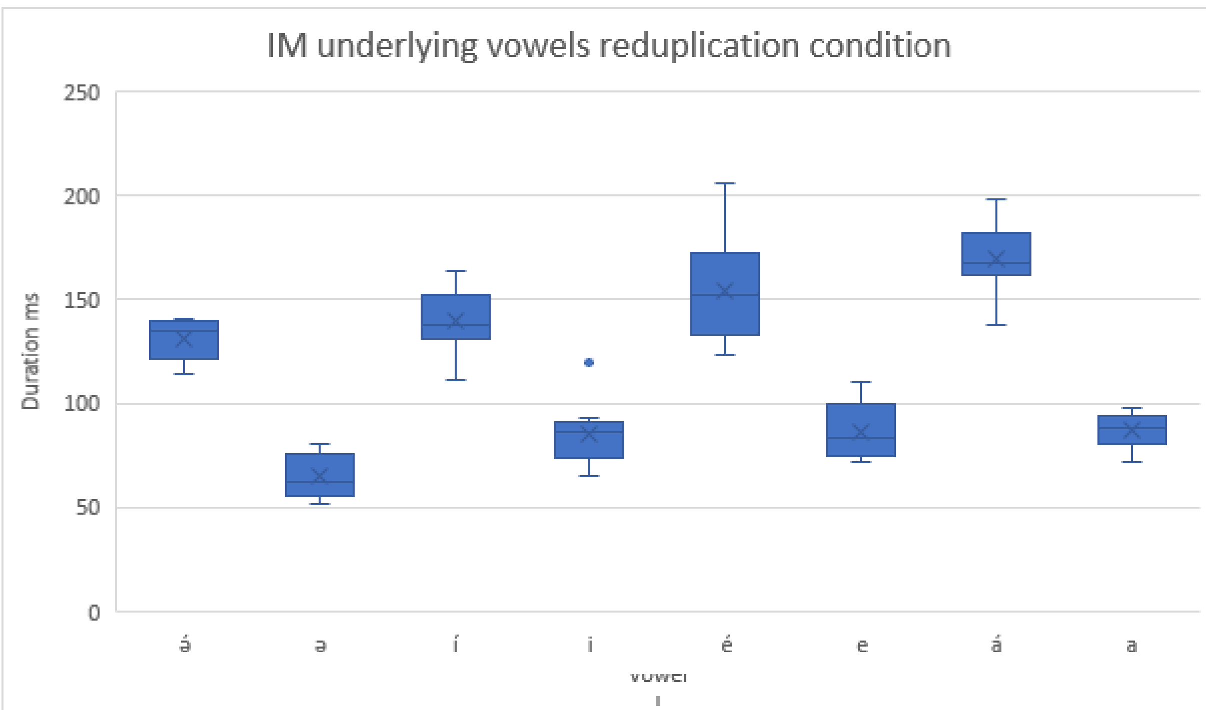
(120)



A simple t-test shows that, for both speakers, the stressed epenthetic vowels are significantly longer than the unstressed epenthetic vowels at $p<0.01$. There is no statistical difference in duration between the stressed underlying schwa versus stressed epenthetic schwa ($p=.83$). There is no statistical difference in duration between unstressed underlying schwa versus unstressed epenthetic schwa ($p=.39$).

In the reduplication condition, the stressed underlying vowels are longer than the unstressed underlying vowels. The stressed underlying vowels are longer than 100ms, whereas, the unstressed underlying vowels tend to be shorter than 100ms, with some exceptions. The biggest difference between the stressed versus unstressed vowels, for both speakers, in the reduplication condition, is between the underlying vowel /a/ in stressed versus unstressed position. Next, is the underlying vowel /i/ in stressed versus unstressed position. There is no overlap at all between the stressed and unstressed vowels. The duration for the reduplication cases, are similar again for both speakers. Both IM and RS have more variation for the stressed underlying vowel /e/ than the other vowels.[160] IM's underlying vowels in the reduplication condition are presented in (121).

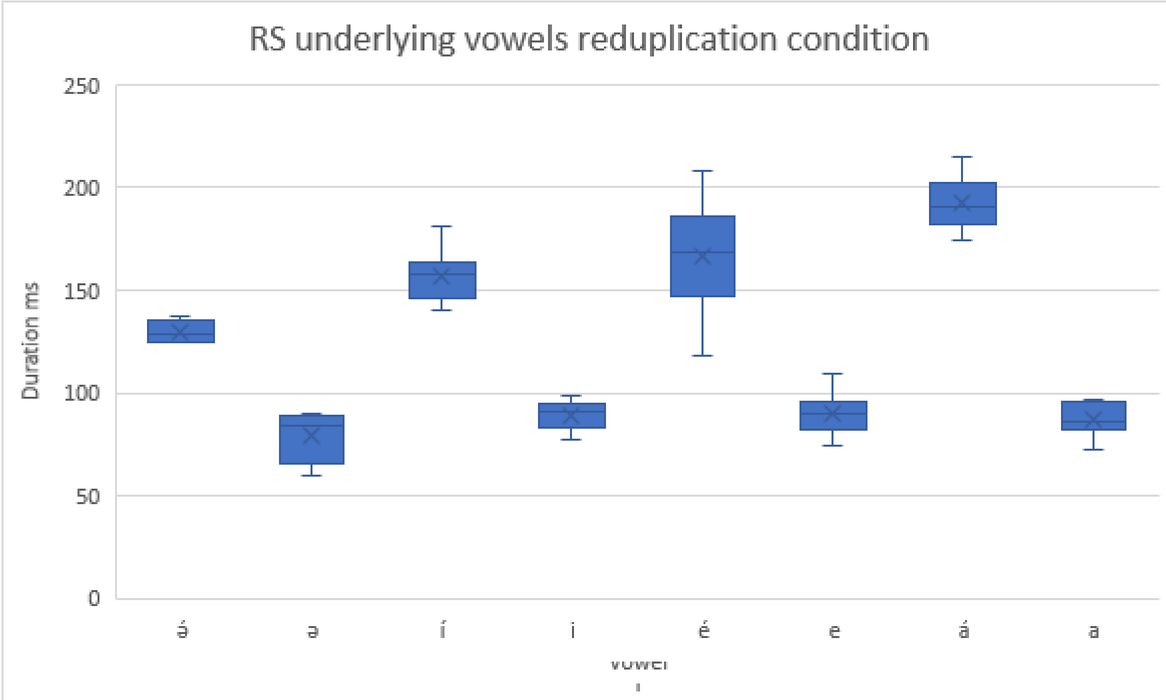
(121)



RS's underlying vowel /a/ is longer than IM's underlying vowel /a/ when it is stressed.

[160] The duration of unstressed vowels in the reduplication condition is longer than in the non-reduplication condition. This is an observation that is both puzzling and interesting. As mentioned in foot note 16, a separate study investigating the duration difference across conditions is a worthwhile area for future study.

(122)

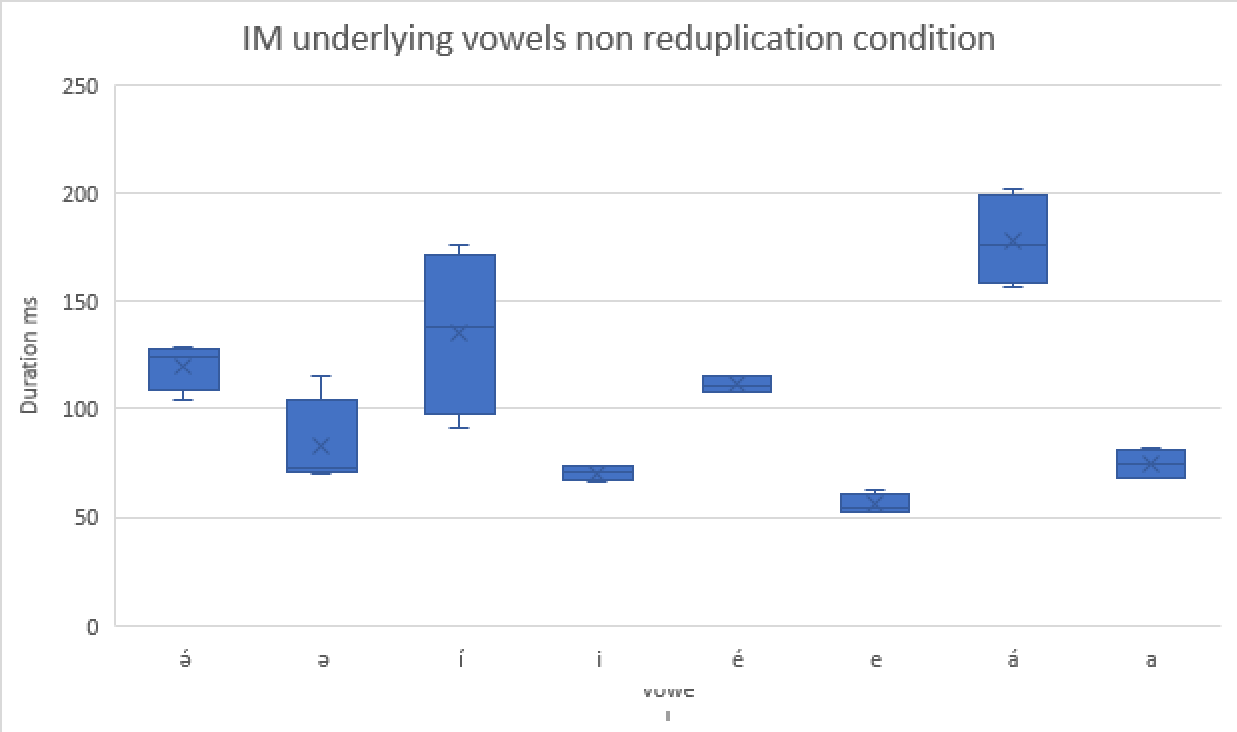


In the non-reduplication condition, stressed underlying vowels are longer than unstressed underlying vowels. In this condition, the stressed underlying vowels, tend to be longer than 100ms, whereas the unstressed underlying vowels tend to be shorter than 100ms, with some exceptions. The biggest difference between the stressed versus unstressed vowels is most noticeable with underlying vowel /a/, and then with underlying /e/. For IM there is no overlap between stressed versus unstressed underlying /i/, whereas there is some overlap between stressed versus unstressed underlying /i/ for RS. Underlying vowel /a/ is always distinctly longer with no overlap when stressed as compared to when unstressed in the non-reduplication condition. The measurements suggest that there is less variation for [e] in the non-reduplicated form for both speakers and somewhat less variation for unstressed [a].[161] A simple t-test shows that stressed vowels in the reduplication condition are significantly longer than unstressed vowels in the reduplication condition for both speakers at $p<0.01$.

The duration for IM's unstressed vowels has less variation in the non-reduplication condition than the reduplication condition except for unstressed underlying schwa. IM's underlying vowel /i/ has the most variation when stressed as compared to the other stressed vowels in the non-reduplication condition and as compared to the reduplication condition. IM's underlying vowels in the non-reduplication condition are presented in (121).

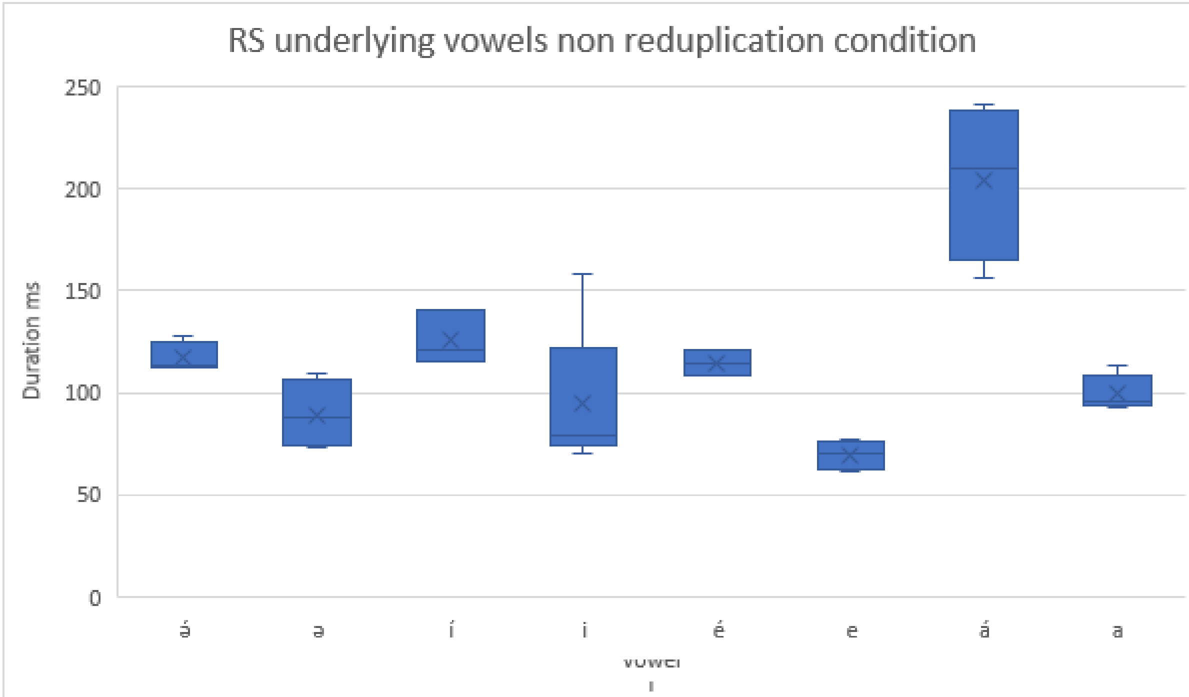
[161] The duration for /e/ in stressed and unstressed position is much shorter in the non-reduplication condition than it is in the reduplication condition. This is a puzzle that is interesting. As mentioned in footnote 16 a separate study investigating the acoustic differences between the reduplication condition and the non-reduplication is a worthwhile area of future study.

(123)



RS's underlying vowel /a/ exhibits greater variation as compared to his other underlying vowels in the non-reduplication condition and as compared to IM's underlying vowels in the non-reduplication condition. RS's underlying vowels in the non-reduplication condition are presented in (124).

(124)



A simple t-test shows that stressed vowels in the non-reduplication condition are significantly longer than unstressed vowels in the non-reduplication condition for both speakers at $p<0.01$.

4.4 Conclusion

In sum, stressed vowels for both speakers tend to have a more discrete vowel space, and to be longer than unstressed vowels in SENĆOŦEN. There is a more or less discrete vowel space for the vowels /i/ and /e/ which is consistent with the findings reported for ləkʷəŋiṅəŋ. Nolan (2017) reports that for stressed vowels that were measured at 50% into the vowel the pattern exhibited a pattern where by there was a more or less discrete vowel space for both /i/ and /e/. There is a certain degree of overlap for stressed /a/ and stressed /ə/ in the reduplication condition which is something also reported for Klallam (Montler 1998) and for ʔayʔaǰuθəm (Blake & Shahin 2008).

The unstressed vowels in the epenthetic condition, and the unstressed vowels in the non-reduplication condition tend to occupy a centralised position in the vowel space. This is a finding which differs from the other Central Salish languages reported on in this chapter. In general, for both conditions, the distribution for the unstressed vowel is more centralised and broader than when it is stressed. Contrastively, the unstressed vowels in the reduplication condition tend to occupy a position in the vowel space that is toward the upper back corner, reflecting the pronunciation of these vowels, which is higher and further back than the centralised vowels. This finding is more similar to the reports about the distribution in the vowel space of unstressed vowels in lək̓ʷəŋiŋ̓əŋ (Nolan 2017), Klallam (Montler 1998) and dxʷləšucid (Barthmaier 1998). Also, in the SENĆOŦEN reduplication condition, more so than in the non-reduplication condition, or the epenthetic condition, the unstressed full vowels, although tending toward the upper back corner of the vowel chart, tended to group together around their underlying qualities. This finding is similar to what Barthmaier

(1998) found in dxʷləšucid, and who interpreted the finding to mean that dxʷləšucid unstressed vowels are more centralized than their stressed counterparts giving them a schwa-like quality, while still maintaining a distinction within that vowels space.

Blake & Shahin (2008) on the other hand, found a different pattern for the unstressed full vowels in ʔayʔaǰuθəm. Contra to the SENĆOŦEN findings, unstressed vowels in ʔayʔaǰuθəm, though moving slightly further back and becoming more central, occupied a similar space to their stressed counterparts. Thus, unstressed vowels remained discrete in quality from each other. Blake & Shahin concluded that although ʔayʔaǰuθəm full vowels are shorter when reduced, their formant measurements indicate that vowel reduction does not involve a neutralization of quality contrast.

With respect to acoustic duration, the general finding was that stressed vowels are longer than unstressed vowels in SENĆOŦEN. This is a finding that is in line with what has been reported on for the other Central Salish languages. The clear difference in acoustic duration between stressed /a/ and stressed schwa in SENĆOŦEN, is similar to a duration difference between /a/ and schwa reported for Klallam. Different from the findings for SENĆOŦEN, where there is a significant difference between the acoustic duration of stressed vs. unstressed epenthetic schwa, Montler (1998) reports no such significance between the acoustic duration of stressed versus unstressed epenthetic schwa in Klallam. This finding is different to what has been reported in this chapter for SENĆOŦEN, where this is a statsitical difference in length between stressed epenthetic schwa versus unstressed epenthetic schwa. Montler (1998) reported that stressed schwa in Klallam is found to be "[…] as short as unstressed vowels and on average is around one half the length of other stressed vowels." Montler (1998: 2) and that "[…] there is no statistically significant difference in length among stressed schwa and the unstressed vowels." Montler (1998: 2)

The duration measurements for SENĆOŦEN schwas, in stressed and unstressed position, is similar to the duration measurements reported for ʔayʔaǰuθəm. Blake & Shahin (2008: 43) report an average duration of approximately 80ms for the non-excrescent schwas in ʔayʔaǰuθəm.

Overall, unstressed vowels in SENĆOŦEN have a broader and less constrained vowel space to that of unstressed vowels and are shorter. The broader and more varied pronunciation of unstressed vowels in SENĆOŦEN as compared to those of

ʔayʔaǰuθəm might be due to coarticulatory effects.[162] Coarticulatory effects are frequently attributed to the shorter duration of unstressed vowels. Silverman (2011) says that "[..] due to its short duration and its tendency to co-articulate, schwa is a likely outcome of vowel reduction in stressless domains [...]" (Silverman 2011). He also says that:

> Flemming [2007] proposes that English schwa's variability is rooted in its short duration. As a consequence of its short duration, vowel quality distinctions are reduced, perhaps to the point of being neutralized. Once neutralized, coarticulation may be engaged in with few limits, as there are no longer any lexical contrasts that might be maintained by inhibiting such co-articulatory tendencies (see especially Öhman 1966 and Manuel 1990, 1999 on the inhibitory role that lexical contrast may play in co-articulation). (Silverman 2011).

The reason that unstressed vowels are usually documented by linguists as schwa, and why speakers write the majority of stressed vowels as E might be a result

[162] There is an insufficient number of language examples analysed for this dissertation to make any conclusive claims about the coarticulatory effects of consonants on vowels in SENĆOŦEN. A study analysing the recorded SENĆOŦEN examples used for the SENĆOŦEN dictionary (Montler 2018) with Nolan's (2017) methodology for investigating the phonetic properties of vowel articulation in lək̓ʷəŋin̓əŋ would be a worthwhile expansion of the study presented in this chapter.

of perceptual factors. Research shows that the ability to determine the quality of a vowel is often more difficult as the vowel decreases in length (see for example, Ohala 1981, Labov 1994, and Silverman 2006). It could be that when a vowel is unstressed and is short in SENĆOŦEN the ability to determine its original quality is no longer always possible and it is thus characterized as a schwa.

There is too little data reported on in this chapter to make any conclusive claims whether or not the vowel quality contrast between full vowels is neutralized to schwa in unstressed position for SENĆOŦEN. The findings do however, look as though unstressed vowels in SENĆOŦEN pattern less like unstressed vowels in ʔayʔaǰuθəm, and more like unstressed vowels in dxʷləšucid. Coarticulation of unstressed vowels has been argued to occur after contrast loss, thus if the broader distribution of unstressed vowels in SENĆOŦEN turns out to be a consequence of coarticulation then that would be evidence that vowel contrast has been lost in this position. Silverman (2011) claims that stresslessness feeds shortening, shortening feeds contrast loss, and contrast loss feeds co-articulation. More research with a wider corpus of vowel tokens in stressed versus unstressed position is required before making such claims for SENĆOŦEN. This chapter of the dissertation contributes to the overall understanding of the phonetic characteristics of vowels in SENĆOŦEN by offering a preliminary investigation of the acoustic correlates of quality and length.

Chapter 5 Syllable Structure and the Distribution of Schwa

5.0 Goals of chapter 5

Chapter 5 argues that the distribution of SENĆOŦEN schwa can sometimes be predicted by the language's prosodic requirements on syllable structure. Section 5.1 lays out the theoretical assumptions about SENĆOŦEN syllables that are followed in this chapter. Section 5.2 proposes a basic syllable structure for SENĆOŦEN, informed by previous research on the sound patterns of SENĆOŦEN (Montler 1989, Leonard 2007). Section 5.3 presents evidence that complex onsets are rare and exist only in special circumstances, in SENĆOŦEN. Section 5.4 presents evidence that root-initial consonant sequences are not equivalent to complex syllable onsets. Section 5.5 presents the case that word-initial consonant sequences are not complex onsets and that obstruents to the left of the morphological root can be extrasyllabic.[163] Section 5.6 presents the argument that sequences of consonants word-internally do not constitute a complex syllable onset and that in some cases obstruents are permitted to be extrasyllabic in this environment. Section 5.7 is a conclusion.

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[163] Investigating the morphoprosodic domains of SENĆOŦEN is a large undertaking, and warrants independent investigation and thus is left for future research (see Czaykowska-Higgins 1996, 2002, 2004a, 2004b and Shaw 2008, 2009 for those types of investigations in other Salish languages).

5.1 Principles of SENĆOŦEN syllable structure

Section 5.1 introduces the theoretical assumptions regarding syllable structure adopted throughout Chapter 5. The ordering of sounds (consonants and vowels) within syllables in SENĆOŦEN is assumed to follow principles of the Sonority Scale. The Sonority Scale is a hierarchy representing the sonority of segmental classes, vowels, glides, liquids, nasals, and obstruents, where vowels are classified as having the highest sonority and obstruents the lowest (see Anderson & Ewen 1987, Blevins 1995, Clements 1990, Selkirk 1984, Harris 1983, Hooper 1976, Zec 1988, 1995 among others).[164] A visual representation of the Sonority Scale is given in (1).

(1) Sonority Scale (Clements 1990)

high sonority								***low sonority***
Vowels	>	Glides	>	Liquids	>	Nasals	>	Obstruents

The organization of SENĆOŦEN sound segments according to the sonority scale is given in (2).

(2) The SENĆOŦEN sonority scale

high sonority								***low sonority***
Vowels	**>**	**Glides**	**>**	**Liquids**	**>**	**Nasals**	**>**	**Obstruents**
[I,A/Á/A̸,O]		[Y,W]		[L]		[N,M]		[S,Ć,P]
[i,e,a]		[y,w]		[l]		[n,m]		[s,č,p]

[164] Parker (2002: 7) says that "[...] the physical force which is minimized at the margins of syllables and rises to the peak in the nucleus was eventually termed *sonority* (e.g., Pike 1943)."

The sound segments within syllables are assumed to be bound to specific organizational principles associated to the sonority relations between segments called the Sonority Sequencing Principe. The Sonority Sequencing Principle refers to an organization of segments within a syllable whereby the peak of the syllable is the segment with the highest sonority. Complex onsets, should they occur, are expected to rise in sonority toward that peak, and complex codas, should they occur, are expected to fall in sonority away from that peak. Morelli (1999: 7) provides the following description of the Sonority Sequencing Principle:

> All the other segments are organized around the nucleus in such a way that the more sonorous segments are closer to the peak and the less sonorous ones are further away from it. This generalization, known in the literature as the Sonority Sequencing Principle (henceforth SSP), was noticed early on by Sievers (1881), Jespersen (1904), Sausurre (1914) and Grammont (1933). More recently, researchers such as Hooper (1976), Kiparsky (1979), Steriade (1982), Selkirk (1982), Clements (1990) have attempted to provide formal characterizations of the SSP.

Parker (2002: 8) provides the following definition of the Sonority Sequencing Principle:

(a) In every syllable there is exactly one peak of sonority, contained in the nucleus.

(b) Syllable margins exhibit a unidirectional sonority slope, rising toward the nucleus.

Principles of Prosodic Theory (Itô 1986: 3-7, 1988, 2018), are assumed to apply to SENĆOŦEN. Ideally, the expectation is that all phonological units are parsed to higher prosodic structure. For example, segments are parsed to syllables, syllables to metrical feet, and metrical feet to phonological phrases. Any unlicenced phonemic material is deleted. These steps taken together are known as the *Strict Layer Hypothesis* (Beckman and Pierrehumbert 1986, Pierrehumbert and Beckman 1988; Nespor and Vogel 1986, Selkirk 1978/1981a, 1981b, 1986, and others). Originally, the *Strict Layer Hypothesis* was proposed as a universal and inviolable rule. Constituents were required to be strictly dominated at every level of the hierarchy. However, later it was acknowledged that this rule could be violable (Itô & Mester 1992, 2003,). In this dissertation, the *Strict Layer Hypothesis* as it applies to SENĆOŦEN is also assumed, in some special circumstances, to be violable. Two mechanisms of the *Strict Layer Hypothesis* are termed *Exhaustivity*, and *Extrasyllabicity*.

The principle of *Exhaustivity* requires that, ideally, no prosodic category is permitted to dominate a constituent that is more than one level below it (see Selkirk 1995). Vowels and resonant consonants, in SENĆOŦEN, never violate *Exhaustivity*. Obstruents, on the other hand, in some special circumstances, are permitted to violate *Exhaustivity*. What this means is that vowels and resonant consonants in SENĆOŦEN are always parsed at the syllabic level, whereas obstruents may not always be. Vowels are always parsed as the peak of a syllable. Glides are usually parsed as either an onset or a coda, and, in special circumstances, can be parsed as the peak of an unstressed syllable. Resonant non-glide consonants are always parsed as an onset or a coda. Obstruents, in general, are parsed as an onset or coda, though, as will be shown in sections 5.5 and 5.6, violations of *Exhaustivity* are permitted by obstruents in special circumstances.[165]

[165] Note that this is contra to Leonard (2007) where it was proposed that fricatives could be parsed as syllable peak.

The term *Extrasyllabicity* refers to the licencing of a consonant directly to the word level. A segment is extrasyllabic if it is not parsed at the syllable level.[166] In sections 5.5 and 5.6, SENĆOŦEN obstruents residing outside of the morphological root are argued, in some cases, to be extrasyllabic. Extrasyllabic obstruents, in SENĆOŦEN, are analysed in this dissertation as skipping both the syllable and the foot level of the prosodic hierarchy and as being parsed directly to the word level.

5.2 SENĆOŦEN basic syllable structure

This chapter builds upon the previous literature on syllable structure in Salish languages (see for instance, Bagemihl 1991, 1998 for Bella Coola, Bianco 1996 for Island Halkomelem, Bird & Czaykowska-Higgins 2016, Blake 1992, 1998, 2000b for ʔayʔaǰuθəm, Czaykowska-Higgins and Willett 1997 for *Nxaʔamxcín*, Dyck 2004 for Squamish, Roberts & Shaw 1994, Marinakis 2004 for Upriver Halkomelem, Matthewson 1996 for *St'at'imcets*, Shaw 2002, 2008 for Downriver Halkomelem, and Urbanczyk 2001 for dxʷləšucid). The claims in this chapter support and further elaborate on Montler's (1989)[167] generalization that syllables have simple onsets in

[166] Another term for an extrasyllabic segment is to say that it is an "appendix" to the syllable (see Vaux & Wolfe (2009)).

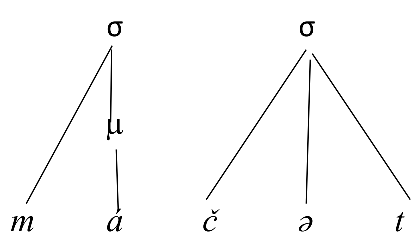
[167] See also Leonard (2007) who also proposes simple syllables in SENĆOŦEN arguing that consonants can serve as syllable nuclei and Bhatt (2007) who proposes parsing stray consonants as onset to empty nucleui following Bhatt and Nikiema (2006).

SENĆOŦEN. In this dissertation the proposal is that the two basic syllable shapes in SENĆOŦEN are open syllables and closed syllables. Open syllables consist of an onset (single consonant) and a nucleus. Closed syllables consist of an onset, a nucleus, and a coda (single consonant). Open syllables can occur in both stressed and unstressed position in a word. The example in (4), illustrates a word with an initial stressed open syllable.

(4) MOĆET
máčət
√mač-ət
√aim-TRNS
'to aim at someone or something' (Montler 2018: 350)

The prosodic structure for *máčət is* given in (5)

(5)

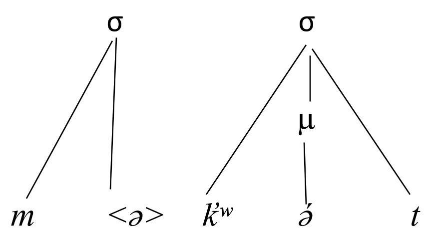


The example in (6), illustrates a word with an initial unstressed open syllable.

(6) MEQET
mək̓ʷə́t
√mk̓ʷ-ət
√all-TRNS
'to take all of something' (Montler 2018: 344)

The prosodic structure for *mək̓ʷə́t* is given in (7)[168]

(7)

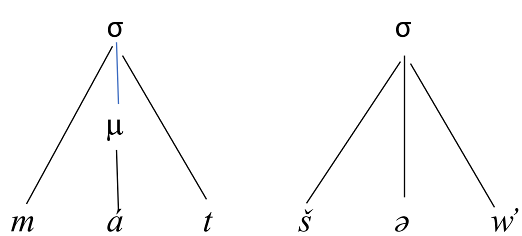


The example in (8), illustrates a word with an initial stressed closed syllable.

(8) MOTŚEU¸
mátšəw̓
√matšəw̓
√shrimp
'shrimp' (Montler 2018: 352)

The prosodic structure for *mátšəw̓* is given in (9)

(9)

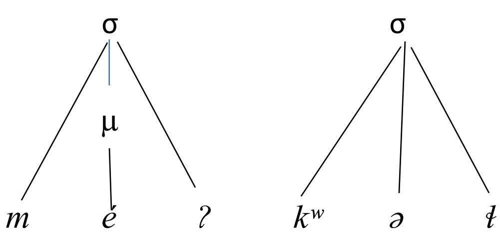


The example in (10), illustrates a word with a final unstressed closed syllable.

[168] An epenthetic schwa is inserted between the initial two consonants of the root. The predictability of the epenthetic schwa in this environment is discussed in section 5.4, where a case is made that root-initial consonant sequences in initial position within a morphoogical root do not constitute complex onsets. The symbols <...> in the prosodic structure diagrams are used to represent epenthetic material.

(10) MÁ¸ȻEŁ
mé$ʔ$kʷəɬ
√meʔkʷ-aɬ
√injure-DUR
‘to get hurt, injured, wounded, broken, out of order. (Montler 2018: 334)

The prosodic structure for *méʔkʷəɬ* is given in (11)

(11)


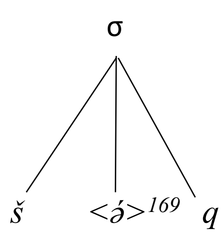
Every syllable in SENĆOŦEN requires a nucleus. When a syllable contains an underlying vowel, that underlying vowel serves as the nucleus of the syllable. If a root does not contain an underlying vowel, then an epenthetic schwa is inserted, as in (12)-(14).

(12) ŚEK̲
šə́q
√šq
√complete
‘to complete (a job), finish doing (something)’ (Montler 2018: 608)

(13) LEȾ
lə́ťᶿ
√lťᶿ
√fill
‘to be full’ (Montler 2018: 299-300)

(14) DEM̦
ť́əm̓
√ťm̓
√hit
‘to be bumped, hit (especially with a projectile) (Montler 2018: 121)

The epenthetic schwa is inserted to serve as a syllable nucleus. The prosodic structure for *šə́q* is given in (15).

(15)


[169] Epenthetic schwa does not have a mora. The vowel in this word is stressed because all words must be stressed in SENĆOŦEN. This is congruent with the notion of Culminativity which says that by default all words must have at least one primary stress (see Liberman & Prince 1977: 202).

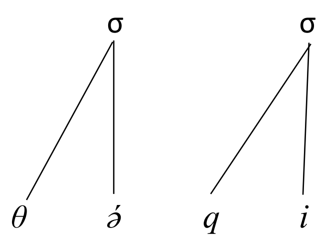
Glides are also permitted to serve as a syllable nucleus, as shown in (16)-(17).

(16) ŦEḴI,
θə́qiʔ
√θəqy̓[170]
√sockeye
'sockeye salmon' (Montler 2018: 697)

(17) SȽÁNI,
sɬéniʔ
s-√ɬenY̓
s-√lady
'woman, lady, female, feminine' (Montler 2018: 526)

The prosodic structure for *θə́qi* is given in (18).[171]

(18)



Every syllable in SENĆOŦEN requires an onset (see Montler 1989, Kioyta 2003, Leonard 2007). The *h/zero* alternation described by Montler (1986) supports this proposal. [h] occurs between the root and the lexical suffix when the suffix begins in a vowel.

[170] The analysis differs from the SENĆOŦEN dictionary see footnote 108.

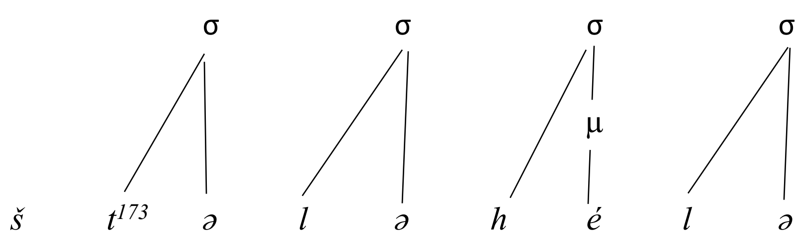
[171] When a glide serves as the peak of a syllable it is never stressed and is never reduced to a schwa vowel, as argued in Chapter 3.

(19) MIȽEHÁU¸TW̱
miłəhéẇtx^{w}
√miłə-eẇtx^{w}
√dance-house
'dance house, longhouse' (Montler 2018: 349)

(20) ŚTELEHÁLE¸
štələhélə
sx^{w}√telə-elə[172]
for-√money-container
'purse, wallet, anything to carry money in' (Montler 2018: 632)

The inserted [h] serves as the onset to a syllable headed by the initial vowel of the suffix. The syllable structure for the word *štələhélə* is shown in (21).

(21)



[172] The analysis for the root of this word differs from that given in the SENĆOŦEN dictionary, where the [h] is included as part of the root (see Montler 2018: 632)

[173] The prefix is parsed directly to the word level thus cannot serve as onset to the syllable. Evidence to support this claim is provided in section 5.4.

[h] does not occur when the preceding stem ends in a consonant.[174]

(22) SOX̱ELÁU¸TW̱
saẋʷəléẇtxʷ
√saẋʷəl-eẇtxʷ
√grass-house
'hay barn' (Montler 2918: 549-600)

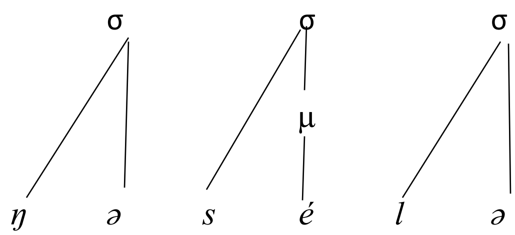
(23) ṈESÁLE
ŋəsélə
√ŋəs=elə
√four=person
'four people' (Montler 2018: 380)

The reason that h-epenthesis does not occur in the examples above is because the final consonant of the root is available to serve as the onset to a syllable headed by the initial vowel of the suffix. The syllable structure for the word *ŋəsélə* is shown in (24).

[174] Although [h] is always present between a vowel-final root ending and a vowel-initial suffix, and although [h] tends to be absent between a consonant-final root and a vowel-initial a suffix vowel, there are at least 5 examples in the Saanich word list (Montler 2015) where [h] is present between a root ending in a consonant and a suffix beginning with a vowel. This observation warrants its own independent investigation to determine whether a systematic explanation can be provided to account for these examples. In this dissertation the 5 examples are treated as exceptional forms. The examples are:

ÁPELSHIŁĆ	ʔepəlshíɬč	apple tree	(Montler 2015: #373.2)
MELYITELHOLȻET	məlyitəlhálkʷət	wedding gown	(Montler 2015: #765.1)
NESHI¸ḰEṈ	nəshíʔqʷəŋ	oil (hair)	(Montler 2015: #1481)
ŚÁTHÁLEḴEN	šethéləqən	sinker	(Montler 2015: #818)
STIḴIWHOŁ	stiqiwháɬ	ride a horse	(Montler 2015: #1550)

(24)



A schwa zero alternation in the control transitive suffix further supports the claim that onsets are required in SENĆOŦEN syllables.[175] CVC shaped roots in the non-actual aspect with control transitive morphology are presented in the examples in (25)-(27). In each case the control transitive morpheme surfaces with a schwa.[176]

(25) N̲ÁȻET
ŋék^{w}ət
√ŋek^{w}-ət
√chew-TRNS
'to chew something' (Montler 2018: 370)

(26) N̲IKET
ŋíq̓ət
√ŋiq̓-ət
√erect-TRNS
'to put up, erect a pole, fence post or mast into a hole'
(Montler 2018 381)

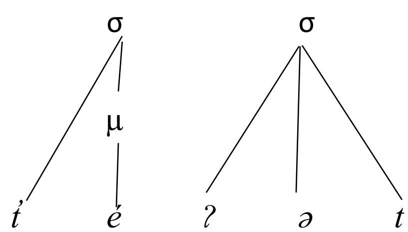
---

[175] Leonard (2007) argues, by examining the patterns of roots with lexical suffixes, that there is a *VV hiatus constraint active in SENĆOŦEN which prevents vowels that are heterosyllabic from occurring adjacent to each other. This hiatus constraint is motivated by the requirement that all syllables must have an onset.

[176] There are 4/123 CVC roots concatenated with the control transitive in the actual aspect which take the *-t* variant. I assume those are either exceptions or better analysed as transitive verbs in the actual aspect.

(27) DÁ¸ET
t̓éʔət
√t̓eʔ-ət
√try-TRNS
'to try, test, taste, attempt, something, check something out'
(Montler 2018: 115)

The syllable structure for the word *t̓éʔət* is given in (28).

(28)


CV shaped roots in the non-actual aspect with control transitive morphology are presented in (29)-(31). In each case the control transitive morpheme surfaces without a schwa.[177]

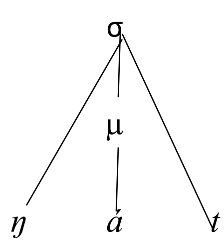
(29) NÁT
nét
√ne-ət
√name-TRNS
'to name someone or something, mention, say or call someone or something by name'
(Montler 2018: 355)

[177] I found only 3 roots of this shape in Montler (2018). The same pattern holds for CCV roots, of which I have found only 7.

(30) ṈOT
ŋát
√ŋa-ət
√eat-TRNS
‘to eat something’ (Montler 2018: 382)

(31) SÁT
sét
√se-ət
√order-TRNS
‘to order, tell, send, coax someone (to do something)’
(Montler 2018: 444)

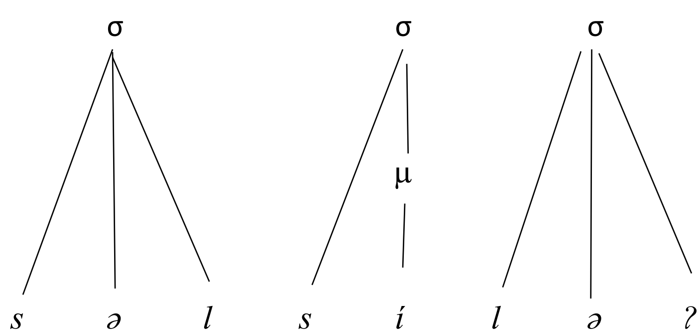
The *-t* variant of the control transitive morpheme occurs with CV shaped roots because every syllable in SENĆOŦEN must have a consonant onset. The deletion of the schwa from the suffix is motivated by the lack of a preceding consonant to serve as its onset. The final consonant of the suffix is parsed as the syllable coda. The syllable structure for the word *ŋát* is illustrated in (32).

(32)


A pattern involving the plural infix provides further evidence that syllables must have onsets in SENĆOŦEN. In (33)-(34) each root has a medial /l/ segment. The plural is formed by reduplicating the initial consonant of the root and placing it in front of the plural infix /əl/.

(33) SELSILE,
səlsíləʔ
<C_1əl>√siləʔ
<PL>grandparent
'a group of grandparents' (Montler 2018: 477)

Kiyota (2003) argues that the initial consonant is copied in cases where it is needed to serve as a syllable onset.[178] The syllable structure for *səlsíləʔ* is given in (34).

(34)


Complex onsets are only permitted in special circumstances and are discussed further in the next section.

5.3 Complex onsets: Exceptional patterns

In some special circumstances, obstruent-resonant sequences are parsed as complex onsets. These special complex onsets are restricted to specific environments. These two environments are as follows: 1) in borrowed words and 2) when both

[178] In chapter 6 a more detailed treatment of the plural infix is presented which argues that the location and shape of the infix, and its associated schwa, is predictable based on foot shape and alignment requirements.

segments in the consonant sequence are laterals. The examples presented in (36)-(38) illustrate that there is no schwa between root initial sequences of two consonants in borrowed words.[179]

(35) CLIPS
klíps
√klips
√grape
'grape' (Montler 2018: 20)

(36) PLEMS
plə́ms
√pləms
√plum
'plum' (Montler 2018: 405)

(37) TLEC
tlə́k
√tlək
√truck
'truck' (Montler 2018: 676)

The assumption in this dissertation is that loan words in SENĆOŦEN constitute their own loan word stratum. Loan word strata, in many languages, are known to have their own phonology which is often quite different from the phonological pattern observed for non-loan words in a language (see for example Itô & Mester 1992, 2003). The syllable structure for the SENĆOŦEN loan word *tlə́k* is illustrated in (38).

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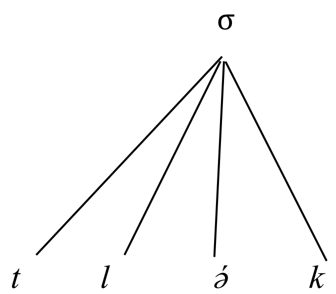
[179] The sonority rises toward the vowel in these words. These words are likely borrowings from English, perhaps also via Chinook Jargon. The [l] is used because SENĆOŦEN does not have the sound [r].

(38)



The examples presented in (39)-(40) illustrate the absence of schwa between two lateral consonants in root initial position.[180]

(39) ŁLOŁ
ɬláɬ
√ɬlaɬ
√travel_by_canoe
'to travel by canoe' (Montler 2018: 329)

(40) T̲LÁ¸EN̲
ƛ̓léʔəŋ
√ƛ̓léʔ-əŋ
√seek-MDL
'to seek, look for, search' (Montler 2018: 746)

The initial consonants presented in (40) and (41) are analysed as a complex onset. The syllable structure for the SENĆOŦEN word *ɬláɬ* given in (43).

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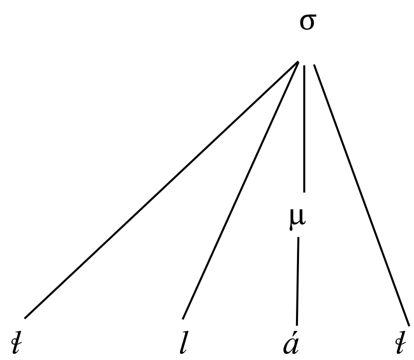
[180] Kiyota (2003) claims that there is an Obligatory Counter Principle (OCP) constraint on adjacent linked segments across syllables, which he says motivates a specific type of plural allomorphy in SENĆOŦEN. The OCP refers to a restriction on adjacent identical features (see Goldsmith 1976). It might be the case that this same OCP constraint triggers the parsing of the laterals as complex onset, rather than separate syllables. The word *T̲LÁ¸T ƛ̓léʔt ⟦√ƛ̓leʔ-ət √seek-CTRNS⟧ seek it*, despite having a complex onset, patterns as a disyllabic root and takes the *-t* variant of the control transitive suffix (see section 5.4). This might be due to a morphological identity effect which preserves the shape of roots so that it is in line with the shape of other roots from the same set, while simultanously avoiding an OCP constraint on adjacent laterals by parsing them together as a syllable onset.

(43)



Unlike the sequences above, obstruent-resonant sequences which occur at the left-edge of a root do have a schwa between them, as is discussed further in the next section.[181]

5.4 Root initial sequences are not complex onsets: voiced/voiceless schwa

This section presents phonological evidence to make the case that, in SENĆOŦEN, root-initial consonant sequences are not equivalent to complex syllable onsets, but rather are parsed into separate syllables. Section 5.4.1 presents evidence from laryngeal combinations. Section 5.4.2 presents evidence from manner of articulation combinations. Section 5.4.3 presents evidence from schwa distribution. Further support for the claim that root-initial consonant sequences as heterosyllabic is the argument, presented in section 5.4.4, that the schwa inserted between sequences of consonants involving glide~obstruent alternations is an epenthetic vowel not an excrescent vowel.

[181]The lat-lat sequences are an exception to this rule.

5.4.1 Root-initial sequences and laryngeal feature disagreement

The first piece of evidence in support of the proposal that root-initial consonant sequences are heterosyllabic comes from patterns of laryngeal combinations. Root-initial consonant clusters can share laryngeal features. The example in (43) has an initial plain stop followed by another plain stop.

(43) TḴAP[182]
tqép
√tqep
√fish_trap
'a type of large river fish trap for salmon' (Montler 2018: 675)

The example in (44) has an initial ejective affricate followed by an ejective stop.

(44) T̲ꝀET
ƛ̓q̓ʷə́t
√ƛ̓q̓ʷ-ət
√stuck-TRNS
'to stick, paste something on, stick something together'
(Montler 2018: 745)

Sequences of two consonants in root-initial position do sometimes disagree in their laryngeal feature specification. The example in (45) has an initial plain stop followed by an ejective stop.

[182]This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 675). The example in (43) uses the first meaning.

(45) PQEṈ
pk̓ʷə́ŋ
√pk̓ʷ-əŋ
√disperse-MDL
'to disperse, dust' (Montler 2018: 406)

The example in (46) has an initial ejective stop followed by a plain stop.

(46) KPEṈ
q̓pə́ŋ
√q̓p-əŋ
√gather-MDL
'to gather, collect' (Montler 2018: 237)

It is less typical crosslinguistically for complex onsets to exhibit a disagreement in their laryngeal feature specification (see Urbanczyk 2001, Greenberg 1978). Thus the observation that they do occur in SENĆOŦEN lends some support to the proposal that consonant sequence in this environment can be analysed as heterosyllabic.

5.4.2 Root-initial sequences and sonority markedness

The second piece of evidence that root-initial consonant sequences are heterosyllabic is that they often do not conform to the *Sonority Sequencing Principle*. According to the *Sonority Sequencing Principle* complex onsets which rise in sonority toward the vowel are considered the least marked type of complex onset. Complex onsets which fall in sonority toward from the vowel are considered the most marked type of complex onset. Sequences that fall in sonority toward the vowel are expected to be broken up by a vowel. Epenthesis is exactly what we see in /CC/ roots which fall in sonority. For example, when the root-initial consonant is a resonant, and the following consonant is an obstruent a schwa is transcribed between the two consonants, as illustrated in (47)-(49).

(47) MESET
məsə́t
√ms-ət
√fold_in-TRNS
'to fold together, fold in (as the top of a sack)' (Montler 2018: 346)

(48) N̲EXET
ŋəx̣ə́t
√ŋx̣-ət
√discipline-TRNS
'to bawl someone out, discipline someone, speak out strongly to someone' (Montler 2018: 381)

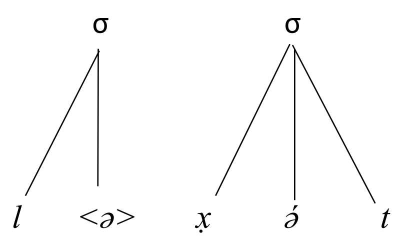
(49) LEXET[183]
ləx̣ə́t
√lx̣-ət
√spread_out-TRNS
'to spread something out, space them out' (Montler 2018: 300)

A schwa serves as the peak of a syllable taking the initial consonant of the root as its onset. A vowel that serves as syllable peak is visible to the phonology. Vowels that are

[183] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 300). The example in (49) uses the first meaning.

visible to the phonology are called epenthetic.[184] The syllable structure for *ləx̣ə́t* is given in (50).

(50)



However, counter to the rules of the *Sonority Sequencing Principle*, underlying /CC/ roots which rise in sonority are also documented with a schwa, as in (51)-(53).

(51) ȻEL¸ET[185]
kʷəl̓ə́t
√kʷl̓-ət
√spill-TRNS
'to pour something, deliberately spill something, tip something over (such as a canoe) to drain it, capsize it.' (Montler 2018: 84)

(52) DEM¸ET
t̓əm̓ə́t
√t̓m̓-ət
√hit-TRNS
'to hit something or someone, throw at someone' (Montler 2018: 122)

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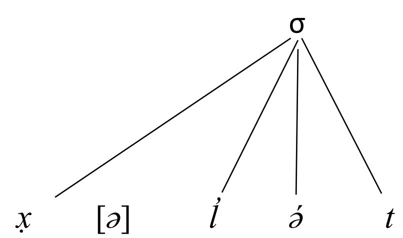
184 A schwa enclosed in angled brackets '<>' is epenthetic. A schwa enclosed in square brackets '[]' is excrescent. A schwa enclosed in slanted brackets '//' is underlying.

185 This word is documented in the SENĆOŦEN dictionary with three meanings (Montler 2018: 84). The example in (51) uses the first meaning.

(53) XEL¸ET
x̣əl̓ə́t
√x̣l̓-ət
√mark-TRNS
'to write something, record something' (Montler 2018: 806)

The sequence of an obstruent followed by a resonant obeys the sonority sequencing principle because they rise in sonority toward the vowel. If they obey the sonority sequencing principle an intervening vowel is not expected because the two segments could constitute a wellformed complex onset. However, sequences such as these in root-initial position in SENĆOŦEN are transcribed with a schwa between the initial and second consonant. It could be argued that this transcribed schwa represents excrescence and plays no role in the phonology of the word. If that were case, the sequence would constitute a complex onset as illustrated in (54).[186]

(54)

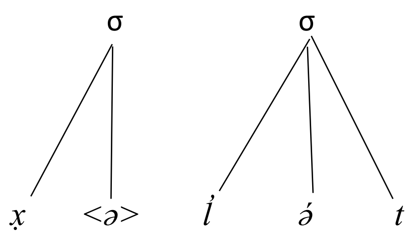


However, the sound alternation processes presented below in sections 5.4.3 and 5.4.4 support instead a proposal that the vowel is epenthetic rather than excrescent. These

[186] See Bird &Czaykowska-Higgins (2016) for a similar explanation for left-edge consonant sequences in Nxaʔamxcín.

processes show that this type of schwa is visible to the phonology. Because of those patterns, schwa in (55)-(57) is analysed, in this dissertation, as an epenthetic schwa, not an excrescent schwa. This schwa is visible to the phonology and serves as a peak to a syllable. The prosodic structure for *x̣əl̓ə́t* that is adopted in this dissertation is given in (55).

(55)



In cases where both initial consonants are obstruents there is no schwa documented.

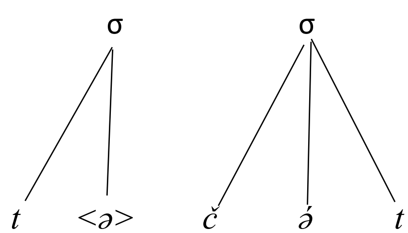
(56) TĆET
tčə́t
√tč-ət
√poke- TRNS
'to stab, poke, spear something or someone' (Montler 2018: 654)

(57) JBET
č̓p̓ə́t
√č̓p̓-ət
√squeeze-TRNS
'to squeeze something' (Montler 2018: 210)

(58) ŚḴET
šqə́t
√šq-ət
√finish-TRNS
'to finish, complete something (such as a job)' (Montler 2018: 623)

According to the Sonority Sequencing Principle complex onsets which plateau into the vowel are marked because they do not rise in sonority toward the vowel.[187] A sequence of two obstruents is an example of a sequence that plateaus into the vowel. In this dissertation, sequences of two obstruents in root-initial position are analysed as heterosyllabic.[188] The syllable structure for *tčə́t* is given in (59).[189]

(59)



5.4.3 Schwa insertion: Schwa~zero alternation

The third piece of evidence in support of the heterosyllabicity analysis for root-initial consonants of two is the schwa~zero alternation observed for the control

[187] Scholarship arguing for the inclusion of sonority plateaus as complex onsets include Fleischhacker (2001) and Krietman (2006) among others. Shaw (2002: 8, 2008: 7) analyses sequences of two obstruents at the left-edge of roots in Downriver Halkomelem as complex onsets. Dyck (2004: 66) analyses some cases of two obstruents sequences at the left-edge of roots in Squamish words as complex onsets. These complex onsets are few in number, and are treated as exceptional cases. Dyck considers these complex onsets to be highly marked.

[188] The patterns of sound alternation presented in sections 5.4.3 and 5.4.4 support this analysis.

[189] The epenthetic schwa is voiceless.

transitive suffix. The pattern of this schwa~zero alternation in the control transitive suffix appears to be correlated to whether the root is monosyllabic or disyllabic. When the root is monosyllabic the control transitive suffix *-ət* variant is used, as in (60)-(62).[190]

(61) ȻÁ¸ET
kʷéʔət
√kʷeʔ-ət
√release-TRNS
'to release, let go of, give up, drop something, leave something alone, ignore something." (Montler 2018 68-69)

(61) ȾÁPET[191]
t̓θépət
√t̓θep-ət
√busy-TRNS
'to make someone busy, occupied, distract someone'
(Montler 2018: 711)

(62) MIW̱ET
míxʷət
√mixʷ-ət
√shake-TRNS
'to rock, shake, move something back and forth' (Montler 2018: 350)

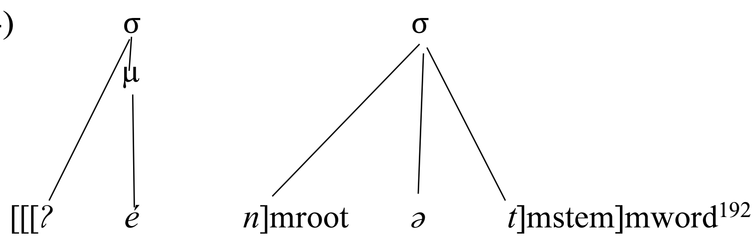
---

190 125/125 CVC roots in the SENĆOŦEN dictionary take *-ət* (Montler 2018).

191 This word is documented in the SENĆOŦEN dictionary with three meanings (Montler 2018: 711). The example in (61) uses the first meaning.

(63) ÁNET
ʔénət
√ʔen-ət
√comply-TRNS
'to comply, agree with someone, allow, obey someone (something), give in to someone' (Montler 2018: 10)

The morphological stem formed from the root and the control transitive is analysed as disyllabic. The syllable structure and the morphological structure for the word *ʔénət* is provided in (64).

(64)


The CəC shaped roots in (65)-(67) take the *-ət* allomorph.[193]

(65) QEȾ́ET
k̓ʷə́t̓ᶿət
√k̓ʷət̓ᶿ-ət
√crooked-TRNS
'to make something crooked' (Montler 2018: 429)

---

[192] Each diagram of the prosodic shape of a word includes also its morphological shape because the number of syllables that a root or a stem has is argued to trigger the schwa~zero alternation in the control transitive. The following abbreviations are used to label the internal morphological structure of the word: mroot = morphological root, mstem = morphological stem, m-word = morphological word

[193] There are 18/18 CəC roots in the SENĆOŦEN dictionary which take the *-ət* allomorph (Montler 2018).

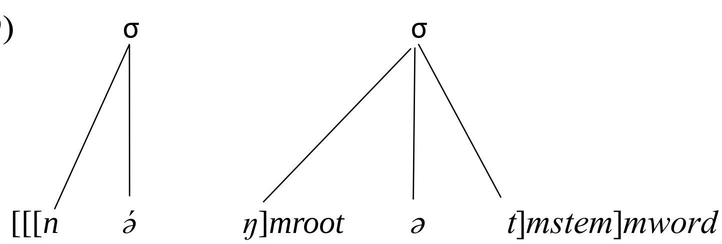
(66) ȾEN̲¸ET
t̓ᶿə́ŋ̓ət
√t̓ᶿəŋ̓-ət
√bite-TRNS
'to put something into mouth, bite something' (Montler 2018: 718)

(67) NEŁET
nə́ɬət
√nəɬ-ət
√fold-TRNS
'to fold it, bring it together' (Montler 2018: 361)

(68) NEN̲ET
nə́ŋət
√nəŋ-ət
√fold-TRNS
'to fold something' ‣ (Montler 2018: 362)

The root and the suffix combine to form a morphological stem which is analysed as disyllabic. The syllable structure for *nə́ŋət* is given in (69).

(69)



The examples in (70)-(72) illustrate CVCəC shaped roots which take the -*t* variant of the control transitive suffix.[194]

[194] 15/15 CVCəC shaped roots documented in the SENĆOŦEN dictionary take the -*t* allomorph Montler (2018).

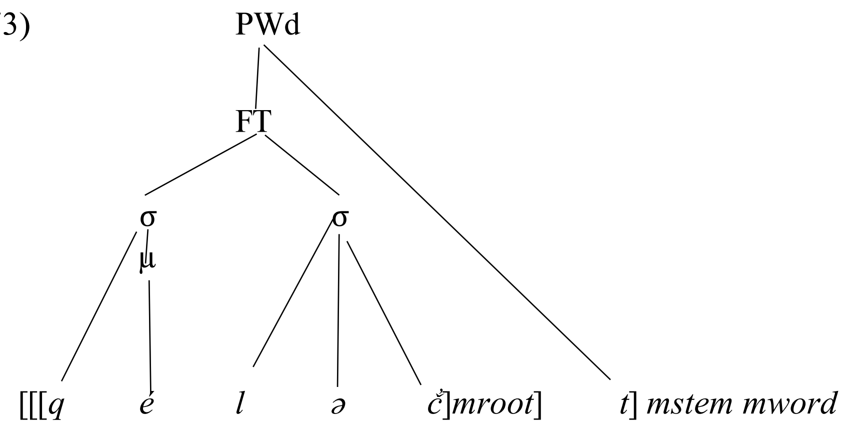
(70) HIWEST
híwəst
√hiwəs-ət
√teach-TRNS
'to teach someone' (Montler 2018: 183)

(71) ṮÁLEST
ƛ̓éləst
√ƛ̓eləs-ət
√back_up-TRNS
'to back something up' (Montler 2018: 733)

(72) ḴÁLEJT
qéləč̓t
√qeləč̓-ət
√spin-TRNS
'to spin wool' (Montler 2018: 254)

The morphological root *qéləč̓* contains two syllables and is thus analysed as a disyllabic morphological root. The control transitive surfaces without a schwa and is analysed as being extrasyllabic. The schwa deletes due to stray erasure and the consonant /t/ is parsed directly to the word level. The syllable structure for the word *qéləč̓t* is presented in (73).

(73)



The examples in (74)-(76) illustrate CəCəC shaped roots which take the *-t* variant of the control transitive suffix.[195]

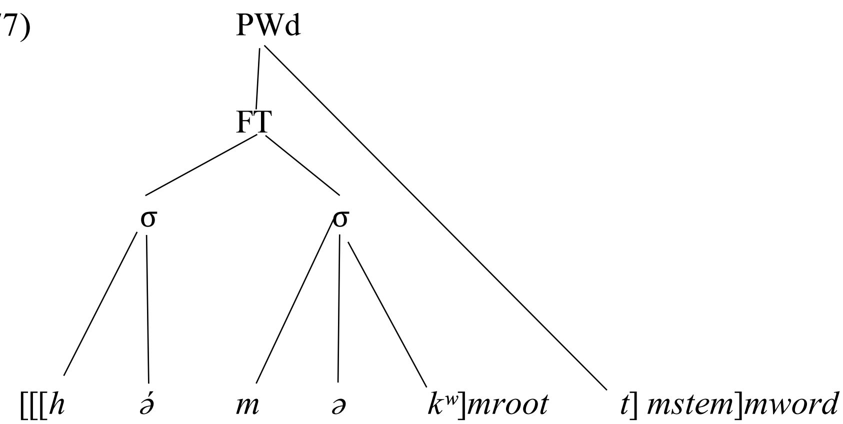
(74) JENEȾ́T
č̓ə́nət̓ᶿt
√č̓ənət̓ᶿ-ət
√tight-TRNS
'to crowd things together, squeeze in something' (Montler 2018: 215)

(75) SEȻEḴT
səkʷə́qt
√səWəq-ət[196]
√whisper-TRNS
'to whisper to someone.' (Montler 2018: 470)

[195] 32/35 CəCəC shaped roots in the SENĆOŦEN dictionary take the *-t* allomorph (Montler 2018).
[196] The rightward stress of this word suggests that it would be better analysed as a CCəC root. For this dissertation, I follow the analyses provided for this word in Montler (2018).

(76) HEMEȻT
hə́məkʷt
√həməkʷ-ət[197]
√pile_on-TRNS
'to pile up on someone or something' (Montler 2018: 178)

CəCəC shaped roots exhibit the same pattern as CVCəC shaped roots. Thus, the same analysis is assumed where the schwa in the control transitive suffix is deleted because it is not parsed as a syllable head. The consonant of the suffix is extrasyllabic and is attached directly to the word level. The syllable structure and the morphological structure for the word *hə́məkʷt* is given in (77).

(77)


The observation, thus far, is that the *-ət* variant of the control transitive suffix occurs with monosyllabic roots and that the *-t* variant of the control transitive suffix occurs with disyllabic roots. CCVC roots, despite having only one vowel, pattern with

[197] Montler (2018: 178) analyses the suffix as /-*t*/ in this word. Throughout this dissertation the suffix is analysed as /-*ət*/.

the disyllabic roots. CCVC roots take the *-t* variant of the control transitive suffix, as illustrated in (78)-(80). [198]

(78) TḴÁPT
tqépt
√tqep-ət[199]
√fish_trap-TRNS
'to trap fish' (Montler 2018: 674)

(79) TSOST[200]
tsást
√tsas-ət[201]
√poor-TRNS
'to have pity on someone' (Montler 2018: 681)

(80) ṮLÁ¸T
ƛ̓lé?t[202]
√ƛ̓le?-ət
√seek-TRNS
'to seek, search for, look for something or someone'
(Montler 2018: 747)

The possible reason why these roots take the *-t* variant of the control transitive suffix, rather than the *-ət* variant is because the roots themselves are disyllabic. As

[198] 5/6 CCVC roots documented in the SENĆOŦEN dictionary take the *-t* variant of the control transitive morpheme (Montler 2018).

[199] The analysis differs from that given in the SENĆOŦEN dictionary (Montler 2018: 674). This dissertation argues that the control transitive morpheme has an underlying schwa.

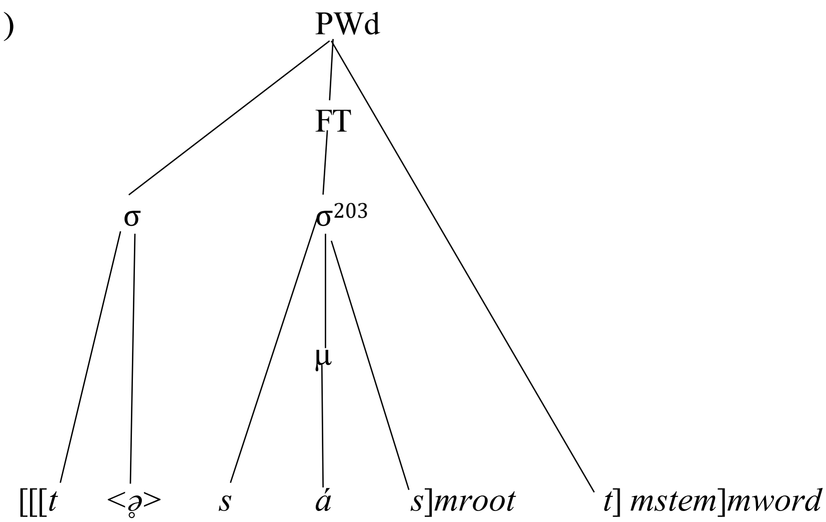
[200] This word is documented with three meanings in the SENĆOŦEN dictionary (Montler 2018: 680). The example in (79) uses the third meaning.

[201] The analysis differs from that given in the SENĆOŦEN dictionary (Montler 2018: 681).

[202] This form patterns as though it is monosyllabic in the sense that no schwa is inserted between the initial consonants and as though it has a complex onset possibly due to the avoidance of an OCP constraint lat-V-lat. This form also patterns as though it is disyllabic in the sense that it takes the *-t* variant of the control transitive. This type of example is treated as an exception.

argued above in this chapter, an epenthetic schwa is inserted after the initial consonant because complex onsets are not allowed in SENĆOŦEN (see section 5.4.1). This schwa is voiceless between obstruents and serves as a syllable peak. The schwa is analysed as an epenthetic vowel. The proposal here is that the presence of this epenthetic schwa is triggering the schwa~zero alternation in the suffix. The syllable structure for *tsást* is given in (81).

(81)



Examples (82)-(83) illustrate CCəC roots take *-t.*[204]

(82) T̲PEXT
ƛ̓pə́x̣t
√ƛ̓pəx̣-ət[205]
√scatter-TRNS
‘to scatter something’ (Montler 2018: 749)

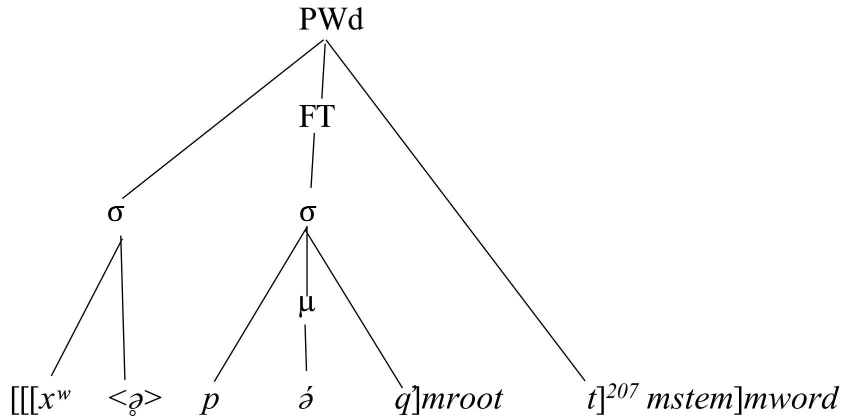
[203] This syllable is equal to a degenerate foot.
[204] 5/6 CCəC roots in the SENĆOŦEN dictionary take *-t* (Montler 2018).
[205] The analysis differs from that given in the SENĆOŦEN dictionary (Montler 2018: 749).

(83) W̱PEKT
xʷpə́q̓t
√xʷpəq̓-ət[206]
√bang-TRNS
'to bang something, make a banging noise with something'
(Montler 2018: 784)

Again, the hypothesis is that the root is disyllabic with the initial consonant parsed as the onset to a voiceless epenthetic schwa. The control transitive suffix is sensitive to the phonological presence of this epenthetic schwa and treats the root as disyllabic triggering the deletion of the schwa from the control transitive. The syllable structure for *xʷpə́q̓t* is given in (84).

[206] The analysis differs from that given in the SENĆOŦEN dictionary (Montler 2018: 783).

(84)



In the next section, evidence from glide, obstruent, and vowel alternations is presented to support the claim that the vowel occurring between root-initial consonant sequences of two are epenthetic not excrescent.

5.4.4 Excrescent vs epenthetic schwa: Glide, obstruent, and vowel alternations

The fourth piece of evidence in support of the proposal that the initial consonants in a root-initial consonant sequence do not constitute a complex onset comes from an alternation process involving glides, vowels, and obstruents. The proposal is that there is a set of consonants underspecified for manner of articulation. The surface manner of articulation for the set of abstract consonants /Y, /Y̓/, /W/, and /W̓/ is dependent on syllable position. Although, not synchronically systematic, the alternation observed is one where an obstruent surfaces in syllable onset position, a

[207]One question that arises from forms such as these is why the schwa deletes when together the root and the suffix could make a trochee that is aligned with the right-edge of the word. A possible reason is that it might be the case that deleting the schwa provides good alignment between the prosodic foot and the morphological root domain.

glide surfaces in coda position, and a vowel surfaces in syllable peak position [208] The following examples illustrate the usual pattern for this alternation with the underlying consonants /Y/, /Ỷ/, and /Ẇ̓/. In (85) the underlying labio-velar consonant /Ẇ̓/ surfaces as the obstruent [kʷ] serving as the onset to the final syllable.[209]

(85) ĆELÁȻES
čəlékʷəs
√čəleẆ̓-es[210]
√pass-PTCAUS
'to pass someone or something' (Montler 2018: 38)

In (86) the underlying high front consonant /Y/ surfaces as the obstruent [č] serving as the onset to the final syllable.

[208] A glide will occur in coda position. The vowel in these types of alternations usually occurs only in unstressed position. In chapter 3, it is argued that the reason for this is because the sound is derived from an underlying consonant that has no mora.
[209] Montler (1986) provides a description of this alternation. This alternation is assumed to happen also with the abstract consonant /W/. Alternations with /W/ are documented elsewhere in this dissertation, and in the SENĆOŦEN dictionary (Montler 2018). The capital letters are used to symbolize that these types of segments are underspecified with respect to their manner features in their underlying representations. The segments tend to become [-continuant] (stop and/or affricate) in onset position, and [+continuant] in peak and coda position (vowel and/or glide).
[210] The puzzle of why the underlying glottalization of the labio-velar segment does not surface in this word is left for future research.

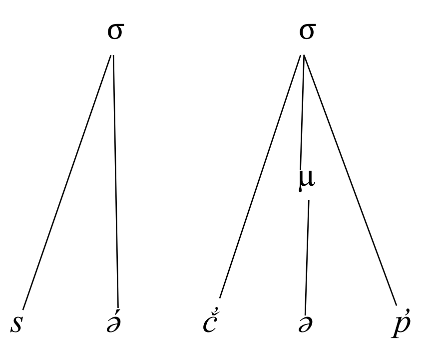
(86) JI¸IĆEȽ
č̓íʔičəɬ
√č̓i‹ʔ›Y-aɬ
√thank‹ACTL›-DUR
'to be thankful, grateful' (Montler 2018: 217)

In (87) the underlying glottalized high front consonant /Y̓/ surfaces as the obstruent [č̓] serving as the onset to the final syllable.[211]

(87) SEJEB
sə́č̓əp̓
√səY̓əp̓
√tickle
'to get tickled' (Montler 2018: 471)

The syllable structure for the word *sə́č̓əp̓* is given in (88).

(88)



The examples in (89)-(91) illustrate the alternation between glide and vowel for the underlying high front glide /y/. In each case, the underlying non-moraic segment

[211] This segment is characterised as a postalveolar glottalized affricate. However, a segment such as this could be argued to be a palatal with the dorsal place features [+high] and [-back]. An analysis involving more phonological patterns is required to determine which segments function together as natural classes in SENĆOŦEN. This is left for future research.

/y/ surfaces as a high front vowel [i] serving as the peak of a syllable when it occurs between two consonants.[212]

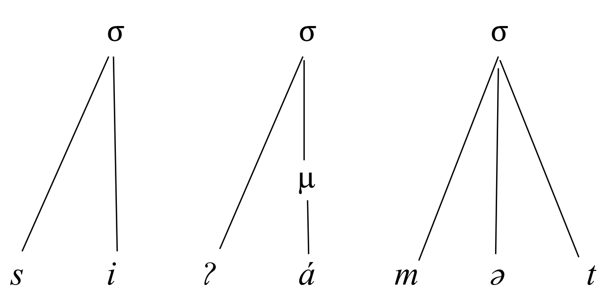
(89) Á¸ITW̱
ʔéʔitxʷ
√ʔeʔy-txʷ
√put_away-CAUS
‘to treat someone well, look after someone or something, be easy on someone’
(Montler 2018: 4)

(90) ȻOTITEṈ
kʷátitəŋ
√kʷaty-txʷ-əŋ
√crazy-CAUS-PSV
‘to be driven crazy’ (Montler 2018: 108)

(91) SI¸OMET[213]
siʔámət
√syʔamət
√slow
‘to be slow’ (Montler 2018: 492-493)

The syllable structure for *siʔámət* is given in (92).

(92)



[212] The surface vowel is also non-moraic.
[213] This word is documented with three meanings in the SENĆOŦEN dictionary (Montler 2018: 492-493). The example in (91) uses the second meaning.

In the following examples the underlyingly non-moraic segments /Y/, /Ỷ/ and /Ẇ/ surface as glides. In (93) the underlying high front consonant /Y/ surfaces as a high front glide [y] serving as a syllable coda when it occurs between a vowel and a consonant.

(93) JIYTEN̲
čʼíytəŋ
√čʼiY-ət-əŋ
√thank-TRNS-PSV
'be thanked, shown respect by someone' (Montler 2018: 219)

In (94) the underlying high front consonant /Ỷ/ surfaces as a high front glottalized glide [ỷ] serving as a syllable coda when it occurs between a vowel and a consonant.

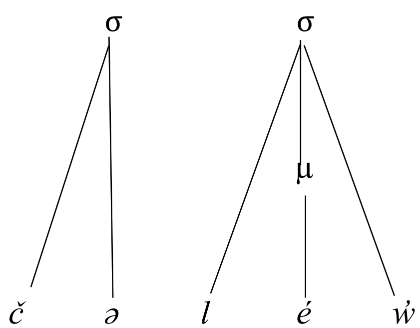
(94) SÍ¸BTEL
sə́ỷp̓təl̓
√s<ə>Ỷəp̓-tal<ʔ>[214]
√tickle‹ACTL›-RCPRCL‹ACTL›
'tickled' (Montler 2018: 496)

In (95) the underlying high back consonant /W̓/ surfaces as a high back glottalized glide [ẇ] serving as a syllable coda when it occurs between a vowel and a consonant.

[214] Both schwas are analysed as underlying. The initial schwa is stressed because the word is in the actual aspect. Although, <> is used to denote epenthesis in the prosodic diagrams, when it is used in the morphological anaylsis it is used to represent the non-conctenative morphology associated with the actual aspect, following the convention in the SENĆOŦEN dictionary (Montler 2018). In this example, the symbol <> is used to enclose the schwa to indicate that stress will be placed on that vowel because the word is in the actual aspect.

(95) ĆELÁU[215]
čəléẇ
√čəleẆ
√pass
‘to pass by (in space or time)’ (Montler 2018: 40)

The syllable structure for *čəléẇ* is given in (96).

(96)


The proposal put forth from here on is that the obstruent~vowel alternations in the remainder of the examples in this section serve as evidence that the schwa inserted between the initial two consonants of those roots is epenthetic, not excrescent. The alternation patterns described below are sensitive to the presence of this vowel. If the vowel were excrescent, then it would not be visible to morphophonological processes such as a glide and vowel alternation.

[215] This word is documented in the SENĆOŦEN dictionary with four meanings (Montler 2018: 40). The example in (95) uses the first meaning.

The next set of examples have all undergone a process of metathesis whereby the underlying full vowel of the root has moved into penultimate position. deLacy (2007) argues that this movement is triggered by stress related pressures.[216] The space left between the two consonants at the beginning of the word is filled with a schwa. Evidence that this schwa is epenthetic, rather than excrescent, is that the initial consonant serves as the vowel's onset, surfacing as a labio-velar [kʷ]. The epenthetic schwa in this case is voiced because it is adjacent to a resonant consonant, as illustrated in (97-99).

(97) ȻEL¸ISE
kʷəl̓ísə
√Wil̓-ət-sə[217]
√come into_view-TRNS -2OBJ
'check on you' (Montler 2018: 85)

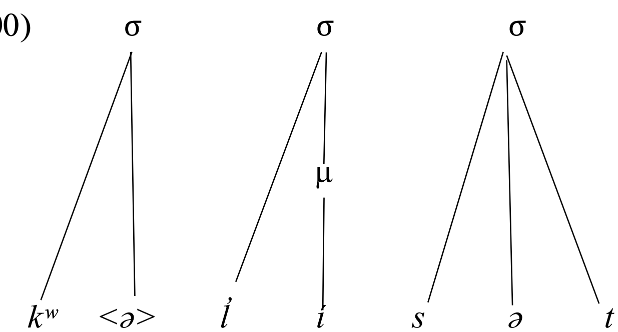
(98) ȻEL¸ITEṈ
kʷəl̓ítəŋ
√Wil̓-ət-əŋ
√come_into_view-TRNS-PSV
'be shown, put into view by someone, or something'
(Montler 2018: 85)

[216] Montler (1986) points out that the lexical strength, and the order, of the root and suffixes in a word influence whether or not this process applies in that word.

[217] The consonant /t/ of the control transitive deletes before the consonant /s/ of the object suffix (Montler 1986). This deletion of coronal segments at specific morphological boundaries has been observed in Lillooet (see Blake 1998). Further research into these types of morphophonological patterns in SENĆOŦEN warrants future study.

(99) ȻEL¸ISET
kʷəl̓ísət
√Wil̓-sat
√come_into_view-RFLXV
‘to be shown oneself’ (Montler 2018: 85)

The syllable structure for *kʷəl̓ísət* is given in (100).

(100)


The observation is that the underlying /Y/ surfaces as [č]. This is the alternate expected in onset position, and is taken as evidence that a schwa is present in the root, and, crucially, that the schwa is phonologically visible, serving as a syllable peak.[218]

(101) ĆḰIN¸ES
čqʷín̓əs
√Yəqʷ=in‹ˀ›əs
√burn=chest‹ACTL›
‘having heartburn, indigestion, pyrosis’ (Montler 2018: 57)

---

218 This set of examples provides further support for the voicelessness of schwa between obstruents.

(102) ĆḰÁSES
čqʷésəs
√Yəqʷ=esis
√burn=hand
'to burn the hand' (Montler 2018: 56-57)

(103) ĆḰÁLET
čqʷélət
√Yəqʷ=elə-ət
√burn=container-TRNS
'to carry the coals (of a fire in a container to start another fire)'
(Montler 2018: 56)

The analysis proposed is that the /Y/ is onset to a schwa that is voiceless between two surface obstruents. This voiceless schwa is not analysed as excrescent, because excrescent vowels are not visible to morphophonological processes such as segmental alternations (Hall 2006).[219] The syllable structure for *čqʷélət* is given in (104).[220]

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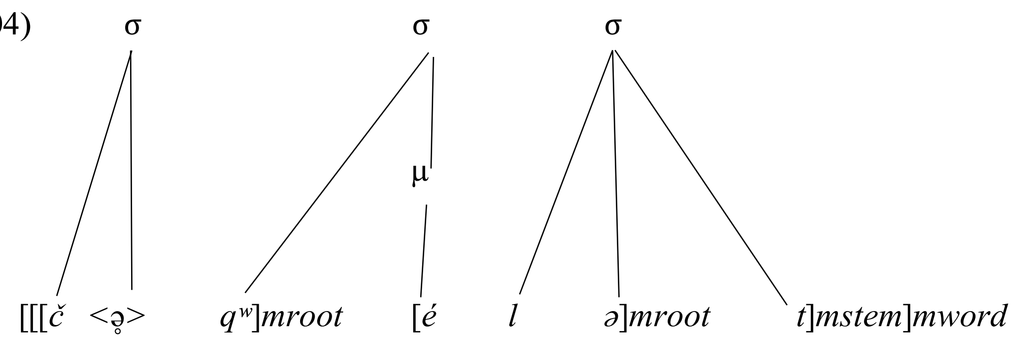
[219] Leonard (2007) analysed these examples as instances of unstressed full vowel reduction.

[220] The root and the lexical suffix and the control transitive suffix are parsed together to form a second morphological stem. The schwa in the suffix does not delete. This lack of deletion might have the potential to be used as evidence for a claim that lexical suffixes in SENĆOŦEN can be equivalent to a morphological root. The investigation of the morphosyntactic status of lexical suffixes in SENĆOŦEN warrants further study. The schwa in the control transitive suffix is not deleted because of the requirement that all syllables have a nucleus.

(104)



The word *ččél̓ŋən̓* presented in (105) has a sequence of two underlying glides, both of which alternate with an obstruent.

(105) ĆĆÁL¸ṈEN
ččél̓ŋən̓
√YeY-el̓ŋən‹ˀ›
√work-want‹ACTL›
'to be wanting to work' (Montler 2018: 29)

In this form, each instance of /Y/ alternates with an obstruent because it is serving as an onset to a vowel.[221] In the first instance that vowel is a voiceless schwa.[222] In the

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[221] The form below follows a similar pattern.

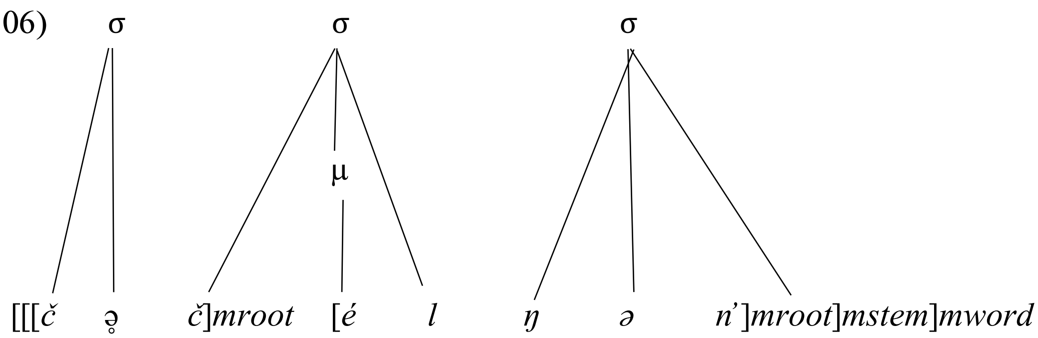
ȻȾÁSET
kʷt̓ᶿesət
√Wet̓ᶿ-sat
√pry-RFLXV
'difficult person' (Montler 2018: 111)

This word is documented in the SENĆOŦEN dictionary, but is neither recorded nor confirmed and thus cannot be used as evidence. However, its documentation suggests that the pattern described is on the right track.

[222] Whether this schwa is derived from the underlying full vowel and devoiced, or whether it is epenthesized following deletion of the UR full vowel is a question left for future research.

second instance that vowel is a stressed full vowel. The syllable structure for *ččéľŋən̓* is given in (106).

(106)



This section has established that root-initial complex onsets are not permitted and that the consonants in root-initial sequences of two are parsed into separate syllables. The next section provides evidence that word-initial sequences of two consonants likewise do not constitute complex onsets. The patterns of occurrence for sequences across the prefix-root boundary suggest that the two consonants are not parsed into separate syllables. Instead, the initial consonant is argued to be extrasyllabic.

5.5 Word-initial sequences are not complex onsets: Extrasyllabicity

Similar to root-initial position, no schwa is transcribed between two obstruents when they occur across a prefix and root boundary, as show in examples (107)-(109).

(107) SŁEM¸X̱ES
sɬə́m̓x̣ʷəs
s-√ɬəm‹ˀ›əx̣ʷ=as
S√smear‹ACTL›=face
‘to have a dirty, smeared face’ (Montler 2018: 527)

(108) ĆȻÁ¸
čkʷéʔ
č-√kʷeʔ
HAVE-√own
‘to own, have, posses’ (Montler 2018: 30)

(109) ŁKEM[223]
ɬq̓ə́m̓
ɬ-√q̓əm̓
PART-√break_off
‘a part, partition, section’ (Montler 2018: 327)

Contrastively to root initial position, however, no schwa is transcribed between an obstruent and resonant across a prefix and root boundary, as is exemplified in (110)-(112).

(110) ĆNÁ
čné
č-√ne
HAVE-√name
‘to have a name’ (Montler 2018: 57)

[223] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 327). The example in (109) uses the first meaning.

(111) SWÍ¸ḴE¸[224]
sẃəy̓qəʔ
s-√wəy̓qəʔ
S-√male
'man, male, masculine' (Montler 2018: 584-585)

(112) W̱MESOST
xʷməsást
xʷ-√ms=as-ət[225]
LOC-√fold=face-TRNS
'to fold something up, close a book' (Montler 2018: 783)

Recall that sequences of obstruent and resonant in root-initial position were separated by a voiced schwa. There is no such schwa in examples (110)-(113). The reason there is a lack of schwa in these words is because the initial consonant of the word is outside of the root domain and is extrasyllabic. In Salish languages it has been demonstrated that morphological processes often ignore segments that reside outside of the root domain (see Czaykowska-Higgins 1998 for the seminal work in this area for Salish languages). In SENĆOŦEN, the morphological process of plural infixation and initial consonant reduplication ignores prefixes, as is illustrated in (113)-(115).

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[224] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 584-585). The example in (111) uses the first meaning.

[225] The analysis differs from that given in the SENĆOŦEN dictionary.

(113) S,EL,ÁLEW̱
sʔəlʔéləxʷ
s-<ʔəl>√ʔéləxʷ
S-<PL>elder
‘a group of elders, parents’ (Montler 2018: 473-474)

(114) STEL,TOL,EU,
stəl̓tál̓əw̓
s-<təl̓>√tál̓əw̓
S-<PL>river
‘rivers’ (Montler 2018: 564)

(115) ST̲ELT̲ÁLḴEM
sƛ̓əlƛ̓élqəm
s-<ƛ̓əl>√ƛ̓éləqəm[226]
S-<PL>fierce animal
‘a group of fierce animals, monsters’ (Montler 2018: 578)

The initial consonant is copied to serve as an onset to the plural infix despite the presence of the prefix *s-* which, presumably, if it were parsed at the syllable level, would make a perfectly suitable onset.[227] The syllable structure of *stəl̓tál̓əw̓* is given in (116)[228].

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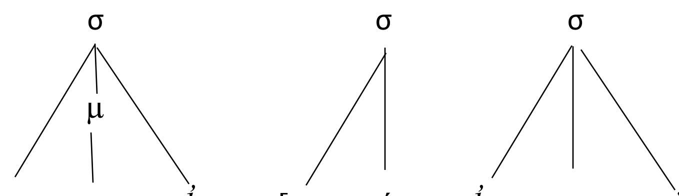
[226] For the purposes of this dissertation, I follow the analysis provided in the SENĆOŦEN dictionary (see Montler 2018: 579) for this word. Whether this schwa should be included in the morphological analysis is a topic for future research.

[227] Parker (2002: 8) says that “[…] /s/ (or perhaps sibilants in general) may be a special case, due to their high stridency.” See also Morelli (2003).

[228] See Shaw (2002, 2008) for a similar anaylsis of left-edge obstruents in another Salish language.

(116)


[[*s* [*t* *ə* *l̓* [*t* *á* *l̓* *ə* *w̓*]mroot]mstem]mword

Other patterns of reduplication also show that the prefix is ignored by these morphological processes. For instance, CV reduplication ignores the prefix and targets the initial CV of the morphological root.

(117) SꝀEꝀO,
sq̓ʷəq̓ʷáʔ
s-CV~√q̓ʷaʔ
S-ACTL~√accompany
‘to be accompanying, going with’ (Montler 2018: 506)

(118) SḴÁ,ḴEU,
sqéʔqəẇ
s-CV<ʔ>~√qəW<ʔ>
STAT-ACTL~√rest<ACTL>
‘to be resting’ (Montler 2018: 511)

(119) SȻUȻEL,
skʷúkʷəl̓
s-CV~√kʷul̓
S-ACTL~school
‘to be learning (how to do something), going to school’
(Montler 2018: 464)

This happens when the prefix is an obstruent and the root-initial consonant is a resonant.

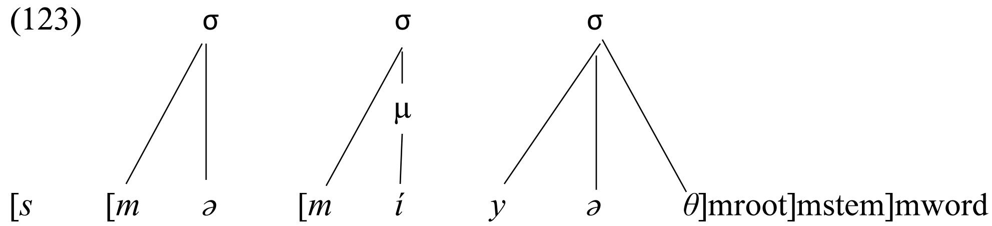
(120) SMEMIDEḴSEN
s-məmít̓əqsən
s-√CV~mi<i>t̓=əqsən
S-√PL~mucus<PL>=nose
‘lots of snot’ (Montler 2018: 534)

(121) SMEMIYEȾ
s-məmíyəθ
s-CV~√m<i>yəθ
S-PL~√deer<PL>
‘a group of deer’ (Montler 2018: 534)

(122) SWEWILTEN
swəwíltən
s-CV~√w<i>l-tən
S-√PL~vessel<PL>-INSTR
‘nets’ (Montler 2018: 583)

Analogizing from the invisibility to morphological processes affecting the root, the prefix is also argued, here, to be invisible to phonological process affecting the root. Residing outside of the root means that a prefix consonant that is an obstruent is not required to be parsed as onset to a syllable (see Czaykowska-Higgins 1998, Shaw 2009). Instead it is simply permitted to be left unsyllabified. The syllable structure of *sməmíyəθ* is given in (123).

(123)



This section, has argued that sequences of two consonants at the edge of words which cross the prefix-root boundary do not constitute complex onsets and that the initial consonant is permitted to be extrasyllabic. Extrasyllabic consonants are often permitted to occur at morphological edges (Green 2003, Rubach & Booj 1992). The next section turns to issues associated with the parsing of consonant sequences word-internally.

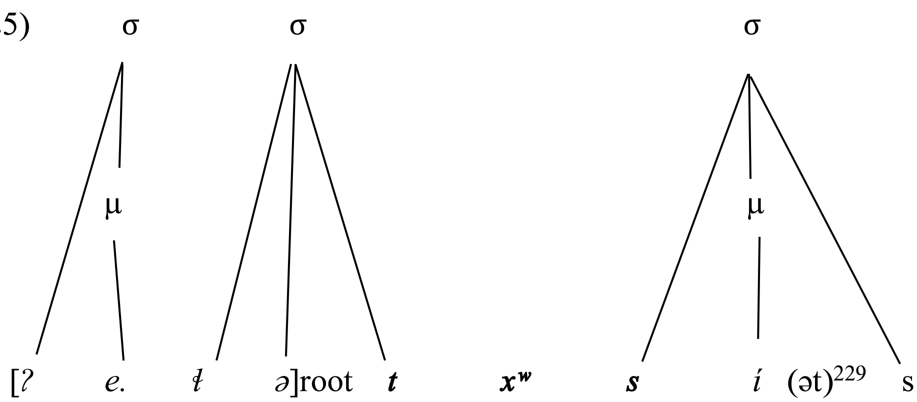
5.6 Word medial sequences are not complex onsets: Extrasyllabicity

This section argues that consonants which cannot be parsed into syllables word-medially are permitted to be extrasyllabic because they occur at the edge of morphological boundaries. A few words in SENĆOŦEN permit sequences of three consonants to occur word-medially. The medial consonant of the sequence is always an obstruent and never a resonant. Sequences of stops and fricatives occur in various combinations. The example in (124) has a consonant sequence of three obstruents (stop, fricative, fricative).

(124) ÁȽETW̱SISE
ʔeɬə**txʷs**ísə
√ʔeɬə-txʷ-si-ət-sə
√be_here-CAUS-BEN-CTRNS-2OBJ
'leave here for you' (Montler 2018: 9)

Given that complex codas and onsets are argued, in this dissertation, not to occur in SENĆOŦEN, the assumption is that the medial obstruent is left unparsed. This assumption fits with the environment where the consonant sequences occur. In each instance where a word medial three consonant sequence occurs the unparsed segment is located at a boundary between morphemes. The syllable structure and the morphological structure for *ʔeɬə**txʷs**ísə* presented in (125) show that the unparsed segment ***xʷ***, itself part of a suffix, is located after the end of the root and before the next suffix.

(125)



The example in (126) has a sequence of two obstruents followed by a resonant.

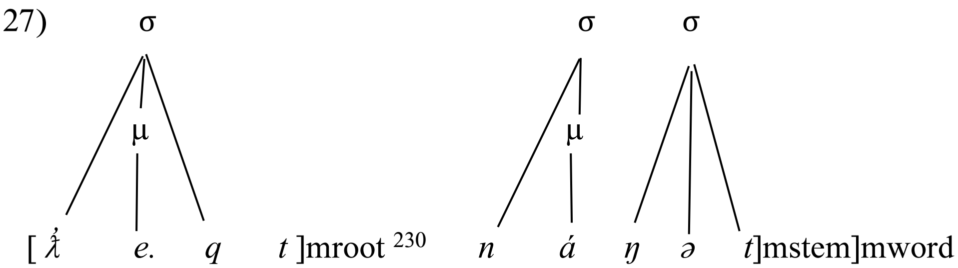
(126) T̲AK̲TNON̲ET
ƛ̓e**qtn**áŋət
√ƛ̓eqt-naŋət
√long-NCMDL
‘to manage to finally be long’ (Montler 2018: 730)

Again, parsing the /t/ as part of a complex coda or onset is not possible because it has already been established that such structure is disallowed in SENĆOŦEN. The consonant /t/ of the suffix is extrasyllabic. Extrasyllabicity tends to happen at morphological boundaries. The /t/ is the final consonant of the root and occurs preceding a suffix. Additionally, the suffix may be a phonological root, evidenced by the observation that although not carrying the primary stress the root retains a full vowel rather than reducing to schwa. This failure of the underlying full vowel in the

[229] The issue of /t/ deletion before /s/ is discussed in Montler (1986). No claim, in this dissertation, is made for why this deletion occurs, but as mentioned in a previous footnote this is a process that warrants further linguistic investigation. The schwa in the control transitive suffix is deleted because of a vowel hiatus violation where every vowel must have an onset (see Leonard 2007).

root to reduce to schwa may mean that the vowel in the root is also stressed. Further research is required to identify whether that is true, and whether that stress is primary or secondary. The syllable structure for the word *ƛ̓e**qtn**áŋət* is given in (127).

(127)



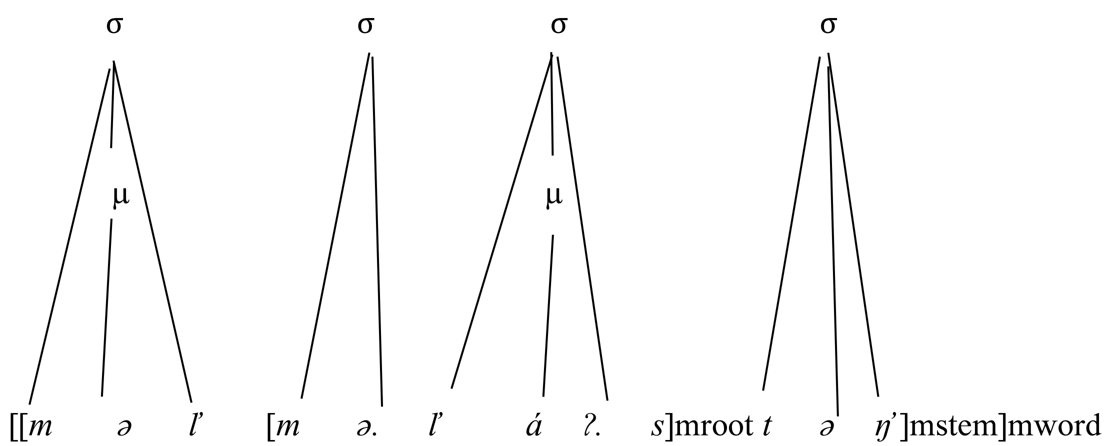
The example in (128) has a sequence of a resonant followed by two obstruents.

[230] This example may have a historic stative suffix. The medial consonant in word medial consonant clusters is always an obstruent. This obstruent is not analysed as the onset to a voiceless schwa. If it were then that schwa would be voiced preceding a resonant. The example in (130) is evidence that there is no schwa present after middle obstruent in word medial consonant clusters.

(128) MEL¸MEL¸O¸STEN̲¸
məl̓məl̓á**ʔst**əŋ’
CVC~√mel̓a‹ʔ›s-t-əŋ
CHAR~√confuse‹ACTL›-CTRNS-PSV<ACTL>
‘being confused, fooled by someone or something’ (Montler 2018: 340)

The medial consonant of the three consonant sequence is located at the right-edge of the root which is an expected position for an obstruent to be unparsed at the syllable level. The syllable structure for the word *məl̓məl̓á**ʔst**əŋ’* is given in (129).

(129)

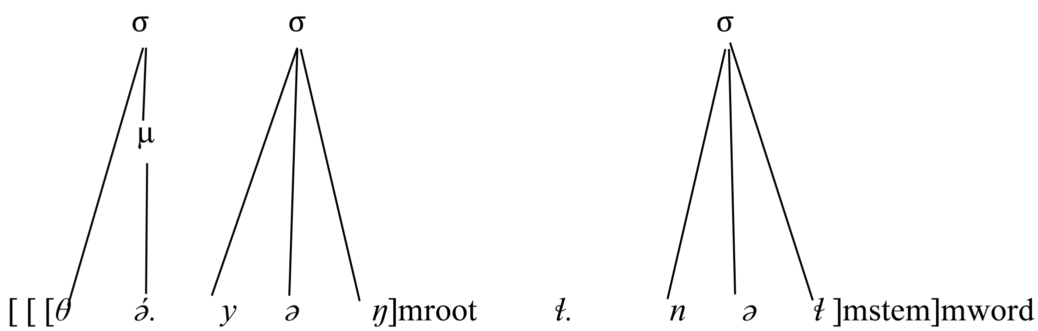


The example in (130) has a sequence of a resonant followed by an obstruent which is followed by another resonant.

(130) ȾÍYEṈŁNEŁ
θə́yə**ŋɬn**əɬ
√θəy-əŋ=ɬnəɬ
√bleed-MDL=throat
'Cypress Island' (Montler 2018: 704)

The medial obstruent is located at the right-edge of the final suffix.[231] The syllable structure for the word *θə́yə**ŋɬn**əɬ* is given in (131).

(131)



5.7 Conclusion

This chapter lays out the basic syllable structure for SENĆOŦEN and makes a case that root initial consonant sequences, word initial sequence of consonants, and word internal sequences of consonants are not instances of complex onsets. Evidence from both phonological and morphological processes are employed to make the case that the initial consonant in a root initial sequence is parsed as the onset to an inserted schwa which is visible to the phonology and thus is epenthetic not excrescent, and which is voiceless between voiceless consonants and voiced next to resonant

[231] Montler (2018) includes the schwa in his analysis of this suffix, and this dissertation follows that lead. The phonological status of the schwa in the middle suffix is left to future research.

consonants. Evidence from both phonological and morphological processes are presented supporting the proposal that obstruents at the edge of morphological domains are permitted to be extrasyllabic.

Chapter 6 Foot Structure and the Distribution of Schwa

6.0 Goal of chapter 6.

Chapter 6 argues that the distribution of schwa is often predictable and that its predictability is often correlated to well formed phonological foot structure and alignment requirements in SENĆOŦEN. The hypothesis is that the schwa~zero alternation observed in processes of reduplication and infixation is motivated by a requirement that left-headed feet be aligned rightward in a word. The findings support previous literature which proposes that left-headed feet are aligned rightward in SENĆOŦEN (see Kiyota 2003, de Lacy 2007, Leonard 2007). Montler (1986: 26) argues that stress tends to fall on the penultimate syllable in SENĆOŦEN. Kiyota (2003) argues that the choice of plural allomorphy is motivated by prosodic factors concerning correct word stress alignment. deLacy (2007) argues that phonological metathesis is driven by prosodic factors on rightward word alignment of prosodic feet. Leonard (2007) argues that the stress assignment patterns of words with lexical suffixes is sensitive to the rightward alignment of left-headed feet (Leonard 2007).

This chapter supports the previous literature through an examination of the distribution of schwa in three different sets of morpho-phonological alternations. The first alternation is between schwa and full vowel in words with CV-reduplication expressing the actual aspect. The second alternation is between schwa and zero in words with infixation expressing the actual aspect. The third alternation is the change in the location of schwa in words with infixation expressing the plural.

The organization of this chapter is as follows: Section 6.1 introduces the theoretical claims made and the assumptions adopted in this chapter. Section 6.2 presents patterns of schwa distribution in words with CV-reduplication expressing the actual aspect. Section 6.3 presents patterns of schwa distribution in words with infixation expressing the actual aspect. Section 6.4 presents patterns of schwa distribution in words with infixation expressing the plural. Section 6.5 is a conclusion.

6.1 Theoretical claims and assumptions

This section lays out the theoretical claims and assumptions used throughout this chapter. In section 6.1.1 claims and assumptions regarding foot structure and alignment are discussed. In section 6.1.2 claims and assumptions regarding the morphological processes of infixation are discussed.

6.1.1 SENĆOŦEN foot structure and alignment

As shown in chapter 2, SENĆOŦEN sounds are organized systematically into a hierarchy of prosodic units (see Benner 2006, Caldecott 1999, Kiyota 2003, Leonard 2007). The focus of this chapter is on the level of the hierarchy which occurs between the level of the syllable and the level of the prosodic word which is called the metrical foot level. This dissertation assumes Selkirk's early model of the prosodic hierarchy, presented in (1).[232]

(1) Selkirk's Prosodic Hierarchy (Selkirk 1978, Selkirk 1995)

utterance (Utt)
intonation phrase (IP)
phonological phrase (PhP)
prosodic word (PWd)
foot (Ft)
syllable (Syl)

Stressed syllables are the heads of metrical feet (see Kiyota 2003, Leonard 2007). Feet are most often trochaic (disyllabic with stress on the leftmost syllable), or degenerate (monosyllabic). Degenerate feet often occur when there is only one underlying vowel in the word, when the final syllable is a full vowel and the initial vowel is a schwa, or when the initial vowel is epenthetic and the second is underlying.

6.1.2 SENĆOŦEN infixes and the *Salient Pivot Hypothesis*

In this dissertation, the Salient Pivot Hypothesis (Yu 2003, 2007) is adopted to account for the placement of morphological infixation in SENĆOŦEN. The Salient Pivot Hypothesis states that infixes are attracted to salient linguistic material.

(2) Salient Pivot Hypothesis (Yu 2007: 9)
Phonological pivots must be salient at the psycholinguistic and/or phonetic level

[232] Caldecott (2009: 44-47) provides an informative historical background of the use of prosodic hierarchies in various theoretical frameworks.

The typology of infixal pivots that Yu proposes is organized into two categories, edge pivots and prominence pivots. Edge pivots can include such phonetic environments as the leftmost consonant, vowel, or syllable, or the rightmost consonant, vowel, or syllable. Prominence pivots can include such phonetic environments as the stressed vowel, syllable, or foot. The two pivot categories for infixation are presented in (3).

(3) Pivot Locations for Infixation (Yu 2007: 8)

a. *Edge Pivot*

Leftmost consonant, vowel, or syllable
Rightmost consonant, vowel or syllable

b. *Prominence Pivot*

Stressed vowel, syllable, or foot

The actual infix in SENĆOŦEN is an example of a prominence pivot. The two variants of the actual infix are *<ʔə>* and *<ʔ>* and they both pivot after the stressed vowel in the word. The different shapes and pivot locations of each infix are presented in (4).

(4) Actual Infixation: Prominence Pivots

Form	*Location*
<ʔ>	Stressed Vowel
<ʔə>	Stressed Vowel

There are 5 weakly suppletive variants of the plural morpheme *<əl>, <C_1əl>, <C_1əl̓>, <ʔlə>*, and *<lə>*. *<əl>* is an edge pivot and pivots after the initial consonant of the root.[233] <*C_1əl*> and < *C_1əl̓*> are also edge pivots located after the initial consonant of the root. <*ʔlə*> and <*lə*> are prominence pivots located after the stressed vowel. The shape and pivot location for the five phonologically conditioned variants of the plural morpheme is shown to be, in section 6.4, predictable and conditioned by the requirement that trochees are right-aligned. The edge pivot variants are presented in (5).

(5) Plural Infixation: Edge Pivots

	Form	*Location*
(a)	<*əl*>	Pivot after the initial consonant
(b)	<*C_1əl*>	Pivot before the root initial consonant
(c)	<*C_1əl̓*>	Pivot before the root initial consonant

The prominence pivot variants are presented in (6).

(6) Plural Infixation: Prominence Pivots

	Form	*Location*
(a)	<*ʔlə*>	Pivot after the stressed vowel
(b)	<*lə*>	Pivot after the stressed vowel

Description and analyses showing the predictable distribution of schwa is presented in the remainder of this chapter. Section 6.2 is concerned with the

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[233] This chapter follows up on a footnote in Kiyota (2003) who leaves an analysis of the plural infix for future research. He is concerned with providing a unified analysis of the different types of morphological processes that are used to express the plural meanings. He says that: "[...] although the various positions for the infix is an interesting issue to consider, I leave this issue for further study, and for the present purpose, focus on the three realizations of plural discussed above." (Kiyota 2003: 6). A unified analysis of the plural morphology in SENĆOŦEN is also provided by Gillon (2000). Likewise, this chapter is not concerned with unifying the different types of non-concatenative morphology (see Montler 1989, Leonard & Turner 2010, Turner & Urbanczyk 2013 for analyses concerned with unifying the different types of morphology associated with the actual aspect in SENĆOŦEN).

distribution of a reduced full vowel (schwa) in CV-reduplication expressing the actual aspect. Section 6.3 is concerned with the schwa~zero alternation in the glottal stop infix expressing the actual aspect. Section 6.4 is concerned with the distribution of schwa in the plural infix.

6.2 Patterns of reduplication and vowel reduction

The purpose of this section is to demonstrate that full vowel~schwa alternation patterns in words with CV-reduplication expressing the actual aspect are predicted by foot shape and alignment requirements that are active in SENĆOŦEN. The following examples illustrate that an underlying full vowel in a monosyllabic root with CV-reduplication expressing the actual aspect undergoes vowel reduction to schwa.

(7) K̲ÁN
qéṅ
√qeṅ
√rob
'to steal, cheat' (Montler 2018: 255)

(8) K̲ÁK̲EN,
qéq̓əṅ
CV~√qeṅ
ACTL~rob
'to be stealing, cheating' (Montler 2018: 253)

(8) ȽOB
łáp̓
√łáp̓
√slurp
'slurp' (Montler 2018: 329)

(9) ȽOȽEB
łáłəp̓
ła~√łap̓
ACTL~√slurp
'slurping' (Montler 2018: 330)

(10) ꝀIṈ[234]
q̓ʷíŋ
√q̓ʷiŋ
√disembark
'to be out of a boat, other conveyance or out of the water, to have disembarked' (Montler 2018: 246)

(11) ꝀIꝀEṈ¸
q̓ʷíq̓ʷəŋ̓
q̓ʷí~√q̓ʷiŋ‹ˀ›
ACTL~√disembark‹ACTL›
'to be getting off, disembarking ' (Montler 2018: 254)

In contrast, the examples the next set of examples illustrate that an underlying full vowel in a disyllabic root with CV-reduplication expressing the actual aspect receives primary stress and does not undergo vowel reduction to schwa.

[234] This word is documented in the SENĆOŦEN dictionary with two meaning (Montler 2018: 246). The example in (10) uses the first meaning.

(12) ȻÁĆEṈ[235]
kʷ**é**čəŋ
√kʷečəŋ
√yell
'to yell, shout, holler, call out' (Montler 2018: 68)

(13) ȻEȻÁĆEṈ,
kʷəkʷéčəŋ̓
CV~√kʷeč-əŋ
ACTL~√yell-MDL
'to be hollering, yelling' (Montler 2018: 76)

(14) DIL,EM
t̓íl̓əm
√t̓íl̓əm
√sing
'to sing' (Montler 2018: 128)

(15) DEDIL,EM,
t̓ət̓íl̓əm̓
CV~√t̓íl̓əm<?>
ACTL~√sing
'to be singing' (Montler 2018: 118)

[235] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 68). The examples in (12) uses the first meaning.

(16) ŚIWE,[236]
šíwəʔ
√šiwəʔ
√urinate
'to urinate' (Montler 2018: 618)

(17) ŚEŚIU,E,[237]
šə~šíw̓əʔ
CV~√šiwəʔ
ACTL~√urinate
'to be urinating' (Montler 2018: 615)

The hypothesis is that the distribution of the full vowel~schwa alternation in CV-reduplication actual forms is predictable and is conditioned by the pressure to have right-aligned trochees.[238] When the target of CV-reduplication is monosyllabic, as in the word *q̓éṅ*, the syllable of the reduplicant and the syllable of the root are parsed together to form a disyllabic trochee. A disyllabic trochee is a foot shape which consists of two syllables where the left-most syllable is stressed. The underlying full vowel in the root is the non-head of the foot and is not stressed. This unstressed vowel is reduced to schwa.[239] The syllable structure for the word *q̓éq̓əṅ* is given in (18).

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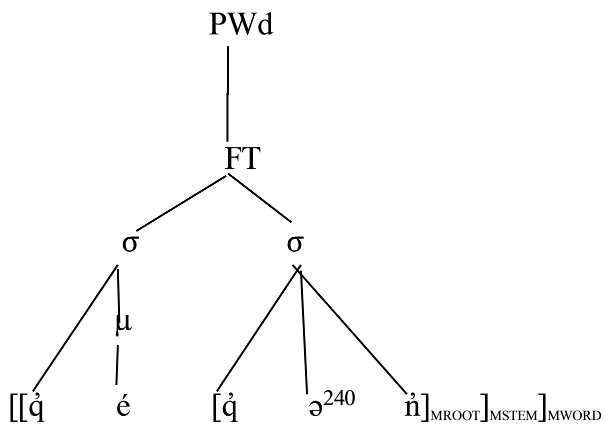
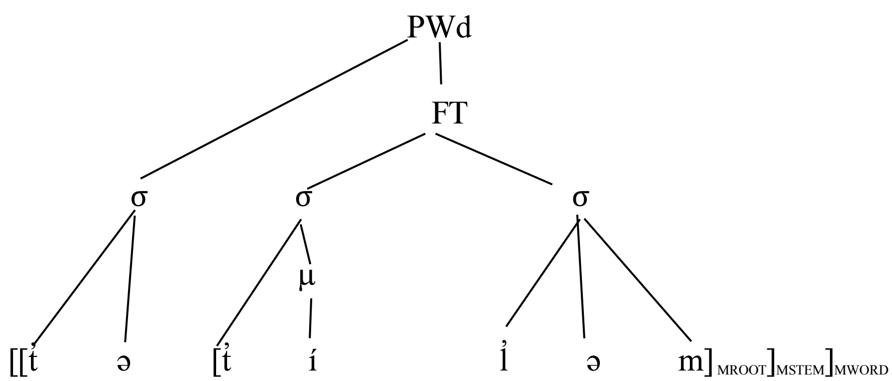
[236] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 618). The example in (16) uses the first meaning.
[237] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 615). The example in (17) uses the first meaning.
[238] See Montler (1986) for an alternative explanation for why stress occurs sometimes on the root and sometimes on the reduplicant which involves proposing that there are two types of reduplication for the actual aspect: C-reduplication and CV-reduplication.
[239] The reduction to schwa is represented phonologically as mora loss.

(18)



When the target of CV-reduplication is disyllabic, as in the word *ṫíl̓əṁ*, the two syllables of the root are parsed together to form a disyllabic trochee. The copied full vowel in the reduplicant is reduced to schwa because it is unstressed, whereas the underlying full vowel in the root is stressed and is not reduced to schwa. The syllable structure for *ṫəṫíl̓əṁ* is given in (19).

(19)



Evidence that reduplication is targeting the root, rather than the stem is that in a word like ***ƚí****ƚək̓ʷsəṅ* which is built on the disyllabic stem *ƚík̓ʷsən*, it is the underlying

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[240] Unstressed vowels lack a mora.

full vowel in the CVC shaped root which is reduced to a schwa. If the whole stem were being targeted for CV-reduplication the prediction is that the root vowel would be stressed and the vowel in the reduplicant would be unstressed and would be reduced to schwa. However, as is illustrated in the next set of examples the opposite is observed. The underlying full vowel in the root is unstressed and reduces to schwa, and the underlying full vowel in the reduplicant is stressed and remains as a full vowel.

(20) ȽIQSEN
ɬík̓ʷsən
√ɬík̓ʷ=sən
√hook=foot
'to trip, get hooked on the foot, stumble' (Montler 2018: 324)

(21) ȽIȽEQSEN
ɬíɬək̓ʷsən̓
CV~√ɬik̓ʷ-sən̓
ACTL~√hook=foot<ACTL>
'to be tripping, stumbling' (Montler 2018: 323)

Contrastively, when the root itself is disyllabic, as it is in the word *t̓ət̓íl̓əm̓,* repeated in the next set of examples, it is the underlying full vowel of the root that is stressed and it is the underlying full vowel of the reduplicant that is not stressed and which reduces to schwa.

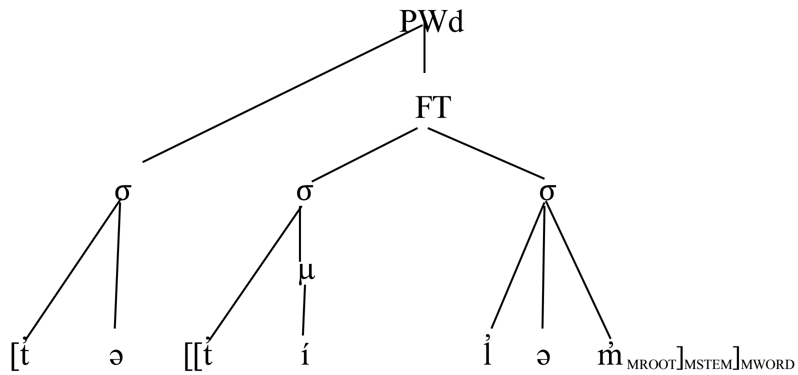
(22) DIL,EM
t̓íl̓əm
√t̓íl̓əm
√sing
'sing' (Montler 2018: 128)

(23) DEDIL,EM,
t̓ət̓íl̓əm̓
CV~√t̓íl̓əm̓
ACTL~√sing
'singing' (Montler 2018: 118)

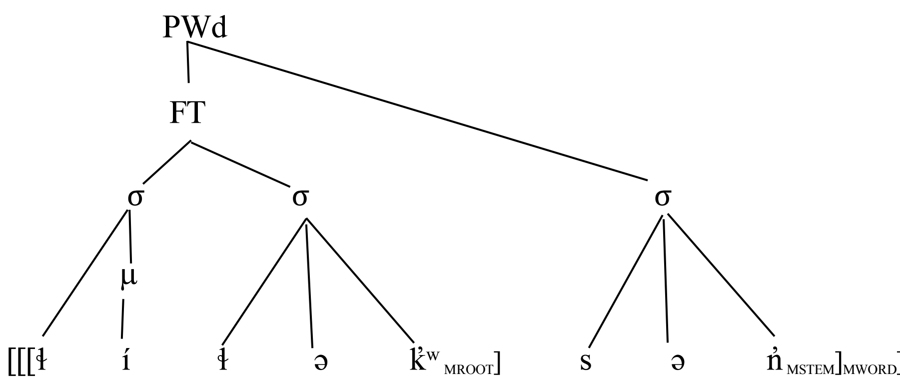
The reason that the stress assignment patterns for the words *ƛ̓íƛ̓ək̓ʷsən̓* and *t̓ət̓íl̓əm̓* are different from one another is because, in each case, the reduplicant is targeting bases with different phonological shapes. *t̓ət̓íl̓əm̓* is stressed on the penultimate syllable because the root is equal to a disyllabic morphological root (*t̓íl̓əm*). *ƛ̓íƛ̓ək̓ʷsən̓*, on the other hand, is stressed on the initial syllable because the morphological root in this word is monosyllabic (*ƛ̓ik̓ʷsən*). The second syllable of the word *ƛ̓íƛ̓ək̓ʷsən̓* is *-sən* which is a lexical suffix meaning 'foot'. This suggests that CV-reduplication in this word does not count the lexical suffix *-sən* as part of its target. It is the reduplicant and the morphological root which are parsed together to form a left-headed binary metrical foot, rather than the morphological root and the suffix.[241]

Prosodic trees for the two words are compared in (23) and (24).

(23)



(24)



In sum, the distribution of schwa in words with CV-reduplication expressing the actual aspect is shown to be predictable. The schwa under study in this section is derived from an underlying full vowel. An underlying full vowel will predictably

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[241] The stress pattern of these words suggests that metrical feet in SENĆOŦEN can sometimes be aligned to the right-edge of the morphological root, rather than the right-edge of the word. The reason for this might have something to do with how suffixation and stress assignment are ordered with respect to each other in specific words, or word families. It is plausible that stress might be assigned prior to the affixation of the lexical suffix. Investigating such possibilities is outside the scope of this dissertation, which is concerned with the predictability of the distribution of schwa. The relationship between morphology and phonology with respect to stress assignment and morphological ordering is an important area for future research.

surface as a schwa when it is not heading a metrical foot. This is because in this position the underlying full vowel is unstressed and as a consequence is reduced to schwa. CV-reduplication targets the root. If the root is CVC then the vowel in the root will be unstressed and reduced to schwa. This is because the CVC root together with the CV reduplicant form a left-headed disyllabic foot. When the root is CVCəC then the full vowel in the reduplicant will be unstressed and reduced to schwa. This is because the root itself equals a left-headed disyllabic foot. The examples in this section support a proposal that metrical feet tend to be aligned rightward in the root.

6.3 Actual infixation and schwa/zero alternation

The purpose of this section is to argue that the distribution of the schwa associated with the actual infix is predictable. Schwa, when it occurs, provides a nucleus to a syllable which is needed to form a disyllabic left-headed foot. In SENĆOŦEN there are two variants of the actual infix *<ʔ>* and *<ʔə>*[242]. These infixes are prominence pivots which always pivot after a stressed vowel. The actual infix pivots after the stressed vowel in the base. The choice of variant is conditioned by the pressure for derived words to have a trochee which is aligned to the right-edge of the

[242] The symbol '<>', in this case, is used to denote that the material within it is a morphological infix. This use of '<>' is in keeping with the Leipzig glossing conventions and the convention used by Montler (2018). No claim is made on whether the schwa in these forms is epenthetic or underlying. It is unlikley excrescent because both its absence and presence are clearly triggered by morpho-phonological factors.

word.[243] In section 6.3.1 the <ʔ> variant is discussed. In section 6.3.2 the <ʔə> variant is discussed.

6.3.1 <ʔ>

The examples in in (25)-(30) illustrate that the <ʔ> variant pivots after the stressed vowel in a disyllabic base.[244]

(25) ÁJET[245]
ʔéč̓-ət
√ʔéč̓-ət
√wipe-TRNS
'to brush, wipe, rub something' (Montler 2018: 4)

(26) Á,JET
ʔéʔč̓ət
√ʔe<ʔ>č̓-ət
√wipe<ACTL>-TRNS
'to be wiping something' (Montler 2018: 5)

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[243] Zimmermann (2013) argues that the continuative allomorphy in Upriver Halkomelem is determined by mapping segments from the base to a prosodic foot.
[244] The glottal stop does not go after the initial consonant because the glottal stop is attracted to a post stress position in SENĆOŦEN (see Caldecott 1999).
[245] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 4). The example in (25) uses the first meaning.

(27) IȽEN
ʔíɬən
√ʔíɬən
√to eat
‘to eat, consume, dine, have a meal’ (Montler 2018: 196-197)

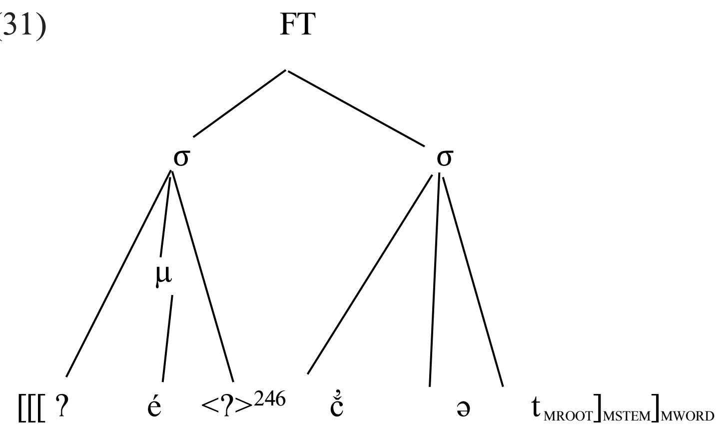
(28) I,ȽEN,
ʔíʔɬən̓
√ʔí<ʔ>ɬən̓
√eat<ACTL>
‘to be eating’ (Montler 2018: 197)

(29) ĆOꝀEṈ
čáq̓ʷəŋ
√čáq̓ʷ-əŋ
√sweat-MDL’
‘to sweat’ (Montler 2018: 59)

(30) ĆO,ꝀEṈ,
čáʔq̓ʷəŋ̓
√čá<ʔ>q̓ʷəŋ<ʔ>
√sweat<ACTL>-MDL<ACTL>
‘He’s pouring with sweat.’ (Montler 2018: 59)

The placement and shape of the actual infix is optimal in these forms because the resulting actual form is equal to a left-headed disyllabic foot. The syllable structure for the word *ʔéʔč̓ət* is given in (31).

(31)



6.3.2 *<ʔə>*

The <*ʔə*> variant pivots after the stressed vowel in (32)-(39).

(32) ELÁ¸NEW̱
ʔəléʔnəxʷ
√ʔəleʔn-naxʷ
√hear-NCTRNS
'to hear something, listen to something or someone.
(Montler 2018: 140)

(33) EL¸Á¸E,NEW̱
ʔəlé**ʔə**ʔnəxʷ
√ʔəle‹ʔə›ʔn-naxʷ
√hear‹ACTL›-NCTRNS
'to be hearing something, listening to something or someone'
(Montler 2018: 139-140)

[246] The insertion of glottal stop does not change foot structure in words like this. This adds more evidence that codas are not moraic in SENĆOŦEN.

(34) EL,XEU,Á
ʔəl̓x̣əẇé
√ʔəlx̣əẇe
√pitlamp
‘to fish or hunt at night (for crab, duck, flounder, etc.) with a torch and spear in shallow water, pit-lamp’ (Montler 2018: 144-145)

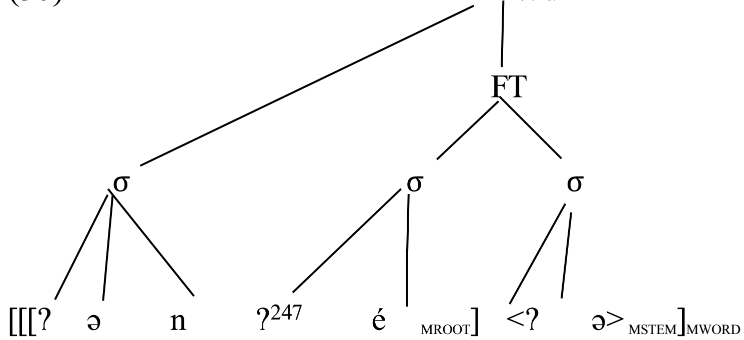
(35) ELXEU,Á,E
ʔəl̓x̣əẇé**ʔə**
√ʔəl̓x̣əẇé<ʔə>
√pitlamp<ACTL>
‘to be fishing or hunting at night with a light, pit-lamping’
(Montler 2018: 145)

(36) EN,Á
ʔənʔé
√ʔənʔé
√come
‘come’ (Montler 2018: 149-150)

(37) EN,Á,E
ʔənʔé**ʔə**
√ʔənʔé<ʔə>
√come<ACTL>
‘to be coming.’ (Montler 2018: 150)

The <*ʔə*> variant results in a schwa placed in a location where it serves as the peak to the unstressed syllable of a right-aligned left-headed foot. The prosodic structure for *ʔənʔéʔə* is given in (30).

(30)



This section has provided evidence that the distribution of schwa is predictable and is sensitive to the rightward alignment of left-headed feet. *<ʔə>* surfaces in cases where a schwa is needed to head a second syllable in the construction of a right-aligned trochee. *<ʔ>* surfaces when the word already has right-aligned, left-headed foot.

6.4 Plural infixation and the distribution of schwa

The goal of this section is to show that the placement and shape of the plural infix is sensitive to the metrical foot structure of the resulting word.[248] Words derived from plural infixation ideally should end in a left-headed disyllabic foot. The weakly suppletive variants of the plural infix are as follows: *<əl>*, *<ʔlə>, <lə>, < C_1əl>,* and

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[247] The combination of /*n*/ and /*ʔ*/ may be underlyingly, and on the surface, a glottalized resonant. If that is the case, then the initial syllable is open and the glottalized resonant would serve as onset to the second syllable. Equally, the complex segment /n̓/, if that is what it is, could decompose into two segments a glottal stop and resonant [n] (see Caldecott 1999 for more on this issue).

[248] Note that Kiyota (2003: 12) says that "[...] I hypothsize that the allomorphe /*əl*/ is underlyingly a prefix, it is normally placed immediately after the first consonant of the root."

< *C_1əl̓*>. The <*əl*> variant of the plural infix targets a stem that is equivalent to a left-headed disyllabic foot and is pivoted after the initial consonant. The plural infix variants <*ʔlə*> and <*lə*> target a stem that is equal to a degenerate foot and are pivoted after the stressed vowel. The variants <*C_1əl*> and <*C_1əl̓*> target stems that are equivalent to trochees and which have a medial [l] or [l̓] and pivot before the initial consonant of the morphological stem. These variants are argued to be chosen and located before the initial consonant to prevent an Obligatory Contour Principle (OCP) violation due to the occurrence of two adjacent lateral consonants. In autosegmental phonology the OCP is a restriction on adjacent identical place features (see Goldsmith 1976). Kiyota (2003: 5) says that for SENĆOŦEN: "The /əl/ allomorph surfaces as the Cəl- reduplicant to satisfy an OCP constraint on lateral sonorants."

6.4.1 <*əl*>

The variant <*əl*> is an example of an edge pivot which is located after the first consonant of a morphological stem which is equal to a trochee. This is illustrated in (31)-(36).

(31) SAḴEŁ
séqəɬ
√s<e>q-əɬ
√outside<RSLT>-DUR [249]
'to be outside.' (Montler 2018: 436-437)

(32) SELAḴEŁ
səléqəɬ
√s<əl><e>q-əɬ
√outside<PL><RSLT>-DUR
'to be outside (of a group)' (Montler 2018: 473)

(33) HI,EU,[250]
híʔəẇ
√híʔəẇ
√front
'the front area, bow (of a canoe or boat)' (Montler 2018: 180-181)

(34) HELI,U,
həlíʔəẇ
√h<əl>íʔəẇ
√front<PL>
'to be in the bow, in the front (of the whole group)'
(Montler 2018: 177)

(35) ŚṈIKEN
šŋíq̓ən
š√ŋíq̓-ən
FOR√erect-INSTR
'any erected pole (for a tent, house, flag), a mast for a sail'
(Montler 2018: 629)

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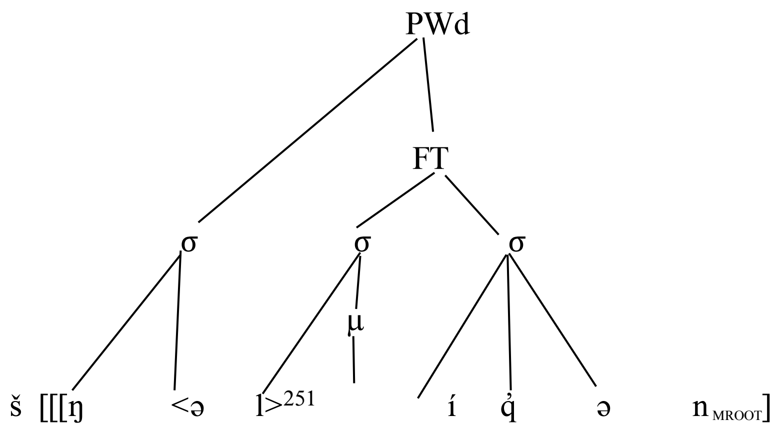
[249] See Turner (2005) for more on the resultive construction in SENĆOŦEN.

[250] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 180-181). The example in (33) uses the second meaning.

(36) ŚṈELIKEN
šŋəlíq̓ən
š√ŋ<əl>íq̓ən
for√mast<PL>-INSTR
'masts' (Montler 2018: 629)

The shape and location of the plural infix is optimal because it yield a right-aligned trochee. The prosodic structure for the word *šŋəlíq̓ən* is given in (37).

(37)



The variant <*əl*> also targets morphological stems which have long vowels. Such forms are illustrated in examples (38)-(41).

[251] In these diagrams the angled brackets are not representing epenthesis as in the other prosodic diagrams, rather they are used to represent non-concatenative morphology, in the same way as they are used in the morphological analysis. In particular, the angled brackets in these diagrams are representing the plural infix.

(38) MOÍ
máaẏ
√máaẏ
√basket
‘any basket’ (Montler 2018: 351)

(39) MELOÍ
məláaẏ
√m<əl>áaẏ
√basket<PL>
‘a group of baskets.’ (Montler 2018: 341)

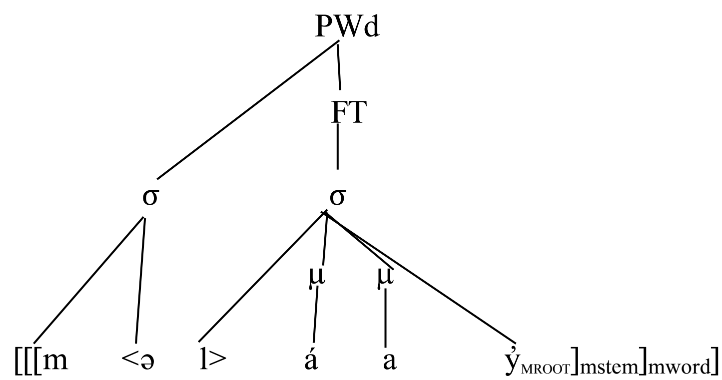
(40) COO
káa
√káa
√car
‘car’ (Montler 2018: 20)

(41) CELOO
k<əl>áa
√k<əl>áa
√car<PL>
‘several cars.’ (Montler 2018: 19)

The second syllable in these words is analysed as a degenerate syllabic foot. The location and shape of the plural infix in these cases support this proposal. Pivoting *<əl>* after the root-initial consonant is optimal because it places the schwa outside of foot domain and ensures the foot is right-aligned.[252] The prosodic structure of the word

məláaẙ is illustrated in (42).

(42)



The *<əl>* infix also pivots after the initial consonant of a disyllabic word ending in a long vowel. This is illustrated in (43) and (44).

[252] These types of roots form the plural in the same way as CV́CəC roots. The plural variant -əl- is placed in front of a right-aligned foot in both cases. CV́CəC roots with this plural variant have a shape Cəl[CV́CəC]$_{\text{FOOT}}$, and CVVC roots with this plural variant have a shape Cəl[CV́VC]$_{\text{FOOT}}$. This pattern is different from the pattern observed with CVC roots. In cases where the root is CV́C the -ʔlə- plural variant is placed after the stressed vowel n the root. CVC roots with this plural variant have a shape [CV́ʔləC]$_{\text{FOOT}}$.

(43) ȾEM,ÁÁN
t̓ᶿəm̓-éen[253]
√t̓ᶿəm̓-éen
√bone-ear
'arrow' (Montler 2018: 716)

(44) ȾELEM, ÁÁN
t̓ᶿələm̓éen
√t̓ᶿ<əl>əm̓-éen
√bone<PL>-ear
'several arrows.' (Montler 2018: 715)

The edge pivot of *<əl>* places the schwa in a location where it can head a non-head foot leaving the word to end in a bimoraic syllable. The bimoraic syllable is aligned to the right edge of the prosodic word and counts as a trochaic foot.[254] The prosodic structure for the word *t̓ᶿələm̓éen* is given in (45).[255]

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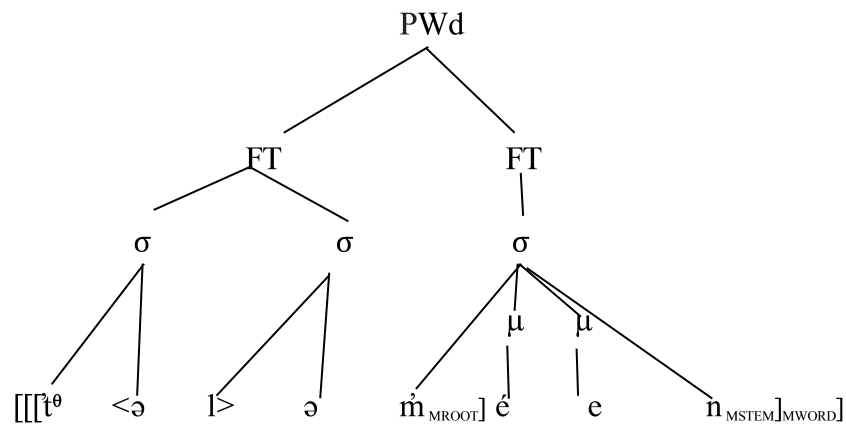
[253] This pattern of infixation suggests that the lexical suffix is parsed within the prosodic word as a left-headed foot.
[254] If this bimoriac syllable did not count as a trochaic foot then the prediction is that the *<ʔlə>* variant would prominence pivot after the stressed vowel to form a foot as is usually the case when the plural infixes into a monosyllabic word (degenerate foot). This will be shown in the next section.
[255] Kiyota (2003: 9) claims the stress system is iterative and that there is a ban on back-to-back stresses in SENĆOŦEN. The initial schwa in this word may have secondary word stress. However, as of yet, no phonetic research has been carried out to determine the correlates of secondary stress in SENĆOŦEN. Ths is an area that warrants investigation.

(45)



The examples in (44)-(47) illustrate that the variant <*əl*> also targets, and pivots after, the first consonant of a morphological stem that ends in two consonants.

(46) SÁĆS
séčs
√sečs
√aunt/uncle
‘aunt, uncle’ (Montler 2018: 438)

(47) SELÁĆS
səléčs
√s<əl>ečs
√aunt/uncles<PL>
‘a group of aunts and/or uncles.’ (Montler 2018: 473)

(48) ŚPEḴST
špə́qst
√šp-əqsən-ət[256]
√whittle-nose-TRNS
‘to sharpen the point of something’ (Montler 2018: 630)

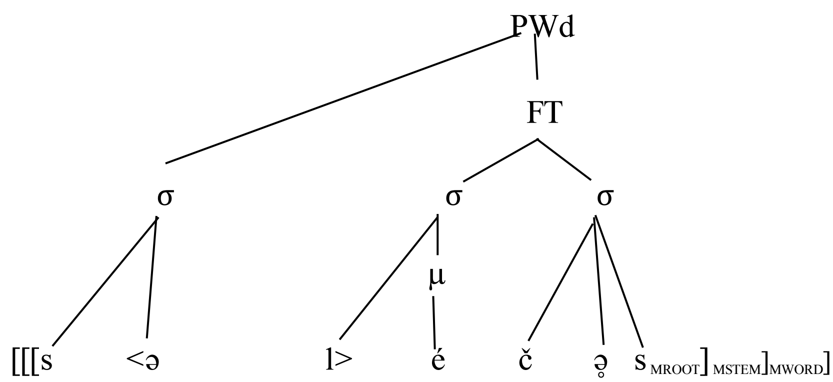
(49) ŚELPEKST
šəlpə́qst
√š<əl>p-əqs-ət
√whittle<PL>-nose-TRNS
‘to sharpen several points’ (Montler 2018: 611)

The observation that *<əl>* edge pivots after the initial consonant in these examples is the identical pattern observed for CVCəC words presented earlier in (31)-(36). The fact that these words pattern in the same way is suggestive that CVCC

[256] The analysis of the control transitive morpheme in this example and the next differs from that given in the SENĆOŦEN dictionary (see Montler 2018: 630).

shaped roots are disyllabic and are equal to left-headed feet.[257] The prosodic structure of *səléčs* is given in (50).

(50)



6.4.2 *<ʔlə>*

The morpheme *<ʔlə>*[258] is an example of a prominence pivot and pivots after the stressed vowel of a monosyllabic root.[259] This is illustrated in (51)-(56).

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[257] Following arguments in Chapter 5, a schwa is assumed to be present between second and final consonants of the root. In the case of *šəlpə́qst* the assumption is that the control transitive suffix-*ət* is parsed directly to the word level and the underlying schwa of the suffix does not surface due to a violation of syllable exhaustivity.

[258] This variant of the plural infix is sometimes analysed as <ʔlə> and sometimes analysed as <l̉ə> in the SENĆOŦEN dictionary. Throughout this dissertation this variant of the plural infix is analysed as <ʔlə>.

[259] Unpublished analyses of plural infix allomorphy include McKercher (1995) and Leonard (2011). Throughout this dissertation the variants of the plural infix are assumed to be weakly suppletive. The glottal stop is assumed to be underlyingly part of this variant of the plural infix. The glottal stop is not necessarily assumed to be part of the underlying form of the other plural infix variants. Hukari (1981) presents on the phonological issues associated with the plural infix allomorphy for Island Halkomelem. Further investigation into the relationship between phonology and morphology as it pertains to the variations in behavior observed for the plural infix patterns in SENĆOŦEN is warranted.

(51) SOŁ
sáɬ
√saɬ
√door/road
'road, trail' (Montler 2018: 546-547)

(52) SO,LEŁ
sá<ʔlə>ɬ
√sa<ʔlə>ɬ
√door/road<PL>
'several roads or doors' (Montler 2018: 546)

(53) NOS[260]
nas
√nas
√fat
'to be fat, corpulent' (Montler 2018: 373)

(54) NO,LES
náʔləs
ná<ʔlə>s
√fat<PL>
'several fat people or animals, lots of fat' (Montler 2018: 372)

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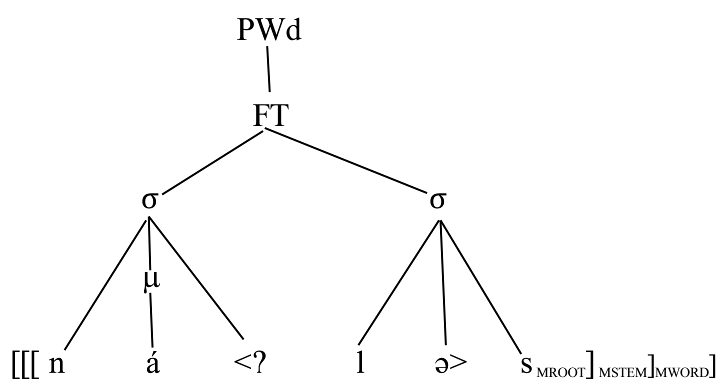
[260] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 373). The example in (51) uses the first meaning.

(55) SȾOM,
s-t̓ᶿám̓
s-√t̓ᶿám̓
√bone
‘bone’ (Montler 2018: 575)

(56) SȾO,LEM,
st̓ᶿáʔləm̓
s-√t̓ᶿá<ʔlə>m̓
s-√bone<PL>
‘several bones’ (Montler 2018: 575)

The prominence pivot of the variant *<ʔlə>* after the stressed vowel in monosyllabic words places the schwa in the correct position to serve as the head to the second syllable of a right-aligned left-headed foot. The prosodic structure for *náʔləs* is given in (57).

(57)



6.4.3 *<lə>*

The variant *<lə>,* which is a prominence pivot, pivots after the stressed vowel in the following examples.

(58) MÁ,ȻEŁ
mé?kʷəɬ
√mé?kʷ-aɬ
√injure-DUR
‘to get hurt, injured, wounded, broken, out of order’
(Montler 2018: 334)

(59) MÁLE,ȻEŁ
méləʔkʷəɬ
√mé<lə>ʔkʷ-aɬ
√injure<PL>-DUR
‘to get hurt, injured, wounded (of a group)’ (Montler 2018: 334)

(60) KÁ,Ṉ̲I,
q̓éʔŋiʔ
√q̓éʔŋy̓
√girl
‘girl, unmarried young lady, maiden (approximately age 13-20)’
(Montler 2018: 222)

(61) KÁLEṈI,
q̓éləŋiʔ
√q̓é<lə>ŋy̓
√girl<PL>
‘a group of maidens, girls’ (Montler 2018: 222)

(62) SĆÁ,ĆE,
sčéʔčəʔ
S-√čéʔčəʔ[261]
S√friend
‘friend/relative’ (Montler 2018: 449)

[261] Montler (2018: 449) says that this might possibly be an example of frozen reduplication.

(63) SĆÁLE,ĆE,
sčéləʔčəʔ
S-√čé<lə>ʔčəʔ
S√friend<PL>
‘a group of friends, relatives’ (Montler 2018: 451)

(64) Á,LEṈ[262]
ʔéʔləŋ
√ʔéʔləŋ[263]
√house
‘house, home.’ (Montler 2018: 5-6)

(65) ÁLE,LEṈ
ʔéləʔləŋ
√ʔé<lə>ʔləŋ
√house<PL>
‘a group of houses’ (Montler 2018: 5)

The pivot location for <lə> places the schwa in a location where it can serve as the non-head of a left-headed foot. These words pattern most similarly to the CVC root, which take the <ʔlə> plural infix, presented in (49)-(54), as opposed to the other types of words, which take the <əl> infix, presented in (51)-(56). The bases that take <lə>, presented in (58)-(65) are perhaps complex morphologically where the infix is targeting only the root, rather than the whole word. For example, *méʔkʷəɬ*, has the

[262] This word is documented in the SENĆOŦEN dictionary with three meanings (Montler 2018: 5-6). The example in (53) uses the first meaning.
[263] This could be phonological evidence that the word is morphologically complex and that the root for house is *√ʔéʔl.*

durative suffix *-ał*. The word *sčéʔčəʔ,* as Montler (2018: 449) points out, might be frozen CVC-reduplication and the word *ʔéʔləŋ* may have had a middle suffix *-əŋ*.[264] If this is in fact the case, then it is plausible that these CVCC roots count as monosyllabic. [265] The foot is aligned to the right edge of the root, rather than the right edge of the word and there is a mismatch between the morphological edge of the root and the phonological edge of the foot due to a requirement that syllables have onsets. The final consonant of the morphological root has to serve as onset to the following vowel and thus is not parsed within the metrical foot. The prosodic structure for the word *méləʔkʷəł* is given in (66).

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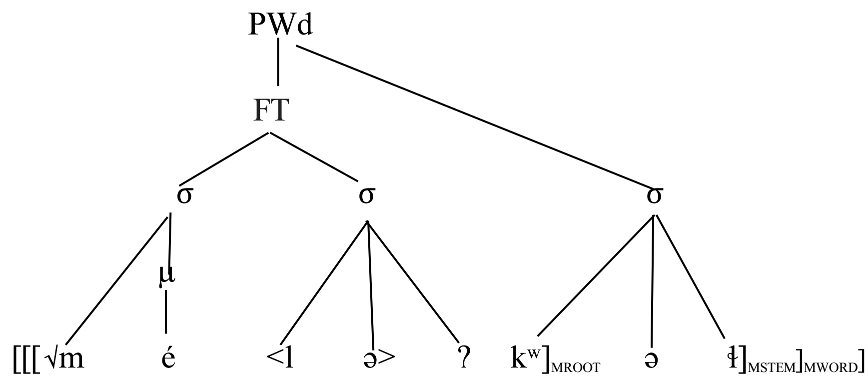
[264] Accounting for *q̓éʔŋiʔ* is more difficult. It may have the relational suffix *-ŋi*. Although, if that is the case, a question that arises is why the glottal stop surfaces at all.

[265] This is in contrast to CVCC roots which do not have glottal stop which take the *-əl* plural and which pattern as though they are disyllabic.

(66)



6.4.4 < *Cəl* > ~ <*Cəl̓*>

The plural variants <*C_1əl*> and <*C_1əl̓*>, examples of edge pivots which are pivoted before the initial consonant of a disyllabic root, have as their second consonant an [l] or [l̓] respectively. The<*C_1əl*>variant is illustrated in (67)-(72).[266]

(67) SILE,
sílәʔ
√sílәʔ
√grandparent
'grandparent' (Montler 2018: 490)

(68) SELSILE,
sәlsílәʔ
<C_1әl>√silәʔ
<PL>grandparent
'a group of grandparents' (Montler 2018: 477)

(69) SÁLES
sélәs
√selәs
√hand
'hand, paw' (Montler 2018: 439-440)

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[266] If the /l/ in the root is not glottalized, then the /l/ of the plural will also not be glottalized.

(70) SELSÁLES
səlséləs
<C_1əl>√seləs
<PL>√hand
‘several hands.’ (Montler 2018: 477)

(71) S,ÁLEW̱[267]
sʔéləxʷ
√ʔeləxʷ
√elder
‘elder’ (Montler 2018: 440)

(72) SEL,ÁLEW̱
sʔəlʔéləxʷ
s-<C_1əl>√ʔeləxʷ
<PL>√elder
‘a group of elders’ (Montler 2018: 473-474)

The <*C_1əl̓*> variant is illustrated in (73)-(76) for <*C_1əl̓*>.

(73) SDÁLṈEW̱
st̓élŋəxʷ
S-√t̓el-ŋəxʷ
S-√medicine-being
‘medicine’ (Montler 2018: 465)

[267] This word is documented in the SENĆOŦEN dictionary with two meanings (Montler 2018: 440). The example in (71) uses the first meaning.

(74) SDEL,DÁL, N̲EW̲[268]
st̓əl̓t̓él̓ŋəxʷ
s-<C_1əl̓>√t̓el̓-ŋəxʷ
s-<PL>√medicine-being
‘lots of medicine’ (Montler 2018: 466)

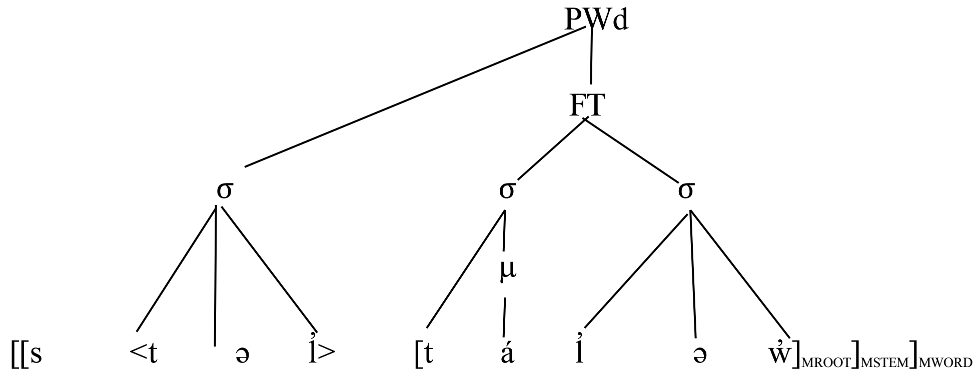
(75) STOL,EU,
stáʔləw̓
s-√táʔləw̓
s-√river
‘river’ (Montler 2018: 568)

(76) STEL,TOLEU,
stəl̓táʔləw̓
s-<C_1əl̓>√taʔləw̓
s-<PL>√river
‘several rivers’ (Montler 2018: 566)

Edge pivoting <*C₁əl*> or <*C₁əl̓*> before the initial consonant of the root serves two purposes. Firstly, it places the schwa outside of the prosodic foot ensuring that it is aligned to the right edge of the word. Secondly, it avoids a violation of *LATVLAT* which Kiyota (2003) argues is an OCP violation. The prosodic structure for *stəl̓tál̓əw̓* is given in (77).

[268] In this word the left-headed foot is aligned to the end of the word, rather than to the end of the root. This suggests that the parsing of suffixes inside and outside morphological word domains may not always be the same for every type of suffix. The morpheme *-ŋəxʷ* is classified as a lexical suffix (Montler 1986). It might be the case that this lexical suffix counts as part of the prosodic foot. Some work exists which investigates the interface between morphology, phonology and syntax and word constituency in SENĆOŦEN (see Czaykowska-Higgins & Leonard 2015, Huijsmans 2015, Kiyota 2003, Leonard 2009). Further investigation, following description and analysis laid out by Czaykowska-Higgins (1996, 2004b), into the patterns of suffixes with respect to the interface between morphology, syntax and phonology in SENĆOŦEN warrants further research.

(77)



This section has argued that the location and shape of the plural infix is conditioned by the prosodic shape of the root and the resulting prosodic shape of the plural form. The ideal goal of a morphologically derived word in SENĆOŦEN is to have a right-aligned trochee. This ideal can be interrupted by complications arising from morphological complexity of a plural target stem.

6.5 Conclusion

This chapter has argued that the distribution of schwa in four sets of morpho-phonological environments is predictable. The location of schwa is sensitive to the alignment of feet. The patterns described and analysed in this chapter support previous claims that SENĆOŦEN feet are left-headed and right-aligned (see Kiyota 2003, de Lacy 2007, Leonard 2007).

Chapter 7 Conclusion

This chapter serves as a summary of the main arguments of the dissertation and discusses the implications that those arguments have for past, current, and future theoretical and documentary work on Central Salish languages and SENĆOŦEN in particular. The central claim argued for in this dissertation is that there are two different types of phonological vowels in SENĆOŦEN, underlying full vowels and schwa. These two types of phonological vowels are differentiated by their phonological representations. The claim in this dissertation is that the set of full vowels are phonologically specified for a mora and for place features, whereas schwa is not specified for either a mora or place features. In addition, in this dissertation, schwa is argued to be a phonological vowel that can be both underlying or epenthetic. The claims, arguments and evidence presented in this dissertation support Montler's (1986, 2018) representation of vowels in SENĆOŦEN, that there is a set of underlying full vowels, and a schwa, which can be underlying or epenthetic. This differs from some of the Salish research which argues that schwa is always epenthetic (Czaykowska-Higgins 1993, Leonard 2007, Kinkade 1998a, Matthewson 1994, Shaw et al. 1999 among others), but agrees with other literature that says schwa can be underlying in some Salish languages (Bianco 1996, Urbanczyk 2001). SENĆOŦEN may fit into a typology of Salish languages, with respect to the inclusion or exclusion of schwa in the underlying vowel inventory, which may have something to do with factors affecting vowels, where the underlying schwa that is present in some Salish inventories is historically a full vowel that either has gone through a historical vowel shift, or that at some diachronic stage was reduced to schwa.

Two diagnostics are presented as evidence for the different phonological representation of vowels. The first diagnostic is the stress patterns of three syllable words where stress is shown to favour an underlying full vowel over schwa, providing evidence to support the proposal that underlying full vowels have a mora and schwa does not. The second diagnostic is one where the stress pattern of words with only schwa are shown to pattern in ways which support the proposal that some schwas are present at the underlying level, and some schwas are inserted after stress assignment has applied.

In this dissertation, Weight-By-Position is argued not to be active in SENĆOŦEN. This is evidenced by the observation that words with open and closed syllables containing only schwa vowels exhibit patterns in stress assignment where open syllables are permitted to be stressed in favour of closed syllables. In fact, all consonants are argued to be underlyingly non-moraic, evidenced by the observation that vocalised glides occur only in unstressed syllables. The claims in this dissertation that schwa and consonants lack mora have important implications for previous claims which have argued that 1) schwa can be moraic, and 2) that codas are assigned a mora in SENĆOŦEN (see particularly Stonham 1994, Davis & Ueda 2006, Zimmermann 2009, Bye & Svenonius 2012, Zimmermann & Trommer 2013). Interestingly, in ʔayʔaǰuθəm all consonants in coda position are argued to be moraic (Blake 2000b), in Squamish only resonant consonants in coda position are assigned a mora (Dyck 2004), and in this dissertation it is argued that in SENĆOŦEN no consonants are assigned a mora in coda position. This observation may prove to be a fruitful area of future comparative phonological research on Central Salish vowel patterns because it predicts that patterns of vowel reduction will exhibit differences in patterns across the languages which correlate with their moraic representations.

A crucial assumption made throughout this dissertation is that there is a relationship between stress and place features, where all unstressed vowels that are not derived from a glide consonant lack their own place features. Some support for this assumption can be found in Chapter 4, where a preliminary acoustic investigation of stressed versus unstressed vowels in SENĆOŦEN is presented. This preliminary investigation shows that unstressed vowels, whether derived from underlying full vowels, underlying schwa, or epenthetic schwa have less stable formant measurements across tokens of the same vowel type than stressed vowels, a property that is suggestive of coarticulation with surrounding consonants. A more extensive study of recordings from the SENĆOŦEN dictionary (Montler 2018), following the methodology laid out by Nolan (2017) for lək̓ʷəŋin̓əŋ is a useful area of future investigation into the phonetic characteristics of vowels in SENĆOŦEN.

Chapter 5 argues that, in general, syllable structure in SENĆOŦEN is simple. The usual shapes are CV and CVC where V can be a full vowel or schwa in stressed or unstressed syllables, and where V can also be a vocalised glide in unstressed position. The occurrence of complex syllable structure is shown to be rare and when it does occur, it is found either in borrowed words, or in environments where two adjacent lateral consonants rise in sonority toward the vowel. Elsewhere, sequences of adjacent consonants in SENĆOŦEN are argued to reside in separate syllables or be extraprosodic.

In Chapter 5 heterosyllabic consonant sequences are argued to fall into two categories. The first category is one where the initial consonant of a root initial consonant sequence is parsed by an epenthetic vowel, which is voiceless between two obstruents. Patterns of sonority sequencing, combinations of laryngeal features and manner of articulation, along with patterns of a schwa~zero alternation involving the control transitive suffix provide the evidence to support this proposal. Further support for the proposal that this inserted voiceless schwa is an epenthetic vowel (phonologically visible) rather than excrescent (phonologically invisible) comes from observing the patterns of obstruent and glide alternations in root initial position.

The second category is one where the obstruents are extrasyllabic. A case is made, in this dissertation, that obstruents are permitted to be extrasyllabic in two positions. The first position is at the word edge, both at the beginning and the end of the word. The second is word-internally. In the case, where the extrasyllabicity is tolerated word-internally the words look as though they are made up of two roots. It is likely that the location of the extrasyllabicity constitutes the edge of a morphological boundary. The standard assumption in the literature is that extrasyllabic segments, if permitted, usually occur at the edge of morphological domains. Future research investigating secondary stress and the lack of underlying full vowel reduction in longer and complex words may yield more insight into understanding why extrasyllabic consonants appear to be permitted word-internally.

In chapter 6, the predictable patterns of schwa distribution, observed in words with infixation, support abstractly representing schwa as a phonologically weightless and placeless vowel. In the context of full vowel~schwa alternations, schwa is shown to occur as the head of the unstressed syllable, rather than the stressed syllable (the non-head of a foot). Likewise, this pattern of schwa distribution supports previously proposed restrictions on foot shape and alignment in SENĆOŦEN that trochaic feet are aligned to the right-edge of the word (Kiyota 2003, Leonard 2007).

Taken together arguments and evidence presented in this dissertation support claims that schwa can be underlying, epenthetic, and derived from underlying full vowels in unstressed position (see van Oostendorp 1995, 1999, 2000). The arguments and evidence presented in this dissertation support, also, Montler's (1986, 1989, 2018) representation of schwa as a vowel that is both present as part of the underlying vowel inventory of SENĆOŦEN, and which can also serve as an epenthetic vowel in the language.

HÍ SW̱ KE SI,I,ÁM,

háy sxʷ q̓ə siʔiʔéḿ

Thank you respected ones

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