An Acoustic Investigation of Vowel Variation in Gitksan

By

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BA, University of British Columbia, 2016

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Abstract

The research question for this thesis is: *How does vowel quality vary across Gitksan speakers, and what sociolinguistic factors may be influencing this variation?* Answering this question requires both that I show *what* the variation is, and *why* it may be that way; I have approached these questions by conducting a study in two parts. First, I conducted a demographic survey and ethnographically-informed qualitative interview with nine Gitksan speakers. Second, I performed an acoustic analysis of vowel variation across these same speakers. The acoustic results lead me to conclude that the low and front vowels show the most variation between speakers. My findings allowed me to add to our understanding of individual variation across speakers and communities. Although further investigation is needed to come to a conclusion about the generalizability of these results, the overarching contribution of my work is to add phonetic detail to previous descriptions of variation between speakers within the Interior Tsimshianic dialect continuum.

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Acknowledgment

First and foremost, I would like to acknowledge the speakers who contributed to this study and to whom I also dedicate this thesis: Barbara Sennott, Art Sampson, Louise Wilson, Glenn Williams, Dr. Jane Smith, Myrna Hill Aksidan, Hector Hill, Ray Jones, and Vincent Gogag. Second, I would like to thank my supervisor, Dr. Sonya Bird, and my committee members, Dr. Alexandra D'Arcy and Dr. Henry Davis. I would also like to thank the members of UBC Gitlab, especially Michael Schwan. Furthermore, I acknowledge the scholars who produced the work on which I was able to base this research for their dedication and hard work. Lastly, I would like to thank my friends, family, supportive partner, and colleagues who have helped motivate me. You know who you are, and that I couldn't have done this without you. *Ha'miyaa.*

Chapter 1: Introduction

1.1 Project Goals and Key Terms

This thesis provides detailed documentation of the surface vowel inventory of nine speakers from six Gitksan communities. Vowel quality is an established feature of accent and dialect across varieties of English (W. Labov, Ash, & Boberg, 2006), and is often a starting point of investigations in variation. Observations about differences in vowel quality have already formed part of established evidentiary claims for dialectal variation within Gitksan, which will be described in detail in Chapter 2 (Fortier, 2016, 2018; Rigsby, 1986; Tarpent, 1987). Thorough acoustic documentation that supports these claims has so far been sparse, and this thesis attempts to supplement existing works.

I use the term *dialect* in this thesis to reflect variation in demographic background and language use across speakers from different villages. I then describe the relevant Gitksan socio-cultural history and characteristics, which I refer to as *Gitksan language context.* With the intention of addressing community revitalization needs and furthering empirical knowledge about vowel variation across Gitksan dialects, the research question for this thesis is: *How does vowel quality vary across speakers of Gitksan, and what sociolinguistic predictors may be influencing this variation?*

To address this two-part question, I conduct (i) a qualitative investigation of speaker responses to a demographic survey and qualitative interview regarding what factors they feel influence the way that they speak, and (ii) a quantitative acoustic study of vowel spaces across these same speakers. I consider each speaker's vowel plot against their demographic backgrounds according to the qualitative factors identified in part one, to develop descriptive

speaker profiles. This culminates in an illustrative figure of all speakers' vowel plots in order of their village of origin from East to West, presented alongside a map of Gitksan territory (Figure 26, p. 70).

With this work, I contribute to Gitksan language revitalization by providing suggested transcriptions based on the dialect identities and pronunciations of the speakers who participated in this study (section 4.4), and word recordings for the Gitksan Mother Tongues Dictionary, a mobile-interfaced multi-dialectal dictionary (formerly Waldayu Mobile) (Pine, 2017). I also add some (preliminary) detail to the empirical understanding of the Interior Tsimshianic dialect continuum, as it relates to vowel inventories (section 4.3). In this way, my contributions are both theoretical and practical.

1.2 Thesis Outline

This thesis is organized as follows: Chapter 2 offers a literature review, which begins with a description of the Gitksan language context, including a review of the literature to date on Gitksan's underlying phonological inventory (subsection 2.2.1), a description of the status of schwa as an underlying and surface vowel (subsection 2.2.2), a description of surface phonetics and co-articulatory patterns (subsection 2.2.3), and a discussion of the variation between /a/ and /e/, an alternation that has been previously employed to divide Gitksan into two dialects: Eastern and Western (subsection 2.2.4). Section 2.3 introduces the sociolinguistic and dialectology literature that is relevant to this thesis. I give a broad description of the field of dialectology, before narrowing in on three relevant dialectology studies in minority language contexts (subsection 2.3.1). I then discuss the sociocultural characteristics of Gitksan that may be of import from a dialectology research perspective (subsection 2.3.2). In section 2.4 I contextualize my research question within the body of literature I have reviewed.

Chapter 3 describes the specific methods I use to address my research question and hypotheses. In section 3.1 I describe my position as a white researcher raised in Canada engaging in research to support Indigenous language revitalization. I then introduce the speakers who worked as consultants on this project in section 3.2. In section 3.3 I discuss my data collection instruments, and in section 3.4 I present my elicitation materials (also available in Appendices A & B), which consist of a demographic questionnaire, qualitative interview, and wordlist. I then detail my specific elicitation procedures (section 3.5) and methods for processing and analyzing both the speakers' qualitative responses and recorded wordlists.

Chapter 4 presents my results, in three parts: qualitative results (section 4.1), quantitative results (section 4.2), and an examination of evidence of a dialect continuum (section 4.3). My analysis of speakers' responses in the qualitative interviews, on factors they felt influenced their way of speaking, (subsection 4.1.2) revealed four themes that were common among the group: (i) language/dialect contact, (ii) socio-cultural characteristics of Gitksan tradition, (iii) engagement in language revitalization initiatives, and (iv) experience with residential schools and colonialism. Section 4.1.2 summarizes my participants' demographic backgrounds, and 4.1.3 summarizes my qualitative results as a whole.

Section 4.2 gives my quantitative results. This begins with a broad IPA inventory that includes pronunciations from all dialects, illustrated by a summary vowel plot. Section 4.2.1 gives an acoustic description and summary demographic profile of each speaker, considered alongside the ethnographic information I gathered from each speaker in the previous section. I make some novel observations of vowel quality not captured by the existing literature on Gitksan. This section concludes with a geographic-acoustic map of my findings, in Figure 26.

Section 4.3 considers whether these acoustic findings could be evidentiary support for a dialect continuum. Section 4.4 summarizes Chapter 4, focusing on what findings support existing literature, novel findings, and how Chapter 4 addresses the research question.

Chapter 5 discusses my findings and concludes this thesis. Section 5.1 focuses on describing community outcomes related to the findings of this thesis and additional contributions. Section 5.2 reviews my methodological observations regarding dialectology in the Gitksan language context and revisits the research question by expanding on the idea of geographic dialect continua. Section 5.3 reviews the unexpected findings I made during my acoustic analysis and points out some areas that may be better addressed by a phonological investigation. Section 5.4 reviews the methodological and contextual limitations of this project. Section 5.5 summarizes my most important findings from across the three phases of my investigation, while considering their contributions. Section 5.6 summarizes future research avenues based on the findings and outcomes of the project. Section 5.7 summarizes this thesis and details take-home messages, touching on community and methodological goals.

Chapter 2: Literature Review

2.1 Introduction to the Gitksan Language Context

The Tsimshianic language family comprises of a Coastal (Maritime) and Interior branch. The Interior branch includes Gitksan and Nisg̲a'a, which are fully mutually intelligible (Brown, Davis, Schwan, & Sennott, 2016, p. 367). Gitksan and Nisg̲a'a have been described as dialects of Interior Tsimshian, sometimes described as part of a Tsimshianic dialect continuum and grouped under the name Nass-Gitksan (Hindle & Rigsby, 1973, p.2). Coast Tsimshian and Southern Tsimshian do not border on Gitksan territory to the same extent as does Nisg̲a'a. However, the Coast Tsimshian community of Kitselas was an important 'border community' with Western Gitksan villages (Henry Davis, Personal communication, November 8th, 2018). Coast Tsimshian shares river connections through the Nass and Skeena rivers with Gitksan and Nisg̲a'a, promoting trade and dialect contact. The map in Figure 1 shows the relevant territories; both Coast and Southern Tsimshian are labeled 'Tsimshian' in this Figure. Maps showing a closer view of Gitksan territory are used starting in Chapter 3.

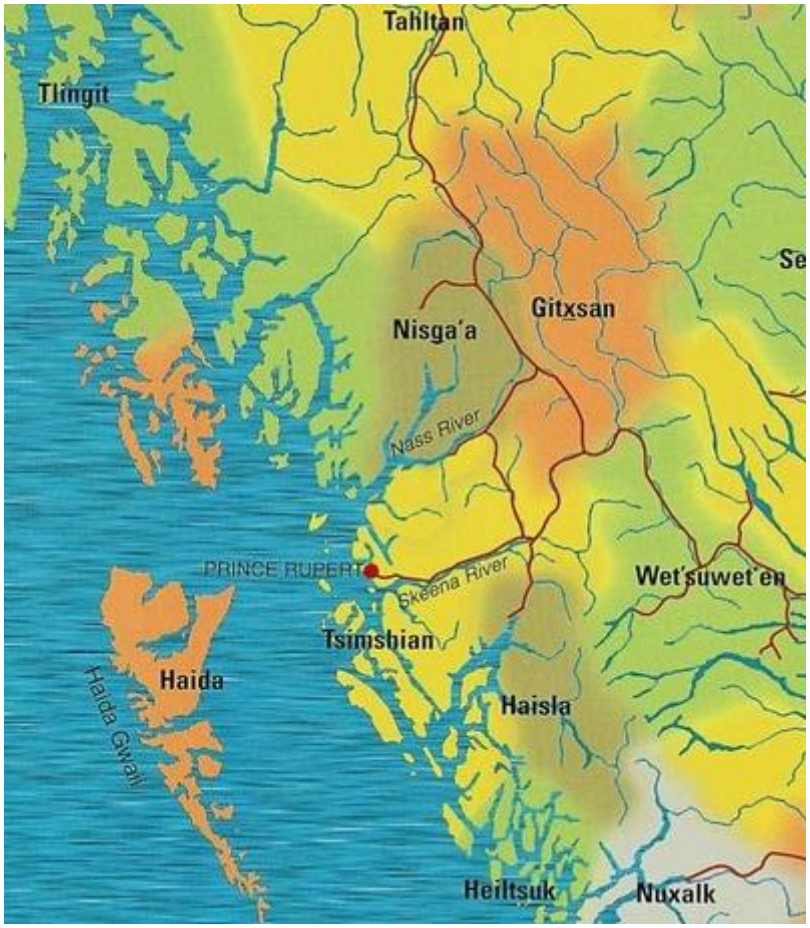

Figure 1: Partial map of Northern BC (Province of British Columbia, 2017).

According to the First Peoples' Cultural Council's (FPCC) *Third Edition of the Report on the Status of B.C. First Nations Languages,* the Tsimshianic language family currently has 1,218 active language learners (Dunlop, Gessner, Herbert, & Parker, 2018).[1] Southern Tsimshian currently has no speakers; as of 2018, Coast Tsimshian has 58 fluent speakers and Nisg̲a'a has 331 (Dunlop et al., 2018; Gessner, Herbert, Parker, Thorburn, & Wadsworth, 2014). There are approximately 528 fluent speakers of Gitksan and approximately 344 community members are actively engaged in language learning (Dunlop et al., 2018). All fluent first language speakers

[1] The 2018 FPCC report uses self-reporting as a measure of speakers numbers.

are approximately above the age of 50 (Henry Davis, Personnal communication, November 8th, 20180, and the language is therefore critically endangered, according to the definition offered by Lewis & Simons (2010). The 2018 FPCC report demonstrates an increase in language vitality from the last report in 2018, though all Indigenous language in BC remain critically endangered (Dunlop et al., 2018). This forms a part of the history and framework of Indigenous languages of British Columbia, which is unique in its concentrated linguistic diversity in combination with the impact of colonial history on language use and cultural practices (Gessner et al., 2014).

Documentation and revitalization work is ongoing both within Gitksan communities and in partnership with universities (e.g. UBC's Gitksan Research Laboratory, Gitlab, which supported this thesis and my development as a linguist). Members of Gitlab are in ongoing consultation with community members through weekly elicitations, fieldwork, community conference attendance, and collaborative publications (such as the Gitksan Mother Tongues Dictionary (Pine, 2017)).

The two major grammatical reference works for Interior Tsimshianic are Rigsby's (1986) *Gitksan Grammar,* and Tarpent's (1987) *A Grammar of the Nisgha Language.* Other important references include Hindle & Rigsby (1973); Mathews & Wale (1996); Rigsby (1989). Based on this collection of work (among others), Gitksan is thought of as having two dialect groups: Eastern and Western (Rigsby, 1986; Tarpent, 1987). These are also referred to as Gyeets (or Gigyeets, literally 'downriver', referring to the Western) and Gigeenix (literally 'upriver', referring to the Eastern)[2] (Mathews & Wale, 1996) by some linguists and speakers. More recent scholarship of Gitksan has suggested six dialects (thought to make up a dialect continuum),

[2] Only one speaker who participated in this study discussed dialect in terms of these descriptors, and so I do not refer to them further.

corresponding to the six extant villages (Brown, 2008; Brown, Davis, Schwan, & Sennott, 2016). Within this dialect classification, the villages are organized as presented in Table 1:

Table 1: Gitksan villages (Traditional and English names) within the East-West dialect classification

Eastern		**Western**	
Traditional Name	**English Name**	**Traditional Name**	**English Name**
Ansbayaxw	Kispiox	Git-wangax̲	Kitwanga
Sigit-’ox̲	Glen Vowell	Git-anyaaw	Gitanyow
Git-an’maaxs	Hazelton	Gi-jigyukwhla	Kitseguecla or Gitsegukla

An alternate view is that each village represents a unique dialect, though the East/West classification is still commonly used. Historically, there may have been additional dialects, stemming from two or more additional communities north of those listed here, from which community members were relocated (Ball, 1998). These are Gisg̲ag̲a’as and G̲aldo’o (north east) and Anlak̲ (north west). Brown et al. (2016) identify the primary dialectal differences in the six-way division as a lexical shift in vowels and palatalization of velar stops in the Eastern dialects (367) (the vowel shift is discussed in 2.2.4). There are also lexical differences between the dialects, which speakers commonly attribute to different trade interactions as well as geographic and/or cultural differences between the villages.[3] There is currently no data available regarding numbers of speakers of specific dialects.

[3] For example, the Western dialects have a word for ‘octopus’, *hats’elda*, which a consultant from Gitanyow explained to me was present in his dialect because of fishing trade with the Coast Tsimshian peoples. I have not been successful in eliciting a word for octopus from consultants from any other village.

2.2 Gitksan Sound System

Scholars have observed a great deal of phonemic and phonetic variation in Gitksan. Over the last 40 years, different perspectives on the observations offered in the earlier literature have emerged. To ground my thesis in the existing body of literature, this subsection synthesizes these varied approaches to understanding Gitksan's sound inventory.

2.2.1 Phonological inventory.

The primary reference for phonological descriptions of the sound inventory of Eastern Gitksan is Rigsby's (1986) grammar of the Gitksan language. This is the only detailed grammar that exclusively describes Gitksan. In subsequent years, several works have added detail to Rigsby's initial inventory, most notably Brown (2008) and Brown et al. (2016), which is a detailed phonetic and phonemic description of Eastern Gitksan from Ansbayaxw. For the Western dialect, the closest detailed phonemic description is found in Tarpent (1987), *A Grammar of the Nisgha Language*.

Figure 2 provides the consonant inventory of Easter Gitksan, adapted from Brown (2008), based on Rigsby's (1986) account:

	Labial	Coronal			Velar		Uvular		Glottal	
Stop	p	t	t͡s		k	kʷ	q		ʔ	
Glottalized Stops	p’	t'	t͡s’	(t͡ɬ’)	k’	kʷ’	q’			
Fricative		s		ɬ			x	xʷ	χ	h
Sonorant	m	w	n	l	j					
Glottalized Sonorants	m’	w’	n’	l’	j’					

Figure 2: Brown’s (2008) Phonological Consonant Inventory of Gitksan

Note especially that the inventory contains uvular consonants and labialized stops. These are relevant for our later discussions of co-articulation. The palatals are also relevant; observe /j/ and /j’/. Surface palatalization of velars /k, g/ is a distinctive feature of the Eastern variety of Gitksan.[4] I have used the terms ‘glottalized stops’ and ‘glottalized resonants’ over ‘ejectives’ to reflect the lenis quality of Gitksan ejectives (c.f. Kingston, 1985; Schwan, 2013).

Rigsby (1986) proposed the underlying vowel inventory for Eastern Gitksan in Figure 3, with a phonemic length contrast, where ‘ː’ marks long vowels.

[4] Note however that co-articulation from phonemic palatals has not yet been observed in the literature, though there is documentation of the co-articulatory effects of palatals in many other languages of the Pacific North West (c.f. Nolan, 2007).

	Front	Central	Back
High	i, iː		u, uː
Mid	eː		oː
Low		a, aː	

Figure 3: Rigsby's (1986) Phonological Vowel Inventory of Gitksan

Brown et al. (2016) agree with Rigsby's phonemic inventory except for the inclusion of schwa. Figure 4 (from Brown et al. 2016) shows the underlying inventory of Gitksan, based on the pronunciations of two speakers (sisters Barbara Sennott[5] and Doreen Jensen†, of Kispiox) of the Eastern variety (Figure 5 in the next section gives surface forms):

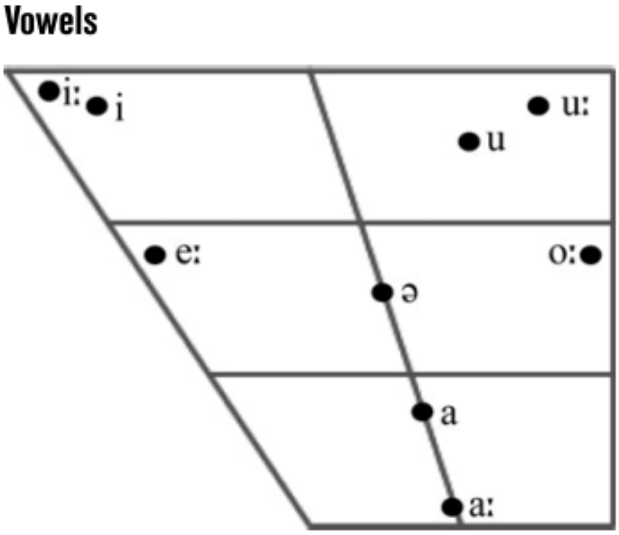

Figure 4: Phonological inventory from Brown et al. (2016)

The following minimal pair illustrates the phonemic length contrast for the high front vowel (Brown, Davis, Schwan, & Sennott, 2016):

[5] Ms. Sennott is also a participating speaker in this study.

(1) is[6]
/is/
[ʔis]
‘soapberries’

(2) iis
/iːs/
[ʔiːs]
‘necklace’

Note that /eː, oː/ do not have corresponding short vowels in Figures 3 and 4, as the rest of the vowels in the inventory do. Rigsby’s view was that short /e, o/ may have been phonologically ‘emerging’ in Eastern Gitksan at the time of his fieldwork (p. 208-209).

According to Rigsby (at the time of his fieldwork), the Western variety had [ɛ] only as an allophone of /a/, which is assumed to be the underlying form of [a, ɑ, ɛ] surface variants (this is an important distinction which is further discussed in 2.2.4) (p. 209). To understand what further inferences we can make about Western Gitksan, it is useful to understand the phonemic vowel inventory that Tarpent posits for Nis̲ga’a (Figure 5):

	Front	**Central**	**Back**
High	i, iː		u, uː
Mid	e, eː		o, oː
Low		a, aː	

Figure 5: Tarpent’s (1987) Phonological Vowel Inventory of Nis̲ga’a (p. 119)

[6] Line 1 of the examples in this thesis indicates the community orthography, line 2 is the underlying phonemes, line 3 is the surface (phonetic) form, and line 4 is the English translation.

As in all Tsimshianic languages, vowel length is phonemic in Nisg̲a'a. In fact, Nisg̲a'a has the same phonological minimal pair as shown in examples (1-2), except that in Nisg̲a'a (as well as in some varieties of Gitksan), *iis* means 'urine'.[7] Note that Tarpent's phonological inventory of Nisg̲a'a, as presented in Figure 5, includes both short /e/ and /o/. Tarpent observes that underlying /e/ is "very rare" (Tarpent 1987: 121), and provides the following examples in which /e, eː/ are in near-minimal pairs:

(3) ts'ex̲
/c'eχ/
[ts'ɛχ]
'mountain juniper'

(4) ts'eek̲'
/c'eːq'/
[ts'ɛːq']
'to be deaf; pus from the ears'

(5) ye'e
/yeʔ/
[yɛʔˠ]
'grandfather' (form of address)

(6) yee
/yeː/
[yɛː]
'to go, walk'

Though there are no perfect minimal pairs that show this contrast, (3-6) illustrate that /e, eː/ do seem to be underlyingly contrastive.[8] Note that (5) shows an example of an 'echo vowel' in the phonetic transcription line. This is a phonetic feature that has been observed in Nisg̲a'a as well as Gitksan (Egelhoff & Babel, 2018; Tarpent, 1987). Given Tarpent's observation that the distribution of short /e/ is "very rare", one could surmise that it is likely an allophone of a

[7] 'iis' may also mean urine in Gitksan; as of my 2017 fieldwork, it seems that the word may be falling into disuse for either definition.
[8] Note that in each of these cases, short [e] appears before a back consonant (uvular or glottal). This suggests that it's underlying quality may be higher, as in /i/, and that the vowel is being lowered.

phoneme with a broader distribution. However, it is also contrastive with short /a/. Recall example (5), compared with the following:

(7) ya’a
/yaʔ/
[yaʔ$^{\Lambda}$]
‘spring salmon’

Between examples (5, 7), /a/ and /e/ clearly introduce a meaning contrast in Nisg̲a’a. Tarpent further observes that there is sometimes “free variation” (123) between long /eː, aː/ in Nisg̲a’a, at the surface level, although acoustic analysis has yet to confirm this.

Tarpent also provides minimal pairs that show a length contrast for /o, oː/:

(8) t’ok̲
/t’oq/
[t’ɔq]
‘to claw at’, transitive

(9) t’ook̲
/t’oːq/
[t’ɔːq]
‘to suck at’, transitive

(10) yo’oks
/yoʔoks/
[yɔʔ^{ɔ}ks]
‘to wash’, transitive

(11) yoo’oks
/yoːʔoks/
[yɔːʔ^{ɔ}ks]
‘to wash’, transitive, plural

(8-11) illustrate that the length contrast between /o/ and /oː/ introduces a meaning distinction, providing evidence that both /o, oː/ are phonemic in Nisg̲a’a.[9] Moreover, Tarpent

[9] As in (3 – 6), these vowels may be lowered (in this instance from /u/).

does not observe /o/ to be rare, as she does /e/. This suggests that at least in Nisg̲a'a, one can safely argue that /o/ is an independent phoneme.

Given Rigsby's observation that (i) short /e, o/ may be phonologically 'emerging' in Gitksan (Eastern and Western) and (ii) Tarpent's proposal that they are present in neighbouring Nisg̲a'a (though /e/ is rare and may require further investigation), then /e,o/ may well be underlyingly present in at least the Western variety of Gitksan. In fact, as I discuss in section 3.4, it became clear early on in my compilation of materials and pilot elicitations that many Gitksan speakers likely had distinct /o/, and I did eventually proceed with this assumption in my wordlist elicitation. As I show in 2.1.4, there is a similar, albeit more complicated, discussion to be had about /e/. In contrast to /o/, I did not proceed with the assumption that /e/ is underlying (including in Western). The reason for this is further expanded upon in 2.1.4.

2.2.2 Schwa.

In addition to the underlying phonemes in Figures 2 & 3, Brown et al. (2016) and Tarpent (1987) posit schwa as underlyingly present in Gitksan and Nisg̲a'a (see Figure 4 for Gitksan). Tarpent posits [ɪ, ɑ, ʊ, ɛ, ɔ] as possible surface forms of schwa. Rigsby (1986, p. 58) also observed that some morpheme final vowels might in fact be an underlying schwa segment. Rigsby's perception is that these vowels are similar in quality to surface allophones of /a, i, u/, conditioned by the features of adjacent consonants. Even though both Rigsby and Tarpent seem to suppose that the schwa segment is underlyingly present, neither of them includes schwa as a phoneme in their proposed vowel inventories. In contrast, Brown et al. (2016) explicitly include it in their phonemic inventory of Eastern Gitksan (see Figure 4).

Examples (12-13) exemplify underlying schwa (bolded in the following): /kʲ**ə**phajkʷ/. Brown et al. propose that underlying schwa is restricted to a subset of Gitksan's function words

(p. 371), where its surface realization varies as a function of the preceding consonant ([a] next to a back C, [u] next to a rounded C, [o] next to a back rounded C, [i] elsewhere). This is supported by my own research that suggests that the short vowels in some categories of function words may be underlyingly schwa (Fortier, 2017). Schwa appears only in unstressed position, however, and so will not be considered in this thesis, which only looks at full vowels in stressed position (see section 3.4 for a description on how I selected the target vowels in elicitation).

In addition to underlying schwa, recent work has identified epenthesized (surface) schwa in Gitksan. The following examples are adapted from Brown et al. (2016):

(12) /kʲəphaj**kʷ**/
[gʲɪpajkʷ]
'fly'

(13) /kʲəphaj**kʷ-m** tsəxʲtsʼikʲ/
[gʲɪpaj**gum** dzix tsʼɪk]
'airplane'

Schwa epenthesis is evident in example (13) between the morphemes /kʲəphajkʷ/ and /-m/. [kʷm] is not a legal consonant cluster in Gitksan (Brown, 2010), and schwa is therefore epenthesized to break it up. Rounding from the labialized velar spreads to the epenthesized schwa, resulting in the surface form transcribed as [u] by Brown et al. (2016).[10] This is but one co-articulatory process that has been observed in Gitksan (see 2.1.3); the authors note that schwa can also surface as [a, ɪ], and this may be the more common process given the relative frequency of rounded versus unrounded conditions.

2.2.3 Surface phonetics & co-articulation.

In addition to the phonemic inventories given in Figures 2-4, Gitksan displays a variety of surface allophones of its vowels, conditioned by co-articulatory effects formalized

[10] I suggest that this segment may be more narrowly transcribed as [ʉ] or [ʊ] based on the phonetic inventory in Figure 6 and my own transcription experience with Eastern speakers.

phonologically as a set of phonotactic constraints (Brown, 2008, 2010; Brown & Hansson, 2008).

Figure 6, reproduced from Brown et al. (2016), shows the variation in one Eastern speaker's surface vowels[11], where individual vowel tokens are plotted along F1 (y axis) and F2 (x axis):

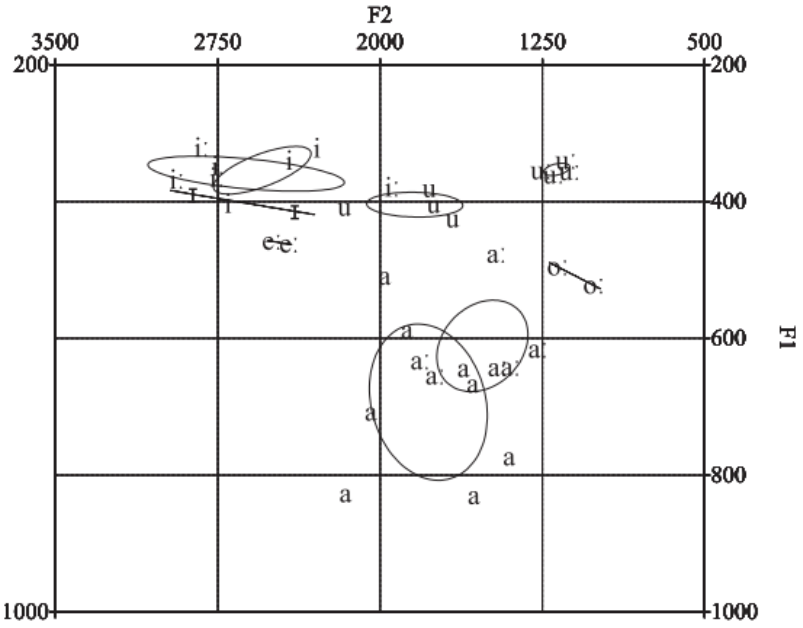

Figure 6: Scatter plot of vowel values from Brown et al. (2016)

Brown et al. (2016) note that labialized velar plosives and fricatives often round the following vowel, as illustrated with epenthetic schwa in example (13). Indeed, some of the [u] vowels in Figure 6 are underlyingly /u/ (high back segments) and others are likely underlyingly schwa, co-articulated with labial/labialized consonants (high central or back segments). Vowel lowering is also noted adjacent to uvular consonants, which is supported by additional studies on other languages of the Pacific North West (Fortier, 2016; Yamane-Tanaka, 2006).

[11] The underlying vowels for the segments captured in Figure 6 are not specified by Brown et al. (2016).

Brown et al. (2016) observe that additional processes phonetically condition the surface realization of underlying or epenthetic schwa (c.f. Brown, 2008; Rigsby, 1986; Tarpent, 1987). This is supported by my own preliminary research on the topic (Fortier, 2017). A detailed description of co-articulation effects is beyond the scope of my thesis. Uvular lowering and labialization in particular directly impact the construction of my wordlist, and so must be kept in mind (see section 3.4).

2.2.4 East and West: The a/e question.

As mentioned above, the main vowel feature that distinguishes East and West Gitksan dialects is a shift between [a] and [e/ɛ]. Rigsby observes that in some phonological environments (in particular where they are not followed by a uvular consonant), where the Eastern dialect has the short vowel [a], the Western dialect has the short vowel [ɛ] (sometimes given as [e]). For example, in examples (14-15) I present the Eastern pronunciation of the word for *liver* and *run,* and in examples (16-17) I present the Western pronunciation:

(14) ban
/pan/
[ban]
'liver'

(15) ba̲x̲
/paχ/
[bɑχ]
'run'

(16) ben
/pan/[12]
[bɛn]
'liver'

[12] Alternatively, /pen/, which would be in line with Tarpent's analysis that uses underlying /e/ in Nisg̲a̲'a.

(17) ba<u>x</u>
/paχ/
[baχ]
‘run’

In the Eastern variety (14-15), it is easy to see how this pattern has been described as uvular lowering: [a] → [ɑ] preceding [χ]. Uvular lowering is a well-documented co-articulatory process in Gitksan, which applies to both long and short vowels. Short vowels tend to be lowered across their duration, while long vowels are diphthongized with a secondary lowered vowel before the uvular (Brown, 2010; Fortier, 2016; Rigsby, 1986; Yamane-Tanaka, 2006). For example, in Figure 6, there are some especially retracted /a/ utterances, which reflect the quality of these lowered vowels in a pre-uvular environment. The Western variety exhibits a similar pattern but is shifted within the vowel space. In the non-uvular condition (coronal or otherwise) [ɛ] is present, with [ɛ] → [a] preceding [χ]. This difference in the application of the co-articulatory process may be due to a shift in the underlying representations of the low/front vowels between the varieties.

In sum, I proceed with the following assumed underlying phonological vowel inventory: /a, a:, e:, i, i:, o, o:, u, u:/. I expect to observe variation in /a/ in particular, as a function of dialect/language identity among speakers, which I turn to next.

2.3 Dialectology in the Gitksan Language Context

Crucial to my thesis is the aim of building an understanding of the intricacies and nuances of the meaning of ‘dialect’ and language identity in the Gitksan language context, and of the suitability and appropriateness of applying dialectology methods in this context.

2.3.1 Dialectology and the minority language context.

In its earliest forms, dialectology attempted to correlate language variation with geographic regions (Chambers & Trudgill, 1980). A modern illustrative example of this is Labov's Atlas of North American English, which shows how vowel pronunciation varies across geographic regions in North America (W. Labov et al., 2006). From its origins, dialectology quickly evolved to include a wide variety of sociolinguistic factors that can be correlated with language variation. Though geographic distance is still a commonly used variable, other variables such as age, sex, mobility, and socioeconomic status have been shown to correlate with language variation (c.f. William Labov, 1993). In trying to tease out the factors that influence variation in the Gitksan language context, these are important sociolinguistic dimensions to keep in mind. However, this is not a large-scale study like that offered by Labov et al. (2006). Such a study requires large amounts of data to produce reliable results, which is not possible in the Gitksan language context.

In asking how a dialectological study might describe the Gitksan language context, there are two possible conclusions that one expects to ultimately land on: (i) a geographic continuum (see Chambers & Trudgill (1980)) or (ii) a Sprachbund (see Schaller (1997)). The Sprachbund analysis is used to describe unrelated languages that influence one another. We know that the Gitksan dialects are related, so the continuum model is the appropriate choice (though it may be worth noting the possible influence of Wit'suweten on Eastern Gitksan).

Many of the available studies on variation have focused on heavily populated and/or widespread language families. A notable exception to this is Stanford's work with the Sui communities of Southern rural China, which have a population of around 200,000 (Stanford, 2008, 2012). Stanford's work has shown results that both align with and differ from traditional

dialectology perspectives, by engaging in analyses that incorporate culturally-specific factors like clan-based social structures. For example, Stanford found that Sui children's dialect acquisition is most influenced by their father's clan dialect (clanship is patrilineal) rather than their same-age peer group as has been shown for English (Eckert, 1988; William Labov, 1964; Stanford, 2008). Stanford describes the relationship between clan and dialect as stable despite movement and dialect contact, calling it a linguistic "act of loyalty" to one's "community of descent" (Stanford, 2007, 2009). Considering the context at hand, Gitksan phratries (sometimes called clans), which are matrilineal (see 2.2.2), may show linguistic loyalty in a similar way.

There is a small but developing body of literature that looks at variation across languages in the Pacific Northwest. Miyashita & Chatsis (2015) worked to develop and deliver Blackfoot language courses to a community of heritage speakers. The authors describe Blackfoot as an understudied language, and the minimal documentation that this affords leads to incomplete representation of varieties of Blackfoot in teaching materials. This prompted an investigation into what varieties of Blackfoot existed in the community, and what sociolinguistic factors were associated with this variation. Miyashita and Chatsis identified three variables that correlated with three types of variation in Blackfoot: (i) region, (ii) generation, (iii) register. It is important to note that while Stanford's work with the Sui operationalizes statistical methods to analyze data and test hypotheses, the Miyashita and Chatsis study is based on speaker perspectives and impressions (author Chatsis is herself a Blackfoot speaker). Each methodological approach yields different kinds of results. While Stanford's method produced robust quantitative data and statistical confidence, the kind of study offered by Miyashita and Chatsis offers qualitative data that is grounded in its context and generates rich reflections via ethnographic methods. In my

thesis, I combine interviews influenced by ethnographic methods with an acoustic study to offer both community-informed insights and empirical phonetic data.

2.3.2 The Gitksan language context and dialectology.

Methods such as dialectometry (cf. Stanford 2012) are heavily quantitative and so require large numbers of speakers and emphasize statistical confidence. This is not possible when working with a small speaker population (Gessner et al., 2014). Nonetheless, several members of the Gitksan community have requested dialect-focused documentation. While this requires a sociolinguistic eye, it would be inappropriate (and impossible) to impose rigorous statistical methods when investigating questions about dialect in the Gitksan language context.

While many of the commonly identified sociolinguistic variables are present in the Gitksan sociocultural context (such as age, gender, etc.), the Gitksan context also potentially offers a look at some sociocultural characteristics that are less commonly studied. Adams' (1973) study entitled *Gitksen Potlech: Population Flux, Resource Ownership, and Reciprocity* outlines several of the unique characteristics of the Gitksan sociocultural environment. Gitksan culture has a detailed set of feast protocols that serve several purposes. Feasts mark occasions (such as death, birth, marriage, and more), encourage social connections, and are a means of redistributing wealth and caring for the community (Adams, 1973). Feasts bring together communities that may not otherwise interact, often separated by significant distance, forming opportunities for linguistic contact between these groups. Feasts also have associated with them strict linguistic protocol for inviting, attending, hosting, and closing a feast (Adams, 1973). This differs depending on the type of feast being held, and the community who is holding it. Feasts are hosted by a particular phratry (a social structure that will be defined shortly), which passes

down their particular social and linguistic protocol for each type of feast. This forms an important part of one's dialect identity.

Gitksan culture has an intricate social structure consisting of houses and phratries, often spread between villages (due to exogamy) (Adams, 1973). Every person belongs to a house and phratry, which are inherited matrilineally (Cove, 1976). One's house and phratry are therefore the same as all one's matrilineal relatives, but different from one's patrilineal relatives. Houses are headed by a chief (and are named according to that chief's name, which is passed down), and are responsible for passing down names, allocating fishing spots, and passing down social knowledge (such as songs, dances, and myths) (Adams, 1973). They operate much like extended families, which also play an economic role. Phratries are larger groups, of which there are four: Ganeda or Lax Seel (Frog or Raven), Laxsgiik (Eagle), Gisk'aast (Fireweed or Killer Whale), Lax Gibuu (Wolf) (Hindle & Rigsby, 1973). There are multiple houses within each phratry.

Social customs around marriage are also historically strictly enforced. Marriage always happens between people from different phratries (Historica Canada, 2018). I have heard reflections from speakers that this serves the purpose of strengthening political and social relations between phratries and encourages variation in gene pools. One does not change one's house and phratry when one gets married. Due to the matrilineal social structure, upon marriage the husband is expected to move to his wife's village. Given the findings from Stanford (2007, 2009), these are important factors for consideration when engaging in sociolinguistic investigation in the Gitksan language context.

Given the discussion in this subsection, there are several sociocultural factors that could be investigated as possible sociolinguistic variables in the Gitksan language context. These include house and phratry (which are tied to matrilineal relations and feast experience), and

movement between villages for marriage. These may not be statistically testable variables in my study, given my small number of participants, but they remain potential predictors.

2.4 Research Question

My research question is: *How does vowel quality vary across speakers of Gitksan, and what sociolinguistic predictors may be influencing this variation?* This is in essence two questions: (i) What is the surface variation across speakers? (ii) Are there identifiable sociolinguistic predictors that can explain this variation? To address these questions, I designed a two-phase study. I first conducted a demographic questionnaire and qualitative (ethnographically-informed) interview (informed by the literature review in 2.2) to produce demographic profiles of each participating speaker. This allowed me to gain insights into what sociolinguistic predictors speakers themselves identify in their language context (see Miyashita & Chatsis 2015).

The second phase of the study was an acoustic analysis of vowel variation across speakers. I had anticipated two possible ways of conducting the quantitative analysis, depending on the spread of demographic factors across the participating speakers: (i) an ethnographically informed series of case studies of vowel variation among individual speakers (ii) an analysis of covariance between sociolinguistic predictors and variation in vowel quality. As I will describe in section 3.6, (i) turned out to be the most appropriate approach given the demographic backgrounds of the speakers I worked with.

Chapter 3: Methodology

3.1 Situating Myself & My Work

I am an outsider to the Gitksan community. I acknowledge that I am a white settler working on unceded Gitksan land for the duration of my fieldwork. As the descendant of white settlers, I have had the privilege to live and study on unceded Tsawassen, Musqueam, Skwxwu7mesh, Tsleil Waututh, Lekwungen and W̱SÁNEĆ lands for most of my life. This forms part of my inherent bias as a researcher and scholar. The strengths that I contribute to this project are those gained by my privilege to have attended a post-secondary institution and to have been given linguistic training: skills in field elicitation, acoustic analysis, and academic writing.

I first came to know members of the Gitksan community in September of 2014, during my fourth year at UBC (during which I took a Gitksan-focused field methods course). Shortly afterwards I began volunteering with the UBC Gitksan lab ("Gitlab"). Gitlab is co-directed by Dr. Lisa Matthewson and Dr. Henry Davis, and it was under Dr. Davis's supervision that I began to work with members of the community both in the lab at UBC, and on fieldwork excursions. Dr. Davis is also the principal investigator of a SSHRC funded multi-language dictionary project, of which the Gitksan dictionary project and the Gitksan Mobile Mother Tongues Dictionary are a part. I am greatly inspired by the Gitksan community's resilience and commitment to language revitalization, and the dedication of the linguists who support these initiatives.

Undertaking this research with the intent to contribute positively to the Gitksan community and avoid harm requires that I critically examine my methodology from an ethical perspective. My primary goal is to document the surface inventory of Gitksan vowels and

investigate sociolinguistic factors that relate to variation. This addresses community requests for the documentation of multiple dialects, and additional literature describing variation. I believe that my research is 'Empowering Research' under Czaykowska-Higgins's (2009) continuum of ethical research, because I strive to address community requests through the design and outcomes of my project.

3.2 Consultants

I conducted elicitations with nine fluent first-language speakers of Gitksan.[13] These consultants' ages range from approximately 50 to 80 years (not all speakers chose to share their exact age, stating simply that they were Elders). Full demographics of the participating speakers are given in section 4.1, and in-depth individual speaker profiles are provided in subsection 4.2.1. I worked with speakers from three communities typically identified as Eastern: Gitanmaaks, Ansbayaxw, Sigidak̲, and three typically identified as Western: Gitwangak̲, Gitsegukla, and Gitanyow, which are identified in Figure 7. These communities follow the Skeena River in a U-shape pattern, not in a simple horizontal East-to-West configuration. Gitanyow is located not on the Skeena but on the geographic corridor between Gitksan and Nisg̲a'a territories. Additional information about each of the participating speakers is included in section 4.1, and their speaker profiles make up most of section 4.2.

[13] I was not able to complete my wordlist with one speaker, Hector Hill, and so his responses appear in my qualitative results (section 4.1) but not my quantitative or integrated results.

Figure 7: Map of Gitksan territory showing consultants' villages of origin, adapted from (Coull, 1996).

Contact and scheduling with speakers was done with the help of Dr. Henry Davis and other senior members of Gitlab. Recruitment and scheduling of elicitation were done upon our arrival to Gitksan territory in July 2017.

3.3 Data Collection Instruments

I recorded each task with a head-mounted microphone, connected to a Marantz PMD561 audio recorder. This equipment was made available to me through the UBC Department of Linguistics, via the UBC Gitksan lab. The head-mounted mic is preferable to a lapel mic because it is less likely to pick up noises as a result of the consultant moving in their seat or causing the lapel mic to brush against their own clothes. The head-mounted mic is also preferable to a mic built in to an audio recording device because it is closer to the participant's mouth and better able to pick-up phonetic detail. A built-in mic is also more likely to pick up background noises, whereas a head-mounted mic records mostly local audio. A stationary table mic was made available for speakers who were uncomfortable with wearing a head-mounted mic.

3.4 Elicitation Materials

Prior to elicitation and after completing verbal consent procedures (see 3.5 for elicitation procedures and added detail), I conducted a short pre-elicitation questionnaire. This

questionnaire included demographic information, and I made sure to thoroughly discuss the publication of this information with all speakers to establish informed consent. The questionnaire originally consisted of eight questions (Questions 1-8 in Appendix A). Another two questions (Questions 9-10 in Appendix A) were asked via follow-up phone call, informed by my initial analysis of the original interview.

The questionnaire was followed by a verbally administered wordlist task designed to elicit the full set of vowels in Gitksan, in carefully controlled segmental and prosodic environments. This wordlist, given in Appendix B, is adapted from a resource commonly referred to as the 'East-West Dictionary', or '*Ha'niimag̲ooansxwhum algax̲hl Gitksen – Gitksan'* (Mathews & Wale 1996), cross-checked with Hindle & Rigsby (1973). The East-West Dictionary contains written entries from the Gyeets (Western) and Gigeenix (Eastern) dialects. There is one key limitation to structuring a wordlist based on dictionary entries: I have to rely on orthography in order to make inferences about pronunciation and corresponding underlying vowels. The Gitksan's community orthography was first developed by Hindle & Rigsby (1973), and further standardized in Rigsby (1986). The orthography is intended to be largely phonetic: the choice of orthographic representation encodes the surface quality of the vowel. I consulted with Michael Schwan (UBC Gitlab member, Ph.D. student and intermediate learner of Gitksan) on the suitability of the wordlist to achieve my research goals. I decided to assume the underlying inventory given by Rigsby (1986), as discussed in subsection 2.1.1 and 2.1.4.

Early on in working with reference materials and speakers I noticed that /o/ was very frequent in the orthography and was judged as a separate sound by speakers. I did not make similar observations for /e/ (recall that Rigsby noted that underlying /o/ and /e/ may be 'emerging'). Therefore, the underlying inventory that my study assumes is /a, a:, e:, i, i:, o, o:, u,

u:/ (see 2.1.1).

Due to the limitations of working with written reference materials and dictionaries, I was not able to elicit each vowel in a phonetically neutral environment. I therefore opted to elicit each vowel in a variety of environments, to capture the full surface range of each vowel's quality. Based on previous studies of co-articulation in Gitksan and in cross-linguistic studies (in particular Nolan (2017), which provides a detailed study of vowel co-articulatory effects in Lekwungen, which shares many consonants with Gitksan), I determined what target environments should be included in my wordlist (c.f. Brown et al., 2016; Brown & Hansson, 2008; Fortier, 2016; Nolan, 2017). These environments included before and after uvulars, labialized velars, palatal glides, glottal stops, and a neutral environment (glottal fricative or a labial, which rarely cause co-articulatory effects).[14] Other than the neutral environment, each of these environments was chosen because the literature suggests that it is likely to have co-articulatory effects and can therefore aid in eliciting a full range of surface vowel qualities, and allow me to eliminate potentially confounding effects of environment on vowel quality.[15] Though it is not the focus of this thesis, this kind of segmental environment control could allow for a dedicated phonetic and/or phonological investigation of the distribution of each of these segments, and to test for co-articulatory effects.

I attempted to find at least three words for each environment, for a total of 30 words per vowel ((5 environments x 2 (pre- & post-)) x 3 tokens = 30). I considered only tokens in which the target vowel was stressed. Not all of these combinations occur; for example, stressed /i:/ never occurs adjacent to a uvular consonant, because it is always lowered (Rigsby, 1986, p. 204).

[14] I learned late in writing this thesis that the glottal fricative /h/ is suspected to lower vowels in Gitksan. Many thanks to Dr. Henry Davis for catching this oversight. Future work should consider this.
[15] I further controlled for this by measuring only the middle 50% of the vowel. See section 3.6 for further details on my phonetic analysis methods.

In the end, the wordlist contained a total of 193 tokens, including 2-3 tokens per vowel in each environment (where possible) (see Appendix B for the complete wordlist).

3.5 Data Collection Procedures

I conducted elicitations in consultants' homes, or in an available room in a local building (e.g. church hall). I made efforts to minimize background noise as needed. Consultants were first guided through the ethics agreement, ensuring informed consent (available in Appendix C). Verbal consent was recorded to ensure that all speakers, regardless of literacy, were equally involved in the consent process. Next, participants were taken through the pre-elicitation questionnaire (given in Appendix A). These first components of the study were recorded using a freestanding microphone (the head mounted mic was employed later as some consultants find it uncomfortable).

Once the pre-elicitation was complete, recording was paused to switch from the free-standing microphone to the head-mounted mic. This was then connected to the recorder, which I listened to with high quality headphones. The recorder volume was adjusted to ensure that usable recordings were produced. Recording quality was ensured by continuing to listen to the recording via headphones, and monitoring and adjusting the input volume levels as necessary.

The wordlist was delivered orally in English. The consultant was asked to translate each word and repeat it three times, in Gitksan. If a consultant was unfamiliar with a word or unable to recall it, I read the Gitksan word as a prompt. I took special care to note when this resulted in a consultant remembering the word and when this resulted in a consultant 'sounding out' my pronunciation of the word. Only words that speakers were familiar with and that did not rely on a prompt from me were used in the final data set (this number varied for each speaker, 95 to 127

words analyzed per speaker, three repetitions each). The recording ended once we completed the wordlist.

3.6 Data Processing & Analysis

I entered the responses to the demographic questionnaire in an Excel workbook, and I transcribed the qualitative interviews using Express Scribe, free transcription software. I analyzed the responses in the questionnaire and interview using a manual coding method (Benson, 2013; MacLure, 2013). I first read the interviews in their entirety and reflected on the common themes that stood out. I then labeled each section of the responses according to any theme that they could be matched with. For those sections that did not have an associated theme, I compared them to one another to see if any additional themes emerged. In the end I was left with four central themes for which there were multiple (two or more) responses (given in section 4.1).

I then looked at the demographic distribution of the speakers I had worked with. As I first discussed in section 2.4, the demographic backgrounds of my speakers could have resulted in two possible approaches for the integrated analysis phase of my investigation: Approach (i) was an ethnographically informed series of case studies of vowel variation among individual speakers (Cameron, Frazer, Harvey, Rampton, & Richardson, 1992; Creese, 2008; Rampton, 2008; Rampton, Maybin, & Roberts, 2015). Approach (ii) was an analysis of vowel variation based on sociolinguistic predictors. I discovered through my analysis of speaker demographic profiles that I did not have the statistical power required to follow Approach (ii). I therefore proceeded with Approach (i), which allowed me to evaluate each speaker's vowels in the context of their demographic background holistically, and to get a sense of what trends would be useful for future research to expand on. In the end, I was also able to go beyond the level of the individual

to address the idea of a dialect continuum within Gitksan, as outlined in section 4.3

For the quantitative (phonetic) analysis, I processed and segmented the wordlist recordings in Praat (a standard software package used in phonetics research (Boersma & Weenink, 2017)). I segmented the wordlist on three tiers: target vowel, V label, and word. The V label tier allowed me to run a script (a tool for automatically taking large batches of measurements) that looked for the label 'V' and exported the target vowel and word associated with that time interval to an Excel spreadsheet. The script also exported each target vowel's duration (ms) and formants one through four across the middle 50 per cent of the vowel, so as to minimize co-articulatory effects (which are not the focus of this thesis but would be an excellent subject for future research).

When segmenting, I placed markers at the start and endpoint of the stable formant structures during the audible vowel. I then extracted formant values from the middle 50% of the vowel. For example, in Figure 8, I segmented only the stable formant structures, avoiding the transition period between the /w/ and the /e:/; formants were calculated from the middle 50% of the resulting segment.

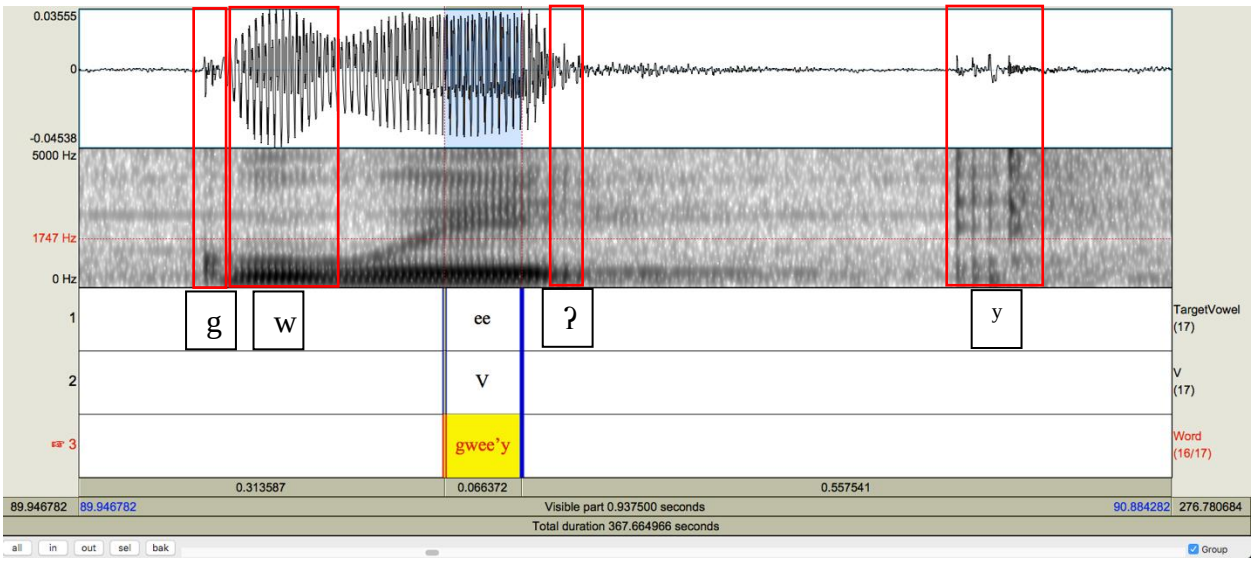

Figure 8: Example of segmentation of /e:/ vowel in the word *'gwee'y' (poor)*.

In analyzing formant data across speakers, sex must be accounted for as it has been shown to influence individual speech patterns (McDonough & Austin-Garrison, 1994). I normalized the F1 and F2 values for sex using the formula first popularized by Lobanov (1971). More recent studies comparing various normalization methods have found that, in a sample of 6 published methods, Lobanov's z-score transformation was the most effective at eliminating anatomical differences while preserving sociocultural variation (Adank, Smits, & van Hout, 2004; Clopper, 2009; Flynn & Foulkes, 2011).

Having normalized formant values, I compared vowels (F1 and F2) across speakers and as a function of the sociolinguistic variables identified by my qualitative analysis. Comparisons across speakers were done visually, by plotting each speaker's vowel space along the F1 and F2 axis (normalized z-scores, -3 to +5). These plots allowed me to identify which vowels showed the most variation across speakers, and therefore which vowels were the best candidates for

examining the effect(s) of sociolinguistic factors identified through the interviews. I plotted the Figures for this analysis in R, using the phonR package (McCloy, 2016).

Chapter 4: Results

The results chapter includes three main parts: Section 4.1 presents a qualitative investigation that addresses what sociolinguistic predictors speakers identify as influencing their speech; I focus on four themes that emerged from the ethnographic interviews, which I then consider against the speaker profiles in 4.2, where they may offer insight into the patterns of variation exhibited by speakers. In section 4.3, I consider move beyond variation at the individual level, providing support for a Gitksan dialect continuum.

4.1 Qualitative Results

This section focuses on the two qualitative components of the study: the ethnographic interviews (4.1.1) and the demographic surveys (4.1.2). Together, findings from these qualitative methods guide the acoustic analysis presented in 4.2

4.1.1 Interview results

In analyzing and interpreting the responses to the open-ended question on background and dialect and language identity (see Appendix A), four primary themes emerged:
(i) language/dialect contact, (ii) socio-cultural characteristics of Gitksan tradition, (iii) engagement in language revitalization initiatives, and (iv) experience with residential schools and colonialism (see also Fortier (2018)). Through my interpretation of these themes, the supporting responses, the relevant linguistic literature, and my understanding of the Gitksan language context, I suggest the following themes for further study: (i) village of birth and early life, (ii) matrilineal house and phratry, (iii) level of engagement in language revitalization

initiatives (and the dialect spoken in those initiatives), and iv) residential school experience.[16] The remainder of this section presents quotes from speakers that relate to the themes mentioned above, and discusses how correlating sociolinguistic factors are addressed in the dialectology literature.

Language and dialect contact were explicitly acknowledged by three speakers. Dialect contact is an important vehicle for variation and change (Chambers & Trudgill, 1980; William. Labov, 2007; William Labov, 1993). One speaker, Ray Jones from Gitsegukla, described his early language learning, at the cannery where his parents worked, in a way that highlighted the importance of language contact, specifically through resource sharing and employment:

> *The North Pacific Cannery, they're mostly Nisg̲a'a and Tsimshian people there during the off-season (…) I learned from the Nisg̲a'a, my friends, listening to Nisg̲a'a language every day, I learned how to speak Nisg̲a'a before I learned how to speak Gitksen. When I was living here as a boy, that's when I started really learning Gitksen. It's the same language grouping under Tsimshian, but there's a definite.... when you learn the language, you also learn the differences.*

In this way, one's first language, and where one lived in early life, are important considerations for Gitksan dialect and identity. This is supported by dialectology research that shows that dialect acquisition is critical between the age of two and puberty, but also that one can acquire a second dialect as late as 17 years of age (Chambers, 1992; Kerswill, 1996; Siegel,

[16] I use the term 'factors' to refer to any potential sociolinguistic factor that is identified in the Gitksan language context. I use the term 'variable' or 'predictor' to refer to the factors that this study will consider in the interpretation of my acoustic results (section 4.4).

2010). Mr. Jones's experience is shaped by recent colonial history in the Pacific North West which has resulted in disrupted dialect boundaries. This bi-dialectal history may be significant when considering his surface vowel inventory.

Dialect contact was described by another speaker in relation to feast protocol. As described in section 2.2.2, feast protocol requires different villages, houses, and phratries to mingle in a formal setting (Adams, 1973). Gitksan feast protocol offers perhaps a unique context for language contact, because while spoken protocols are strictly scripted, they have some variation between villages. Hector Hill, also from Gitsegukla, described dialect contact during feasts as follows:

> *Growing up in the village of Gijigyukla'a, we speak to the other people in Gitanmaaks, Kispiox, Glen Vowell, Kitwancool, Kitwanga, and we never thought about the dialect until the feast (...) Every time we go into a different village they do something different than the way we do it. But they respect and honour. And some of the protocol is a little bit different than the way they do it but it's all the same. It's given to them.*

Speech protocols during formal feasts are passed down through one's matrilineal phratry. Though some formal language is reserved exclusively for the feast hall, many speakers observed that their language learning and dialect identity was heavily influenced by their exposure to formal speeches. This reinforces the idea that one's village in early life is important for language exposure and dialect acquisition, and brings us to our second theme, sociocultural characteristics of Gitksan tradition. The characteristics that I describe in this paper are feast protocol and matrilineal inheritance. These two are linked, because feasts are hosted by one's phratry, which

is inherited matrilineally. Feast protocol is important because it contains specific spoken exchanges and procedures. Mr. Hill later gave me an example of serving food at the feast and observing lexical differences where the word for offering someone coffee to *drink (t'is)* could be misinterpreted as offering someone coffee to *punch (t'is) ('Luu t'is aks tun', literally, 'There's a lot of coffee or water in here').* Feast protocol was acknowledged by two other speakers as being an important factor in formation of their dialect identity. Myrna Hill Aksidan, also of Gitsegukla, stated the following:

> *(I) went from a very young age. I can remember going to feast house, and I sat with my mom, and all they used was our language. So, I grew up hearing, seeing, and learning through my mom and through my dad, everything that's done culturally in our village, and a lot of the things that I learn is basically from seeing, hearing, and learning."*

Mrs. Hill Aksidan also introduced the idea of one's mother as an important teaching figure. Because Gitksan culture is matrilineal, inheritance (which includes stories and cultural knowledge, such as feast protocol) is passed down through the mother (and her phratry). Mrs. Hill Aksidan elaborated on this idea:

> *I've learned through the Elders, watching and hearing how they walk, how they talk, and I tried to bring that along with me, or wherever, and whatever I do, and I watch how I speak. I have to walk softly because I hold Grand mum's matriarch name now. It's one of the highest names that come from this village. (…) it's how I learned everything that I learned, it's through my mum and through my aunts and uncles.*

The importance of one's mother, her family, and her heritage were emphasized by two other speakers. Louise Wilson, of Kispiox, spoke about how the passing of her mother at age 10 had an impact on her continued language exposure and learning. For the remainder of her upbringing she was raised primarily by her father. Despite other women moving into the house after her mother's passing, Ms. Wilson described her speech as having "a mixture of influences, definitely a strong male influence." Given the emphasis on one's mother's heritage, I propose that one's phratry and house are important sociolinguistic factors in the Gitksan dialect context. Whether one was raised by members of that phratry and house, or, as in the case of Ms. Wilson, a community member or differing matrilineal heritage, may also be relevant.

Vince Gogag, of Gitanyow, described his matrilineal chieftainship as being an important motivator for his language revitalization efforts. Involvement in language revitalization initiatives was explicitly identified by four speakers as being important for their dialect identity. This involvement includes participation in language documentation and teaching, multimedia projects such as radio programs, and intergenerational teaching. Due to there being a small population of speakers, these revitalization initiatives and projects often include speakers from a variety of dialect backgrounds. Ray Jones, of Gitsegukla, passionately described the experience of being part of his local cultural support program:

> *We really have a lot of fun bringing back some real old languages that are out of use. And that's very interesting, when you would say something you know that people said quite often 60 to 70 years ago you know. And that would trigger somebody else's*

memory. So, in one respect that program, you know when we're together in our staff group, it's been a lot of fun bringing back or remembering old words and meanings.

Based on the previous passage and my knowledge of lexical differences across dialects (see Mathews & Wale, 1996), it is my understanding that in this passage, Mr. Jones was describing observing different word usage between his present-day dialect and/or dialect identity, and that of others in the group. Some words that are in common usage for speakers of some dialects may feel old-fashioned or out of date for others. Through participation in language revitalization, speakers are sharing their language knowledge with one another in concentrated ways, and this may be an environment for language change (though this requires further investigation). I suggest therefore, that whether or not a speaker is involved in language revitalization projects and what the dialects are that are being spoken in those projects, are important variables for investigating speakers' dialects, as they may bear some influence on learned pronunciation later in life.

Mr. Jones also described an initiative by his community's cultural support program to travel to the site of the residential school that the members were forced to attend. Residential schools and the effects of colonialism on language and dialect identity were described by seven of the nine speakers with whom I worked. This made it the most heavily emphasized theme. In a follow-up interview with Ray Jones, he explained how residential school had directly impacted his speech:

> *When I got back from residential school, I had made sure I didn't lose my language (…) I had two or three buddies I always spoke the language with and we would make sure that nobody was listening in, so we didn't get caught. So, when I got home, a lot of the older people couldn't understand me because I was speaking our language a different way. I thought I was speaking properly.*

In the above quote, my understanding is that Mr. Jones was making an observation about changes in his speech that arose as a direct result of having an isolated speech community of a few boys with whom he could speak his language at residential school. His speech was markedly different from that of his home community upon his return to his community. Attendance at residential school is therefore an important variable that I consider in my later analysis. It may be that speakers exhibit differing acoustic vowel characteristics based on whether or not they attended an institutional school.[17] It is also possible that, through contact with children from other communities at institutional schools, dialect mixing occurred (Henry Davis, personal communication, November 9th, 2018).

Hector Hill explained how the trauma of institutional schooling makes it hard to engage in language research that focuses on his personal dialect identity, despite his long-term dedication to language revitalization and collaborative work with linguists:

[17] The term 'institutional school' is used deliberately over the term 'residential school' in this context, because residential school is but one type of institutional school that was imposed on communities in Northern B.C. Children were also made to attend Residential Day School (family placement outside of the community) or Indian Day School (White-run school on or near reserve) depending on the circumstances under which they were entered into institutional schooling.

The government, the school, the church said that our language was not good. (…) They just said it was really bad, that we can't use it, that it was the devil's language. And yet, in our language, we pray to the creator. We thank the creator for our language, our land (…) and the people that come, even though they're mean to us we still pray for them that one day they will see that as well as they are, we are created. So, (…) to say something good about it, it's pretty hard (…) Once you hear that your language is not right, you can't speak it, it's the devil's language, and if I keep speaking it that I would burn in hell. (…) Today they don't speak it. Today they've given up. They're too scared. And now their children aren't even allowed to speak their Gitxsen language. And for me, I still use it because it's the language that I grew up with. And no matter what anybody says you know, if it's dirty to them then that's their own fault. That's their own belief, that's their own thinking (…) So, it's pretty hard to hear you say that you're interested in how I speak and the dialect."

My understanding of Mr. Hill's sentiment is that because of the trauma of institutional schooling, focusing on his personal dialect identity is harder than focusing on the bigger picture of language revitalization. Mr. Hill also introduced the idea of the intergenerational trauma of institutional schools (which he later emphasized more directly). This was echoed by Louise Wilson, a younger speaker who attended Indian Day School. Ms. Wilson said that her generation "had learned from our generations before not to use the language at school." Between these two examples, I notice that whether or not a speaker attended institutional schooling may influence their thoughts about and/or relationship with their dialect identity. Therefore, I believe that this should be considered as a sociolinguistic variable when working with communities that have

been affected by institutional schooling, while at the same time recognizing that conversations about dialect can be uncomfortable for speakers.

Other impositions of colonialism were observed by the speakers. This included the imposition of borders that separated villages (as in the case of Ansbayaxw and Sigidak̲), the discouraging and criminalization of Gitksan cultural traditions (Fiske, 1997), and forced assimilation into colonial culture for the sake of gainful employment. This underscores the importance of the places where a speaker has lived as a sociolinguistic factor. It may also be worth considering a speaker's career, and what language or dialect was spoken in their workplace, though I do not address it in this paper. It may or may not be appropriate to relate career factors to socio-economic status, which is a robust sociolinguistic factor in dialectology (Chambers & Trudgill, 1980; William Labov, 2001). This requires further investigation as it relates to the Gitksan language and the settler colonial context.

This section has identified the following themes from my qualitative analysis of the speaker interviews: (i) Language/Dialect Contact, (ii) Socio-Cultural Characteristics of Gitksan Tradition, (iii) Engagement in Language Revitalization Initiatives, and (iv) Institutional Schooling. Based on these themes, I suggested the following sociolinguistic factors: (i) village of birth and early life (ii) matrilineal phratry (iii) level of engagement in language revitalization initiatives (and the dialect spoken in those initiatives), and (iv) type of institutional school. A speaker's village of birth and early life is a robust sociolinguistic factor in the study of language variation (Chambers & Trudgill, 1980; William Labov, 1993). Matrilineal house and phratry is a prominent factor in the Gitksan language context, parallel to the patrilineal clan in Sui communities of rural China (where children acquire their father's clan's dialect when forming their own linguistic identity; Stanford, 2008). It may be the case that this factor is relevant in the

Gitksan context as well. Other factors that would be of interest to consider are a speaker's first language (which is Nisg̲a'a for one speaker, and a Gitksan dialect for the rest), by whom a speaker was raised (including patrilineal relatives and their phratries) and a speaker's career and workplace language or dialect. While it is not possible to explore any of these factors within this thesis (because of very different individual speaker profiles – see 4.1.1), they are useful to keep in mind for future work on Gitksan and other languages with similar social and historical contexts.

4.1.2 Demographic Summary.

This section summarizes demographic variables across speakers so that I may refer to them when presenting their speaker profiles in section 4.3. All participating speakers are above the age of 55. Those who did not wish to offer their age stated that they were Elders. Five of these speakers are men, and four are women. Age, sex, East/West classification, and lineage are summarized in Table 2:

Table 2: Speakers' General Demographics

	Sex	**Age**	**Eastern/Western Classification**	**Phratry**	**House**
Myrna Hill Aksidan	Female	Not given	Western	Gisk̲'aast	'Wii Gyet
Vince Gogag	Male	78	Western	G̲aneda	G̲amlax̲ Yeltxw
Hector Hill	Male	64	Western	Gisk̲'aast	'Wii Seeks ('Wii Gyet)[18]
Ray Jones	Male	72	Western	Lax̲ Gibuu	Wilp Tsimtaahloox
Art Sampson	Male	55	Eastern	Lax̲ Gibuu	X̲eem Lax̲a
Barbara Sennott	Female	Not given	Eastern	Lax̲ Seel	Wilp G̲eel
Dr. Jane Smith	Female	Not given	Eastern	Lax̲ Gibuu	Tso'oslee
Glenn Williams	Male	61	Western	G̲aneda	Hawils
Louise Wilson	Female	58	Eastern	Lax̲ Gibuu	Wilps Luus

Note that Ray Jones' first language was not Gitksan – it was Nisg̲a'a. This kind of mixed acquisition is an important variable in considering his surface vowel inventory.

The following Table summarizes information that is relevant to speakers' childhoods:

[18] The name of this house has changed during the current generation. The previous name was 'Wii Gyet, and the current chief of that house has inherited the name 'Wii Seeks. The name 'Wii Gyet is not currently in use.

Table 3: Speakers' Early Life Demographics

	Birth Village	**Caregivers & Phratry**	**Type & Duration (Grades) of Institutional Schooling**
Myrna Hill Aksidan	Gitsegukla	Mother: Gisk̲'aast, Father: Tsimshian	Indian Day School, K-6
Vince Gogag	Kitwancool	Mother & grandmother: G̲aneda, Father: Lax̲ Seel, Grandfather: Lax̲ Gibuu	None
Hector Hill	Gitsegukla	Mother: Gisk̲'aast, Father: Tsimshian	Indian Day School, K-6
Ray Jones	Gitsegukla	Moher: Lax̲ Gibuu, Father: G̲aneda	Residential School, 5-6 & 9-12
Art Sampson	Sigidak̲	Mother: Lax̲ Gibuu, Father: G̲aneda	Indian Day School, ½ year
Barbara Sennott	Ansbayaxw	Mother & grandmother: Lax̲ Seel	Residential School, 1 year
Dr. Jane Smith	Gitanmaaks	Mother: Lax̲ Gibuu, Father: not given	None
Glenn Williams	Gitwangak̲	Mother: Lax̲ Gibuu, Father: Lax̲ Seel	Indian Day School, K-7
Louise Wilson	Ansbayaxw	Mother: Lax̲ Gibuu, Father: Lax̲ Seel	Indian Day School, K-6

Five of the speakers have remained in their childhood villages, while the remaining four moved to Vancouver during their adulthood (all indicated that this was either for study or employment, see Table 3 on speakers' adulthood demographics). All villages described by Brown et al. (2016) as relevant for dialectal distinctions are represented in this group. Village of early life is therefore a likely an important sociolinguistic factor in the Gitksan language context.

All speakers indicated that they were either raised by their parents or their maternal grandparents, who come from a variety of houses and phratries, including one Tsimshian father. Their caregivers' speech may play a role in the speech of the participants in this study.

Informed by my analysis in section 4.1.1, I followed up with speakers to inquire as to their attendance at institutional schooling. As summarized in Table 3, two speakers attended

residential school (for one year, and six years), five speakers attended Indian Day School (for seven to eight years), and two speakers did not attend any institutional school. This was the most heavily emphasized factor by the participating speakers.

Table 4 summarizes information relevant to the speakers' adult lives:

Table 4: Speakers' Adulthood Demographics

	Present Day Village	**Eastern/Western Classification**	**Involved in revitalization?**	**How often?**	**Other dialects spoken?**
Myrna Hill Aksidan	Gitsegukla	Western	Yes	Once per year	n/a
Vince Gogag	Vancouver	N/A	Yes	2 hrs per week	n/a
Hector Hill	Vancouver	N/A	Yes	2 hrs per week	n/a
Ray Jones	Gitsegukla	Western	Yes	4 days per week	Mix of Western dialects
Art Sampson	Sigidak̲	Eastern	No	n/a	n/a
Barbara Sennott	Vancouver	N/A	Yes	4 hrs per week	n/a
Dr. Jane Smith	Gitanmaaks	Eastern	Yes	12 to 15 hours per week	n/a
Glenn Williams	Gitwangak̲	Western	Yes	3-4 hours per week	Mix, mostly Western dialects
Louise Wilson	Vancouver	N/A	Yes	Once per year	n/a

All speakers either remained in their home village or moved to Vancouver, as is the case with roughly half of the speakers (for Ms. Wilson, this was a recent move, within the last two years, from Moricetown, Wet'suwet'en territory). Whether or not a speaker moved into the city is therefore a potential factor to consider, though some literature suggests that relocation to urban centres is not a predictor of variation in minority speech communities (e.g. Patrick, 2002).

I followed up with speakers to ask about their involvement in language revitalization initiatives. All speakers save for one are involved in language revitalization, varying from once per year to four days per week. Only two of the speakers, Mr. Glenn Williams and Mr. Ray Jones, have contact with other fluent speakers during these projects.

4.1.3 Summary of qualitative results.

The qualitative results that I have outlined throughout section 4.1 demonstrate the richness of knowledge and perspective that speakers can offer when contributing to phonetic studies. A simple demographic questionnaire written by a community outsider cannot capture the detail of the experience of language use in the Gitksan language context. This qualitative component of my study contributes to my overall research findings in two ways: the demographic profiles provide speaker-specific speaker demographics that are used to describe individual speaker vowel plots (4.2 – 4.3); the ethnographically-informed interviews, although they are not directly incorporated into the acoustic analysis (for reasons outlined above), are meaningful in a more nuanced way. At a concrete level, they help explain some of the observed variation in vowel production; at a more abstract level, they also contextualize my work, providing more holistic guidance in terms of the kinds of considerations that should be kept in mind in my work and in future documentation work in the Indigenous language revitalization context. .

4.2 Quantitative Results

This section addresses hypothesis (i), that vowel pronunciation differs across speakers. This section illustrates the results of the acoustic experiment detailed in chapter 3. The images have been produced using the phonR package, which is a standard tool for statistical analysis and visualization of acoustic measurements (McCloy, 2016).

This section presents the illustrated vowel spaces of the group of speakers (Figure 9) with a corresponding IPA Table of the surface inventory for suggested narrow transcription practices (Table 6), and of each individual speaker with a brief reminder of their demographic profile (subsection 4.2.1). This section also provides descriptions of notable and unique characteristics of each speaker's vowel system, described with ethnographically-informed findings from section 4.1.

The vowel plots given in this chapter are normalized with a z-score transformation. The following Table provides approximate z-score ranges for the phonetic segments I perceived while processing and analyzing the tokens. Interested readers may wish to refer back to this Table for the remainder of this Chapter.

Table 5: *Approximate z-score ranges for observed phonetic segments across all speakers.*

	i	**ɪ**	**ɛ**	**e**	**æ**	**a**	**ɑ**
F1	(-1)-(-3)	0-(-1)	1-(-0.5)	0.5-(-1)	3-1	1-4	1-3
F2	1.5-2.5	1.5-0.5	0-1	0.5-2	0.5-1	0.0-0.5	(-1)-0.0

	ɨ	**ʉ**	**ʌ**	**u**	**ʊ**	**o**	**ɔ**
F1	(-0.5)-(-1.5)	(-0.5)-(-1.5)	0.5-(-0.5)	(-2)-(-1.5)	0-(-1)	0-1	0.5-1.5
F2	0.5-(-0.5)	0.5-(-0.5)	0.5-(-0.5)	(-2)-(-1)	(-0.5)-(-1)	(-0.5)-(-1.5)	(-0.5)-(-1)

Figure 9 shows the vowel plot for all tokens from all speakers, labeled as the underlying vowels proposed by Rigsby (1986).

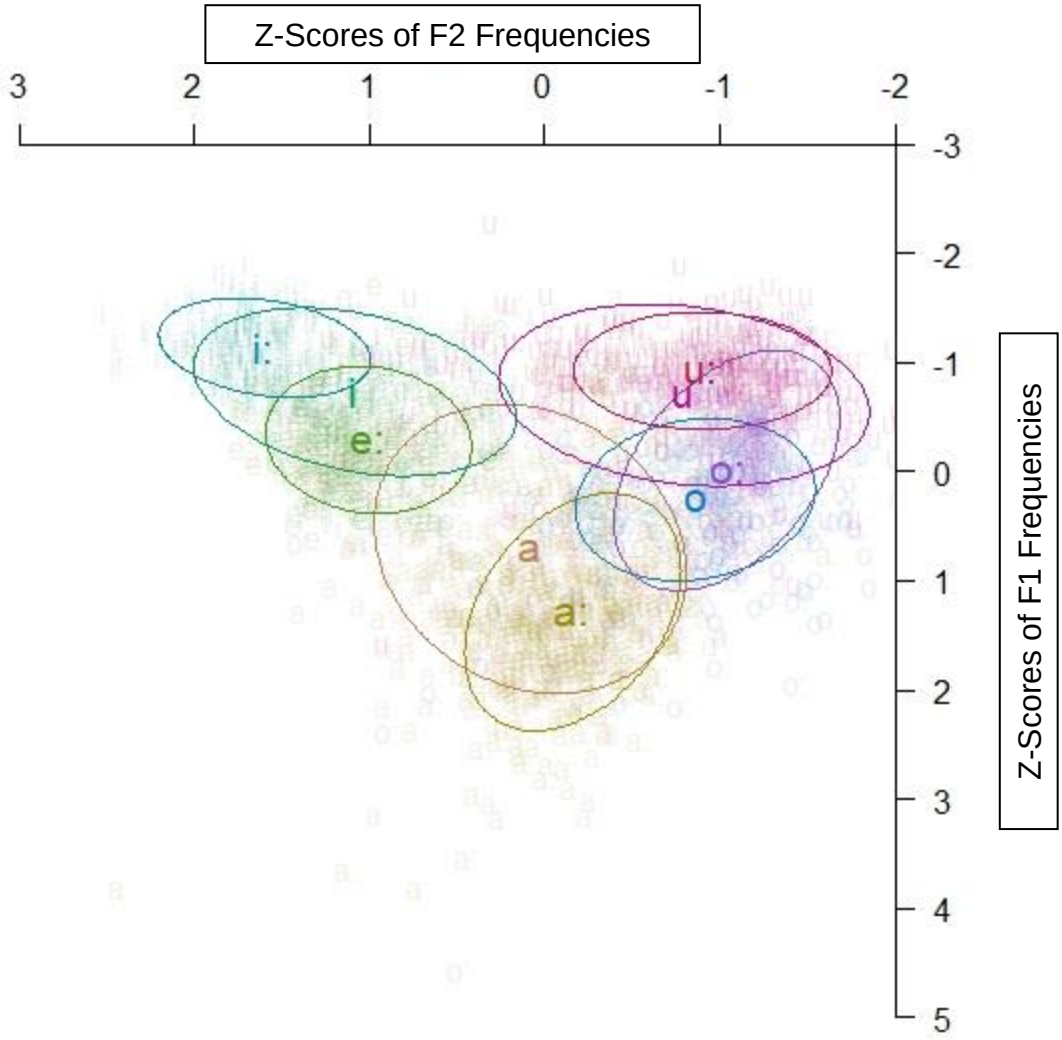

Figure 9: Plot of all target vowel utterances from all participating speakers, given as z-scores of F1 and F2 frequencies.

The bolded labels in Figure 9 are the mean realizations in normalized F1/F2 space, and the ellipses are set at a confidence interval of 0.95. The wide dispersion for [a] corresponds to the predictions made by the literature discussed in section 2.1.4; that is, there is wide variation in pronunciation of this vowel, with multiple potential transcriptions (cf. Table 3) that relate to the z-score ranges given in Table 2. The /a/ question will be further discussed in a subsection of

4.4.1. Recall that the goal of this thesis is not to provide a re-analysis of the underlying inventory. My documentation of the surface forms is, however, informed by my understanding of the current status of the underlying inventory as described in section 2.1.4 and my findings regarding /o/. My goal is to document the surface variation so that it is preserved in the literature both for community use and to inform future phonetic or phonological investigation.

In contrast to Brown et al.'s (2016) phonetic inventory from Figure 6, the spread of the /a:/ phoneme is overall lower than /a/ as well as being more back. It is consistently the case that long and short vowels differ in their location on the plot. The short vowels tend toward more central pronunciations, which is consistent with Brown et al.'s findings shown in Figure 6. Table 6 gives my suggested transcriptions for the surface vowel inventory across all dialects observed in this study, based on the dispersion demonstrated in Figure 9 and my own corresponding auditory analysis.

Table 6: Suggested transcriptions for the surface vowel inventory (in stressed position) across the dialects of Gitksan.

/Underlying/	**[Surface]**
/a/	[ɛ, ʌ, æ, a, ɑ, ɪ[19]]
/aː/	[æː, ʌː, aː, ɑː]
/eː/	[eː, ɪː]
/i/	[i, ɪ, ɨ]
/iː/	[iː, ɪː, ɨː]
/u/	[u, ʌ, ʊ, ʉ]
/uː/	[uː, ʊː]
/o/	[o, ɔ]
/oː/	[oː, ɔː, ʊː]

[19] This variant occurred for speaker Vince Gogag, of Gitanyow.

The purpose of the suggested transcriptions in Table 6 is to capture variation in the surface vowel pronunciation within the IPA framework. For community members and teachers trained in IPA, this Table may also serve as a conversion chart for dialect-inclusive pronunciation materials.

There are several areas of overlap in Table 6. /a, i/ can both surface as [ɪ],[20] while /e:, i:/ can both surface as [ɪː]. Additionally, in the rounded segments, both /u:, o:/ can surface as [ʊː]. The phonological reason for this is unclear to me at this time.

4.2.1 Speaker Profiles.

In this section I review each speaker's demographic profile in a descriptive manner and present their acoustic vowel plots. I describe speakers' vowel variation and suggest possible ways to account for this variation with sociolinguistic predictors (possible predictors were reviewed in the previous section). Note that the following variables are not known for all speakers: frequency of communication with family members in Gitksan, and parents' village of origin.

The speakers are presented in order from most Eastern to most Western, with regard to their villages along the Skeena River and Nass corridor. The relevance of these images is summarized at the end of the section, in Figure 26.

Barbara Sennott.

Barbara Sennott (Harris) is a female speaker who at present day lives in Vancouver. Ms. Sennott is from Kispiox (the Eastern-most village along the Skeena River, Figure 10). She learned her language from her maternal grandmother.[21] She attended residential school between

[20] This occurred most notably in the second syllable of the word *alayst*, which some speakers of Gitxsanimx̲ and Gitxsenimx̲ pronounced something like [ə.ˈlɪˀst].

[21] Clara Harris† was a primary consultant for Bruce Rigsby.

ages 9 and 10.[22] Today, Ms. Sennott speaks Gitksan primarily to her relatives and through language revitalization initiatives, working as both a language teacher and linguistic consultant on a weekly basis. She was one of the speakers featured in Brown et al. (2016), and this is reflected in the similarities between Figures 4 and 11.

Figure 10: Map of Kispiox within Gitksan territory, adapted from (Coull, 1996).

Ms. Sennott's vowel space (Figure 11) is characteristic of the Eastern pronunciation, as described by Rigsby (1986) (who worked with many members of the Harris family) and as reported in Figures 4 and 6 (based in part on Barbara's own speech). She has few tokens approaching the [ɛ] range, and a mid-low [a] range. While Ms. Sennott exhibits a low /a:/ pronunciation, it is not as distinctly low as that of Ms. Wilson and Mr. Sampson, shown later in Figures 12 and 14. Note also that there is a 'stray' /a/ token just above the /u/ space. This is likely a phonological shift where an /a/ token has become rounded.[23] This will be further discussed in section 5.3. Additionally, Ms. Sennott has some overlap in her /o:/ and /u/ spaces. This is not unexpected as short vowels tend to be more centralized (Brown et al., 2016), and other speakers in this study exhibit the same trend.

[22] Despite this, Ms. Sennott did not at any time attend a non-institutional school.
[23] This measurement has been double-checked and was intended to measure an underlying /a/ which was pronounced as [u], adjacent to a labial velar.

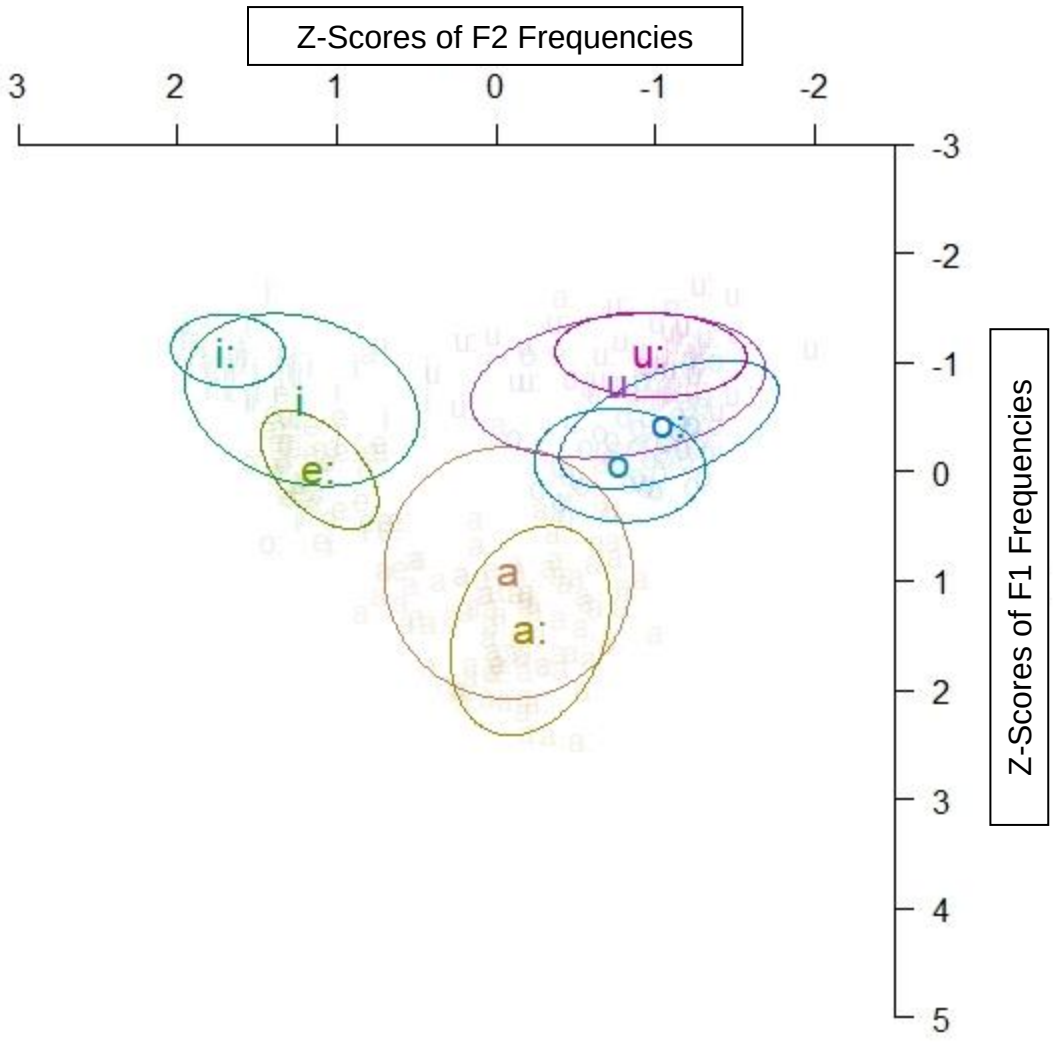

Figure 11: Plot of all target vowel utterances by speaker Barbara Sennott, given in z-scores based on F1/F2 frequency.

Louise Wilson.

Louise Wilson is a female speaker who recently moved to the Greater Vancouver area from Moricetown, having grown up in Kispiox (Figure 10). She learned to speak her language from her mother and father. Ms. Wilson attended Indian Day School from ages 6 to 12. Today,

she speaks her language primarily with her relatives and through her engagement in language revitalization classes, which occur every summer.

Like Ms. Sennott, Ms. Wilson's vowel space (Figure 12) is characteristic of Eastern pronunciation, as described by Rigsby (1986). However, though her average /a/ vowel is within the expected range, she has some definitive [ɛ]-like pronunciations. From the ellipses in Figure 11, it is shown that Ms. Wilson has quite a lot of variety in her pronunciation of /a/. She has some disparate pronunciations of particularly low /a:/ vowels, also shared by our next speaker, Mr. Sampson (Figure 14). These low /a:/ vowels occur preceding uvular consonants, such as in the following:

(18) gaaq̲
/gaːq/
[gɑːq]
'raven'

These exemplify uvular lowering, which has been well-documented in the literature (Brown et al., 2016; Fortier, 2016). Like Ms. Sennott, Ms. Wilson has some overlap in her /o/ and /u/ vowels.

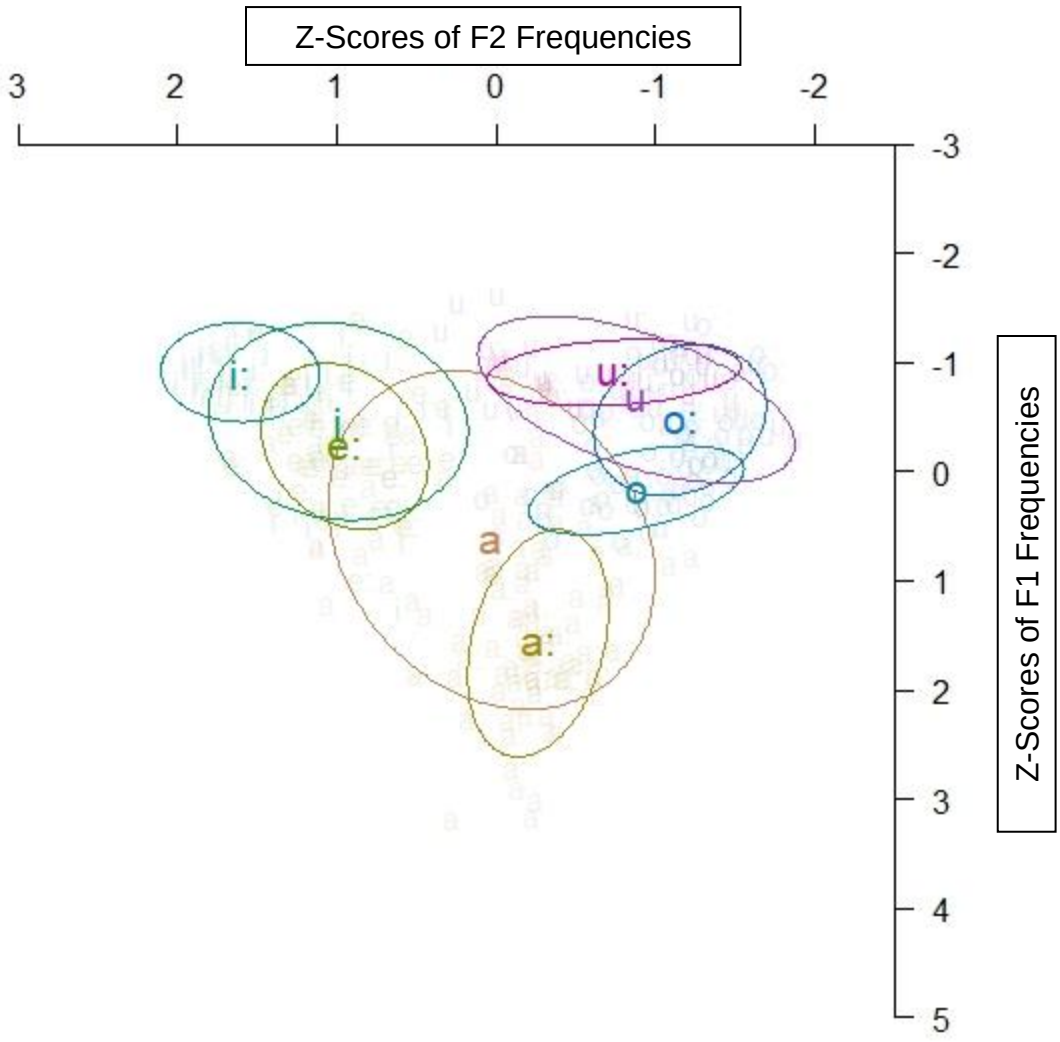

Figure 12: Plot of all target vowel utterances by speaker Louise Wilson, given in z-scores based on F1/F2 frequency.

Art Sampson.

Art Sampson is a male lifetime resident of Sigidak̲ (Glen Vowell, an Eastern village, Figure 13). Mr. Sampson learned his language from his mother and father. He attended Indian Day School for the duration of his education. Today, Mr. Sampson regularly speaks his language with his relatives, including taking on the role of language teacher to young children.

Figure 13: Map showing Glen Vowell (Sigidak) within Gitksan territory, adapted from (Coull, 1996).

As with the previous two speakers, Mr. Sampson's vowel space (Figure 14) is characteristic of the Eastern pronunciation, as described by Rigsby (1986) and given in Figures 5 and 6. He has very similar pronunciations to Ms. Wilson (Figure 12). Mr. Sampson has a varied range of /a/ quality, including some very [ɛ]-like utterances. He also has some very low /a:/ pronunciations. As discussed earlier, this is a product of uvular lowering. Unlike our previous two speakers, Mr. Sampson does not have extensive overlap in his /o/ and /u/ ranges. Furthermore, he has some retracted and lowered /i/ utterances. While it is in line with the description set out in Brown et al. (2016) for the short vowel /i/ to be more central than the long vowel /i:/, Mr. Sampson has some utterances that are more [ɨ] and [ʌ]-like in quality. This may reflect individual speaker variation, or be correlated with Art's village of origin, which is unique to him within this study. Vincent Gogag, whose vowel space is shown in Figure 23, also has these realizations of /i/.

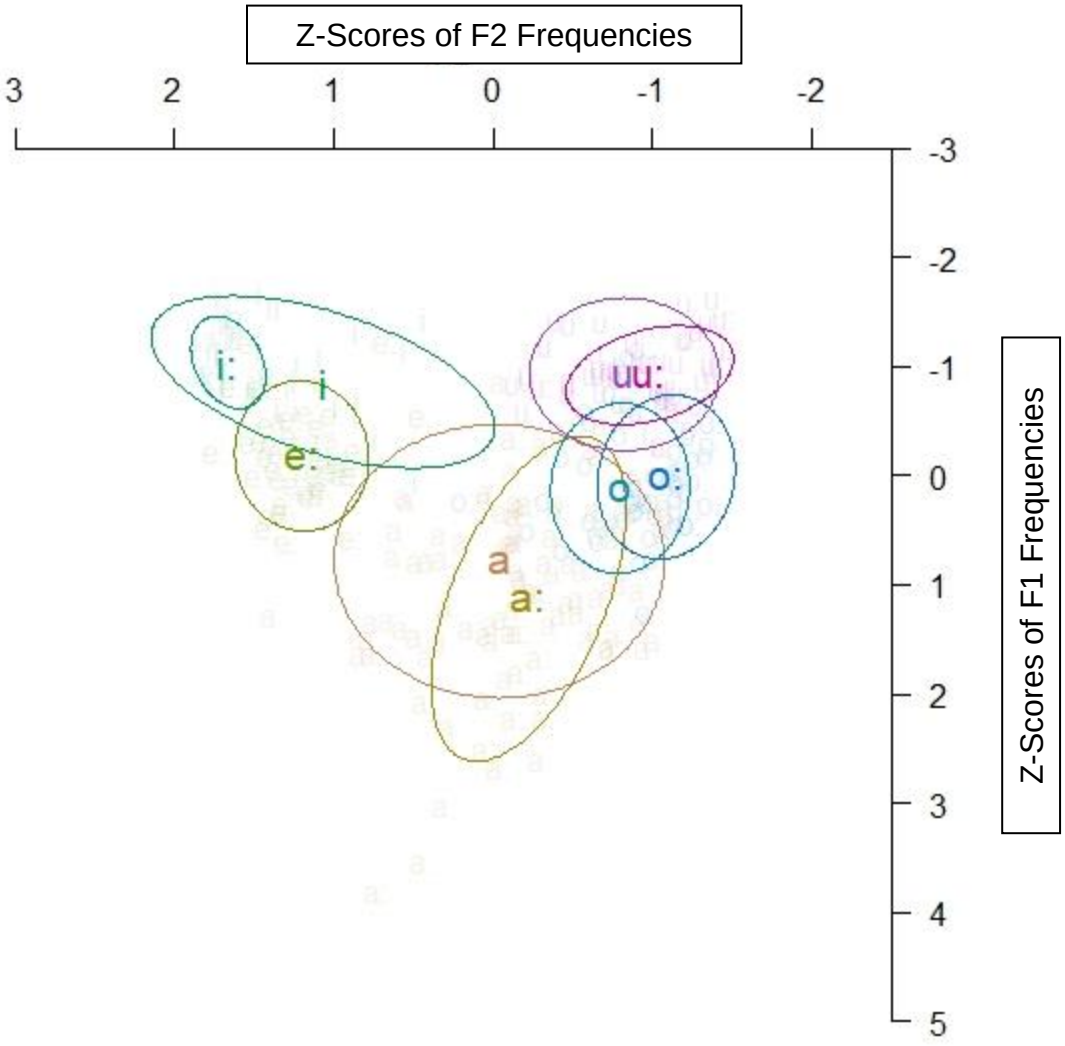

Figure 14: Plot of all target vowel utterances by speaker Art Sampson, given in z-scores based on F1/F2 frequency.

Dr. Jane Smith.

Dr. Jane Smith is a female lifetime resident of Gitanmaaks (an Eastern village, Figure 15). Dr. Smith did not attend an institutional school. Today, she regularly speaks her language with her relatives, and in her role as a language teacher. Dr. Smith is also an author of numerous Gitksan language books and resource materials (Mowatt, 2000; Smith, 2004).

Figure 15: Map of Gitanmaax within Gitksan territory, adapted from (Coull, 1996).

Dr. Smith's vowel space (Figure 16) is quite unique among the participating speakers. Her /a/ and /a:/ vowels are similarly low to the other Eastern speakers, however they overlap almost entirely, and she has no raised pronunciations of /a/, as the other speakers do. Dr. Smith also does not produce as many centralized vowels as the other participating speakers. As such, her vowel space could be described as de-centralized.

It is worth noting at this point that Dr. Smith is a language educator, and it has been documented in phonetic literature that language educators tend to tailor their pronunciations towards the 'ideal' target resulting in hyper-articulation (Saito & van Poetern, 2012; Uther, Knoll, & Burnham, 2007). This tailored pronunciation may account for the de-centralization observed here. It is worth noting that Dr. Smith's /a/, /o/, and /u/ are nearly equally as back as one another. This may be a feature of her dialect; further investigation is required.

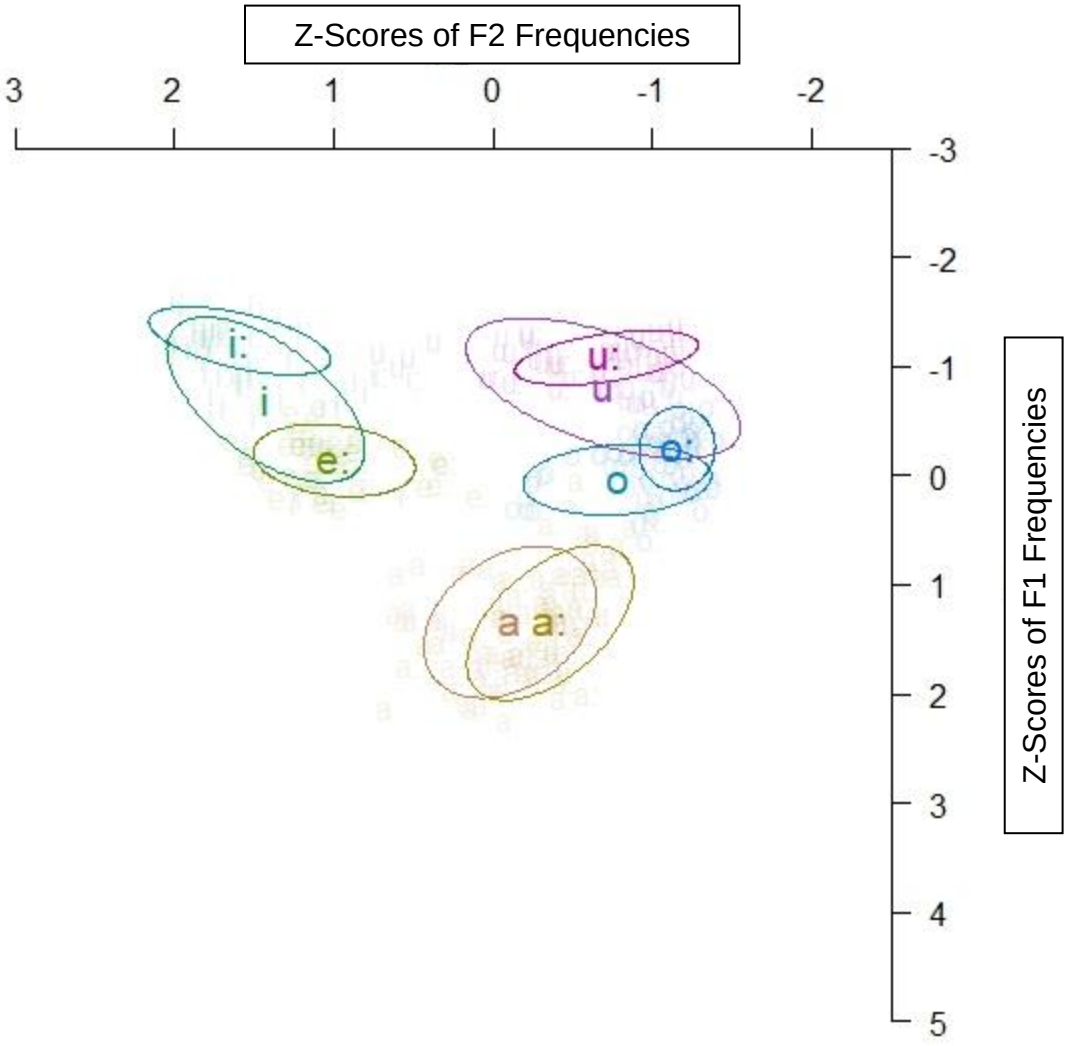

Figure 16: Plot of all target vowel utterances by speaker Dr. Jane Smith, given in z-scores based on F1/F2 frequency.

Myrna Hill Aksidan.

Myrna Hill Aksidan is a female lifetime resident of Gitsegukla (a Western village, Figure 17). Mrs. Hill Aksidan learned her language from her mother and father. She is the first speaker from a Western village that I describe in this section. Mrs. Hill Aksidan attended Indian Day School from Kindergarten through to Grade 6. Today, she regularly speaks Gitksan with her relatives, including at least one speaker of Nisg̲a’a.

Figure 17: Map of Gitsegukla within Gitksan territory, adapted from (Coull, 1996).

Mrs. Hill Aksidan's vowel space (Figure 18) is the first to appear in this section that is exemplary of the Western pronunciation, as described by Rigsby (1986). This is exemplified by the overlap between her /a/ and /e:/ ranges. Mrs. Hill Aksidan's /a:/ utterances are somewhat higher than the previous speakers, and her back vowels are similar in their range and pattern of overlap. Her /e:/ utterances are raised and do not vary in their quality. These features are consistent with Rigsby's (1986) observations about the surface features of Western dialects. These features also resemble Tarpent (1987)'s surface inventory for Nisga'a. This could be attributed to Mrs. Hill Aksidan's father being Coast Tsimshian, or a function of living in a Western village. Mrs. Hill Aksidan also has very retracted /i:/ utterances, which is a feature that has not previously been described in the literature. This may be attributable to her dialect, village, or lineage. No other Western speaker shares this retraction to the same extent as Mrs. Hill Aksidan.

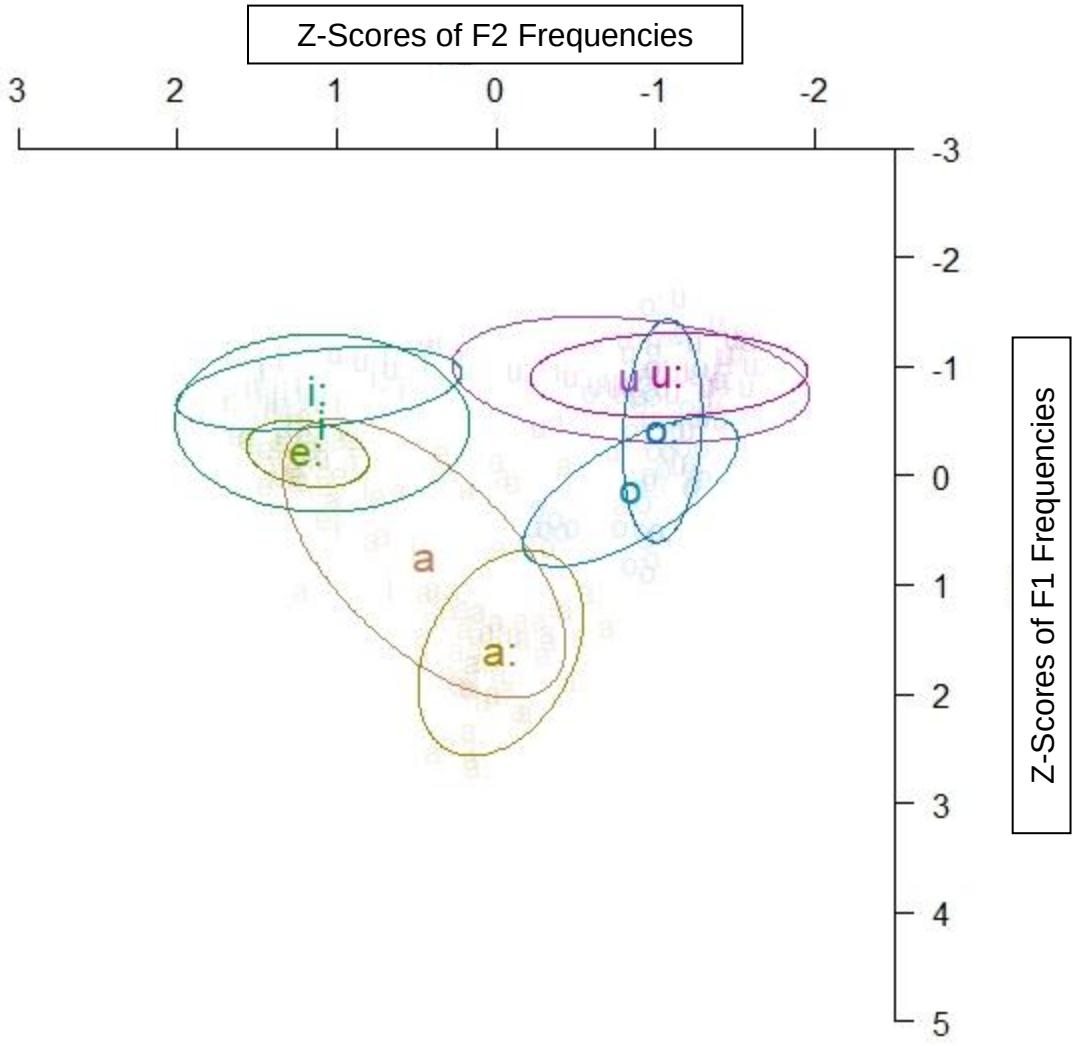

Figure 18: Plot of all target vowel utterances by speaker Myrna Hill Aksidan, given in z-scores based on F1/F2 frequency.

Ray Jones.

Ray Jones is a male speaker who has lived most of his life in Gitsegukla (a Western village, Figure 17). In early childhood Mr. Jones lived in a predominantly Nisg̲a'a-speaking community, and he is therefore a bilingual speaker of Nisg̲a'a and Western Gitksen. This may account for some of the unique features of his vowel space. Mr. Jones's first language is Nisg̲a'a, which he acquired because he was being raised by his parents in a community of cannery

workers whose dominant language was Nisg̲a'a. Sometime before age 5, Mr. Jones began acquiring Gitksan, taught to him by his grandparents. He attended Residential School for the duration of his education, except for Grades 7 & 8, during which he 'stayed home'.[24] Today, Mr. Jones speaks primarily Gitksen, most often with his relatives, as well as through his work as a community support worker and as part of language and culture revitalization programs.

Mr. Jones's vowel space (Figure 19) is noticeably higher, when compared to Mrs. Hill Aksidan's utterances shown in Figure 18. Most strikingly, his /a/ and /a:/ utterances are raised to a nearly central position. Mr. Jones's /i/ and /i:/ utterances are also very fronted, and do not display the retraction described for Figure 18 (so it is unclear if this retraction is a dialect feature of Gitsegukla Gitksen). He also shows some centralization of the /u/ utterances, towards a [ʌ]-like pronunciation. The extent to which Mr. Jones's vowel ranges overlap with one another is unique to him, in the context of this study. This may be a feature of his first language, house, or lengthy attendance at residential school, none of which are shared by other speakers in this study. This requires further investigation and no generalizations can be made from these observations.

[24] This may refer either to homeschooling or Indian Day School.

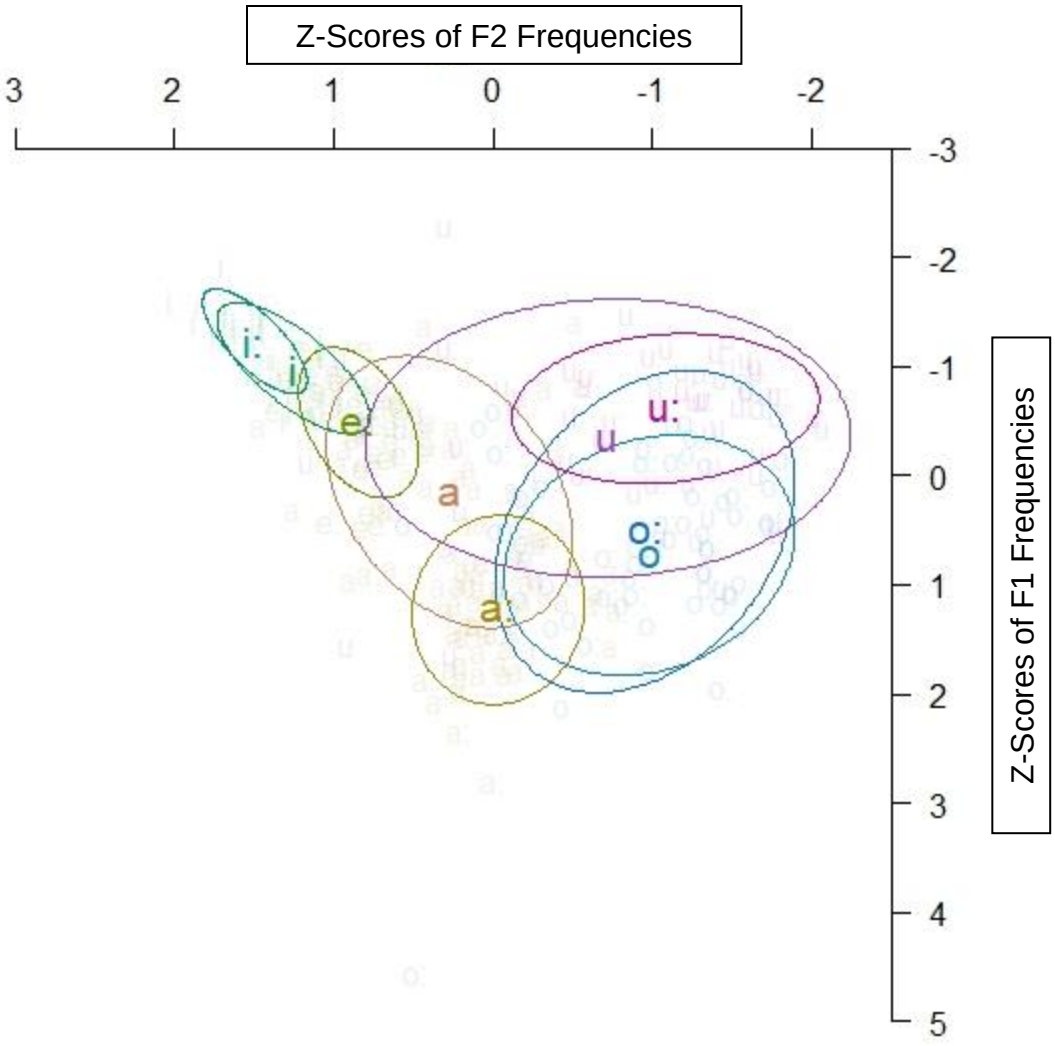

Figure 19: Plot of all target vowel utterances by speaker Ray Jones, given in z-scores based on F1/F2 frequency.

Glenn Williams.

Glenn Williams is a male speaker and lifetime resident of Gitwangak̲ (a Western village, Figure 20). Mr. Williams learned his language from his mother and father. He attended Indian Day School from Kindergarten to Grade 7.

Figure 20: Map showing Gitwangak within Gitksan territory, adapted from (Coull, 1996).

Mr. Williams's vowel space (Figure 21) is somewhat unique, because, as I will discuss, while it is phonetically mostly typical of the Eastern pronunciation described by Rigsby (1986) (despite Gitwangak typically being considered a Western village), he does use some 'fronted' /a/ pronunciations associated with the Western variant of the East/West a/e distinction. Note that unlike the vowel spaces of Ray Jones and Myrna Hill Aksidan (Figures 19 and 18 respectively), who are also from geographically Western villages, Mr. Williams has more overlap of his /a/ range with /a:/, and less with /e:/. Furthermore, there are no other obvious distinctions in his overall vowel space from the speakers from typically Eastern villages. Mr. Williams has similarly low /a:/ utterances, and less centralization than either Mr. Jones or Mrs. Hill Aksidan. Mr. Williams has some fronted /a/ tokens that align with his Western geographic origin, such as the following:

(19) gyat
[gʲat]
/gʲɛt/
'man'

(20) yats
/jats/
[jɛts]
'to hit'

Mr. Williams did not, however, use [ɛ] in the following tokens, unlike other Western speakers:

(21) gwanks
/gʷanks/
[gʷãnks]
‘spring water’

(22) n’akw
/ʔnakʷ/
[ʔnakʷ]
‘far’

By displaying some features of characteristically Eastern speech, and some features of characteristically Western speech, Mr. Williams’ vowel space contributes added nuance to our understanding of the East/West dialect split. Additional investigation with more participating speakers from Gitwangak is needed to come to a better understanding of whether this pattern is representative of Mr. Williams dialect or individual variation.

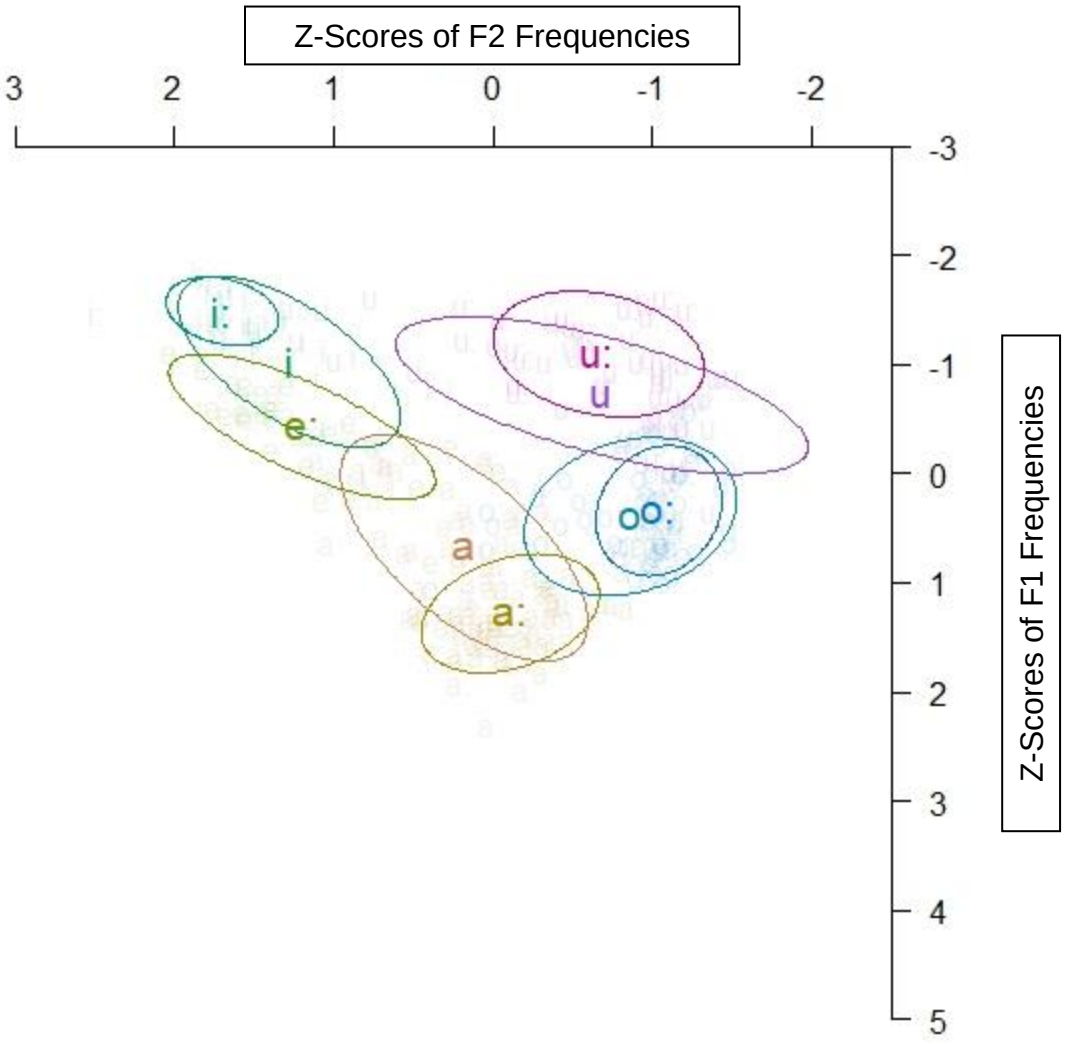

Figure 21: Plot of all target vowel utterances by speaker Glenn Williams, given in z-scores based on F1/F2 frequency.

Vincent Gogag.

Vincent Gogag is a male speaker from Gitanyow (a Western village, Figure 22), who relocated to Vancouver as a young adult. Mr. Gogag learned his language from his mother and father, and maternal grandparents, who were from Anlak̲ (a community which he now describes as a 'ghost town', and he estimates is roughly five to six miles West of Gitanyow). Mr. Gogag

spent a lot of his time in between Gitanyow and Anlak̲ and did not attend any institutional school. Gitanyow is not situated along the Skeena River like other Gitksan villages. Gitanyow is situated along the corridor between the Nass and Skeena rivers. As described by Tarpent (1987), its geographic proximity to Nisg̲a'a territory promoted trade relations through fishing and other resources, resulting in language contact between these communities.

Figure 22: Map of Gitanyow within Gitksan territory, adapted from (Coull, 1996).

Mr. Gogag's vowel space (Figure 23) resembles a more centralized pattern as was described for Ray Jones (Figure 18). This may be due to Gitanyow's geographical proximity to Nisg̲a'a-speaking villages and Mr. Jones's first language, which is Nisg̲a'a. There is currently no available phonetic work on Nisg̲a'a with which to compare Mr. Gogag's and Jones' vowels. Although Mr. Gogag has some lowered pronunciations of /a/ and /a:/, the average for these vowels remains quite high, exhibiting some central overlap with /o:/ and /o/, which is not observed for other speakers. He has a high front average for /i:/ utterances, with some retracted pronunciations. Perhaps most striking are Mr. Gogag's high, retracted /i/ and /e:/ utterances, which are not observed elsewhere and have yet to be described in the literature. He is demographically very unique, so this could be due to his dialect, village or origin, absence from any institutional school, or house. Further note that Mr. Gogag has a large amount of F2

variation – this may be due to his individual ‘style’ in wordlist elicitation, where he varies the intonation of each repetition of a token.

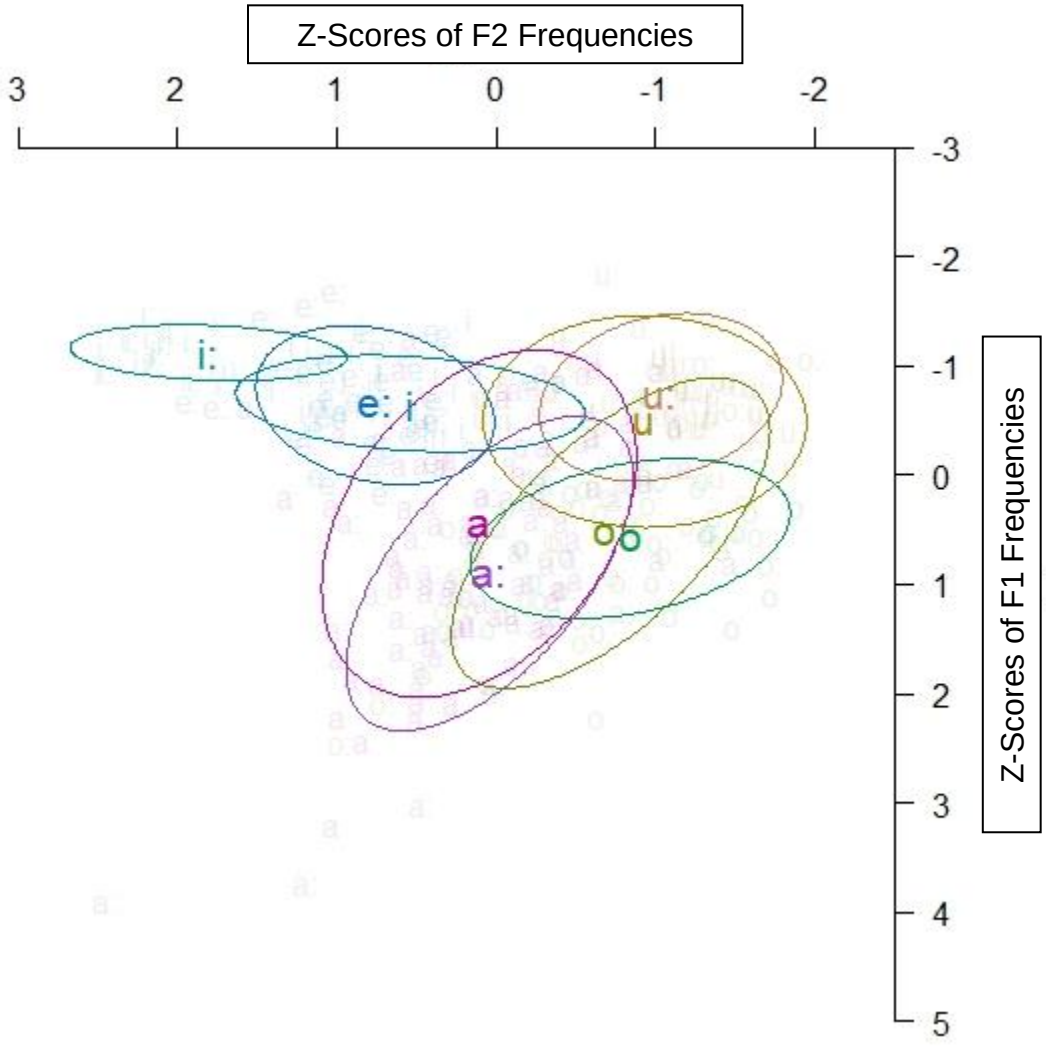

Figure 23: Plot of all target vowel utterances by speaker Vincent Gogag, given in z-scores based on F1/F2 frequency.

The individual speaker vowel plots provided in 4.2 show interesting variation in vowel pronunciation. The key observations from this section are summarized as follows:

i) retraction of /i/ towards an /ɨ/-like pronunciation (Figure 23)

ii) retraction of /i:/ towards an /ɨ:/-like pronunciation (Figures 18 & 19)

iii) centralization of the low and back vowels, as well as raising of /e:/ (Figures 18, 19, & 23)

iv) unique phonetic characteristics of Glenn Williams, a speaker from Gitwangak̲ (Western village), and whose vowel space largely resembles participating speakers from Eastern villages, except for a limited number of raised and fronted /a/ tokens (Figure 21)

In the following section, I consider speaker variation in terms of a possible dialect continuum, looking for patterns that show a gradual phonetic shift between speakers, across communities on the Interior Tsimshianic dialect continuum.

4.3 Towards Evidence of a Dialect Continuum

This section focuses on my findings as they relate to the question of a dialect continuum. The particular focus is on the realization of the a/e vowel which, as discussed in Chapter 2, has been identified as a key maker in the East-West dialect split. While the a/e distinction is to some extent predictive of a speaker's village of origin, it is not uniformly aligned with dialect/language identity, and adds nuance to the East/West split based specifically on the presence of [a] or [ɛ]. This prompts me to ask: Does the way in which pronunciations of /a/ pattern between villages suggest a dialect continuum, or a set of related dialects? A continuum would predict progressive and incremental shift in a uniform direction across communities (Chambers & Trudgill, 1980; Nerbonne & Kleiweg, 2007), like so:

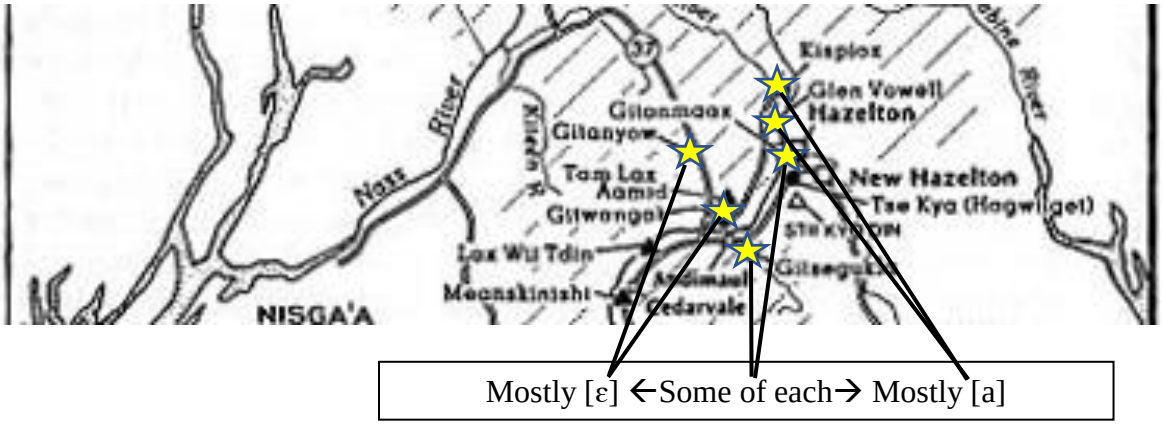

Figure 24: Visualization of predicted a/e continuum.

The pattern in the Figure 24 does not entirely line up with recorded /a/ pronunciations from section 4.2. A more representative image of speakers' pronunciations is given in Figure 25:

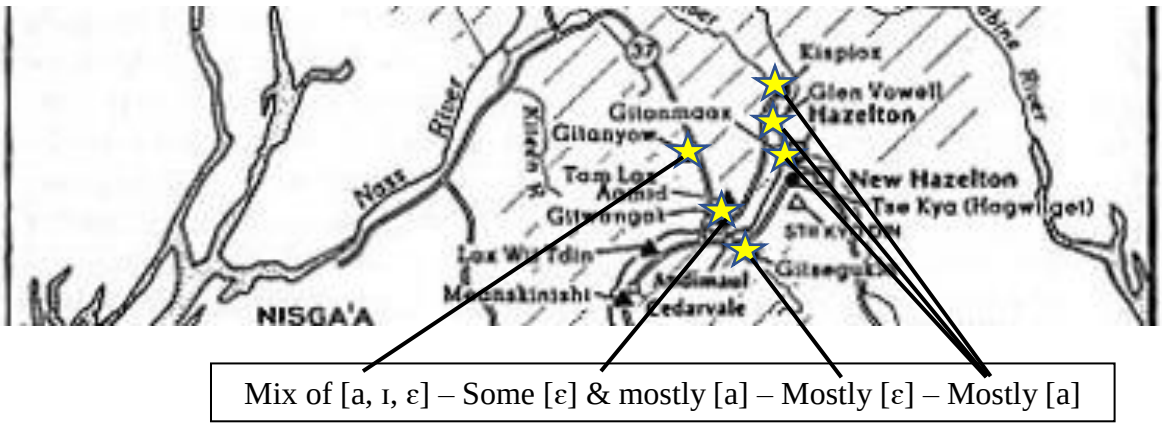

Figure 25: Visualization of a/e pattern across villages

Gitsegukla speakers uttered more [ɛ] vowels, the Gitwangak̲ speaker (Glenn Williams,) less so, and the Gitanyow speaker (Vince Gogag) about as much as Gitsegukla speakers, with many tokens of /a/ that surfaced as [ɪ]. Eastern speakers (Gitanmaaks, Sigidak̲, Kispiox) uttered mostly [a] vowels, with the [ɑ] vowel occurring in the uvular lowering environment.

The speakers from Eastern villages have vowel spaces that match up with the phonological descriptions offered by Rigsby (1986) and acoustic observations from Brown et al. (2016). This is most evident in the lowered /a/ and /a:/ pronunciations and the lack of raising in the /e:/ vowel that is observed for the Western speakers. There is also some evidence that speakers from Western villages have vowel spaces that line up with the predictions made by the literature: all Western speakers have at least partial a/e shift, where some or many /a/ utterances overlap with the /e:/ range. This shift is exemplified in Figure 25,

Complementing the specific illustration of the a/e shift above, (Figures 24 and 25), Figure 26 provides a more holistic view of what could be interpreted as a dialect continuum. This Figure displays the surface vowel inventory of each of the participating speakers from East to West, in coordination with a map showing their village of origin. It is evident upon visual inspection of this Figure that there are trends in vowel space moving along this continuum, as described throughout this chapter.

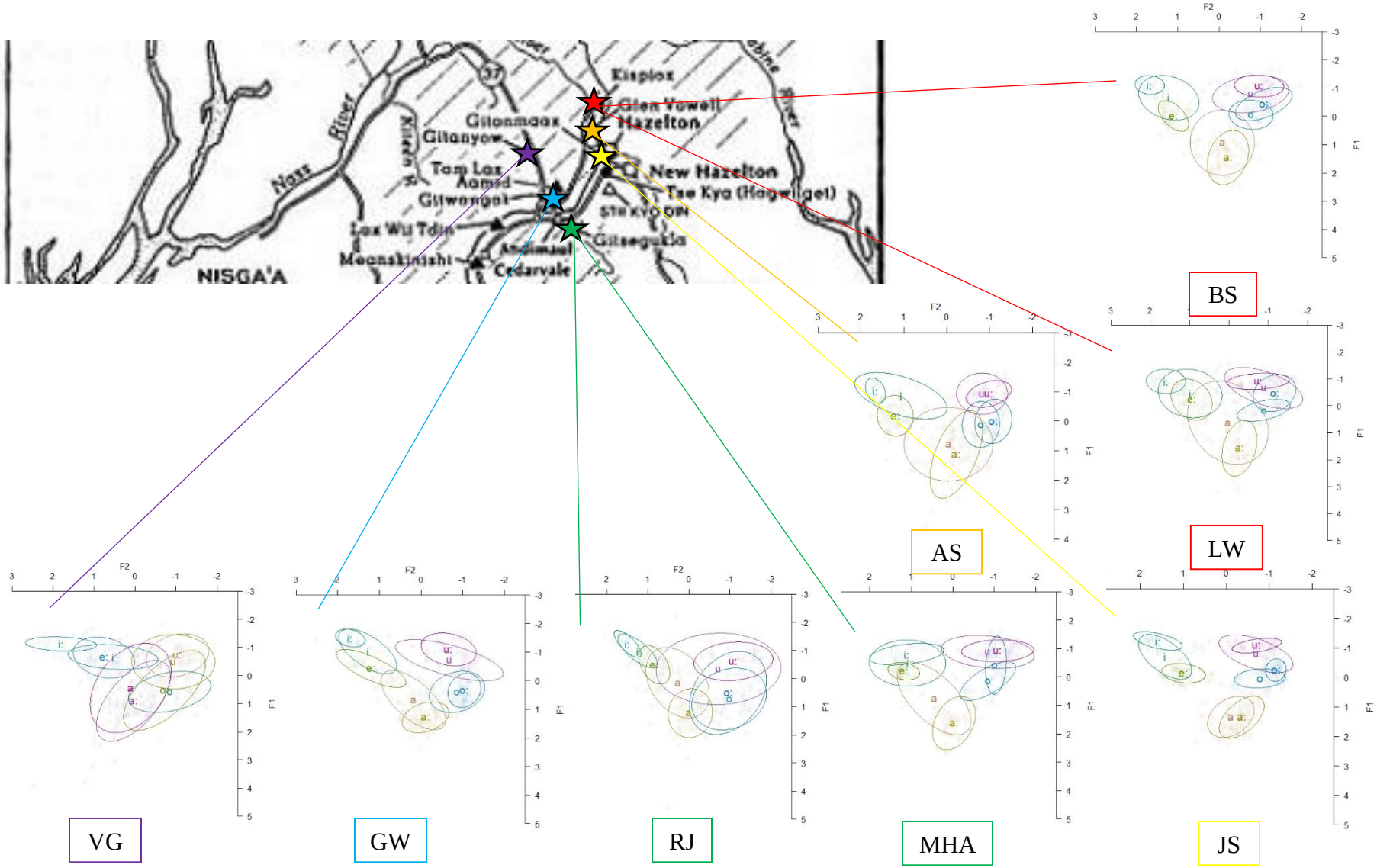

Figure 26: Visual summary of speaker profiles (vowels given as z-scores of F1 and F2 frequencies) adapted from Figures 10-23 and (Coull, 1996)

4.4 Summary of Results

My research question was: *How does vowel quality vary across speakers of Gitksan, and what sociolinguistic predictors may be influencing this variation?* In answer to the first part of the question, I made several observations regarding the nature of vowel variation among the participating speakers (section 4.2), including i) retraction of /i/ towards an /ɨ/-like pronunciation (Figure 20), ii) retraction of /i:/ towards an /ɨ:/-like pronunciation (Figures 18 & 19), and iii) centralization of the low and back vowels, as well as the raised /e:/ (Figures 18, 19, & 23). Specifically, I wish to highlight the observations made about Glenn Williams's speech (Figure 21) which includes [ɛ] utterances but an overall vowel space consistent with Eastern speakers, which is different from all other speakers in the study. Additionally, Vince Gogag, who has variation in F2 ranges not seen in other speakers, and Dr. Jane Smith (whose unique de-centralization may or may not be a dialect feature).

The qualitative component of my study was designed to enable me to answer the second part of my research question. I was able to identify a number of factors potentially influence vowel variation (section 4.1), related to the themes of (i) language/dialect contact, (ii) socio-cultural characteristics of Gitksan tradition, (iii) engagement in language revitalization initiatives, and (iv) experience with residential schools and colonialism. Because my study included relatively few speakers, each with very different backgrounds related to language use, I was not able to incorporate these factors into my quantitative analysis. The one factor I *was* able to consider was dialect, and I was able to provide tentative support for a dialect continuum within Gitksan.

As demonstrated in section 4.3, the overall finding of this chapter is that generalizations about the East-West dialect split hold true for many speakers, however, there is additional

individual variation and nuance within this split. This variation supports the idea of a dialect continuum along the Interior Tsimshianic branch.

Table 7 gives an expanded version of Table 6, suggesting dialect/ -specific transcriptions for each underlying vowel (bolding indicates unique realizations).

Table 7: Suggested village-specific transcriptions of the underlying vowels.

/Vowel/	**Kispiox, Sigidak**	**Gitanmaaks**	**Gitsegukla, Gitwangak**	**Gitanyow**
/a/	[ʌ, a, ɑ]	[a, ɑ]	[ɛ, ʌ, æ, a]	[ɛ, ʌ, æ, a, **ɪ**]
/aː/	[aː, ɑː]	[aː, ɑː]	[aː]	[æː, aː, **ʌː**]
/eː/	[eː]	[eː]	[eː]	[eː, **ɪː**]
/i/	[i, ɪ]	[i, ɪ]	[i, ɪ]	[i, ɪ, **i̞**]
/iː/	[iː]	[iː]	[iː, **ɪː, i̞ː**]	[iː]
/u/	[u, ʌ, ʊ]	[u, ʊ]	[u, ʊ, **ʉ̟**]	[u, **ʌ**, ʊ]
/uː/	[uː]	[uː]	[uː, ʊː]	[uː, ʊː]
/o/	[o]	[o]	[o, ɔ]	[o, ɔ]
/oː/	[oː]	[oː]	[oː, ɔː]	[oː, ɔː, **ʊ̟**ː]

Chapter 5: Discussion & Conclusion

This chapter discusses the primary findings of Chapter 4 and the place of this thesis within the body of literature on Gitksan surface phonetics and variation.

5.1 Community Outcomes

This thesis came about because I wanted to use my research platform to address community requests that had been made to UBC's Gitlab before and during my association with the lab. Many speakers have requested multi-dialect materials, something that is being addressed by the Gitksan Mother Tongue's Dictionary.[25] As a phonetician I have attempted to further support this effort by providing a phonetic description of vowel variation cross dialects/language-identities (summarized in Table 7). I also collected my audio recordings with the intention of incorporating them into the Gitksan Mother Tongues dictionary. In this way, more speakers using the app will be able to hear their and/or their families' dialects represented.

5.2 Dialectology in the Gitksan Language Context

The process of writing this thesis revealed to me aspects of my implicit bias as a researcher of which I had not previously been aware, and taught me valuable lessons about the suitability of traditional dialectology to the Gitksan language context. My early research intentions in approaching this project were to apply traditional dialectology methods, including dialectometry (cf. Nerbonne & Kleiweg, 2007; Stanford, 2012) to what I had previously suspected was a geographically motivated dialect continuum, as suggested by my 2016 study (see 4.3 for an updated perspective on this notion). This prompted me to consider my research question in two parts: (i) What is the surface variation across speakers? (ii) Are there identifiable

[25] https://mothertongues.org/gitksan/#/home

sociolinguistic predictors that could explain this variation? Because of my limited familiarity with the statistical requirements of dialectology research, I did not realize that addressing these questions with statistically driven dialectology methods was a naïve goal until after collecting recordings and working with speakers to understand each of their demographic contexts. Indeed, I had been aiming to conduct this type of analysis, which I referred to in chapter 3 as Approach (ii), to address part (ii) of my research question. Due to the nature of the data that I gathered (in terms of variation in demographic spread across speakers) I was unable to do this. Knowing that I still had access to a rich set of data with corresponding qualitative insights, I focused instead on what I referred to in chapter 3 as Approach (i): an ethnographically informed series of case studies of vowel variation among individual speakers.

I was able to plot vowel realizations for speakers from Gitanmaaks, Gitwangak̲, and Gitanyow, all of whom have specific characteristics that may be indicative of dialectal variation. Dr. Jane Smith, of Gitanmaaks, had what I described as a 'de-centralized' vowel space. This may be an individual variation owing to the fact that she is a language teacher (Saito & van Poetern, 2012; Uther et al., 2007).

Glen Williams, of Gitwangak̲, had an interesting surface inventory (Figure 21), in that it adds nuance to our understanding of the East/West dialect distinction. Previous literature proposes to classify Gitwangak̲ with Western dialect descriptions. To classify Mr. Williams as a Western speaker would also be to predict that he would produce mostly [ɛ] in the context of the a/e shift; this was at least partially true (see Figures 21 and 26). However, when compared to other Western speakers, Mr. Williams did not share certain other vowel characteristics that distinguished them from speakers from Eastern villages, such as retracted high vowels. In fact, except for a partial a/e shift, Mr. Williams' vowel space was remarkably similar to that of Art

Sampson, a speaker from Sigidak̲ (see Figure 13). In this way, Mr. William's position on the e/a shift was consistent with the established East/West split (Western surface variants) but the remainder of his vowel realizations align with Eastern pronunciations.

There was previously no acoustic documentation of speakers from Gitanyow. Vince Gogag thus provides the first view of vowel realizations for this village. His vowel space appears different from those of other participating speakers in numerous ways (see Figures 23 and 28). This included high, retracted, and overlapping /i/ and /e:/. Future research can consider these observations and work to confirm whether Mr. Gogag's variation is reflective of an overall pattern across speakers from Gitanyow.

5.3 Unexpected Observations

Though the primary focus of this thesis was documentation of surface variation in vowel quality, I observed some surprising results with specific wordlist items that were not related to my research question. This section will present some individual tokens for which speakers' productions were unexpected and intriguing.

First, I will examine several tokens for which the orthography firmly suggests unrounded surface quality, but some speakers produced rounded vowels. Observe the following:

(23) 'miigwint
/ʔmi:gʷint/
[ʔmi:gʊnt]
'strawberry'

All speakers gave the phonetic pronunciation listed in 23, but all dictionaries I have access to use the orthography *miigwint*. However, given the consistent and intended correlation between surface quality and orthography at the time that the Gitksan writing system was developed and the consistent use of this spelling across source materials (Hindle & Rigsby, 1973; Mathews & Wale, 1996; Rigsby, 1986), one could confidently surmise that the phonetic

pronunciation must have at some point approximated [ʔmiːgʷɪnt]. One possibility is that the vowel has maintained its lax quality but has taken on the rounded quality of the preceding stop. Indeed, I have proposed a similar analysis of underlyingly placeless vowels in Gitksan function words (Fortier, 2017). Variation between gʷi ~ gu has also been observed in the literature as a common alternation in free variation and across dialects (c.f. Tarpent, 1987, p. 51).

I observed a similar co-articulatory effect in the following example:

(24) antamgwiitxwhl wineex
/antamgʷiːtxwɬ wineːx/
[andamgʷiːtxwɬ wineːx] OR [andamgʊːtxwɬ wineːx]
'person who says grace before food is served' or 'grace giver'

In (29), the effect is potentially less straightforward than in (28). This token has the same consistent spelling across source materials. However, as I've noted in the phonetic line, some variation in pronunciation of this token occurred. Vince Gogag, of Gitanyow, gave the second pronunciation. The vowel [iː] tends to be more tense than [i], which is often more central (Brown et al., 2016). Consequently, it is also curious why his pronunciation used [ʊː] and not [uː]. It is not clear to me what is conditioning the lax variant to surface, although possibly it is simply reflective of free variation (I did note in Chapter 4 that Mr. Gogag produced quite a lot of F2 variation). It may be that (28-29) are indicative of a change in progress. Further investigation is needed to substantiate any claims to this effect.

Similarly, in Figure 11 in section 4.2 it was shown that speaker Barbara Sennott (of Kispiox) has some high back /a/ and /aː/ utterances overlapping with her /oː/ and /uː/ ranges. This was a result of the following token:

(25) gwanks
/gʷãnks/
[gʷõnks]
'spring water'

No other speakers produced this surface realization for this token and it is my intuition that it is an idiosyncratic pronunciation. However, a future analysis may find additional, similar pronunciations, which show co-articulation of a labial gesture that is underlyingly consonantal in environments like (28-30).

I also observed one particularly surprising token that may have implications for change over time and feast protocol. Observe the following token (31):

(26) halaydim tets[26]
/hala^{j}tim tats/
[halajdim tɛts] (Gitxsanimx̲) [halajdim tɪts] (Gitxsenimx̲)
'settlement feast invitation ceremony'

The observed pronunciations given in (31) are surprising for speakers from Eastern villages. Rigsby (1986, p. 6) noted that [ɛ] should only appear adjacent to a uvular, resulting from underlying /i/. When I asked for this item in elicitation, many speakers observed that they had not heard this word in a very long time (but not, however, that they had never heard it at all). Invitation ceremonies[27] are apparently less common today, as cellphones and social media are the primary ways in which feast invitations are given out.[28] It may be the case that over time there has been a shift in items similar to (31) where now Eastern village speakers use [a] and Western use [ɛ], but that the pronunciation in (31) has frozen from disuse. I do not have enough data to confirm this or to posit directionality of a vowel shift between dialects or over time. Further investigation is certainly needed to make proposals about the directionality of vowel shifts from proto-Tsimshian to modern day Tsimshianic languages.

[26] Note here that the orthographic choice to use /e/ was consistent in all source material.
[27] These are ceremonies whose purpose is to invite community members to feasts.
[28] This information was shared by Myrna Hill Aksidan.

In short, there remain some interesting points to be investigated regarding the conditioning of surface vowel quality in items like (28)-(29). The conversation on directions for future research resumes in section 5.5.

5.4 Limitations & Lessons Learned

As I have noted throughout this thesis, I was working with some limitations that impact what I was able to do and what I am able to say. There are certain inherent limitations when working with an under-documented language, especially when one is not a native speaker of that language. To compile my wordlist, I used existing written documents that used an orthography intended to reflect the phonetic realization of vowels (Hindle & Rigsby, 1973; Mathews & Wale, 1996). However, there were some discrepancies in orthographic representation across these documents, and where they differed, I excluded the entries. This, along with the fact that there seem to be gaps in distribution of certain combinations of adjacent underlying phonemes, meant that I was not able to find tokens to satisfy all the target environments that I was seeking. Furthermore, the fact that I was eliciting with speakers of different language/dialect identities meant that I did not always have a token for a certain environment prepared that existed in each speaker's dialect (even though I piloted the wordlist with three speakers from different villages in an attempt to ensure that the items I had selected were present across dialects).

My limited experience as a researcher meant that I initially misunderstood appropriateness of two sociolinguistic factors that were not ultimately an acceptable line of inquiry for several of the speakers that I worked with: age and marriage. Both these factors were a source of discomfort in my demographic questionnaire and qualitative interview for several speakers. Even though these may have yielded interesting results as sociolinguistic predictors, I did not consider them in my analysis.

Furthermore, my initial goals when designing this study were naïve. My original intention was to use the interview responses in section 4.1 to develop a strict set of sociolinguistic factors against which to compare vowel quality. This was inspired by the sociophonetic studies I reviewed in section 2.3. However, working with a small number of speakers would have meant that in order to do this I would have needed speakers' demographic backgrounds to vary in specific ways in order to satisfy this kind of analysis. Naturally, this was not the case. I therefore had to reconsider that data that I had gathered and the value that it naturally offered, rather than trying to assign my own conception of what was valuable in it in order to satisfy my research goals. These research goals were not community-focused goals and had to be let go. In the end, I was still able to make important observations about individual speaker variation, and to suggest important sociolinguistic factors that can and should be considered in the Gitksan language context.

5.5 Summary of Findings & Contributions

The findings and discussion offered in this thesis add detail to the empirical body of work on Gitksan phonetics and lay the foundation for future research on the phonetic variation in Gitksan. The primary contribution of this thesis to the existing literature is the phonetic documentation of vowel inventories across varieties of Gitksan. This includes the suggestion that individual variation between the participating speakers may be indicative of further nuanced dialectal variation. This thesis has presented case studies of specific speakers, the variation among which may be idiolectal (meaning unique to that speaker alone) or representative of a dialect trend. Future research can expect variation up to and including all surface vowels listed in Table 7.

This thesis also demonstrates that the combination of traditional elicitation techniques combined with ethnographically-informed approaches can add richness to the interpretation of patterns found in phonetic data analysis. The variation between speakers from Kispiox and Sigidak̲, and speakers from Gitsegukla was predicted by the previous literature: this included the a/e shift and other phonetic characteristics associated with the Eastern but not Western variety (Brown et al., 2016; Fortier, 2016; Yamane-Tanaka, 2006). I also found evidence of /e:/ raising and /i:/ retraction in speakers from Gitsegukla and Gitanyow, which has not previously been documented.

5.6 Directions for Future Research

Throughout this thesis I have identified some specific areas for future research. These broadly fall into the categories of phonological, phonetic, and sociolinguistic research.

For future phonological research, I suggest following up on the discussion of underlying /e/ from 2.1.4, keeping in mind the surface inventory identified in this thesis, to see if Tarpent's analysis of underlying /e/ may apply in Gitksan (Tarpent, 1987). Addressing this issue requires updated work with modern speakers of Nis̲ga'a, acoustic documentation of their speech, and a complementary phonological investigation into the underlying inventory.

Now that I have been able to provide a detailed surface vowel inventory, future phonetic research can aim to provide an account of co-articulatory effects,[29] like Nolan's (2017) study of Lekwungen vowels and co-articulation. I also did not explore any possible effects of individual speaker variation in duration. Future work should investigate possible sources of variation in duration among speakers, possibly taking a sociolinguistic lens, as I have done in this thesis. It may be the case that certain demographic groups produce shorter vowels, and that this has a

[29] This has already been done from the phonological point of view (c.f. Brown, 2008; Brown, 2010).

subsequent effect on vowel quality. Furthermore, future phonetic research can use the findings in this study as a basis for additional phonetic documentation of vowel variation.

I also suggest detailed investigation into the effect of segmental environment on surface vowels, similar to my 2017 study of underlying schwa in some function words (Fortier, 2017). Based on the amount of variation in surface quality of what is presumed to be underlying /a/, and the documented co-articulation of this vowel in uvular environments (Brown et al., 2016; Brown & Hansson, 2008; Fortier, 2016; Yamane-Tanaka, 2006), I suspect that some of the words which are presumed to have underlying /a/ may in fact have underlyingly placeless vowels. Investigating the underlying inventory would require a detailed approach to eliciting /a/ forms in as many environments as possible, coupled with a phonological investigation of underlying forms and phonological processes that lead to the surface form. Similarly, in 5.3 I identified some curious observations that can also be followed up on with a more focused historical phonological analysis, including whether they are indicative of a change in progress or over time, as they relate to proto-Tsimshian.

There are several sociolinguistic findings and observations to follow up on as well. First, several speakers who are heavily involved in language revitalization reported that they feel this is an important part of how they speak today, with some emphasis on pronunciation and dialect. While I was unable to address this in the present study, it is a noteworthy point that should be followed up on.

Second, several speakers, especially those who work in culture- and language- specific environments, talked about how their careers interact with their language use. Career, often as it relates to socio-economic status, is a widely studied sociolinguistic predictor variable of language variation and change (Chambers & Trudgill, 1980; William Labov, 2001). I also

learned from several speakers who were raised in rural communities that one's career is often linked to movement towards urban centres later in life. Therefore, this may interact with variation in one's pronunciation over their lifetime. Lastly, given research that has shown that clan is an important predictor variable in the Sui language context (Stanford, 2007, 2008, 2010), future studies should seek to work with numerous speakers from varying houses and phratries in order to test matrilineal lineage and cultural inheritance as a predictor of language variation in the Gitksan language context.

5.7 Final Thoughts

There are two final thoughts that I would like to finish with. The first relates to variability and is especially relevant to the community requests that inspired this thesis. Building on existing phonetic descriptions of Gitksan dialects and the a/e shift, this project has shown that, at least on the individual level, there is more detailed variation in vowel pronunciation than was previously thought.

The second is that the Indigenous language context in British Columbia is an important opportunity for developing emerging methodologies. As a naïve researcher, I had to learn as I progressed through this project to be flexible in my approaches and analyses, even when the recordings had already been collected and the study had already been designed. As I discussed in section 5.2, I approached this project with the idea to use methods that required statistical power that could not be achieved in the Gitksan language context. Rather than abandoning this line of inquiry, I adapted my research focus and specific approaches such that valuable knowledge related to my research question still emerged.

In conclusion, this thesis has asked *How does vowel quality vary across speakers of Gitksan, and what sociolinguistic predictors may be influencing this variation?* I have

documented several dialect-specific and individual speaker features of surface vowel inventories across five Gitksan villages. Some of these observations confirmed the inventories from the existing body of literature, and some of the observations added additional detail. This is not to say that the research question has been satisfied and the investigation now concluded – far from it. Indeed, I hope that this thesis can serve its purpose in supporting, in however small a way, discussions about dialect in both the Gitksan and linguistics communities.

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Appendices

Appendix A

Demographic questionnaire and qualitative interview.

1. What is your first language?
2. What is the name of your dialect?
3. Where did you grow up?
4. By whom were you raised?
    a. What is the house (*wilp)* and phratry (*pteek*) of the people who raised you?
5. What is your house (*wilp)* and phratry (*pteek*)?
6. Are you married?
    a. What is the house (*wilp)* and phratry (*pteek*) of the person you married?
    b. Did you move when you were married, and if so, where to?
7. What is your age?
8. Is there are other information about your background that you think influences the way you speak?
    a. Is there anything else you would like me to know about your dialect?
    b. Use prompting, open-ended follow-up question to elicit qualitative data
9. Are you actively involved in language revitalization?
    a. If so, how many hours per week?
    b. If so, do you meet with other speakers? Of what dialects?
10. Did you attend residential or Indian Day School?
    a. If so, from what age and for how long?
    b. If so, were you permitted to go home for any periods of time?

Appendix B

Wordlist.

Some items in the wordlist satisfy multiple target environments for certain target vowels. They are however only listed once.

Target Vowel	Target Environment	Word	English	Dialect	Source
a:	q_	k_aat	cane; walking stick	Gyeets	EWD
		g_aakhl	mouse	Gyeets	EWD
		g_aak_	raven	Gyeets	EWD
	_q	g_aak_	raven	Gyeets	EWD
		aak_	lips	Gyeets	EWD
		nax_naax_t	duck	Gyeets	EWD
	kw_	gwaast	to lend	Gigeenix	EWD
		gwaatl'ax_	snail; slug	Gyeets	EWD
		Ha'nii Sgwaa'ytxw	Sunday; a day to rest	Gyeets	EWD
	_kw	haldaakws	liniment; ointment	Gyeets	EWD
		sa'naakwa	leaf eating caterpillar	Gyeets	EWD
		gaakw	tendon; sinew		Michael
		x_sgyaak	eagle	both	EWD
		g_ayaax_xw	dark grey	Gyeets	EWD
	_y	ay'aay	ptarmigan	East	Kathy
		wilaayasxw	Brother in law	Gigeenix	EWD
		wilaay'y	I know	both	EWD
	.'_	aak_	lips	Gyeets	EWD
		t'aap	to hammer	Gyeets	EWD
		aadihl	nevermind	Gyeets	EWD
	_'	k'ala'waa'	fox	Gyeets	EWD
		Ha'nii Sgwaa'ytxw	Sunday; a day to rest	Gyeets	EWD
		haa’atxw	Red headed wood pecker	Gigeenix	EWD
	h_	amhaawak_	birch tree	Gigeenix	EWD
		haahlx_an	wall	Gyeets	EWD
	_h	t'aap	to hammer	Gyeets	EWD
		sg_aahaat	abdominal oblique	Gyeets	EWD
e:	q_	ts'ilg_ees	chipmunk	Gyeets	EWD
		g_eewin	seagull	Gyeets	EWD
		x_eek_	bank swallow	Gyeets	EWD
	_q	eek_	coho salmon	Gigeenix	EWD

		x_eek_	bank swallow	Gyeets	EWD
	kw_	gwee'y	poor		Michael
		gwee'yt	soft		Michael
	_kw	k'eekw	one (human)	Gigeenix	EWD
		sdik'yeekw	brother; sister; sibling	Gigeenix	EWD
		g_aseexw	groin; lower abdomen	Gigeenix	EWD
	y_	yee	walk	all	EWD
		sdik'yeekw	brother; sister; sibling	Gigeenix	EWD
	.'_	eek_	coho salmon	Gigeenix	EWD
		ee'e	yes	all	EWD
		k'eekw	one (human)	Gigeenix	
	_'	ihlee'e	blood		EWD
		see'lax_	needle	Gyeets	EWD
		gwee'y	poor		EWD
	h_	meex_	sour	Gyeets	EWD
		max_ meek_	blue grouse	Kathy paper dictionary	
i:	kw_	gwiikw	groundhog	all	EWD
		gwiiswis	rain gear	Gigeenix	EWD
		antamgwiitxwhl wineex	A person who blesses the food before it is eaten	Gigeenix	EWD
	_kw	diikw	sister	Gyeets	EWD
		hlgiikw	Woman’s sister	Gigeenix	EWD
		gwiikw	groundhog	all	EWD
	_y	ts'iiya	baby moose	Gigeenix	EWD
	.'_	iis	necklace	Gyeets	EWD
		hlgim ii'uxwt	sons	Gyeets	EWD
		ts'iiya	baby moose	Gigeenix	EWD
		hlgim ii'uxwt	sons	Gyeets	EWD
		bii'y	Address form of one’s uncle	Gigeenix	EWD
	h_	hiihluxw	morning	all	EWD
		miinax_s	ankle	Gyeets	EWD
	_h	lasa 'wiihun			
		niihuksxw	hanging up	Gigeenix	EWD
o:	q_	limixtx_ook_xw			
		g_oops	little boy's penis	Gyeets	

		g_oop	waves	Gigeenix	EWD
		ha'mook_	Cow parsnip or rhubarb	Gyeets	EWD
		mook_	Bull kelp	Gyeets	EWD
	kw_	gwisgwoos	Stellar's jay	Gyeets	EWD
		gwooyim	spring time	Gyeets	EWD
		nigwoot	Father	Both	EWD
	y_	k_'yootxs	Gigeenix EWD		
		gyoodan	horse	all	EWD
		biyoosxw	flies in general	Gyeets	EWD
	_y	enhooya'	tools	Gyeets	EWD
		gwooyim	spring time	Gyeets	EWD
		g_ant'oo'	safety pin	Gyeets	EWD
	‘_	Ye’oosit	Person who is assigned to wash the corpse after a death	Both	EWD
	_'	g_ant'oo'	safety pin	Gyeets	EWD
		Limixoo’y	Lament; mourning song of our ancestors	Gyeets	EWD
	h_	hoo'oks	Balsam	Gyeets	EWD
		enhooya'	tools	Gyeets	
	_h	g_oops	little boy's penis	noun	
		g_alg_'oop	fish heart	both	
u:	q_	t'imk_uukw	buttocks	Gyeets	EWD
	_q	uuk_	copper	Gyeets	EWD
	_kw	uukw	home brew	Gyeets	EWD
		guukwst	to be soaked in water	Gyeets	EWD
		k'uukw'	tail	Gigeenix	EWD
	y_	hlbiiyuuhumsxwit	messenger	Gyeets	EWD
		ji gyuu'n	now	Gigeenix	EWD
		miyuup	rice	all	EWD
	_y	hlguuya	small Jack spring		EWD
	.'_	uuk_	copper	Gyeets	EWD
		uukw	home brew	Gyeets	EWD
		k'uukw'	tail	Gyeets	EWD
	_’	suu'wa	A person or persons who go from house to house to invite the community to a feast	Gyeets	EWD
		ji gyuu'n	now	Gigeenix	EWD
	h_	huut	to flee		EWD

		gibuu	wolf		EWD
		buusii	house cat		EWD
	_h	hlbiiyuuhumsxwit	messenger	Gyeets	EWD
		gep suubit			
		miyuup	rice	all	EWD
a	q_	g_ayda ts'uuts'	mushroom	All	Michael
		g_an	tree		my brain
		g_asx_	Wild rice; chocolate lily bullets	Gigeenix	EWD
	_q	ts'ak_	nose	Gyeets	EWD
		hak_	goose	Gyeets	EWD
		nax_	snowshoes	Gyeets	EWD
	kw_	gwalkw	to be dry	Gigeenix	EWD
		gwanks	spring water	Gigeenix	EWD
		gisg_angwa'ltxw	robin	Gigeenix	EWD
	_kw	n'akw	far	Gigeenix	EWD
		jakw	to kill	Gigeenix	EWD
		Hakwhl	Hook or gaff	Both	EWD
	y_	yats	to hit	Gigeenix	EWD
		Yahlx_	Phlegm	Both	EWD
		Gyat	Man	Both	EWD
	_y	halaydim tets	A settlement feast invitation ceremony	Gigeenix	EWD
		alayst	lazy	Gigeenix	EWD
	.'_	ts'ak_	nose	Gyeets	EWD
		am	good	my brain	EWD
		.'ap	bee, in general	Gyeets	EWD
	_'	ha'w	stop	Gigeenix	EWD
		lo'oba ts'a'l	fool hen	Gigeenix	EWD
		gisg_angwa'ltxw	robin	Gigeenix	EWD
	h_	hap	cover	Michael	EWD
		hak_	goose	Gyeets	EWD
		ha'w	stop	Gigeenix	EWD
	_h	am	good		Michael
		hap	cover		Michael
		.'ap	bee, in general	both	EWD
u	q_	ts'im k_ul	Anus	Both	EWD
	_kw	mukw	purple; ripe	Gigeenix	EWD
		hugwast	snare	Gyeets	EWD
		ayukws	house crest	Gyeets	EWD

	y_	ayukws	house crest	Gyeets	EWD
		yukw	a big feast	both	EWD
		k'yul	one (human)	Gigeenix	EWD
	.'_	an'un	hand; arm	Gigeenix	EWD
		ubin	pregnant	both	EWD
		tk_'am'u'y	my body	Gigeenix	EWD
	_'	tk_'am'u'y	my body	Gigeenix	EWD
		du'ust	Over there	Gyeets	EWD
		gu'us't	Over here	Gyeets	EWD
	h_	hupx_	forehead	all	EWD
		mukw	purple; ripe	Gigeenix	EWD
		hugwast	snare	Gyeets	EWD
	_h	gup	to eat	all	EWD
		hupx_	forehead	all	EWD
		ubin	pregnant	both	EWD
i	q_	k_ihlx_	Chest	Gyeets	EWD
		g_in	skunk	Gyeets	EWD
		g_i'n	to chew	Gyeets	EWD
	_kw	t'ikw	Belly-button	Gyeets	EWD
		ixw	fish; hook; line	Gyeets	EWD
	y_	yip	land; ground	Gyeets	EWD
		yimk_	whiskers	Gyeets	EWD
	.'_	ixw	fish; hook; line	Gyeets	EWD
		is	soapberries	both	EWD
	_'	.'nax_'ni'y	Listen!	Gyeets	EWD
		k'i'y	one thing	Gyeets	EWD
	h_	hlbi'l	ten (money)	Gyeets	EWD
		hlbin	any whale	Gyeets	EWD
	_h	lax_dibilix	Forehead	Both	EWD
		yip	land; ground	Gyeets	EWD
		yimk_	whiskers	Gyeets	EWD
o	q_	g_os	light	Gyeets	EWD
		g_oy'max_	bright	Gyeets	EWD
	_q	lok_	rotten	Gyeets	EWD
		dok_	to take	Gyeets	EWD
		bok_	top side part of the buttocks	Both	EWD
	y_	t'imk'yo'o	Spine	Gigeenix	EWD
		gyop'	go ahead	Gigeenix	EWD
		hak'yo'	One’s back	Gyeets	EWD

_y	g_oy'max_	bright	Gyeets	EWD
.'_	o'os	cross cousin	Gyeets	EWD
	sk_an nisk_'o	Thimbleberry plant	Gyeets	EWD
_'	o'os	cross cousin	Gyeets	EWD
	simmo'osxw	Blonde, ‘the true blonde’	Gigeenix	EWD

Appendix C

Ethics agreement.

Participant Verbal Consent Script

GITKSAN (AND RELATED LANGUAGE) SOUNDS

You are invited to participate in a study entitled Variation in Gitksan Vowel Inventories that is being conducted by myself, Kyra Fortier. I am a Master's student in the department of Department of Linguistics at the University of Victoria and you may contact me if you have further questions using the contact details at the end of this document. As a Masters student, I am required to conduct research as part of the requirements for a degree in linguistics. It is being conducted under the supervision Dr. Sonya Bird and with the support of Dr. Henry Davis. You may Dr. Bird, Dr. Davis, or myself using the contact details at the end of this document.

Purpose and Objectives
The purpose of this research project is to record the ways that speakers of Gitksan, and related languages, pronounce the sounds of their language. These recordings will be and a) analyzed as part of my thesis work, and b) incorporated into the Waldayu Mobile Gitksan Dictionary.

Importance of this Research
Research of this type is important because it allows us to document and preserve the range of pronunciations of Gitksan, and can form the basis for inclusive teaching materials and pronunciation guides for learners.

Participants Selection
You are being asked to participate in this study because of a) your previous working relationship with Dr. Henry/Davis (if applicable), b) your specific language knowledge.

What is involved
If you consent to voluntarily participate in this research, your participation will include a questionnaire about where you grew up and learned your language, and the dialect that you have spoken in your life. Secondly, we will record a wordlist where I will ask you to translate some English words into Gitksan and repeat them 3 times. Translation tasks are hard even for professional interpreters, so if at any time you feel tired or stressed about remembering a word, we can skip a word or end the task at your own discretion. Our entire interview will be recorded and I will take some notes as we go through the questionnaire and wordlist.

Inconvenience
Participation in this study may cause some inconvenience to you because of the time that you elect to spend participating.

Risks

The only risks to you in participating in my study are possible emotional discomfort due to the difficulty of translation, and fatigue from the task. To prevent or to deal with these risks you are welcome to skip words in the wordlist task, take breaks, or end the session at any time.

Benefits
The potential benefits of your participation in this research include increased awareness of the sounds you use in your language, and contribution to a multi-dialectal dictionary.

Voluntary Participation
Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will be used only with your permission, and entirely deleted if you so request.

Compensation
You will be provided with compensation of $30 CDN per hour of elicitation, provided by the UBC Gitksan Research Laboratory (Dr. Davis). If you choose to withdraw before the study is complete, you will be compensated for the amount of time completed, pro-rated. If you later choose to withdraw your data, no changes will be made to the compensation that you have received.

Anonymity
In terms of protecting your anonymity you may choose for your name to be included in my results, or to excluded and assigned a confidential ID number. Your name, if you consent to its publication, will be used in a) my thesis and b) the *Waldayu* Mobile Gitksan Dictionary. If you consent to the publication of your recordings in the *Waldayu* Mobile Gitksan Dictionary, anonymity may be limited by potential identification of your voice by dictionary users.

Confidentiality
Your confidentiality and the confidentiality of the data will be protected by exclusive storage on my personal computer and external hard drive, which are password protected and not accessible by any other party. Confidentiality may be limited by the identification of your voice on the *Waldayu* Mobile Gitksan Dictionary, which is possible because all of our speakers are from Gitksan territory, as are most of the dictionary users. Furthermore, your participation will not be confidential if you consent to the publication of your name in association with your recordings and information, in either a) my thesis or b) the *Waldayu* Mobile Gitksan Dictionary. It is also possible that other community members will know that you have contributed to this project through word of mouth, which can happen in small communities.

Dissemination of Results
It is anticipated that the results of this study will be shared with others through the publication of a) my thesis and b) the *Waldayu* Mobile Gitksan Dictionary. Furthermore, part or all of my thesis will be used in presentations at scholarly meetings, published articles, Chapters, or books, and on the internet.

Disposal of Data

Data from this study will be kept on my personal laptop, and sound files for each word will be housed on the *Waldayu* dictionary server. This data will not be destroyed so that it can continue to be used for acoustic analysis and accessible to learners of Gitksan.

Contacts

Individuals that may be contacted regarding this study include myself and my supervisor.

Kyra Fortier: 778-990-5972, kyrabw93@gmail.com
Dr. Sonya Bird: 250-721-7434, sbird@uvic.ca
Dr. Henry Davis: 605-822-8948, henry.davis@ubc.ca

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your verbal consent response, recorded by the researcher below, indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to participate in this research project.

_____	YES / NO	_____
Name of Participant	*Verbal Consent Given?*	*Date*

I consent to be identified by name / credited in the results of the study: YES / NO

I consent to have my responses attributed to me by name in the results: YES / NO

I consent to have my responses published in a) Kyra Fortier's thesis: YES / NO
b) *Waldayu* Mobile Gitksan Dictionary: YES / NO

Future Use of Data

I consent to the use of my data in future research: YES / NO

I consent to be contacted in the event my data is requested for future research: YES / NO

A copy of this consent will be left with you, and a copy will be taken by the researcher.