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Guc̓a: An Account of the Phonetics, Phonotactics, and Lexical Suffixes of a K^{w}ak̓^{w}ala Dialect

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

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ABSTRACT

Guc̓a: An Account of the Phonetics, Phonotactics,

and Lexical Suffixes of a Kʷaḵʷala Dialect

by

Rebekka S. Siemens

Guc̓a is a dialect of Kʷaḵʷala, an endangered Wakashan language that is spoken on the northern end of Vancouver Island, British Columbia, and the adjacent mainland. This study is based on a corpus of elicited and naturalistic language recordings made in the home of the Wallas family of Quatsino between 2011 and 2014. The study contributes to the documentation of this little-studied dialect by describing, in Chapter 2, the phoneme inventory and the phonetic character of the segments as well as common phonological processes in this variety of the language. In addition, the phonotactics of the language and related phonological phenomena are documented and investigated with regard to their potential phonetic bases in Chapter 3. The typologically unusual lexical stress system displays a "default-to-right" pattern, whereby the leftmost heavy syllable in the word is stressed, but if none is heavy, the rightmost is stressed. The weight distinctions employed by the language shed light on our understanding of sonority and are interesting because while resonants increase a syllable's sonority and weight, glottalization of a coda consonant reduces a syllable's sonority and weight. The investigation of the acoustics of stress and of

syllable weight in Guc̓a indicates that glottalization reduces the duration and pitch of resonant coda consonants, and that these parameters correlate with syllable weight in this language. Chapter 4 investigates the current status and use of the lexical suffixes, an important morphophonological and grammatical structure in this language. These derivational suffixes often resemble roots semantically and induce phonetic changes on the stems they attach to, which are not part of the regular phonological processes of the language. Because of their structural dissimilarity to grammatical structures in the dominant English language, they are perhaps prone to early loss in the context of language endangerment. However, this study finds that they are still robustly in use by speakers and that they do not show signs of phonological weakening.

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CHAPTER ONE

Introduction

1 Introduction

Guc̓a is a variety of Kʷaḵʷala, a Wakashan language spoken on the coast of British Columbia. In Galois (1994), he identifies the Kwakwa̲ka̲'wakw as the people who speak or spoke Kʷaḵʷala and who inhabit northern Vancouver Island and the adjacent mainland of British Columbia. Kʷaḵʷala has about 165 native speakers (First Peoples' Cultural Council 2014) and is actively being revitalized through community initiatives, and the efforts of many individuals and families. There are also a number of Kwakwa̲ka̲'wakw First Nations scholars doing research with the language, culture, and history of Kwakwa̲ka̲'wakw people.[1] Due to the effects of colonialism, including especially the relocation of communities and residential schooling, many Kwakwa̲ka̲'wakw have become separated from their historical culture, place, language, and ways of life.

Among the dialects of Kʷaḵʷala, Guc̓a is perhaps the least documented. The Guc̓a dialect is critically endangered; the research here is based on original fieldwork documentation with speakers from the only extant family (to my knowledge) to be speaking Guc̓a across three generations of family members.[2] This study aims to analyze certain highly salient phonological and morphological characteristics of Guc̓a, in order to provide a

[1] For example, Marianne Nicolson (2005), Patricia Rosborough (2012), Laura Cranmer (2015), and Daisy Sewid-Smith (1992) among others.

[2] I was told there may be two sisters who also speak Guc̓a together, living in another location, but I have been unable to verify this information. The Wallas family are the only native speakers of Guc̓a I have been able to find.

more robust documentation of this extremely endangered language. I investigate three main areas of inquiry: the phonological inventory; phonotactics, syllable structure, and stress; and the lexical suffixes that produce phonological changes in the final consonants of the stem to which they attach. These have been chosen as likely avenues of fruitful inquiry based on their typological interest, and because they are core elements of language documentation and can form the basis for future work. They allow for interesting points of comparison with other dialects of Kʷaḵʷala, in addition to being significant and prominent in the language.

1.1 Social and historical context of the Kwakwa̲ka̲'wakw of Quatsino

The Quatsino First Nation Reserve (generally referred to as Quatsino) is located in the north of Vancouver Island, British Columbia, in Canada. The reserve is situated on a cleared space in the woods, just a mile inland from the small town of Coal Harbor, which is on the waters of the Quatsino Sound. The community moved, or more accurately was relocated, to this place in the 1960s and 1970s as part of the implementation of policies by the Canadian government to assimilate First Nations populations. Actually, the Quatsino First Nation Band is an amalgamation of five tribes: the Quatsino, Koskimo, Giopino, Klaskino, and Hoyalas, who spoke the same dialect (Guc̓a) of Kʷakʷala (The Bill Reid Center, no date).See the inset in the map in Figure 1.1 below. The Koskimo have been the most dominant group since the mid-1700s. The official joining of the tribes occurred in the 1920s (Goodfellow 2005), by which time three of the five tribes – Giopino, Klaskino, and Hoyalas – had lost their distinct identity.

At the time of first contact, the five tribes of Quatsino Sound inhabited numerous seasonal and permanent sites around the Sound. The old Quatsino settlement [χʷətís], where most speakers of Guc̓a lived after the time of contact until the 1960s, was more remote than their current location, was accessible only by boat, and was on the waterfront of Quatsino Sound but nearer the mouth of the sound compared to the current reserve. The old Quatsino village is still designated as tribal land (Quattishe Indian Reserve No. 1) (The Bill Reid Center, no date), although the only full-time residents of the area are non-Native people living in an adjacent town, also called Quatsino.

Figure 1.1. Traditional territory of the Quatsino First Nation

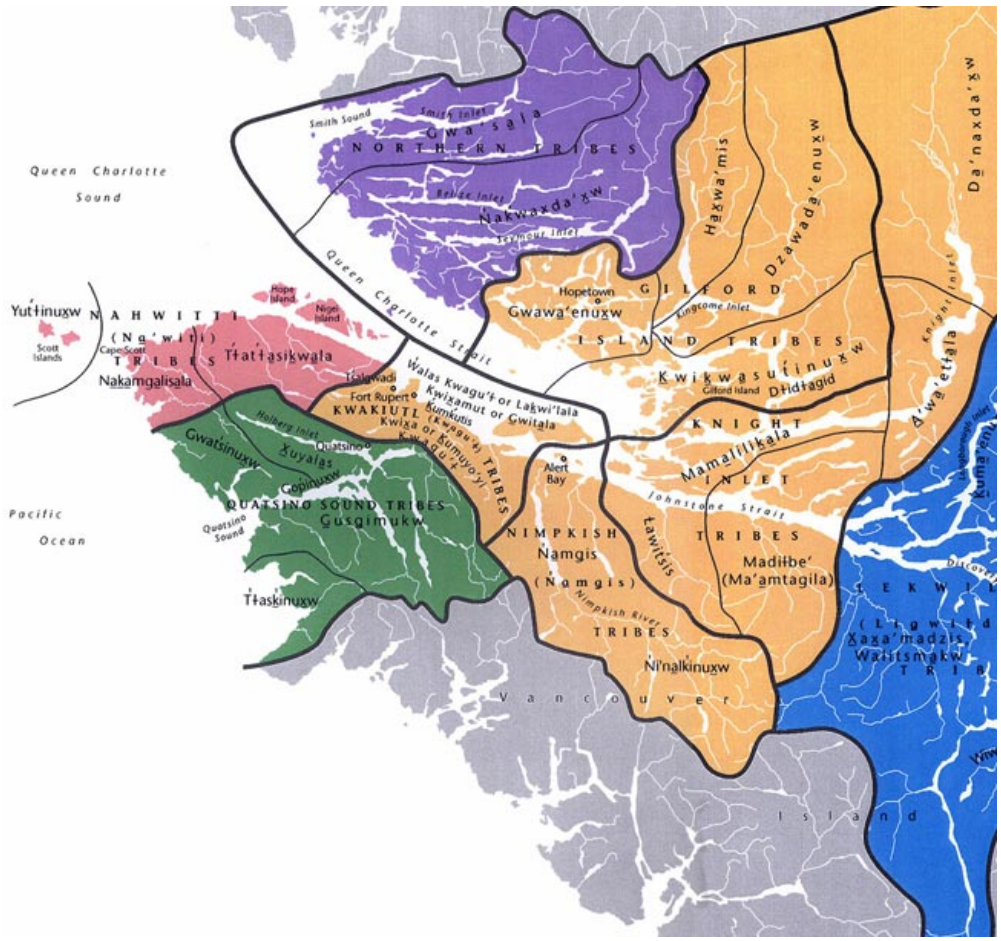
The inset in Figure 1.1, above, shows the location of the traditional territory of the five tribes of Quatsino Sound Kwakwaka'wakw (The Bill Reid Center, no date).

More so than other Kwakwaka'wakw communities, the Quatsino community gave up holding *potlatches*, an important symbolic and substantive cultural activity, early on in the anti-potlatch period (1885-1951) and has yet to hold one since the easing of government policies. As with other Kwakwaka'wakw communities, the Quatsino people's traditional way of life, including food gathering, fishing, and hunting, was largely replaced by industrial fishing, logging, and paper-milling operations, which now employ many First

Nations people. Thus, the connection to the land is still palpable, though much changed from its traditional, pre-contact, relationship.

The map in Figure 1.2 below is from the U'mista Cultural Center (First Nations Land Rights and Environmentalism in British Columbia). It shows traditional Kwakwaka'wakw territory on the north end of Vancouver Island, the adjacent mainland, and smaller islands between. The portion shaded in green shows the area traditionally inhabited by the Quatsino Sound tribes. The other shades represent other dialect groups of Kʷakʷala. The dialect that has been best described historically is Kwakiutl of Fort Rupert, in the orange shaded area. Kwakwaka'wakw society was traditionally ranked and socially stratified based on wealth. This ranking existed both within kin groups and on a larger scale among tribes. According to the U'mista Cultural Centre's webpage, the Quatsino tribes were among the lower-ranking tribes.

Figure 1.2. Kʷakʷala dialect map



1.2 Linguistic background, genetic relationships, grammatical overview

Kʷakʷala is a Wakashan language of the northern (Kwakiutlan) branch of the family. It is most closely related to Haisla, Heiltsuk (formerly Bella Bella), and Ooweky'ala, and more distantly to the Southern Wakashan (Nooktan) languages Ditidaht, Makah, and Nuuchahnulth (Bach 2004). Kwakwaka'wakw territory also borders on Salishan language areas. The name *Kʷakʷala* refers to all or any of the five dialects of the language, but it is also used to refer specifically to the dialect spoken around Fort Rupert, which is the

most studied variety of the language. Similar confusion exists about the term *Kwakiutl*, which was previously used to refer to both the dialect of Fort Rupert and the language group as a whole. However, I will use *Kʷaɬkʷala* to refer to the language as a whole and *Kwakiutl* to refer to just the Fort Rupert variety because that is how I have heard several Kwakwa̲ka̲'wakw people use the terms recently.

Kʷaɬkʷala is a polysynthetic language that can express a whole clause within a single phonological word. Unmarked, pragmatically neutral clauses are predicate-initial, and the language is exclusively suffixing (with the exception of reduplication) (Bach 2004; Rosenblum 2013). When arguments are lexically specified, the unmarked order of constituents is VSO or rather PSO, where P stands for "predicate." Lexical and pronominal arguments of the predicate are case-marked with enclitics on the preceding element of the clause. Case marking is nominative-accusative with both primary and secondary objects as core arguments, in addition to the oblique cases (Rosenblum 2013).

One of the things Kʷaɬkʷala is known for is its unusual and unusually large inventory of consonants, both areal features of the Northwest Coast Sprachbund (Shaw 2009b:22, Beck 2000, Boas 1947). The consonant inventory for Kwakiutl contains 42 distinct consonant phonemes. Among the rarer consonants are a series of glottalized sonorants or resonants. These are particularly interesting because of the way they interact with other aspects of the phonology, such as syllable weight and vowel epenthesis. There is also a uvular series of obstruents that is in danger of being lost through a merger with the velar series as a consequence of several generations of disruption in intergenerational transmission. The Guc̓a phoneme inventory is discussed in detail in Chapter 2.

Another aspect of Kʷaḵʷala phonology of interest is the stress system and phonotactics. Kʷaḵʷala is reported to have a rare, default-to-opposite stress pattern (discussed in Chapter 3). Primary stress normally falls on the leftmost heavy syllable of a word, but if a word has no heavy syllables, the stress will fall on the rightmost syllable (Wilson 1978, Shaw 2009a).

A characteristic feature of the morphology of Kʷaḵʷala, as in other languages of the Northwest Coast area, is the large number of suffixes that contribute substantial semantic content to their host/stem words (Bach 2004). The meaning contributed by a particular suffix can vary considerably depending on the stem that it joins and other factors that are not semantically transparent. For this reason they are referred to as lexical suffixes; their meanings are largely unpredictable but lexical rather than grammatical in nature. In Kʷaḵʷala these suffixes are divided into three phonological classes, each class interacting phonologically with the stem in a particular way by either "weakening" or voicing, "hardening" or glottalizing, or not changing the final stem consonant. Guc̓a lexical suffixes are the subject of Chapter 4.

1.3 Documentation of the language and dialect differences

While there is substantial documentation of the Kwakiutl dialect of Kʷaḵʷala from Franz Boas and George Hunt starting in the late 1800s up to the mid-1900s, and spurring a continuation of theoretical and descriptive work on the dialect since that time, there is little documentation of other Kʷaḵʷala dialects, Guc̓a being perhaps the least documented of them. I am aware of a dissertation (Goodfellow 1999) and a book published in 2005 from the same study, as well as a paper on syllable structure (Wilson 1978) that provide some

documentation of Guċa. The Goodfellow dissertation compares two Kʷaƛʷala-speaking communities in terms of social and cultural aspects of language change, Quatsino being one of the two communities. The study on syllable structure compares Ooweky'ala and Kʷaƛʷala, using Guċa as a representative variety of Kʷaƛʷala.

Guċa is largely mutually intelligible with the other dialects of Kʷaƛʷala. Speakers of Guċa are familiar with the Kwakiutl dialect and are aware of many of the lexical differences between the dialects, although there seem to be some Kwakiutl words that Guċa speakers do not understand. Fort Rupert, the reserve of the Kwakiutl-speaking people, is geographically the closest First Nations community to Quatsino and is also situated near Port Hardy, the largest urban center on the north of Vancouver Island. Kwakiutl has been in a culturally central location, both geographically and figuratively. When asked about dialect differences, the first thing mentioned by Kwakiutl speakers is that the Guċa words seem to be shorter or have shorter endings. An example of this is the word for 'Quatsino dialect' which is referred to as *Guċala* by Kwakiutl dialect speakers, but is just *Guċa* in Guċa dialect (for further discussion see Chapter 4). Another observation is that some of the vowels in high-frequency words the dialects share are different (see Chapter 2 on vowels).

1.4 Kʷaƛʷala and Guċa

The history of linguistic study of Kʷaƛʷala begins with the work of George Hunt and Franz Boas. These works include an unpublished manuscript of a dictionary (1948), edited by Boas' daughter after his death, a grammar with a glossary of suffixes (1947), published posthumously and edited by Boas' daughter and Morris Swadesh, and 'A Revised List of Kwakiutl Suffixes' (1924), as well as many other works, including an ethnographic

description and collection of texts published as *The social organization and the Secret Societies of the Kwakiutl Indians* (1897). These works have served as a source of information and point of departure for many subsequent studies and have made the study of Kʷaƛʷala a rich field of inquiry. They serve as a point of reference and comparison for my own study of the little-documented dialect Guc̓a, and have been an invaluable resource in conducting fieldwork.

Boas describes the phonology and morphosyntax of the language in great detail, and also provides some information on dialect differences, and discourse-level phenomena. My study will refer to the Boas and Hunt material as a record of the Kwakiutl dialect as it was spoken approximately 75 years ago, and will provide a comparison with Guc̓a as it is presently spoken, focusing on the morphophonology. The relative completeness of the Boas and Hunt records and the fact that they come from a time when the speech community and culture were still intact with normal intergenerational transmission have made these records a standard for subsequent linguistic study and for revitalization work on Kʷaƛʷala. A study comparing contemporary Kwakuitl with Guc̓a would necessarily involve further fieldwork and would pose difficulties for comparison, since the dialects are now less stably differentiated from each other than previously. One of the consequences of the endangerment of Kʷaƛʷala has been some degree of dialect leveling, through intermarriage, population migration to major urban centers that are outside of traditional Kwakwa̲ka̲'wakw territory, and the dramatic decline in the number of speakers of the speech communities.

Among the many works on Kʷaƛʷala that have since been published, I will focus here on those most relevant to the state of language endangerment and to Guc̓a. In 1999, Stan Anonby published an article on the state of Kʷaƛʷala endangerment, titled "Reversing

Language Shift: Can Kʷaƛʷala be Revived?" The article outlines his assessment of the state of the language as spoken in Alert Bay in the 1990s and details his perspective on reasons for its critical endangerment, as well as the necessary and possible steps that can be taken to revitalize the language. He identified the critical role of elders and the need to reestablish intergenerational transmission. He also noted obstacles that could impede success which included, among others, lack of appropriate materials for adult learners, lack of fluent speakers able to teach, and lack of immersion settings or other contexts of use in the community. These obstacles are similar across Kwakwa̲ka̲'wakw communities and have been prominent features of the linguistic ecology of Quatsino.

Goodfellow (1999) is a dissertation and case study of the social and historical aspects of language loss in two Kwakwa̲ka̲'wakw communities; it profiles language use across three generations in Quatsino and Kingcome Inlet. Goodfellow finds that although the language is in decline, it is still spoken even by young adults in a limited way for the purpose of expressing identity and for cultural practices. Thus, although Goodfellow documents that the state of loss and change in the language is quite advanced in the younger generations, she also notes that they are part of a movement of cultural revival that may encourage language revitalization if it is successful.

In Goodfellow (2005), which is based on her dissertation, Goodfellow notes that as the economic base of the Kwakwa̲ka̲'wakw was weakened and their language and culture simultaneously eroded by the forces of colonialism, there was a "loss of functional utility" for the Kʷaƛʷala language. In her work, she investigates the question of what effects this social situation has on the internal (phonological, grammatical, and lexical) structure of the language. She examines the use of certain linguistic features – the set of lexical suffixes –

among three generations of Kʷaƛʷala speakers from two different dialect areas and communities in an attempt to understand changes taking place in the language over time. She finds that the structural nature of the language is being influenced by English, especially in the speech of the youngest generation, for whom English is their dominant language.

The present work follows this study fifteen years later. It primarily focuses on the features of Guc̓a as it is spoken by the Wallas family, and the similarities and differences between Guc̓a and Kwakiutl as documented in the Boas materials. Generational differences are considered, but are not the primary focus of the current study. Chapter 4 discusses the use of the lexical suffixes and argues that, contra Goodfellow, the suffixes remain a central feature in use by all three generations.

Both Anonby and Goodfellow expound on some of the sociohistorical reasons for the current state of Kʷaƛʷala. Among the important reasons noted for the decline of the language is the association that it came to have during the colonial and residential school periods with the colonial perception of the traditional culture as non-progressive. This negative association was strongly encountered in the residential school policy for native children and assimilationist practices of the Canadian government toward First Nations communities. These institutionalized actions were destructive of traditional ways of life and community and served to stigmatize the language as well. Children were forbidden to speak the language and were punished for doing so. Many of them were so traumatized by the experience that they lost or repressed their ability to speak Kʷaƛʷala.

The current movement towards language revitalization constitutes a conscious effort on part of the Kwak'wakwakw to counter this historical trauma and to reclaim their

heritage. This phenomenon has been discussed by Patricia Shaw. In her paper on "Negotiating Against Loss" in endangered language work, Shaw (2004) details the wide-ranging and sustained losses that indigenous, First Nations, Canadian communities have suffered as a result of Euro-colonialism, the resulting psychological effects on the individual and the community, and how such a psychology of loss interacts with work on a community's language, especially by outsider linguists. The losses she describes range from lands to education and child-rearing, medicine to language and ceremonies, but all revolve around a loss of control, loss of trust for outsiders to the community, and loss of individual and cultural identity that leave people feeling vulnerable and defensive. Shaw acknowledges that a new research paradigm is emerging and notes that this psychology of loss needs to continue to be thoroughly addressed by both endangered language communities and linguists in order for the goals of language revitalization and documentation to be realized. In spite of the challenges to successfully working together, communities and linguists have mutually enhancing and compatible goals and are both highly motivated. Shaw makes the case that local community control of goals and research proceedures in language reclamation projects is critical to the success of such projects and that the outside researcher who participates in such projects must understand the psychology of loss that surrounds the language and revitalization work for the community and individuals.

Rosborough (2012) is an investigation of learning Kwaḵʷala and being indigenous. In addition to studying the role of decolonization and Indigenization in learning Kʷaḵwala, the author uses the Ḵangextola framework, an indigenous methodology based on the metaphor of making a button blanket, the regalia of the Kwakwaka'wakw, to understand the

complexities of learning Kʷaƛʷala. She studies her own process of learning Kʷaƛʷala and finds that a multifaceted approach, applying indigenous principles to learning and teaching, and recognizing the impacts of colonization is needed. The literal and symbolic meanings and constructs of the language need to be understood in order to maintain the spirit of the language and Kwakwa̲ka̲'wakw culture. This work, with its focus on decolonization and the Indigenization of the process of language learning, has informed my thoughts as an outsider linguist engaged in writing a dissertation for academic audiences. I am aware that although my work may form the basis for documentation of Guc̓a, it is inherently connected to the colonizing powers.

Kʷaƛʷala has become well known among linguists for aspects of its grammar, especially its large and unusual consonant inventory, word-level stress patterns, and morphosyntactic features that it shares with other languages in the Pacific Northwest Sprachbund (Gordon et al. 2012, Shaw 2009a; Gordon 2002, 2006; Bach, 2004, Beck 2000). Wilson (1978) compares the stress pattern found in Quatsino Kʷaƛʷala (Guc̓a) with that of Ooweky'ala (this work referred to it as Heiltsuk, though it has since been shown to be a different but closely related language to Heiltsuk; see Bach 2004). Wilson discusses the stress pattern found in Guc̓a, contrasting it with that of Ooweky'ala and using the comparison to propose a vowel deletion phenomenon in Ooweky'ala. This is one of the few studies of Kʷaƛʷala that uses Guc̓a as a representative dialect and provides a good basis for understanding stress in Guc̓a. We will return to this article in Chapter 3.

1.5 Data and methodology

The data for this study were collected using traditional elicitation techniques in Quatsino. All of the data come from members of the Wallas family, discussed below. The elicitations were captured by audio recording and transcribed with the assistance of the speakers of the language. The data were collected over three fieldtrips between 2011 and 2014.

I am grateful to the members in the Wallas family, who worked with me to produce the recordings that became the basis of this study. I worked with three generations of speakers, all bilingual in Guc̓a and English with varying degrees of proficiency. Emma Wallas, the grandmother and mother of the family, was in her eighties when she passed away, just weeks before completion of this study. Her daughters, who live in the same house or next door, are in their late fifties to early sixties. Emma and her daughters used Guc̓a on a daily basis to talk to each other. Previously they worked together in the family fishing business and used Guc̓a regularly in their work. The youngest speaker, David Hanuse, who goes by the name Sonny Wallas, is the grandson of Emma Wallas. He also participated in the recordings. He is in his late 30s and frequently stays at the family home.

Emma Wallas was one of the few children of her generation to avoid residential school. Her mother kept her at home, so that she began to learn English only as an adult. When Emma's children were young, the Quatsino people lived on Quatsino Sound, in the old Quatsino village [χʷətís]. At that time and in that place, the community language was Guc̓a and so Emma's children grew up speaking the language. They recall going to elementary school there and encountering English for the first time. They have been bilingual in English since early childhood. Although the two daughters that I worked with

are fluent speakers, they often deferred to their mother as the expert speaker when questions came up in our discussions of the language.

In the 1960s, the Quatsino people were moved to the new reserve, ostensibly to have access to secondary schools, roads, and medical care. In the old Quatsino, the school only went through grade six, meaning that the older children would be required by the Indian Agent to move to Alert Bay in order to attend St. Michael's residential school. In order to avoid sending their children away for most of the year, the Wallas family and other families chose to move to the new reserve, which was close enough by road to Port Hardy that the children could attend the schools there. This move changed the fabric of the community. They recall that in the old Quatsino village, there used to be church potlucks and other community events where Guc̓a was used. In the new Quatsino, these language usage patterns did not reemerge.

Sonny spent much of his childhood in the company of Emma, his grandmother, and his grandfather, Jumbo Wallas, and learned the language from them. Although his participation in the recordings was limited to a short time, Sonny is very interested and knowledgeable about traditional culture, and is also eager to find ways to talk about new concepts in the old ways, using Guc̓a (see Chapter 4). He has developed his own orthography and has a vocabulary collection that includes astronomy terms and technology terms, among others. He worked with me on transcribing one of our recordings.

This study will be both descriptive and comparative, in that it will describe aspects of the phonology and morphology of Guc̓a, comparing it to the description of Kwakiutl from the Boas materials. This study is inevitably shaped by the context of extreme endangerment and the way in which the social processes of linguistic decline and language

revitalization within the larger Kʷaƛʷala community have influenced the language of Quatsino. In particular, it was not possible to elicit carefully constructed and robust data sets that typify much work in phonetics. Elicitation sessions were characterized by extensive conversation in English and Guc̓a as the family discussed and settled on particular forms for lexical items. Dialect differences were often noted, especially by comparing Guc̓a forms to Kʷaƛʷala. Finally, it should be noted that the recording environment was often not ideal; because we were limited by mobility issues, the recordings were made in the Wallas home, where is was not possible to control for background or ambient noise.

As noted above, I was referred to these members of the Wallas family as perhaps the only remaining fluent speakers of Guc̓a who learned it as a first language and continue to speak it regularly among themselves. Because of this, the language has become a code specific to that family unit and so is indexical of those social and familial relationships. My impression is that the use of the language by Sonny, the youngest speaker, is especially significant to himself and to the Kwakwaka'wakw community at large in marking his identity as a culture-bearer and community leader. For this function, what appears to be deemed most important is not analytical conformity to some standardized form of the language, but the fact of it – the linguistic act of speaking that establishes him as a culture-bearer within his community.

During one recording session, there was discussion of how Emma and her husband had chosen not to speak English to their children, even though they might have done so, since they both spoke English by the time they were raising children. Instead, they spoke Guc̓a at home and when they needed to choose between sending their children away to

Alert Bay to school or moving to be near schools in Port Hardy, they chose to move so that they could keep their children with them at home.

1.6 Goals and Implications of this Study

This study constitutes a descriptive contribution to the documentation of Guc̓a, which has been until now little described. In contributing to the description of Guc̓a, it enlarges our knowledge of Kʷaḵʷala, the Northwest Coast, and Native American linguistics. It details typologically interesting features of the language.

Chapter 2 presents a detailed study of the segmental phonology, including phonetic and phonological descriptions of each segment of the inventory and the phonological processes that occur as they combine.

Chapter 3 describes syllable structure and the typologically unusual default-to-opposite system of stress assignment. It builds on the broader phonological literature of the sonority hierarchy by investigating in phonetic detail the typologically unusual glottalized resonants and their impact on the preceding vowel and the assignment of stress. The analysis presented extends the current view of sonority as reflective of the intersection of the sound-source scale and the aperture scale proposed by Miller (2012). This understanding allows for a principled analysis of the quite complex patterns of syllable weight and stress in Guc̓a.

Chapter 4 discusses a prominent typological feature of the language, the system of lexical suffixes. In addition to a discussion of the semantics and morphophonemic properties of the suffixes, there is also a discussion of how the suffixes are used by

speakers. The data suggest that the suffixes are a highly salient feature of the grammar and are being actively used by speakers, including Sonny, the youngest of the speakers.

Overall, the dissertation contributes to our understanding of typologically rare features of a complex language that is now spoken by members of a single family. Lexical differences with the other dialects of Kʷaƛʷala, both for full words and for lexical suffixes, are noted throughout, as are cases of dialect difference based on vowel coalescence, epenthesis of schwa, and other phonetic differences. The present study also identifies areas of interest for future research.

CHAPTER TWO

Phonetics and Phonemics of Guc̓a

2.1 Goals and structure of the chapter

This chapter aims to describe the phonemes of Guc̓a in phonetic detail, and to describe the complex interactions and effects of the consonants and vowels upon each other. In order to describe the system of phonemes, basic aspects of the morpho-syntax and phonology, including syllable structure and the stress system, will be surveyed in Section 2.2. Section 2.3 describes the cross-linguistically large consonant inventory as well as the relatively small inventory of vowel phonemes. In Section 2.4 interactions among consonants and vowels and common phonological processes are discussed, and Section 2.5 concludes this chapter.

2.2 Basics of the grammar and phonology

As background to the discussion of the phonemes of Guc̓a in Section 2.3, a brief introduction to the grammar and phonotactics of the language is provided here. Guc̓a and Kʷak̓ʷala are highly polysynthetic in their morphology, combining roots with prefixes and suffixes to form complex words which often include all of the information contained in a sentence, including person, number, and roles of participants. Not only that, but the meanings expressed by the words thus formed are often not deducible from the parts. Many of the suffixes, called “lexical” suffixes, contribute complex and not entirely transparent lexical content to the words. Likewise, the phonology of the combinations of lexical suffixes with stems is complex, in that the lexical suffixes can have various effects on the

final consonants of the stem, outside of the normal phonological processes in the language (to be discussed fully in Chapter 4). The basic syntax of the language is predicate-initial, with subjects, objects, and obliques following the predicate if they appear as separate lexical items (Boas 1947, Levine 1977, Anderson 1984, 1992, Bach 2004, Rosenblum 2013).

Syllable structure and stress are relevant to some of the discussion below of phonemes and the interactions of consonants and vowels. Syllables are composed of obligatory onsets of one consonant followed by a vowel nucleus and optionally, any coda consonants. The coda includes up to four consonants in a cluster. Therefore, there are no syllable-initial consonant clusters and no vowel-initial syllables. The constraint on onsets helps to clarify the inventory and phonological processes at several points in the analysis below. Stress is predictable and falls preferentially on syllables with a vowel nucleus that is not schwa, but that is a "full" vowel with a clear, unreduced quality and pronunciation. (See Section 2.3.2 for more on vowels and Chapter 3 for a full discussion of syllables and the stress system). Since stress is predictable, it has not been marked in phonemic representations.

2.3 The phonemes of Guc̓a

Guc̓a (like other varieties of Kʷaḵʷala and other languages of the Northwest coast) has a large consonant inventory (42) that features typologically unusual distinctions, such as a three-way laryngeal contrast between ejective, voiced, and voiceless stops and affricates, as well as a contrast between plain and glottalized sonorants (resonants), and a place distinction between uvular and velar stops and fricatives. By comparison with the rich

variety of consonants, the vowel inventory (4) is small but interesting in its organization. It will be discussed in detail in Section 2.3.2 below. Due to the characteristically polymorphemic and polysyllablic structure of words in Kʷaƛ̓ʷala, minimal pairs are rare. The focus here will be on demonstrating phonemes in different positions in the word and syllable, and on describing them in phonetic detail. The examples provided are phonemic transcriptions, with phonetic transcriptions provided in square brackets where this differs from the phonemic one. The phonemic transcription is informed by the relevant materials from the Boas publications (the grammar and glossary of suffixes (Boas 1947) and the dictionary (Boas 1948)), but does not assume the Boas forms are underlying representations for Guc̓a.

2.3.1 Consonants

The inventory of consonants is illustrated in Figure 2.1. The organization of the consonant chart follows that of Shaw (2009) for Kʷaƛ̓ʷala. The North American Phonetic Alphabet (NAPA) system of symbols is used.

Figure 2.1. The consonants of Guc̓a

Stops and affricates

p	t	c	ƛ	k	k^w	q	q^w	ʔ
p̓	t̓	c̓	ƛ̓	k̓	$k̓^w$	q̓	$q̓^w$	
b	d	d^z	λ	g	g^w	g	g^w	

Fricatives

	s	ɬ	x	x^w	χ	$χ^w$	h

Resonants

	m	n	l	y	w
	m̓	n̓	l̓	y̓	w̓

2.3.1.1 Stops and Affricates

Guc̓a, like other varieties of $K^waḵ^wala$, makes a three-way distinction between voiceless, ejective (glottalized), and voiced stops and affricates. The voiceless series appears in the top line of Figure 2.1, followed by the ejectives in the second line, and the voiced series in the third line. These occur at places of articulation from bilabial to uvular. Some exhibit secondary articulations, expanding an already large inventory of stops and affricates. The voiceless series is regularly aspirated.

Also, notice the distinction between the labialized (k^w, $k̓^w$, g^w, x^w, q^w, $q̓^w$, g^w, $χ^w$) and non-labialized velar and uvular consonants. This distinction is systematic for the plain, ejective, and voiced stops and affricates, as well as the fricatives. The uvulars exhibit a clear distinction between plain and labialized consonants, as the plain consonants do not have an off-glide. The velar consonants, however, have a more complex distribution

because the non-labialized velars are phonetically pronounced with a palatal off-glide before vowels (except before /i/). (See discussion below of the phoneme /k/ and other velars, and Section 2.3.2 on vowels). So the velars would be more accurately described in phonetic terms as two series, one palatalized and one labialized. Orthographically representing these palatalized velars as plain captures a phonemic parallelism with the two series at the uvular place of articulation.

2.3.1.1.1 Voiceless, non-glottalized stops and affricates

The voiceless stops are regularly aspirated in all positions of the word and syllable, though the dorsals are prone to spirantization in coda position. Since aspiration is completely regular for the stops, it will not be transcribed in the phonetic representations of examples. The phonetic character and distribution of each phoneme will be discussed and exemplified below.

The voiceless bilabial stop /p/, which occurs in word-initial, word-medial, and word-final positions as well as in syllable onsets and codas, is pronounced as a voiceless aspirated stop, as illustrated in (1).

1)	a. /pa.ʔak.sənd/	[pá.ʔak.sənd~pá.hax.sən]	‘to split wood’
	b. /sən.pa/	[sə́n.pa]	‘swear’
	c. /ẇap/	[ẇap]	‘water’

The voiceless alveolar stop /t/ appears word-initially and medially in syllable onsets as exemplified in (2a-c). The absence of attested forms with /t/ in final positions is likely accidental.

2) a. /ta.gəɬ.ta/ [tá.gʸɪɬ.ta] ‘able to be waded across’

b. /c̓əlχʷs.ta.gi.la/ [c̓ól̓χʷs.ta.gi.la] ‘make hot water’

c. /dᶻa.qʷəχs.ta/ [dᶻá.qʷaχs.ta] ‘supper/evening meal’

The alveolar affricate /c/ is pronounced as a voiceless alveolar stop released into an alveolar fricative. One of the speakers regularly substitutes a palato-alveolar affricate for this segment, which I attribute to idiolectal variation. This phoneme also occurs in all positions of the syllable and word, as illustrated in (3).

3) a. /ce.la.yu/ [cé.la.yu] ‘bailer’

b. /ci.gʷə.yu/ [cí.gʷə.yu] ‘shovel’

c. /q̓aṁ.ƛənc/ [q̓áṁ.ƛənc] ‘can be found’

The lateral affricate /ƛ/, exemplified in (4), is pronounced by making a stop closure with the tongue in the alveolar region of the mouth and releasing it into a lateral fricative. This segment occurs in word-initial and medial positions as a syllable onset.

4) a. /la.ƛən gʷa.wə.ɬaɬ/ [lá.ƛən gʷɔ́:.ɬaɬ] ‘I go north’

b. /ƛa.q̓aχs.tənd/ [ƛá.q̓aχs.tənd] ‘hit on rear end’

For some speakers, this is perceived (and pronounced) as ‘kl,’ with velar closure and written with ‘kl’ or ‘cl’ when writing notes and the like. This perceptual and articulatory neutralization of the contrast between alveolar and velar place of articulation as the initial closure in the lateral affricate series is consistent with a cross-linguistically attested dispreference for coronal-dorsal contrasts before laterals—a phenomenon which is thought to have a perceptual basis. In fact, many languages (such as English, German, Norwegian, and Thai, among others) allow syllable-initial clusters with a lateral in second position /kl, gl, pl, bl/ but do not include /tl, dl/ (Kawasaki 1982, Flemming 1995, 2007). While the /ƛ/

of Guc̓a is a single-segment affricate, rather than a cluster, the articulatory gestures and acoustic properties are undoubtedly similar to the clusters discussed in the literature. The reason for this dispreference is thought to be that formant structure and release burst cues for coronal-lateral clusters (/dl, tl/) are acoustically similar to those for dorsal-lateral clusters (/gl, kl/). Specifically, the acoustics of /l/ shift and obscure the formants and release cues of the stop segment because the /dl, tl/ clusters (and of course the affricates /ƛ, ƛ̓/) are coarticulated (Kawasaki 1982, Flemming 2007, Gutierrez 2015).

Halle, Best, and Bachrach (2003) conducted a cross-linguistic perceptual study with French and Modern Hebrew listeners as subjects. They tested perception of /dl/ versus /gl/ and /tl/ versus /kl/ using the same set of stimuli (nonce mono-syllables produced by a native Hebrew speaker), both for native speakers of French, which doesn't allow /dl/ and /tl/ clusters, and for native speakers of Hebrew, which distinguishes the coronal and dorsal clusters. The French speakers had a tendency to hear the coronal clusters as velar, especially /tl/ as /kl/. Interestingly, the Hebrew speakers also had some, lesser but statistically significant, trouble correctly identifying articulations of /tl/ by a Hebrew speaker as such, and sometimes mis-categorized them as /kl/.

Bilingualism and contact with English may also be influencing perception of /ƛ/ as /kl/ for Guc̓a speakers since English allows /kl/ and /gl/ clusters, but not /tl/ and /dl/ clusters. Cross-linguistically, it is more common not to have the coronal versus dorsal distinction before laterals, so it is not surprising that in spite of the many place contrasts of other consonants in Kʷakʷala, the language does not exhibit a contrast between lateral affricates at different places of articulation, but only has one each of the voiceless, glottalized, and voiced lateral affricates, /ƛ, ƛ̓, λ/ (all alveolar in most descriptions). This

lack of place contrast is likely due to the perceptual difficulty of distinguishing coronal versus dorsal lateral affricates and clusters, leaving room for variation.

The voiceless velar stop /k/ is normally pronounced with a palatal off-glide, and with aspiration, [kʸ][3]. Although the glide sometimes affects the quality of the following vowel rather than surfacing in the transition from the /k/, examples of both can be found. When /k/ precedes a consonant, it is often pronounced as [k] without the glide, as in the example *ỷák.səm* 'naughty person'. When it is immediately followed by the (homorganic) vowel /i/ there is no audible effect from the glide, as in the example *kí.λaċ̓* 'gill net boat'. Each of the examples with /k/ below in (5) is given in both phonemic and phonetic transcriptions in order to highlight the phonetic distribution of the glide. This phoneme occurs word-initially and medially and in syllable onsets and codas.

5) a. /kuqʷ.ċ̓ə.na/ [kʸúχʷ.ċ̓ə.na] 'broken hand'

b. /ki.λaċ̓/ [kí.λaċ̓] 'gill net boat'

c. /la.ka.gas/ [lá.kʸa.gʸas~lá.kʸa.gæs] 'toilet'

d. /ỷak.səm/ [ỷák.səm] 'naughty person'

The voiceless labialized velar stop /kʷ/ contrasts with both the velar /k/ and the labialized uvular /qʷ/. It can occur in all parts of the word or syllable, though as example (6) shows, phonetically it is often spirantized in word- or utterance-final position.

6) a. /qa.yəlkʷ/ [qá.yəlxʷ] 'someone who walks about outside'

b. /qə.dəlkʷ/ [qə.də́lkʷ] 'stubborn person'

c. /kʷikʷ gukʷ/[kʷí.kʸuxʷ] 'eagle's house'

[3] The voiceless series of stops is predictably aspirated and so aspiration is not indicated in the phonetic transcriptions.

Note that (6a) and (6b) both end in the same suffix, *+əlkʷ* 'having the habit of', however the consonant appears spirantized when in an unstressed syllable and not spirantized when closing a stressed syllable. Spirantization of dorsal stops seems not to be completely regular, but is common in coda position and depends on factors such as fast versus careful speech, and stress as seen in (6a-b).

Example (6c) is composed of two words, /kʷikʷ/ 'eagle', and /gukʷ/ 'house', and seems to be an ad-hoc compound that came about when I asked how to say 'eagle's nest'. The speaker first said the words together in rapid succession, and then uttered them separately. As a compound, the coda /kʷ/ of the first word merged with the onset /gʸ/ of the second word, resulting in voiceless [kʸ]. However, since Guc̓a, like other dialects of Kʷak̓ʷala, exhibits neutralization of rounding/labialization before /u/ (see Section 2.4.3), it is difficult to determine which of the homorganic consonants deletes. Given this neutralization, it may be that the second homorganic consonant, /gʸ/, is the one that deletes, leaving /kʷ/, which then becomes unrounded before /u/.

Turning to the plain voiceless uvular stop, /q/ is pronounced by a closure of the vocal tract with the back of the tongue (dorsum) making contact with the uvula. It occurs word-initially, syllable-initially, and syllable-finally, as seen in (7).

7)	a. /qa.yəlkʷ/	[qá.yəlxʷ]	'someone who walks about outside'
	b. /qə.dəlkʷ/	[qə.də́lkʷ]	'stubborn person'
	c. /hə.qəɬ.mɛʔ/	[ha.qaɬ.mɛ́ʔ]	'internal swelling'
	d. /ɬa.ɬəq.c̓ə.na/	[ɬá.ɬəq.c̓ə.na]	'itchy hands'

Like /q/, the labialized voiceless uvular stop is produced by a closure of the back of the tongue with the uvula. /qʷ/ has the secondary labial articulation and is also prone to

spirantization, as shown below in (8c). /qʷ/ occurs word-initially and medially and as a syllable onset or coda, as shown by (8a-c).

8) a. /qʷi.sə.y̓ənχ.ẇəɬ/ [qʷí.sə.y̓ən.χə.ẇəɬ] ‘last year’

b. /dᶻa.qʷəχs.ta/ [dᶻá.qʷaχs.ta] ‘supper/evening meal’

c. /kuqʷ.c̓ə.na/ [kʸúχʷ.c̓ə.na] ‘broken hand’

While the glottal stop behaves somewhat differently from the other stops and affricates, it will be discussed here because it patterns with the plain voiceless stops and affricates. It is pronounced by making a complete closure at the glottis or by creaky voice on the preceding vowel when in syllable codas. (See Chapter 3 for further discussion of the phonotactics of the glottal stop). It can occur in word- or syllable-initial and final positions, as exemplified below in (9). Word-initial glottal stop, while phonetically present, is not written in most of the orthographies used by speakers of Kʷak̓ʷala or Guc̓a (for example, the U’mista orthography). Instead, these words are usually written as vowel initial. However the presence of word-initial glottal stop as a phoneme is supported by: (1) the analysis of syllable structure, which finds the glottal stop as an onset word-medially, (2) the fact that it is clearly present in connected speech, and (3) the pervasive generalization that all other syllables begin with a single consonant onset, as shown in (9).

9) a. /ʔu.q̓ʷas/ ‘believing’

b. /hi.ʔənχ/ [hé.ʔənχ] ‘summer’

c. /meʔ/ ‘salmon’

d. /saʔχs.diʔ/ [saʔχs.díʔ] ‘skirt’

2.3.1.1.2 Glottalized stops and affricates

The glottalized stops and affricates are pronounced similarly to their plain, non-glottalized counterparts except that they carry an additional closure at the glottis which creates a pressure build-up in the vocal tract, producing an ejective sound upon release. The release of the stop or affricate is accompanied by a strong burst of air that creates a gap of near-silence between the release of the stop and the beginning of the next sound. In terms of gestural timing, release of the oral constriction happens first, and the audible burst of air is due to the increased air pressure in the chamber between the oral closure and the closed glottis. Commonly the closed glottis has been raised, due to the air pressure from the lungs, causing an increase in the air pressure of the trapped air above the glottis.

The phoneme /p̓/ is a voiceless bilabial stop with glottalized release. It occurs word-medially in syllable onsets as exemplified in (10). Though not found in the database currently, it is also expected to occur word-initially and in codas, based on the Boas documentation.

10) a. /mu.p̓ən.xʷaʔ.c̓ənχ/ [mó.p̓ɪn.xʷaʔ.c̓ənχ] ‘Thursday’

b. /hi.ʔənχ.p̓a.n̓a.kʷa/ [hé.ʔənχ.p̓a.n̓a.kʷa] ‘spring’

The glottalized alveolar stop /t̓/ is produced by closure of the vocal tract at the alveolar ridge with secondary closure at the glottis. Like /p̓/ above, /t̓/ is exemplified in (11) word-medially in syllable onset position, but likely also occurs word-initially and in coda position.

11) /ha.t̓e.nuχʷ/ ‘to be naughty, disobedient’

The alveolar glottalized affricate /c̓/, exemplified in (12), is pronounced by making a closure at the alveolar ridge which is released into [s].[4] Simultaneous with the release of the oral stop as [s], the pressure from the glottal closure creates a strong burst of air. /c̓/ occurs in all parts of the word and syllable, that is both initially and finally, but not in tautosyllabic clusters.

12) a. /c̓a.ʔe/ ‘basket’

b. /di.gi.lac̓/ ‘tea pot’

The glottalized lateral affricate /ƛ̓/ is pronounced by simultaneously making a stop closure at the glottis and at the alveolar ridge which is then released into a lateral fricative. The pressure release from the glottal closure occurs simultaneously with the fricative. Like the voiceless lateral affricate /ƛ/, /ƛ̓/ seems to vary in articulation and/or perception of place between alveolar and velar. This segment occurs word-initially and medially in syllable onsets, as in (13).

13) a. /ƛ̓a.qʷa.tu/ ‘red head’

b. /ki.ƛ̓i.nuχʷ/ ‘gill netting’

The phoneme /k̓/ is a voiceless velar stop with glottalized release. Like non-glottalized /k/, it is phonetically palatalized except before /i/. It occurs word-initially and medially in syllable onsets, as in (14).

14) a. /k̓a.sən/ [k̓ʸá.sən] ‘I’m not’

b. /k̓əl.k̓aχs.diʔ/ [k̓ʸél.k̓ʸaχs.diʔ] ‘diaper’

c. /ʔi.k̓u.ɬa.la/ [ʔí.k̓ʸu.ɬa.la] ‘to go up above’ (in ‘to go upriver’)

[4] Like /c/, this sound is more post-alveolar or palatalized for one speaker.

The labialized and glottalized voiceless velar stop /ƙʷ/ is produced by simultaneous closures of the vocal tract at the glottis and the velar region and is released with both the glottal burst of pressure and the labial off-glide [w]. It is exemplified in (15) in word-medial but syllable-onset position, though it is expected to occur word-initially as well.

15) /c̓ə.ƙʷəχst/ [c̓ə.ƙʷʊsχt] 'short person'

The glottalized uvular stop /q̓/ is pronounced by creating a stop closure between the back of the tongue and the uvula, and simultaneously closing the airway at the glottis. Upon release of the oral stop, the glottalized release is audible. This segment occurs initially both in the word or syllable.

16) a. /q̓am̓.ƛənc/ 'can be found'

b. /ƛa.q̓aχs.tənd/ 'hit on the rear'

c. /λi.q̓a.q̓e.bəs/ 'someone fond of giving advice'

The labialized glottalized uvular stop is pronounced just like the non-labialized one (/q̓/) but with an additional labial off-glide on the release of the stop. The example in (17) shows it in word-medial, syllable-initial position.

17) /ʔu.q̓ʷas/ 'believing'

2.3.1.1.3 Voiced stops and affricates

The voiced stops and affricates form a parallel series to the voiceless aspirated and glottalized stops and affricates. They are usually voiced, though they may be voiceless unaspirated in utterance final position, an observation made by Boas for other Kʷaƙʷala dialects as well (1947:211). In the Guc̓a data examined here, intervocalic examples show

voicing during the stop closure, while word-initial instances begin voicing immediately upon release of the closure.

The voiced bilabial stop /b/ is pronounced by making a complete closure at the lips. Intervocalically, it may be voiced during the stop closure. Voicing begins immediately upon release of the stop when it is word-initial or syllable-initial after another obstruent and followed by a vowel. It occurs in word- and syllable-initial positions, as shown in (18).

18)	a. /bə.wik^{w}/	[bə.wíx^{w}]	‘pregnant’
	b. /su.ba.yu/	[sú.bə.yu]	‘axe’
	c. /naχ.bəs/		‘drunkard’
	d. /sən.bəs/	[sə́n.fəs~sə́n.bəs]	‘fond of swearing’

The voiced alveolar stop /d/ is pronounced by making a stop closure at the alveolar ridge. It occurs word- and syllable-initially and word- and syllable-finally, as shown in (19).

19)	a. /də.gi.dᶻas/	[də.gí.dᶻəs]	‘graveyard’
	b. /yu.dəx^{w}.p̣ən.x^{w}aʔ.c̣ənχ/	[yú.dʊf.p̣ən.x^{w}aʔ.c̣ənχ]	‘Wednesday’
	c. /saʔχs.diʔ/	[saʔχs.diʔ]	‘skirt’
	d. /ẉə.daχsd/	[ẉə.dáχst]	‘to be cold on the butt’
	e. /həm̓.xid/		‘eat’

The voiced alveolar affricate /dᶻ/ is pronounced by making a stop at the alveolar ridge which is released into a voiced dental fricative [z]. This segment occurs word-initially and word-medially as a syllable onset, as shown in (20).

20) a. /dᶻa.qʷəχ.sta/ [dᶻá.qʷaχ.sta] ‘supper’

b. /ha.mə.dᶻas/ [há.mə.dᶻəs] ‘bee hive’

c. /ʔəmɬ.dᶻas/ ‘playground’

The voiced lateral affricate /λ/ is pronounced by making a stop closure at the alveolar ridge and releasing that into a lateral approximant. Unlike its voiceless and glottalized counterparts, the place of articulation for this phoneme does not seem to vary between alveolar and velar, but is consistently alveolar, possibly because the voiced lateral approximant provides better transition cues for place. Recall that in the Halle, Best, and Bachrach (2003) study, /dl/ was perceived accurately more often than /tl/ by both French and Hebrew listeners. /λ/ occurs word-initially and medially in syllable onsets, as in (21).

21) a. /λi.q̓a.q̓e.bəs/ ‘someone fond of giving advice’

b. /ki.λac̓/ ‘gill net boat’

c. /λən.ka/ [λə́n.kʸɛ] ‘woodpecker’

The voiced velar stop /g/ is usually pronounced [gʸ], with a palatal off-glide, like its voiceless and glottalized counterparts /k/ and /k̓/, discussed above. The off-glide often colors the character of a following vowel or may not surface phonetically if the segment is followed by a consonant. When any of the palatalized obstruents are followed by the vowel /i/, the palatal off-glide is imperceptible or does not surface. Note that in example (22c), the palatal is incorporated into the schwa, changing its character to [ɪ] and not surfacing as an off-glide. /g/ is found word-initially and medially in syllable onsets.

22) a. /gaχ/ [gʸaχ] ‘to come’

b. /gəl.das/ [gʸɛ́l.das~gʸíl.das] ‘treasure box’

c. /gən.gənɬ.bəs/ [gín.gɪnɬ.bəs] ‘fond of children’

d. /c̓əlχʷs.ta.gi.la/ [c̓ólχʷs.ta.gi.la] ‘make hot water’

e. /di.gi.lən/ [dí.gi.lan] ‘I make tea’

The labialized voiced velar /gʷ/ is pronounced by making a stop closure between the hard palate and the tongue dorsum. The off-glide [w] is heard upon release of the stop. This phoneme occurs word-initially and medially in syllable onsets, as shown in (23).

23) a. /gʷa.ʔi.na/ [gʷé.n̓a] ‘north’

b. /c̓i.gʷə.yu/ ‘shovel’

c. /ni.gʷac̓/ ‘light’

d. /ʔəl.gʷac̓/ [ʔə́l.gʷac̓] ‘blood vessel’

The voiced uvular stop /G/, exemplified in (24) is pronounced by making a stop closure between the tongue dorsum and the uvular region of the vocal tract. It occurs in syllable-onset position word-initially and medially.

24) a. /Gu.la.li/ [Gó.la.li] ‘salmon berries’

b. /na.Gas.ta/ ‘dipper’

c. /Gu.c̓a/ ‘language from Quatsino’

The labialized voiced uvular stop /Gʷ/ shows limited distribution compared to other obstruents, but can be found word-initially as illustrated in (25).

25) a. /Gʷaʔs.ta/ [Gʷaʔs.tá] ‘sit in bathtub’

b. /Gʷəl.qʷa/ [Gʷól.qʷa] ‘tickle’

2.3.1.2 Fricatives

The inventory of fricatives includes sounds in the back of the vocal tract, including uvulars and /h/. The fricatives are all basically voiceless although they may undergo voicing assimilation. The frequency of occurrence of fricatives is robust because many of the stops undergo spirantization or de-occlusivization. For each fricative the airflow is impeded so that it is forced through a narrow passageway, creating turbulence or friction with a resulting high-pitched noise.

The voiceless alveolar fricative /s/ is pronounced with the tongue tip barely touching the roof of the mouth between the alveolar ridge and the teeth,[5] so that when air is expelled from the lungs, a high-pitched friction is created. /s/ is found in word-initial, medial, and final positions both in syllable onsets and codas. It is frequently found in consonant clusters as well, as shown in (26).

26)	a. /sə.ƙa.p̓ən.χʷaʔ.c̓ənχ/	[sə.ƙá.p̓ən.χʷaʔ.c̓ənχ]	‘Friday’
	b. /saʔχs.diʔ/	[saʔχs.díʔ]	‘skirt’
	c. /ƛa.wi.ga.ƚaʔs/	[ƛá.wi.ga.ƚaʔs]	‘stands behind’
	d. /ƙa.sən/	[ƙʸá.sən~ƙʸǽ.sən]	‘I’m not’

The lateral fricative, /ɬ/, is pronounced with the tongue tip touching the roof of the mouth behind the alveolar ridge. The sides of the tongue are relaxed so that air can flow along the sides of the tongue, creating friction. This segment can be found word-initially, medially, and finally in both syllable onsets and codas, as illustrated in (27).

[5] Like the alveolar affricates /c/ and /c̓/, /s/ is frequently palatalized or more post-alveolar for one speaker.

27)	a. /ɬa.ɬəq.c̓ə.na/		‘itchy hands’
	b. /q̓ə.cə.ɬe.na/	[q̓a.cə.ɬe.ná]	‘meat to be eaten’
	c. /ta.gəɬ.ta/	[tá.gʸɪɬ.ta]	‘wading across’
	d. /qʷi.sə.y̓ənχ.w̓əɬ/	[qʷí.sə.y̓ən.χə.w̓əɬ]	‘last year’
	e. /guɬ.to/	[gʸúɬ.tɔ]	‘late night snack’

The voiceless velar fricative /x/ is usually pronounced with a palatal off-glide [xʸ], a pattern that matches the velar stops. The palatal off-glide does not surface if it is followed by another consonant. It may affect the quality of the following vowel in addition to or instead of appearing as a glide. Compare the pronunciation of example (28b), [xʸɪ.sá] ‘to be lost’, where the /ə/ is raised to [ɪ] but the glide remains audible, to example (22c) in which the palatalization on /gʸ/ raises the /ə/ to [ɪ] but does not surface as an off-glide ([gín.gɪnɬ.bəs] ‘fond of children’). When followed by the homorganic vowel [i] the glide is not audible, collapsing with the [i]. It appears word-initially and medially as both a syllable onset and coda, as seen in (28).

28)	a. /xac̓/	[xʸac̓~xʸæc̓]	‘smoke house’
	b. /xə.sá/	[xʸɪ.sá]	‘to be lost’
	c. /yá.yax.sa/	[yá.yax.sa]	‘fast runner’

The labialized velar fricative /xʷ/ is pronounced like the plain velar fricative except that the lips are rounded throughout the segment, and at the release there is a labial off-glide. The labial off-glide can have a strong effect on preceding vowels. The example word in (29b) shows the effect of /xʷ/ on a preceding schwa (/ə/ > [ʊ]). Notice that /xʷ/ in (29b) assimilates to the following labial and is realized as a phonetic [f] before /p̓/, even though

[f] is not part of the phonemic inventory.[6] /xʷ/ occurs word-medially in both onsets and codas.

29)	a. /mu.p̓ən.xʷaʔ.c̓ənχ/	[mó.p̓ɪn.xʷaʔ.c̓ənχ]	‘Thursday’
	b. /yu.dəxʷ.p̓ən.xʷaʔ.c̓ənχ/	[yú.dʊf.p̓ən.xʷaʔ.c̓ənχ]	‘Wednesday’

The voiceless uvular fricative /χ/ is pronounced by creating a near closure at the back of the vocal tract (between the uvula and the tongue body), which then creates turbulence when air passes from the lungs into the vocal tract. It occurs word-initially, medially, and finally in syllable onsets and codas as seen in (30).

30)	a. /χi.χaχ/	[χɛ́.χaχ]	‘bones’
	b. /qəm̓.χuɬ.c̓ə.na/	[qəm̓.χóɬ.c̓ə.na]	‘left hand’
	c. /ya.χi.di ƛ̓iχʷ/	[yá.χɛ.di ƛ̓íχʷ]	‘melted ice’
	d. /c̓ə.k̓ʷəsχd/	[c̓ə.k̓ʷʊ́sχt]	‘short person’
	e. /c̓ə.ẁənχ/		‘winter’
	f. /ƛ̓a.ƛ̓aqʷ.c̓ə.na/	[ƛ̓á.ƛ̓aχʷ.c̓ə.na]	‘red hands’

The labialized uvular fricative /χʷ/ is pronounced with two points of constricted airflow: at the back of the oral cavity there is near complete closure, creating turbulence in the airflow at the uvular point of articulation, and at the lips, there is rounding and constriction, especially on the release of the fricative into the labial off-glide. This segment occurs word-medially and finally in syllable onsets or codas and is found in consonant clusters, as shown in (31).

[6] Similarly, a phonetic [f] surfaces in the form /sən.bəs/ [sə́n.fəs~sə́nf.bəs~sə́n.bəs] ‘fond of swearing’. This may be due to the idiolectal variation of just one speaker, as previously mentioned regarding the palatalization of /c, c̓, s/.

31)	a. /dᶻu.dᶻu.χʷa.m̓ac̓/	[dᶻú.dᶻə.χʷɔ.m̓ac̓]	‘sink/basin’
	b. /c̓u.χʷi.dac̓/	[c̓ó.χʷe.dac̓]	‘bath tub’
	c. /c̓əlχʷs.ta.gi.la/	[c̓ɔ́lχʷs.ta.gi.la]	‘make hot water’
	d. /du.gʷi.nuχʷ/		‘troll netter’

The glottal fricative, like the glottal stop in relation to the other stops, has a distribution that differs from that of other sounds in the fricative class. The phoneme /h/ is pronounced by creating light turbulence at the glottis as air passes into the vocal tract. As shown in example (32), this phoneme is common in word-initial position but not attested in other positions of the word or syllable.[7]

32)	a. /ha.m̓əlkʷ/	[ha.m̓ɔ́lkʷ]	‘someone who eats a lot’
	b. /hu.y̓e.ma/		‘countable’
	c. /ha.mə.dᶻas/	[há.mə.dᶻəs]	‘bee hive’
	d. /hə.qəɬ.mɛʔ/	[ha.qaɬ.mɛ́ʔ]	‘internal swelling’
	e. /ha.t̓e.nuχʷ/		‘to be naughty, disobedient’

2.3.1.3 Plain resonants

The bilabial nasal /m/ is pronounced with the lips together, vibration at the glottis, and a lowered velum so that air passes out through the nose. It occurs word-initially, medially, and finally in onset and coda positions, as shown in (33).

[7] Except as an allophone of /ʔ/, as in example (1a), in the word ‘split wood’ /paʔaksənd/ [pá.ʔak.sənd~pá.hax.sən]. Presumably, it would also surface medially as an onset in reduplicative forms, but I have not encountered an /h/-initial stem with reduplication in the corpus to date.

33)	a. /ma.mə.ỷa.ʔənχ/		‘fishing season’
	b. /meʔ/		‘salmon’
	c. /mi.məχ.bəs/	[mɛ́.məχ.bəs]	‘someone fond of sleeping’
	d. /həm.sa/	[hám.sa]	‘pick berries’
	e. / n̓əm.p̓ən.χʷaʔ.c̓ənχ/	[n̓ə́m.p̓ɪn.χʷaʔ.c̓ənχ]	‘Monday’
	f. /ni.gʷa.ỷəm/	[né.gʷa.ỷəm]	‘lamp’

The alveolar nasal /n/ is pronounced with the tongue against the alveolar ridge, voicing at the glottis, and a lowered velum, which allows air to flow out through the nose. This segment can occur word-initially, medially, or finally in both onset and coda positions and occurs in consonant clusters, as seen in (34).

34)	a. /nə.qi.laχ.sta/	[nə.qé.laχ.sta]	‘lunch’
	b. /λən.ka/	[λə́n.kʸɛ]	‘woodpecker’
	c. /q̓an.ỷu/		‘sewing needle’
	d. /di.gi.lən/	[dí.gi.lan]	‘I make tea’
	e. /c̓ə.ẇənχ/		‘winter’

The lateral approximant /l/ is pronounced by touching the tongue tip to the alveolar ridge and letting the air pass over the sides of the tongue. Voicing is normally present during this segment though it can be partially or fully de-voiced in clusters with voiceless consonants, as in (35a), but does not neutralize with /ɬ/, which has more frication and high-frequency noise. It occurs word-initially and medially in syllable onsets and codas and can occur in clusters, as illustrated by (35).

35) a. /li.xʸəlc̓/ ‘can be rolled’

b. /Gu.la.li/ [Gó.la.li] ‘salmon berries’

c. /yəw.la/ [yów.la] ‘windy’[8]

d. /k̓əl.k̓aχs.diʔ/ [k̓ʸél.k̓ʸaχs.diʔ] ‘diaper’

The palatal approximate or glide /y/ is pronounced by placing the tongue blade almost against the hard palate. Airflow is less restricted than during a fricative and more restricted than for a vowel. This segment is voiced and occurs word-initially or medially in onset position, as shown in (36).

36) a. /yəw.la/ [yoẃ.la] ‘windy’

b. /yəw.gʷəl.sa.ʔənχ/ [yú.gol.sa.ʔənχ] ‘windy season’

c. /q̓an.y̓u/ ‘sewing needle’

d. /qa.yəlkʷ/ [qá.yoxʷ] ‘someone who walks about outside’

The voiced labio-velar approximate /w/ is pronounced by creating a constriction and rounding of the lips, while simultaneously creating a constriction at the velar point of articulation. /w/ is attested word-initially and medially in syllable onset or coda positions, as shown in (37).

37) a. /wa/ ‘river’

b. /yəw.la/ [yów.la] ‘windy’

c. /ƛ̓á.wi.ga.l̓aʔs/ ‘stands behind’

[8] The phonetic vowel quality [o] in this word seems to arise from the co-articulation of /əw/. Boas (1948) lists the stem yəw-; and the əw > o pattern is described on page 212 of Boas 1947. Though related forms have [u] in this position, the 1948 grammar lists the form ‘wind’ as /yɔ.la/ (p. 39). The form for ‘wind/windy’ may be suppletive or its origin may be otherwise lost to diachrony.

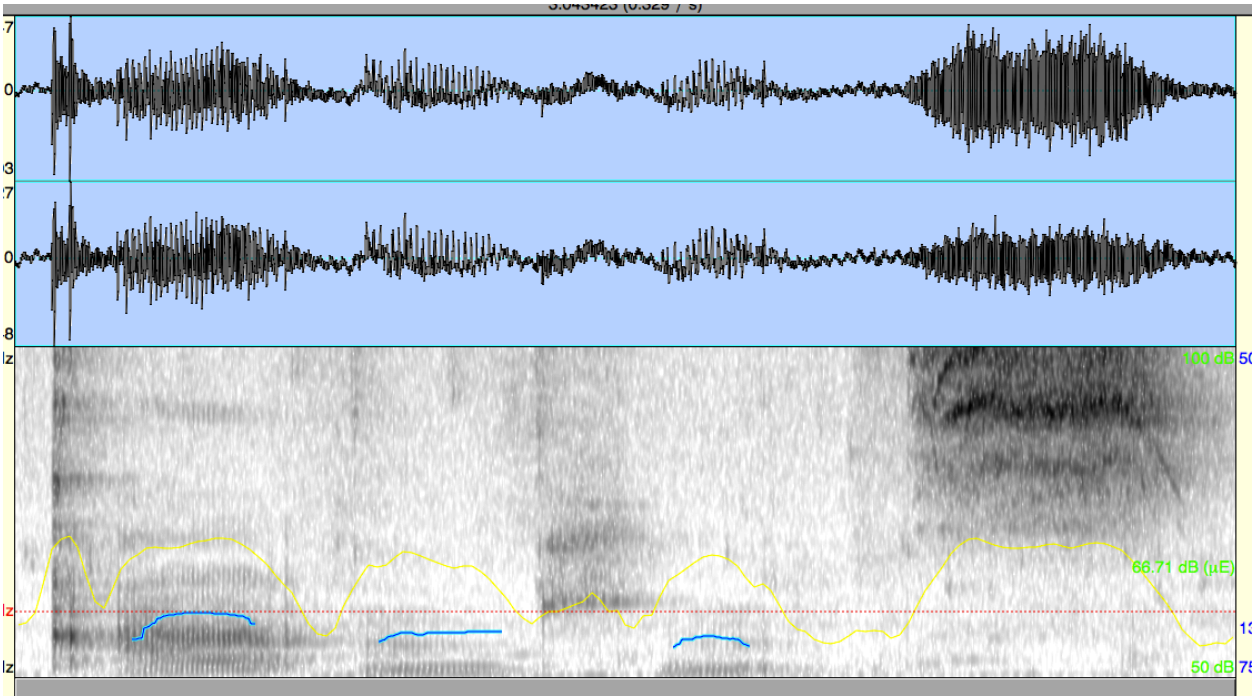
2.3.1.4 Glottalized resonants

One of the more cross-linguistically rare features of the sound system of Guc̓a is its series of glottalized resonants, which it shares with other varieties of Kʷaḵʷala. The stability of these phonemes under the conditions of language shift and English dominance is potentially undermined, particularly in word-initial position, where the cues for glottalization are more difficult to perceive. The glottalization is particularly difficult to perceive for people whose first language is English, since English does not use glottalization contrastively. This has contributed significantly to the loss of this feature of the phonology and phonetics of Kʷaḵʷala through the generations of residential school children who became English-dominant and then raised their children in English-only environments. This section describes the distribution and phonetic character of the glottalized resonants as used by current speakers of Guc̓a. For further discussion of the phonetics and phonotactic patterns of the glottalized resonants, see Chapter 3.

The glottalized /m̓/ is pronounced just like the plain /m/ except that it is immediately preceded by a glottal closure or creak. This is heard primarily on the preceding vowel rather than during the consonant. A spectrogram and waveform in Figure 2.2 show the pre-glottalization of /m̓/ in the word /q̓əm̓.χənc/ [q̓ám̓.χənc][9] 'can be found', example (38c). Notice the irregular pitch-pulses characteristic of creaky voice at the end of the vowel [a], followed by a complete stop and then a brief period of creaky voice at the beginning of the /m̓/.

[9] This word is interesting because the stress pattern is unexpected, given the glottalized resonant coda [m̓]. See Chapter 3 for further discussion.

Figure 2.2. Pre-glottalization of /m̰/



Since this segment is pre-glottalized, the glottalization in utterance or word-initial position would be especially difficult to perceive for people who learned English as their first language. Consequently, the distinction may be collapsing in initial position. Only word-medial, post-vocalic examples, as shown in (38) are found in the current data set.

38) a. /hə.m̰ənχ/ [ha.m̰ánχ] ‘meal’

b. /q̰u.m̰es/ [q̰ó.m̰ɛs] ‘crab’

c. /q̰əm̰.ɤənc/ [q̰ám̰.ɤənc] ‘can be found’

The glottalized /n̰/ is an alveolar nasal, just like its plain counterpart except that it is pre-glottalized. The glottal stop or creak can be heard on the preceding vowel, if there is one. When in initial position, the glottalization is on the beginning of the /n̰/. This segment occurs word-initially and in syllable onsets, as seen in (39).

39) a. /n̓əm.p̓ən.χʷaʔ.c̓ənχ/ [n̓ə́m.p̓ɪn.χʷaʔ.c̓ənχ] ‘Monday’

b. /n̓a.lu.ɬa/ ‘south’

c. /gʷa.ʔi.na/ [gʷé.n̓a] ‘north’

d. /hi.ʔənχ.p̓a.n̓a.kʷa/ ‘spring’

The glottalized /l̓/ is a lateral approximate, pronounced like /l/ with the difference of pre-glottalization. It is exemplified below in word-medial position as a syllable onset and intervocalically. This is the ideal environment for producing and perceiving glottalization.

40) /yá.l̓ənχ/ ‘clam digging season’[10]

The glottalized /y̓/ is an approximate pronounced just like /y/ except that it is pre-glottalized. It occurs significantly in word-initial position as well as medially, in syllable onsets, as seen in (41).

41) a. /y̓ák.səm/ ‘bad, naughty person’

b. /hú.y̓e.ma/ ‘countable’

Glottalized /w̓/ is pronounced just like its plain counterpart, the labiovelar /w/ except that it is pre-glottalized. It occurs word-initially and medially as a syllable onset, as seen in (42).

42) a. /w̓a.n̓as/ ‘hiding place’

b. /w̓ə.daχsd/ [w̓ə.dáχst] ‘to be cold on the butt’

c. /qʷi.sə.ʔənχ.w̓əɬ/ [qʷí.sə.ʔən.χə.w̓əɬ] ‘last year’

d. /c̓ə.w̓ənχ/ ‘winter’

[10] In the recording for this study, each of three speakers says the word ‘goodbye’ /həlakesl̓a/. It would be interesting to see whether /l̓/, is indeed phonetically glottalized in this post-consonant position. However, the word was not purposely included on the recording, and there is significant overlap between two speakers, while a third speaker is far from the microphone, so the recording quality is too poor to say with any certainty whether glottalization surfaces or not.

The next section (2.3.2) turns to the vowel phonemes and their pronunciations.

2.3.2 Vowels

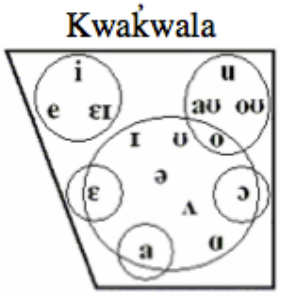
The following chart (Figure 2.3) presents the vowels of Kʷaƛ̓ʷala as described by Boas, Shaw, and others in a schematic of the vowel space (Boas 1947, Grubb 1977, Shaw 2009, Gordon et al. 2012).

Figure 2.3. The vowel phonemes of Guc̓a

i		u
(ɛ)	ə	(ɔ)
	a	

Most descriptions of the Kʷaƛ̓ʷala vowel system describe it as a system of four vowels with many phonetic variants due to the influence of surrounding consonants and dialectal variation. A distinction is made between the "full vowels" /i/, /u/, and /a/ along with their phonetic variants, and the centralized vowel schwa. What is meant by "full vowels" is vowels with an unreduced phonetic quality and which, in the stress-system (discussed in detail in Chapter 3), preferentially bear stress (Boas 1947, Shaw 2009, Gordon et al. 2012). While the number of vowel phonemes is small and the system appears quite simple in contrasts, having one each of high-front, high-back, low-central, and reduced vowels, it yields many different phonetic variants. The graphic in Figure 2.4, from Werle (2010:6) "The Phonology of Wakashan Languages," is illustrative of the overlap of allophones of different phonemes in the vowel space.

Figure 2.4. Kʷakʷala vowel space, with phonemes bounded by circles



The vowel system of Guc̓a is basically similar to the descriptions of other Kʷakʷala dialects. One change occurring across the dialects is that the phonetic variants [ɛ] and [ɔ] seem to be developing phonemic status in certain environments—this was noted already in Boas (1947:207) and has been mentioned by later scholars as well (Werle 2010). The intricacies of the vowel system of Guc̓a are described in the following sections. First, in this section, the phonemes, including [ɛ] and [ɔ] are introduced and described phonetically with examples. In Section 2.4, more detail is provided on the allophonic and phonetic variants of vowels and consonants as they interact with each other in different phonological and morphological environments. While the examples and descriptions are of Guc̓a, many of the phenomena are likely also true for other dialects of Kʷakʷala.

2.3.2.1 Full vowels

The full vowels with clear independent phonemic status include /a/, /i/, and /u/. The vowel /a/ and its phonetic variants will be discussed first. The vowels /u/ and /i/, along with their counterparts [ɔ] and [ɛ], which seem to be moving toward independent phonemic status, will be discussed next. It should be noted that many times the changes to vowel quality do not appear to be systematic, but may be attributable to the effects of slow versus fast speech, idiolectal differences, or morphological conditions such as the presence of morpheme boundaries (Gordon et al. 2012:26, Werle 2010:8, Boas 1947:207, 213).

The phoneme /a/ is the most common vowel in Guc̓a. It is usually pronounced as a low central vowel but can be affected by surrounding sounds so that its variants include [ɔ], [æ], and [ə]. After labialized dorsals /a/ often results in [ɔ], and a preceding velar with a palatal off-glide often results in [æ]. /a/ occurs in stressed and unstressed syllables, open and closed syllables, and in the presence of any consonant. In unstressed syllables the phonetic quality is sometimes closer to [ə], as in examples (43g-h). The list of words below serves to illustrate the distribution of /a/.

43)	a. /xac̓/	[xʸac̓~xʸæc̓]	‘smoke house’
	b. /ya.ɬ̓ənχ/	[yá.ɬ̓ənχ]	‘clam digging season’
	c. /həm.sa/	[hám.sa]	‘pick berries’
	d. /wa/		‘river’
	e. /qa.yəlkʷ/	[qá.yoxʷ~qá.yʌlxʷ]	‘someone who walks about outside’
	f. /dᶻa.qʷəχ.sta/	[dᶻá.qʷaχ.sta]	‘supper’
	g. /də.gi.dᶻas/	[də.gí.dᶻəs]	‘graveyard’
	h. /ha.mə.dᶻas/	[há.mə.dᶻəs]	‘bee hive’

i. /xə.sa/	[xʸɪ.sá]	‘someone who is lost’
j. /ǩa.sən/	[ǩʸá.sən~ǩʸǽ.sən][11]	‘I am not’
k. /qʷa.da.yu/	[qʷɔ́.da.yu~qʷə.dá.yu][12]	‘knife’
l. /Gu.la.li/	[Gó.la.li]	‘salmon berries’

The vowel /i/ is a high front vowel that is pronounced with the tongue high in the mouth, near the hard palate. Depending on the surrounding sounds, this is sometimes phonetically [e] or [ɛ], a slightly lower or more centralized vowel sound. This lowering occurs frequently in proximity to uvular consonants and glottal stops. A preceding uvular or /h/ often lowers /i/ to [ɛ, e], as does a following glottal stop. The list below presents instances of /i/, illustrating its appearance in open and closed syllables, stressed and unstressed syllables, and in the environment of a wide variety of consonant phonemes.

44)	a. /qʷikʷ /	[qʷixʷ]	‘eagle’
	b. /hi.ʔənχ/	[hí.ʔənχ~hé.ʔənχ]	‘summer’
	c. /Gu.la.li/	[Gó.la.li]	‘salmon berries’
	d. /bə.wikʷ/	[bə.wíxʷ]	‘pregnant’
	e. /həm̓.xid/	[ham̓.xíd]	‘eat’
	f. /ki.λac̓/	[kí.λac̓]	‘gill net (boat)’
	g. /ǩəl.ǩaχs.diʔ/	[ǩʸél.ǩʸaχs.diʔ]	‘diaper’
	h. /χi.χaχ/	[χé.χaχ]	‘bones’
	i. /hiɬ.ǩuɬ.c̓ə.na/	[héɬ.ǩʸuɬ.c̓ə.na]	'right hand'

[11] While the form for ‘no’ is [ǩi], the other negative forms have the vowel [a] or [æ] in the stem syllable in Guc̓a.

[12] The shifting of stress in the phonetic realizations of (43k) imply a restructuring of the lexical representation for /qʷadayu/ > /qʷədayu/ ‘knife’.

The vowel /u/ is a high back vowel, pronounced with lip-rounding and the tongue high and toward the back of the mouth. A more centralized version of this vowel is [ʊ], common in unstressed syllables. The presence of a uvular consonant can cause /u/ to be pronounced [ɔ/o]. The phoneme /u/ occurs in open and closed syllables, stressed and unstressed, and beside any consonant except /w/. The list of words below illustrates the variety of environments in which /u/ occurs.

45)	a. /ʔu.q̓ʷəs/	[ʔú.q̓ʷas]	‘believing’
	b. /q̓a.q̓u.c̓a.yu/	[q̓á.q̓o.c̓ə.yu]	‘crab trap’
	c. /hiɬ.k̓uɬ.c̓ə.na/	[héɬ.k̓ʸuɬ.c̓ə.na]	'right hand'
	d. /dᶻə.mi.dᶻə.mi/	[dᶻə.mí.dᶻə.mi]	‘cat’[13]
	e. /q̓u.m̓as/	[q̓ó.m̓es]	‘crab’
	f. /guɬ.tu/	[gʸúɬ.to]	‘late night snack’
	g. /Gu.la.li/	[Gó.la.li]	‘salmon berries’

2.3.2.2 Schwa

Schwa /ə/ is a special vowel in Kʷak̓ʷala because it behaves differently than the other vowels in regards to stress (see Chapter 3 for full discussion of stress). It is dispreferred as a stressed vowel. It has been hypothesized (Lincoln & Rath 1980, Fortescue 2007) that schwa was (and maybe still is in some dialects) primarily an epenthetic vowel, and not a phoneme in the parent language. The distribution of schwa across cognates in Northern Wakashan languages, and in Kʷak̓ʷala reduplication patterns and syllabification of

[13] This is unrelated to the word for ‘house cat’ in the other dialects, which is /bú.si/, a borrowing from Chinook Jargon. The Guc̓a form for ‘cat’ is based on the root dᶻəm- ‘to cover with sand, soil, or ashes’.

consonant clusters, suggests that it is the default vowel when words are syllabified (Bach, Howe, and Shaw 2005, Shaw 2011). The classification of schwa is further complicated because phonetically, it can be derived from the reduction of a "full" vowel in an unstressed syllable, or it can take on other vowel qualities due to the influence of surrounding segments, resulting in multiple phonemic sources for the sound [ə] as well as many phonetic qualities of /ə/. Examples of schwa in various stressed and unstressed syllables, open and closed syllables, and in proximity to different consonant types are presented in list form here as an illustration of the distribution of the phoneme schwa.

46) a. /qʷi.sə.ɣ̓ənχ.ẘəɬ/ [qʷí.sə.ɣ̓ən.χə.ẘəɬ] 'last year'

b. /bə.wikʷ/ [bə.wíxʷ] 'pregnant'

c. /c̓ə.ẘənχ/ [c̓ə.ẘɔ́nχ] 'winter'

d. /c̓ə.k̓ʷəχsd/ [c̓ə.k̓ʷʊ́χst] 'short person'

e. /λən.ka/ [λə́n.kʸɛ] 'woodpecker'

f. /na.Gəm/ [ná.Gəm] 'pail/bucket'

g. /sən.pa/ [sə́n.pa] 'swear'

h. /ẘə.daχsd/ [ẘə.dáχst] 'to be cold on the butt'

i. /mi.məχ.bəs/ [mé.məχ.bəs] 'fond of sleeping'

j. /mə.na.c̓i/ [mə.ná.c̓i] 'drum'

k. /c̓əx.q̓á/ [c̓ɪx.q̓á] 'hangover'

l. /hə.m̓əlkʷ/ [ha.m̓ə́lxʷ] 'someone who eats a lot'

2.4 Phonological processes: interactions among consonants and vowels

Many of the interactions between consonants and vowels were exemplified in the preceding section on the vowels and their allophones. As others have pointed out (e.g., Werle 2010), the consonants are more stable than the vowels. This stability serves to maintain the many contrasts and results in only a small degree of allophony for consonants. Conversely, this contrast is supported by the flexible and highly allophonous vowel system. This section describes the interactions among consonants and vowels.

2.4.1 Vowel coalescence and the status of /ɛ/ and /ɔ/ as phonemes

One of the processes contributing to the status of /ɛ/ and /ɔ/ as phonemes is vowel coalescence. In certain situations, which do not seem to be completely transparent or regular, two vowels may merge across a consonant, specifically a glottal stop /ʔ/. An example of this is the word for 'north'. This word is pronounced [gʷé.n̓a] in Guc̓a. However, there is reason to think, based on comparison with other dialects and the Boas documentation of Kʷak̓wala, that the [e] vowel quality is the result of the coalescence of /i/ and /a/ across a glottal stop from the underlying form /gʷá.ʔi.na/.

Another kind of evidence that /ɛ/ and /ɔ/ are functioning as independent phonemes comes from near minimal pairs such as the following [u]-versus-[ɔ] pair: [c̓ú.ɬa.tu] 'red head' and [gʸúɬ.tɔ] 'late night snack'. The word for 'salmon' is [mɛʔ]. It is unclear whether this is a case of coalescence of /i/ and /a/ across glottal stop (like 'north' [gʷé.n̓a] /gʷá.ʔi.na/) or if it is a lowering of /i/ caused by the following glottal stop. See also (32d). Either way, synchronically it contrasts with /i/ in the same environment in the words 'skirt'

[saʔχs.díʔ] and ‘diaper’ [ƛ̓ʸél.ƛ̓ʸaχs.diʔ]. In cases such as these, the sources of [e, ɛ] and [o, ɔ] are sufficiently opaque that they may be analyzed as distinct phonemes.

2.4.2 Consonant effects on vowels

As was noted in Section 2.3.2 on vowels, the uvular consonants, /h/ and /ʔ/, sometimes have a lowering effect on following vowels, turning /i/ into [e, ɛ], /u/ into [o, ɔ], and /ə/ into [ɔ, a]. The glides and off-glides, either palatal or labial, can have a strong effect on schwa especially, but also on other vowels. Thus, schwa following the palatalized velars or /y/ is often [ɪ], and /a/ can be [æ]. Following a /w/ or labialized dorsal obstruent, it is often [ʊ], while /a/ can become [ɔ]. These labialized consonants can sometimes have anticipatory effects on a preceding vowel as well, when they are parsed in the coda.

2.4.3 Effects on consonants

Consonants are affected by surrounding segments and by position in the syllable or word. Spirantization of voiceless stops parsed in syllable codas is seen in /kuqʷ.c̓ə.na/ > [kʸúχʷ.c̓ə.na] ‘broken hand’ as /qʷ/ changes to [χʷ]. The same process is exemplified by the final segment in example (47) ‘eagle’s house’ which goes from /kʷ/ to [xʷ].

47) /kʷikʷ gukʷ/ [kʷíkʸuxʷ] ‘eagle’s house’

Two other types of change to consonants are also exemplified in (47). Common consonant-on-consonant effects seem to be those resulting from the merger of consonants near the same place of articulation when they are in contact. This is exemplified when the two words, /kʷikʷ/ ‘eagle’ and /gukʷ/ ‘house’ are compounded. It seems that the [kʷ] at the end of ‘eagle’ and the [gʸ] at the end of ‘house’ merge by deletion of one of the segments.

There are two possibilities for how this merger occurs: the [kʷ] could delete after devoicing the [gʸ], *or* the [gʸ] could delete, leaving the [kʷ] to be parsed as an onset before /u/—an environment where the rounding contrast on dorsals is regularly neutralized, turning [kʷ] to [kʸ]. This second possibility for the merger of the two stops is more appealing because the rounding neutralization of dorsals before /u/ is a general process in Kʷaɬʷala (Boas 1947:214, Werle 2010:10-11). The stages for deriving the phonetic form of 'eagle's house' can be roughly characterized as: /kʷikʷ gukʷ/ >*kʷikʷukʷ> [kʷíkʸuxʷ].

2.5 Conclusion

This chapter has focused on the phonemes of Guc̓a, their phonetic manifestations, and some of the ways they affect and are affected by surrounding sounds. The segmental inventory of Guc̓a is the same as that of the Kʷaɬʷala dialect, described by Boas and others. Among the consonants, there is evidence that some have a restricted distribution in terms of where they occur in the word or syllable. The basic phonemes of the vowel system were introduced with examples showing some of the complex interactions of segments, giving rise to many vowel qualities from only a few phonemes. The development of [ɛ] and [ɔ] into independent phonemes was discussed. Phonology and phonotactics, including syllable structure, the stress system, and the special phonological status of particular segments will be investigated next in Chapter 3.

CHAPTER THREE

Phonotactics

3.1 Introduction: structure and aims of this chapter

This chapter examines various phonotactic characteristics of Guc̓a phonology, describing and investigating syllable structure, stress patterns, and the particular ways that the phonology and phonetics of Guc̓a interact with each other. There are several areas of particular theoretical interest, which have received attention in the literature. These include stress systems and their basis in syllable structure and sonority, the acoustic correlates of stress, sonority, and syllable weight, and the relative phonetic prominence of different vowel qualities or consonants. There are striking cross-linguistic patterns of syllable structure, stress, and sonority, but there are also language-specific distinctions, which appear to have phonetic and phonological bases. Guc̓a is an interesting case to investigate because like other Kʷak̓ʷala dialects, it exhibits a default-to-right stress pattern, which is cross-linguistically rare. In addition, the glottalized segments of the language and vowel quality interact with sonority (and stress) in interesting ways.

3.2 Key theoretical concepts and literature review

3.2.1 Theoretical assumptions

As is commonly discussed in the literature on syllables, the concept of "syllable" is an abstraction, though evidence for it cross-linguistically is quite strong since various phonological processes across languages – such as stress assignment, reduplication, and tone – target the syllable as the relevant unit of language, rather than a segment, morpheme,

word, phrase, etc. Syllables are formed around an essential core, called the nucleus. The nucleus is normally a vowel, though in some languages other segments, such as resonants, may also be possible nuclei. Each vowel nucleus is accompanied by optional consonants, which group together with it. Consonants that precede the nucleus, but group into the same syllable with it, form the onset of the syllable (Kenstowitz 1994:252-253). While onsets are not required in all languages, there is a cross-linguistic tendency to maximally fill syllable onsets (Maximal Onset Principle, e.g., Selkirk 1982, 1984). In demarcating syllables in a language, the vowel nuclei are first identified, and then the onsets are filled to the maximum allowed by the phonotactic constraints of the language. Any consonants that remain unassigned to a syllable associate with the syllable of the vowel preceding them, forming the coda of that syllable. Both onsets and codas are subject to constraints on which consonants may occur in consonant clusters and in what order.

The overall governing principle of segment ordering is that the vowel nucleus is the most sonorous or phonetically prominent part of the syllable, i.e., the peak. The onset should build up in sonority to the peak, while the coda should decline from it. Sonority describes the relative prominence and periodicity of a syllable or segment. The most sonorous sounds are vowels, followed by glides, then nasals and approximates, then fricatives, affricates, and stops. Voiced sounds are more sonorous than voiceless ones. Typically, syllable onsets do not affect the sonority of a syllable, and so do not enter into rules with regards to the assignment of stress. The nucleus in particular, and often the nucleus and coda together—called the rime—do affect a syllable's sonority and hence its ability to bear stress. In the generative framework described by Kenstowitz (1994:253), the

nucleus projects the coda as an immediate sister while the onset is a branch off of the higher syllable node.

In Guc̓a, sonority is a property of syllable rimes (nucleus and coda together). Stress in particular appears sensitive to rime sonority. Briefly, the central non-low vowel schwa is less sonorant than full vowel qualities. Thus, in most cases, a schwa nucleus does not attract stress while a full-vowel nucleus does. In addition, resonants in coda position increase the sonority of the rime, while glottalized resonants or a glottal stop decreases the sonority. Accordingly, a schwa plus a plain resonant will attract stress, while a schwa plus a glottalized resonant will not. Finally, a full vowel followed by a glottal stop in the coda will not attract stress, but it appears a full vowel followed by a glottalized coda resonant does attract stress[14]. The light status of the glottal stop coda after a full vowel is curious since in some languages, such as Kamchadal, Mundari, and Mam, the glottal stop is heavier than other coda consonants (Gordon 2006:122.) These facts will be discussed in detail in Section 3.4.

3.2.2 Previous Literature on Kʷaƛ̓ʷala Stress

Kʷaƛ̓ʷala has been the subject of a number of studies on syllables and stress because the language exhibits typologically unusual patterns, raising theoretical questions about the cross-linguistic nature of syllable weight and stress placement. It is important to place this investigation of Guc̓a within the framework of previous studies on Kʷaƛ̓ʷala, in particular, those on stress and on syllable weight.

[14] This syllable type, VR', is extremely rare or unattested. Potential cases may be analyzed instead as having the underlying form /əR'/.

Boas (1947) describes the stress patterns found in Kʷaƛ̓ʷala in a section of the grammar on "accent" (p.218). The description is primarily based on stem types or shapes rather than syllable type, though the term syllable is used in describing which part of the word is accented. Since accent is not described in terms of syllable types, the description is rather long, and with many exceptions explained for each stem type, depending on the suffixes that follow it.

In brief, Boas states that stems of the following types are not accented on the stem, but on a later syllable: CəC and CəCC. Stems of the types CVC, CəRC, and CVCC are accented on the first syllable of the stem. Though not definitive of default-to-right stress, this description is consistent with the default-to-right analysis of stress put forward by later scholars. (See Bach (1975), Lincoln and Rath (1980), S. Wilson (1978), and Zec (1988) for further discussions of Kʷakʷala stress.)

Wilson (1978) presents a distributional analysis of syllable structure for Kʷaƛ̓ʷala and Ooweekyala (Heiltsuk). The Kʷaƛ̓ʷala data for this paper come from Quatsino (Guc̓a dialect), making it an especially relevant reference point for the current study. The primary aim of the Wilson study is to provide supporting evidence for the phonological usefulness and reality of the notion "syllable" for describing phonotactic patterns in these two languages. In doing this, Wilson tests and rephrases the Boas description within contemporary phonological terms. The paper also provides comparative data on the two languages, both from the Northern Wakashan family.

Wilson concludes that the syllable is a useful and well-motivated concept in Kʷaƛ̓ʷala because syllables can be simply parsed and described, and are useful in explaining the stress pattern. Based on the structure of minimal, monosyllabic words,

Wilson analyzes syllable structure in Quatsino (Guc̓a dialect). The study finds that each syllable is composed of exactly one initial consonant and one vowel plus optional coda consonants. The stress pattern for Guc̓a, as described in the paper, is stress on the first non-central vowel, or on the first central vowel followed by a plain resonant in the same syllable. If there are only central vowels in the word and none is followed by a tautosyllabic plain resonant, then stress falls on the last vowel of the word. Wilson finds that for Oweekyala, the syllable is less easily defined. However, based on comparison of cognates with Guc̓a and on phonetic analysis of Oweekyala, Wilson concludes that the segmentation of syllables actually follows the same principles as in Guc̓a.

Gordon (2000) provides a typology of default-to-opposite stress systems described in the linguistics literature. These are systems in which the stress normally falls on the first or last heavy syllable in a prosodic domain (usually the word), but if all syllables are light, the stress placement "defaults" to a syllable on the opposite edge of the word or domain. Thus a default-to-right system normally stresses the first heavy syllable, but in the absence of heavy syllables, it stresses the last, right-most syllable. Likewise, a default-to-left system normally stresses the last heavy syllable, but in the case of all light syllables, the first one is stressed. Gordon points out an asymmetry among these systems, in which most systems analyzed as default-to-opposite are of the default-to-left type, rather than being evenly distributed between default-to-left and default-to-right. Kʷaƙʷala is typologically unusual in this way, since it is not only default-to-opposite, but also default-to-right.

Gordon re-examines eleven languages with reported default-to-opposite stress. In doing so, he finds that many of these systems can be re-analyzed so that the "default" prominence is shown to be more accurately associated with intonation, rather than lexical or

word-level stress. Another finding is that many languages described as default-to-opposite are found to be default-to-opposite only for primary stress, but not for secondary stress, which occurs regularly on all heavy syllables. Kʷaƛʷala is one of two languages examined in the study for which Gordon finds inconclusive evidence for default-to-opposite stress. While Kʷaƛʷala has a default-to-right pattern for many words, Gordon concludes that the original Boas description includes examples that counter this analysis, and that the default-to-right description of stress in most of the literature on Kʷaƛʷala might be based on prosodic prominence in intonation units or other prosodic units above the word level. Ultimately, Gordon is unable to determine if Kʷaƛʷala is a true case of default-to-opposite stress.

Shaw (2009) describes the stress system and related syllable-structure constraints in Kʷaƛʷala, confirming that the system is best and most accurately described as a default-to-right stress system, a typologically rare system and classification which was previously questioned in Gordon (2000).

The relevant facts presented by Shaw (2009) for Kʷaƛʷala are summarized here. The syllable rime determines the weight of a syllable and its ability to bear stress or not. The following rime types attract stress or are heavy in this system: VO, VR, əR, and VR'. In this notation, V stands for vowel, O for obstruent, R for resonant, ə is schwa, and the apostrophe indicates a glottalized segment. By contrast, the following rimes are light, do not attract stress, and can only be stressed in the "default" situation: ə, əO, əR', əʔ, and Vʔ.

3.2.3 Relevant Literature on Syllable Weight and Sonority

One phonotactic property of syllables often used in discussing the ability of syllables to bear stress is "weight." (For an excellent overview of this subject, see Gordon 2006.) Weight is a phonological property, rather than a phonetic one, and languages differ as to how they categorize syllables by weight. In many languages a two-way distinction is made among syllables: heavy and light. In these cases, lexical stress is normally attracted to or allowed on heavy syllables, but not on light ones. In a few languages, a three-way distinction is made between heavy, light, and super-heavy syllables. Often the differences in weight can be correlated to acoustic or phonetic properties of the syllables that are classified into each category. For example, heavy syllables are often of longer duration, higher pitch, and/or greater intensity than light syllables. However, languages do not all divide heavy and light syllables in the same way (Gordon 2002:52-53).

“Sonority” is a phonological principle which describes the relative acoustic prominence or perceptual salience of different classes of sound segments (see Parker 2002, Gordon et al. 2012). It is a phonologically useful concept because it explains the syllable structure patterns, stress patterns, and other phonological phenomena that are language specific, yet follow universal tendencies. The extensive literature describes continua of various acoustic properties that contribute to sonority, or lack thereof. For a full description of the historical discussion and controversy and many specific scales proposed by scholars, see Parker (2002).

Miller (2012) describes sonority as a concept useful for describing segment-sequencing patterns. The sonority hierarchy targets classes of sounds, describing their perceptual salience with regards to inherent features of the sound segments, such that

sounds higher on the scale are more prominent than those lower on the scale. According to Miller, two scales of articulatory prominence overlap to best capture patterns of sonority: the Aperture Scale and the Sound Source Scale. The Sound Source Scale describes the nature of, or lack of, sound emanating from the vocal folds, while the Aperture Scale captures the degree and nature of impedance in the vocal tract to airflow. The overlap of these two scales gives a complex sonority hierarchy, which Miller describes at length. The basic concept is that any two sounds may be compared based on their place on the two scales. If either of them outranks the other on both scales, it is more sonorous. If they each outrank the other on one of the scales, but not the other, it is ambiguous which is of higher sonority. Interestingly, Miller does not include glottalized sounds on either scale, since it is unclear on which of the two scales glottals would properly belong. Instead, Miller notes that there is both phonetic and phonological evidence suggesting that glottalized resonants are less sonorant than modal voiced resonants, and he leaves the creaky voiced sonorants unranked with regards to the two scales. Kʷaƛ̓ʷala is one of the languages that is cited as providing phonological evidence for the lower sonority of glottalized sonorants. Thus an investigation into the phonetic differences between the modal voiced and creaky voiced sonorants of Guc̓a may provide a better understanding of the mechanisms behind reduced sonority in the case of creaky voice. As pointed out in Miller (2012) and elsewhere, the principal way in which creaky voice is understood to reduce sonority is by reducing the fundamental frequency (F0). Exactly how F0 is related to Miller's Sound Source and Aperture Scales is not well understood.

Parker (2002) is a dissertation exploring sonority and its phonetic bases. Parker conducts a thorough review of the literature on sonority and sonority scales, summarizing

earlier accounts of the relative sonority of sound segments and also of phonetic correlations with sonority. He then conducts several experiments in English and Spanish to test five potential phonetic correlates for sonority. The primary result of his study is that average intensity in decibels (dB) for a sound segment correlates to a very high degree with its phonological position on the sonority hierarchy. He also finds that the sonority scale is basically language-universal, with language-specific differences due to factors other than sonority. Since his study only included English and Spanish, it had nothing to say about glottalized sonorants or creaky voice.

Gordon et al. (2012) sets out to answer persistent questions about the status of central vowels in the sonority hierarchy, and the phonetic characteristics that distinguish schwa from more peripheral vowels. Different vowel qualities and heights are compared in five languages, some of which treat schwa as phonologically lighter than other vowels, and some of which treat it as equally sonorant. Contrary to the findings of Parker (2002), mentioned above, intensity is not found to correctly predict the lower sonority of schwa. In fact, no single acoustic measure accounts for the lower sonority of schwa, leading Gordon et al. to conclude that it is a complex of acoustic – and perhaps even articulatory – factors, rather than perceptibility considerations, that are responsible for the low sonority of schwa. The sonority of schwa has also been a topic of typological interest. In many languages schwa shows phonological behavior that differentiates it from other more peripheral or longer vowels. This is the case in Kʷaƛ̓ʷala, which was one of the five languages that Gordon et al. (2012) investigated. They found that in languages that treat schwa as phonologically lighter than other vowels, schwa is in fact phonetically shorter, and less prominent on acoustic measurements. In languages where the phonology treats schwa the

same as other vowels, schwa shows greater similarity in prominence and duration to the other vowels of the language. Gordon et al. (2012) establish the following hierarchy of prominence/sonority for vowels: /a, e, o, u, i, ə/. They assert that languages may distinguish phonological categories at any point along this phonetic continuum of prominence. Thus, in Kʷaƛʷala at least, the distinction is between schwa, which is short and centralized, and the rest of the continuum. Other languages such as the Jaz'va dialect of Komi, Kara, Gujarati, Yimas, and Kobon (Gordon 2002) draw the distinction between the mid and high vowels, so that /u/, /i/, and /ə/ are all in the same light category.

3.2.4 Relevant Literature on Glottalization

As early as Sapir (1938) "Glottalized Continuants in Navaho, Nookta, and Kwakiutl", the typologically unusual nature of the glottalized resonant consonants was being studied in Kʷaƛʷala and other North American Languages. Sapir (1938) advances a hypothesis about the diachronic origin of these segments in the languages of his study and also describes their phonetic realization. The timing of the glottalization is said to be simultaneous with the beginning of the continuant, but not preceding the continuant consonant. This is contrary to my finding for Guc̓a, in which glottalized resonants are pre-glottalized (see Section 3.5, Figure 3.16). Sapir dates the genesis of the glottalized continuants to the Wakashan period and connects their origin with the "hardening" suffixes of the language, which are discussed in detail in Chapter 4.

Gordon and Ladefoged (2001) describe various typological and acoustic characteristics of a continuum of phonation types. The continuum ranges from breathy voice, to modal voice, to creaky voice. Among the languages cited as having creaky-voiced

sonorants, Kʷaƛ̓ʷala is described as having pre-glottalized sonorants, including typologically rare, word-initial, pre-creaked sonorants. The authors show that in Kʷaƛ̓ʷala, like many other languages with glottalized sonorants, these segments are usually pre-glottalized, that is: glottalization falls on the first half of the sonorant and the end of the preceding vowel. This cross-linguistic tendency is theorized to preserve phonetically salient formant transitions from the sonorant to the following vowel, which are important cues to identifying the place of articulation of the sonorant. Kʷaƛ̓ʷala is one of the few languages that has a phonemic contrast between modal and glottalized sonorants in word-initial position. The fact that many languages have this contrast in other positions (post-vocalically) but don't allow it in word-initial position is likely due to competition between realizing the glottalization and still preserving the place and formant transition information without a preceding vowel. The acoustic parameters of creaky voice that are discussed by Gordon and Ladefoged (2001) include decreased pitch, decreased intensity, and spectral tilt (highly positive for creaky voice).

Shaw and Campbell (2005) examine initial glottalized sonorants in Nɬeʔkepmxcin (Thompson Salish) to determine if the timing pattern of glottalized sonorants described in the literature (pre-glottalized in prevocalic position) and the accompanying perceptually based explanations for this pattern are well-founded or if the apparent pattern is a result of an accidental gap in the typology (since languages with these sounds are few and often underdocumented). If a result of an accidental gap, the evidence for the independence of phonology and phonetics is strengthened. Shaw and Campbell show that in fact the word-initial glottalized resonants of Thompson Salish are primarily post-glottalized. Their methods for investigation of the timing of glottalization involve acoustic analysis of

glottalized and plain versions of /l, m, n, w, y/ in word-initial, prevocalic position. The following cues to glottalization were analyzed using Praat software, with the location of the cues, relative to the sonorant, noted: the presence of a full glottal stop, pronounced irregularity or rise in pitch, significant drop in intensity, and visible presence of creaky voice/laryngealization in the waveform or spectrogram. These were then tallied for each token and speaker to yield results as to the relative timing of the glottalization (pre, mid, throughout, post). They conclude that post-glottalization is the primary realization of glottalized resonants in word-initial, prevocalic position; therefore, the timing of glottalization is purely phonological, rather than being a phonetically-based phenomenon. While the timing of word-initial resonants is not directly related to the study in this chapter, the methodology for identifying cues to glottalization informs the acoustic analysis of glottalization undertaken in Section 3.6.

3.3 Guc̓a Syllable Structure

The minimal syllable in Guc̓a contains a vowel nucleus (either a full vowel or schwa) and a single requisite onset consonant. This minimal syllable structure can be represented schematically as CV or Cə. In addition, syllables can have optional coda consonants.

The syllable nucleus in Guc̓a is usually composed of a single vowel,[15] which can either be a short central vowel, /ə/, or a longer full-vowel, /a/, /i/, or /u/ (abbreviated V in

[15] There are a small number of cases of apparent vowel coalescence across syllable boundaries, which present interesting challenges to the analysis of syllable boundaries and structure. See Chapter 2, Section 2.4.1 for an example of this.

this chapter for the sake of identifying patterns and schematizing the representation of syllable structure).

Onsets are composed of only one consonant, which in theory can be any consonant in the inventory. However, the distributional facts show preferences for some consonants over others in this position. In particular, /h/ only occurs in syllable onsets (and especially word-initially) and not in codas. Conversely, the glottalized resonants show a very limited distribution in word-initial position, and though they are attested in both onset and coda positions, they are far more common in codas. This latter fact is probably due to difficulty with realizing and perceiving acoustic cues for both glottalization and the place of articulation on a segment not in post-vocalic position. Post-vocalic glottalized resonants are normally pre-glottalized in Guča, as will be shown below in the section on glottalized resonants, and in fact in many languages they are phonologically banned when not following vowels (Gordon and Ladefoged 2001:394).

Indeed, while onsets are simple in Guča, containing exactly one consonant (contrary to the cross-linguistic tendency to maximize onsets (Selkirk 1984)), codas are often complex and may contain clusters of up to three consonants. There are restrictions on sequences of coda consonants as follows; note that phonetic transcriptions are provided only where these differ significantly from the phonemic ones:

1. When there is only one consonant in the coda, any consonant except /h/ is permissible.

   48) Examples of CVC syllables

/ẇap/		'water'
/gəl.das/	[gʸə́l.das]	'treasure box'
/kʷikʷ/	[kʷixʷ]	'eagle'

2. When there are two consonants in the coda, the following patterns are attested: CəRO,[16] CVχs, and CVRχ.

   49) Examples of CVCC syllables

/pa.ʔak.sənd/		'split wood'
/ya.ɬənχ/		'clam digging season'
/Galχ.bəs/		'fond of swimming'
/nə.qi.laχs.ta/	[nə.qé.laχs.ta]	'lunch'

3. In CVCCC syllables, the attested possibilities are limited to CVχsd#, and Cəlχʷs.

   50) Examples of CVCCC syllables[17]

/c̓ə.ƛʷəχsd/	[c̓ə.ƛʷə́χst]	'short person'
/ẇə.daχsd/	[ẇə.dáχst]	'to be cold on the butt'
/c̓əlχʷs.ta.gi.la/		'to make hot water'

[16] Examples of the CəRO-type syllable in Pattern 2 are numerous and varied as to which obstruent may appear as the final consonant. These CəRO examples are also consistently word-final; whether this is accidental or systematic is not clear.

[17] Based on the above examples of CVCCC syllables, I expect to find CVCCCC# where the coda consonants are RχsO#, for example the string 'əlχsd' in word-final position seems likely, though it is not attested in the corpus.

This overview of syllable structure provides important background and analytical assumptions for discussion in the following section of the lexical stress patterns and syllable weight.

3.4 Stress

As noted above, the stress pattern of Kʷaƙʷala is described in the literature as default-to-right (Wilson 1978, Wilson 1986, Shaw 2009). Default-to-right stress systems realize stress as near the left edge of the word as possible (on the first heavy syllable), but if there are no appropriate (heavy) syllables for bearing stress in the earlier syllables of a word, the last, or rightmost syllable is stressed (even if it is light). Guc̓a follows this pattern of lexical stress.

In Guc̓a (as in Kʷaƙʷwala), syllables that count as heavy are those with the following elements in the rime: V, əR. These can be followed by one or more coda consonants, as previously described in Section 3.3. Any syllable with a full vowel nucleus, or with a schwa followed by a plain resonant in coda position, will attract stress, and the first such syllable from the left edge of a word will bear primary stress. If there are only light syllables in a word, the rightmost syllable is stressed. Light syllables are those with a schwa nucleus, such as open syllables with schwa, or schwa followed by a coda obstruent (ə, əO). There are two interesting caveats to this categorization. First, a full vowel followed by a glottal stop (Vʔ) does not attract stress and, second, neither does a schwa followed by a glottalized resonant (əR'). Based on these facts, it appears that glottalization reduces sonority or prominence and therefore the ability of a syllable to bear stress. These patterns are summarized in Figure 3.1, where O indicates any obstruent other than glottal stop, R

indicates a resonant, the apostrophe indicates glottalization of a segment, and ∅ indicates no coda (an open syllable). These facts can be represented by positing the following two interacting sonority hierarchies for Guc̆a; one concerned with vowels and the other concerned with consonants. These are represented in Figure 3.1.

Figure 3.1. Syllable Weight Matrix; Score > 1 = Heavy

		High ⟷ Low		
High ↕ Low	CODA		VOWEL	
			Full V = 1	Schwa = 0
		R = 2	3	2
		∅, O, R' =1	2	1
		ʔ = 0	1	0

The arrow on the horizontal axis in Figure 3.1 represents vowel sonority or weight, while the vertical axis represents coda sonority or weight. This matrix allows one to calculate a numerical index of syllable weight for each syllable type. Within this matrix, full vowels are given a score of 1, while schwas are scored as zero. Among codas, plain resonants are given a score of 2; open syllables (no coda consonants), obstruents, and glottalized resonants are given a score of 1; and the glottal stop is given a score of zero. The shaded boxes in the figure show the calculated scores for each combination of vowel and coda type. A score of 2 or 3 on this scale indicates a heavy syllable type (dark grey), while a score of 1 or 0 indicates a light syllable (lighter grey).

Note that glottalized resonants and obstruents pattern together with open syllables because full vowels, but not schwa, are stressed when these consonants are in coda

position. The glottal stop is least sonorant because regardless of vowel quality, no syllable with a glottal stop in the coda attracts stress.

Examples illustrating the stress patterns of Guc̓a are given below. Those in (51) first exemplify heavy syllables receiving stress. Those in (52) show the "default" case of light syllables being stressed in the absence of heavy syllables in a word. Those in (53) illustrate the special cases of glottalization reducing the stress-bearing capacity of a syllable: either the syllables have a full vowel that is not stressed when followed by a glottal stop, or they have a schwa followed by a glottalized resonant that does not take stress.

51) Left-most heavy syllable stressed

[hí.ʔənχ]	'summer'
[sú.bə.yu]	'axe'
[c̓ú.χʷi.dac̓~c̓ó.χʷe.dac̓]	'bath tub'
[há.mə.dᶻəs]	'bee hive'
[kúqʷ.c̓ə.na]	'broken hand'
[yá.ɬ̓ənχ]	'clamming season'
[ƛ̓él.ƛ̓aχs.diʔ]	'diaper'
[mə.ná.c̓i]	'drum'
[sə.ƛ̓á.p̓ən.χʷaʔ.c̓ənχ]	'Friday'
[kí.x̓̌i.nuχʷ]	'gill net'
[də.gí.dᶻas]	'graveyard'
[də́nχ.bəs]	'fond of singing'

52) Only the right-most syllable is heavy, and therefore stressed

[c̓ə.ẇə́nχ]	'winter'
[qə.də́lkʷ]	‘stubborn person’
[bə.wíkʷ~bə.wíxʷ]	‘pregnant’
[hə.m̓ác̓]	‘dish’
[xʸə.sá]	‘lost'[18]
[c̓əxʸ.q̓á]	'hangover'

53) No heavy syllables; right-most syllable stressed

[c̓ə.k̓ʷə́χst]	'short person'

54) Syllables with schwa plus glottalized resonants, or with full vowel plus glottal stop, are light

[həm̓.xíd]	'to eat'
[saʔχs.díʔ]	'skirt'
[də.daʔɬ.bə́s]	‘fond of laughing’

Among the questions raised by these facts of Guc̓a phonology, two stand out: Why is it that the plain resonant following schwa increases its weight so that it patterns with heavy syllables? And, how does glottalization – glottal stop following full vowels and glottalized resonants following schwa – reduce the weight of a syllable so that it patterns as light as opposed to heavy? The following sections explore the acoustic properties of lexical items in an attempt to answer these questions. But first, an excursus on the nature of the data is warranted.

[18] The examples ‘lost’ and ‘hangover’ may actually belong to group (53) “No Heavy Syllables; Right-most Syllable is Stressed,” but there is an (apparent) ban on schwa in word-final position, since all would-be schwas are /a/ in this position.

3.4.1 On the Nature of the Data Set

When one explores the acoustic properties of a language, it is best to examine multiple carefully chosen words that hold constant particular phonological variables, so that one can be certain that these other variables do not confound the results. For many languages, assembling lists of such words is relatively straightforward, given the morphological and phonological structures that underlie the forms. In Guc̓a this task is difficult, due in part to the polysynthetic nature of the language and details of the phonology: the complex syllable codas, the large number of consonant contrasts, and the extensive allophonic variation found in vowels. When one tries to substitute segments to get minimally different sets, there are typically other, independent morphological or phonological processes that come into play, shifting the segments found in the focus of the study. As a result, truly comparable examples illustrating minimal differences are few.

In addition, the historical context of conquest and its profound impact on the current situation of this language and its speakers called for a family-centered, flexible style of gathering words, stories, and conversation. Family dynamics, speaker age, health, and fatigue, all impacted speakers' ability to produce long lists of phonologically-related words out of context. In being interested both in how the language was used in daily interaction as well as in recording sufficient vocabulary for a phonetic and phonological description, it was not my aim to be solely in control of what the speakers produced. Instead, I recorded as much as possible, collecting the data forming the basis of this study. My goals for this work were broader than this phonetic study; I was also endeavoring to document the language for

the speakers and their community and for potential use in future language reclamation projects.

As I examine the acoustic features of lexical items in order to address the interesting questions posed above, in most cases there are not enough items that are minimally distinct to do the statistical analyses that one would find in a more controlled or experimental setting. I thus present descriptive analyses, rather than statistically verifiable results. Given that very little data on this language is likely to become available in the future, I believe this holistic descriptive approach is valuable.

3.4.2 Acoustic correlates of stress

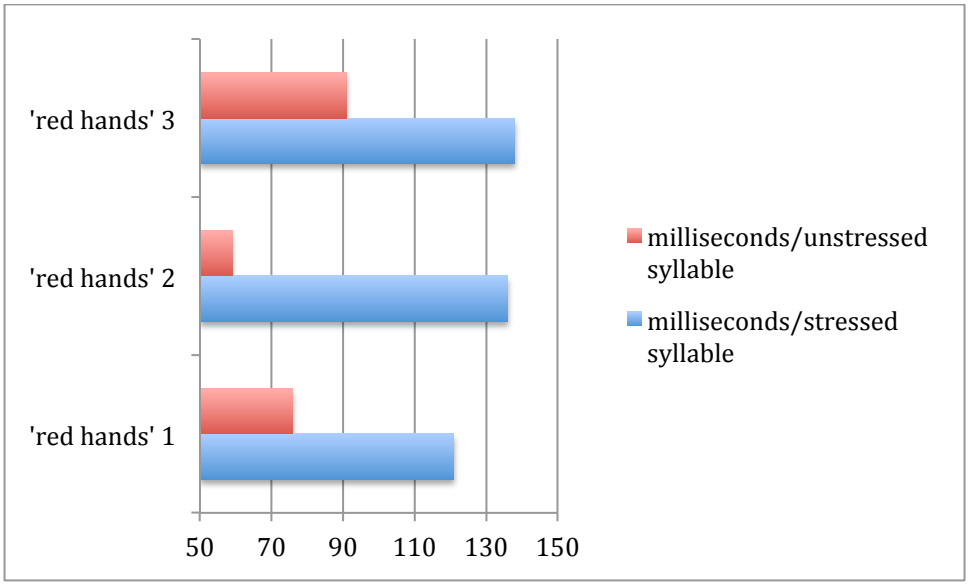
The first acoustic dimensions to be explored in this chapter are the correlates of stress (F0, intensity, and duration). We begin this study using a very small but idealized set of words in order to obtain a baseline understanding of acoustic correlates of stress. These contain only the vowel /a/, so that vowel quality can be controlled for and eliminated as a factor influencing measurements. Each word is at least three syllables long so that the final syllable can be excluded from measurements since final lengthening, common in most languages, can be avoided as a confound to duration measurements. The first two syllables were both heavy syllables (not containing glottal stop in the coda) and, given the stress pattern, the first syllable of each word was stressed while the second was not. Thus the comparison within each word is between the stressed (first) and unstressed (second) syllable.

Three different lexical items in the database met the above criteria and were thus included in the first round of measurements. The first lexical item, [ʔ̓á.ʔ̓aqʷ.c̓a.na] 'red

hands', included three tokens spoken by Female Speaker 2 (FS2). The second lexical item, [ná.Gaχs.ta] 'dipper', included four tokens spoken by a different speaker, Female Speaker 1 (FS1). There were also four instances of the third lexical item, [yá.yax.sa] 'fast runner', all spoken by FS1.

Here the results are presented in graphic form, separated by speaker in order to capture any intra-speaker differences in the phonetic realization of stress. Figure 3.2 presents the duration of the vowels (represented in milliseconds) of [ɬ̓á.ɬ̓aqʷ.c̓a.na] ‘red hands’ by FS2.

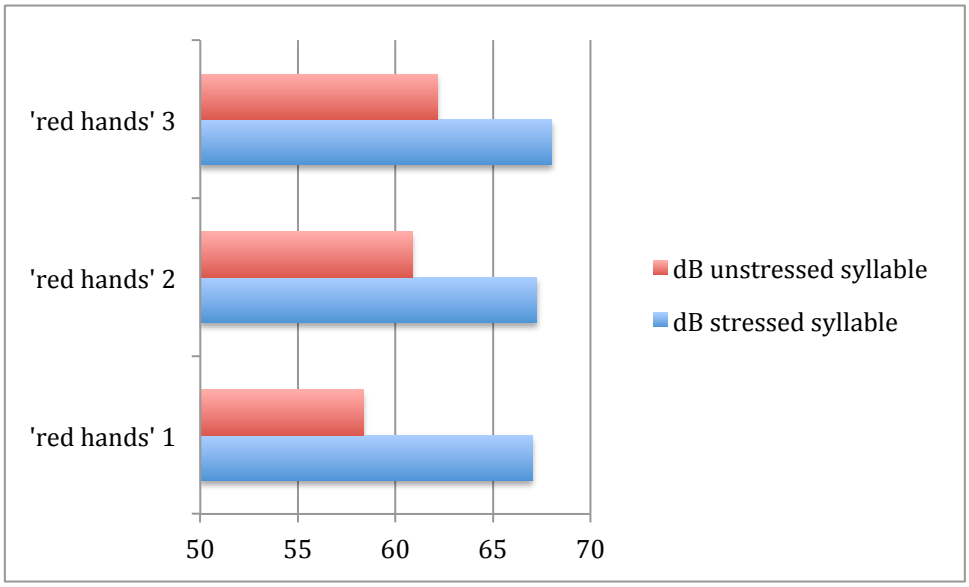
Figure 3.2. Duration differences between stressed and unstressed vowels in the word [ɬ̓á.ɬ̓aqʷ.c̓a.na] 'red hands' (speaker FS2)



Each of the tokens shows a clear difference of approximately 50 milliseconds or more between the stressed and unstressed syllables.

Figure 3.3 graphs the intensity measurements (represented in decibels) of the two syllables in all three repetitions of this word.

Figure 3.3. Comparison of intensity of stressed versus unstressed syllables in the word [ɤ̓á.ɤ̓aqʷ.c̓a.na] 'red hands' (speaker FS2)

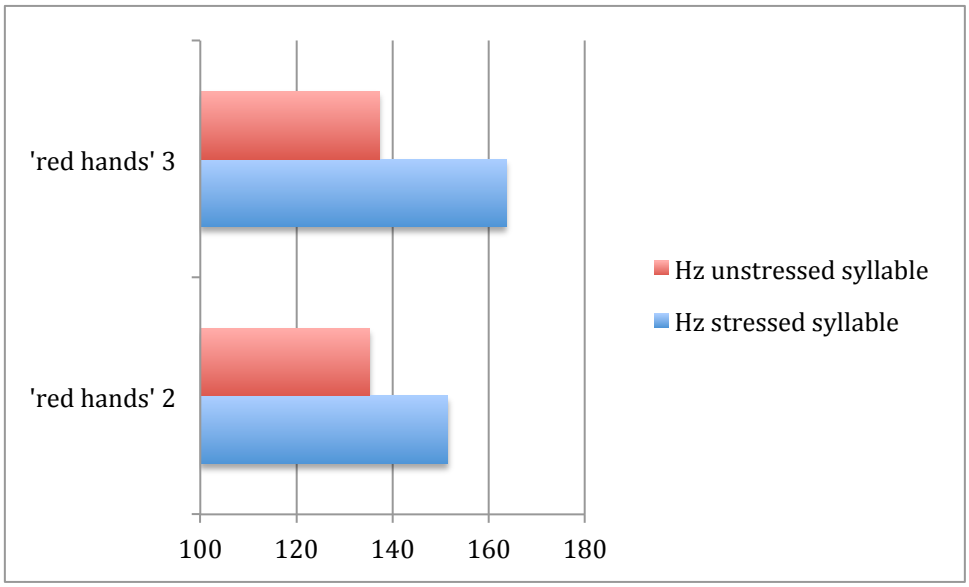


There is a clear difference (approximately 7 dB) in intensity between the stressed and unstressed vowels of each token.

Figure 3.4 presents the pitch (fundamental frequency, represented in hertz) of the vowels in the stressed and unstressed syllables.[19]

[19] In one repetition of this word, the speaker devoiced the vowel. Thus Praat does not deliver a reading for F0. That example has been excluded from this chart.

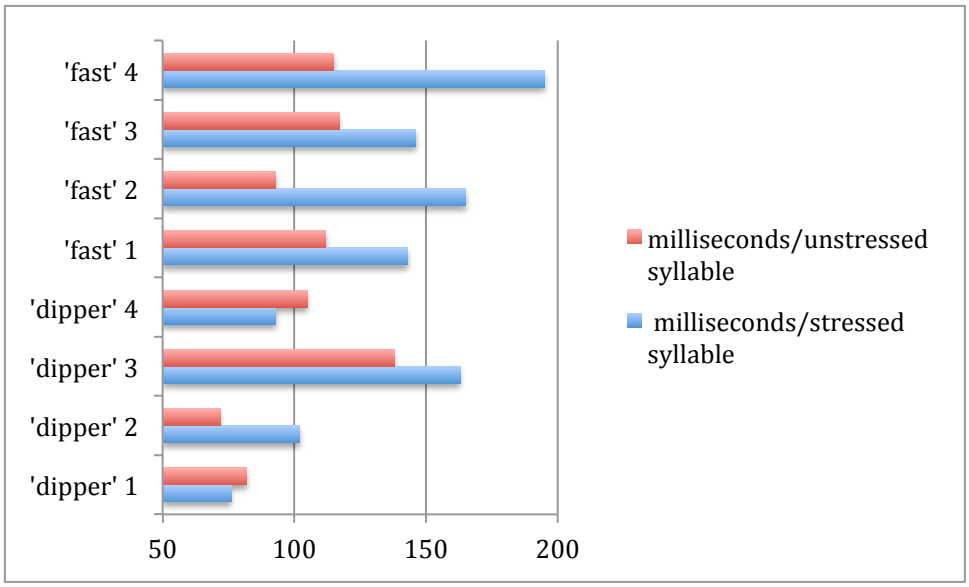
Figure 3.4. F0 comparisons between stressed and unstressed vowels for [ɤ̆á.ɤ̆aqʷ.c̓a.na] 'red hands' (speaker FS2)



These two tokens show a clear pitch difference of about 15 Hz for the second repetition and 25 Hz for the third repetition.

Turning to the measurements for Speaker FS1, the same comparisons are provided in Figures 3.5 through 3.7 for the forms [ná.Gaχs.ta] 'dipper' and [yá.yax.sa] 'fast runner'. Figure 3.5 examines the differences in duration of the vowels for the tokens spoken by FS1.

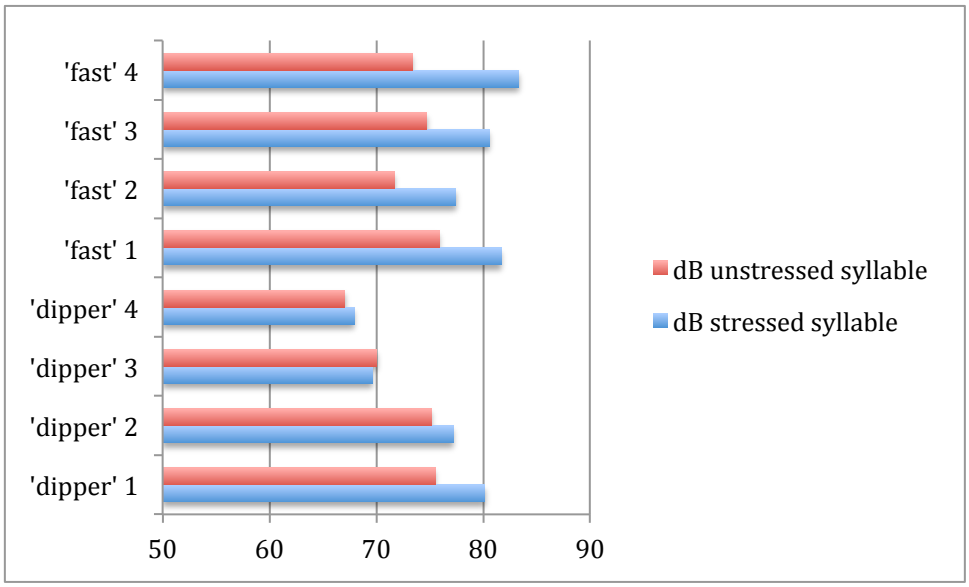
Figure 3.5. Duration of stressed versus unstressed syllables for the words [ná.Gaχs.ta] 'dipper' and [yá.yax.sa] 'fast runner' (Speaker FS1)



The differences in duration of the vowels between the stressed and unstressed syllables are less clear for this speaker than for FS2. In all of the tokens of 'fast runner' the stressed syllable is clearly longer. However, for the word 'dipper', tokens 2 and 3 have a slightly longer unstressed syllable.

In Figure 3.6, intensity of the vowels is compared.

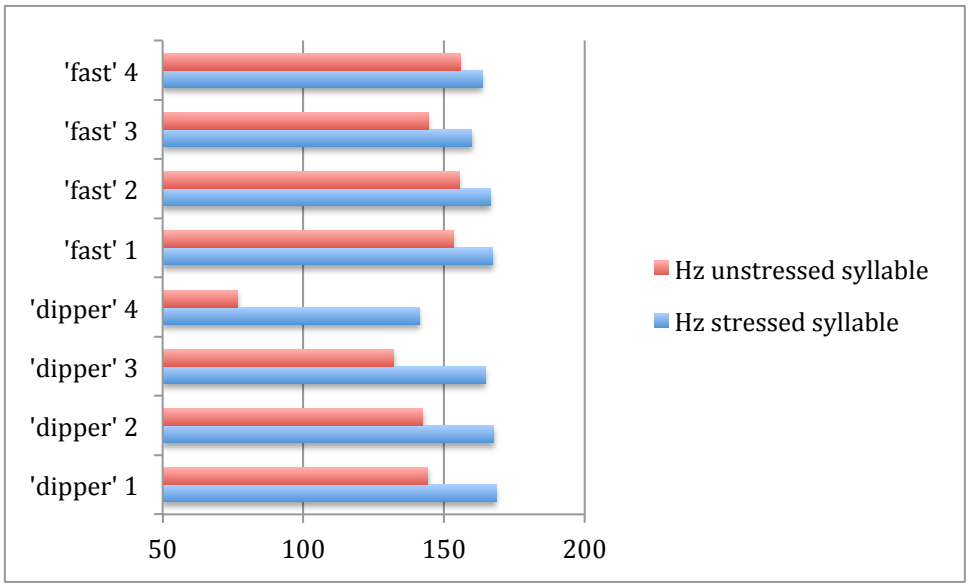
Figure 3.6. Intensity measurements for the stressed and unstressed syllables of [ná.Gaχs.ta] 'dipper' and [yá.yax.sa] 'fast runner' (Speaker FS1)



The stressed syllables are of higher intensity than the unstressed syllables, with one exception. For the token 'dipper' 3, the intensity levels are almost the same for the two syllables.

Figure 3.7 graphs the difference in fundamental frequency of the vowels.

Figure 3.7. Pitch comparison between stressed and unstressed syllables (Speaker FS1)



Pitch is consistently higher for the stressed syllable in each token. The greatest difference is about 75 Hz in 'dipper' token 4, and the smallest difference is approximately 8 Hz for 'fast' token 4.

Based on these measurements, increased pitch, intensity, and duration are all good indices of stress. While in some tokens, the difference of one of the measures examined here may be small or even reversed, in combination, the three measured parameters clearly accompany stress, reflecting increased articulatory effort.

In order to confirm this finding and increase the number of syllables measured, a second set of measurements was made on a broader set of lexical items. Each of the words contains a stressed and unstressed syllable with the same vowel quality, so that measurements of pitch, duration, and intensity are comparable. The stressed and unstressed

measurements were averaged across all of the tokens containing the same vowel quality in this set (including tokens by three different speakers).

55) Data set for stressed versus unstressed vowels of the same quality within the same word:

[ƛ́á.q̓aχs.tənd] ‘spank’ FS1 (2 repetitions)

[ƛ̓á.ƛ̓aqʷ.c̓ə.na] ‘red hands’ FS2 (3 repetitions)

[ƛ̓á.qʷa.tu] ‘red head’ FS1 (3 repetitions)

[ƛ́á.wi.ga.l̓aʔs] ‘stands behind’ FS2 (2 repetitions)

[dᶻá.qʷaχs.ta] ‘supper’ FS1 (1 repetition)

[q̓ʷí.ɬi.da] ‘able to be crushed’ FS3 (1 repetition)

[kí.ƛ̓i.nuχʷ] ‘gill net’ FS2 (2 repetitions)

[dí.gi.lan] ‘make tea’ FS1 (1 repetition)

[dí.gi.lac̓] ‘tea pot’ FS1 (2 repetitions)

[dú.duɬ.c̓ə.na] ‘numb hand’ FS2 (2 repetitions), FS3 (3 repetitions)

[yú.du.p̓ən.xʷaʔ.c̓ənχ] ‘Wednesday’ FS1 (1 repetition)

[c̓ə.ƙʷə́χsd] ‘short person’ FS3 (1 repetition), FS2 (3 repetitions)

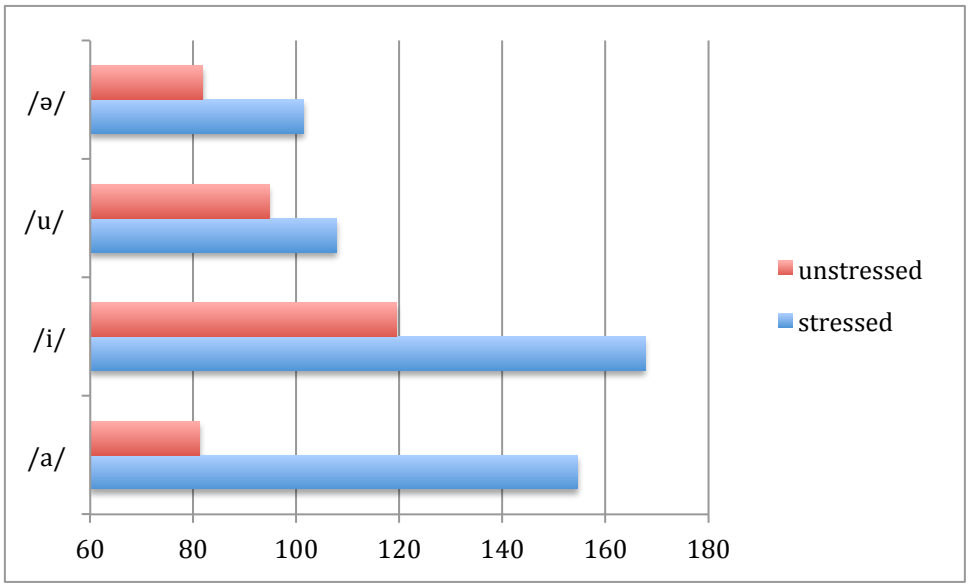
[qə.də́lkʷ] ‘stubborn person’ FS1 (3 repetitions)

[gə́n.gənɬ.bəs] ‘fond of children’ FS1 (2 repetitions)

[n̓ə́m.p̓ən.xʷaʔ.c̓ənχ] ‘Monday’ FS1 (1 repetition)

We begin by comparing the durations of the stressed and unstressed syllables in these words. Figure 3.8 shows the aggregate data on duration for each vowel quality.

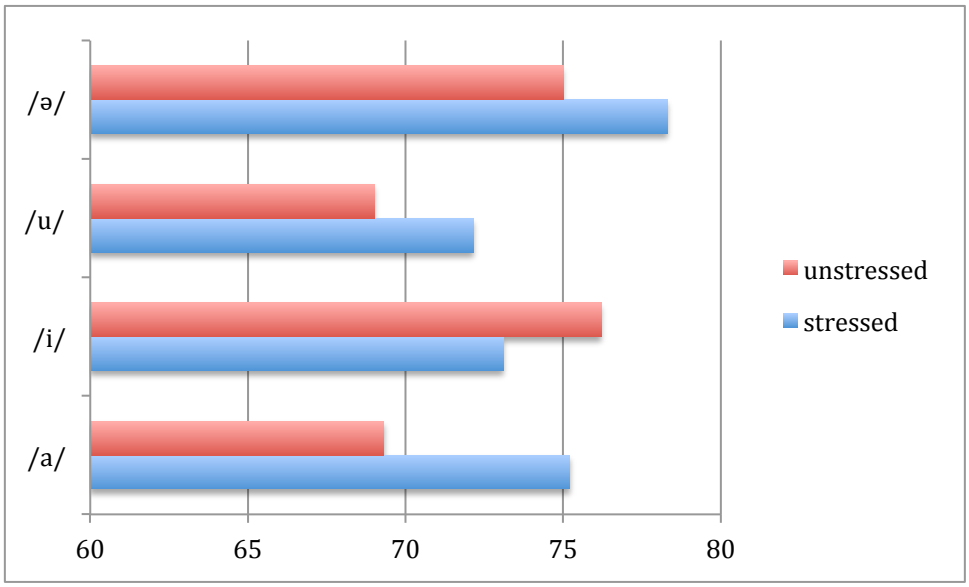
Figure 3.8. Duration (in ms) of stressed versus unstressed vowels within a word



The difference in duration between stressed and unstressed vowels in the same word is clear for all vowels qualities, though it is most prominent for /a/ and /i/.

Figure 3.9 demonstrates that measures of intensity all show a difference between stressed and unstressed vowels for each vowel quality, except that for the vowel /i/ the direction of the difference is reversed so that the unstressed /i/ is higher in intensity than the stressed /i/. Within-word comparisons of average intensity for each vowel are presented in Figure 3.9.

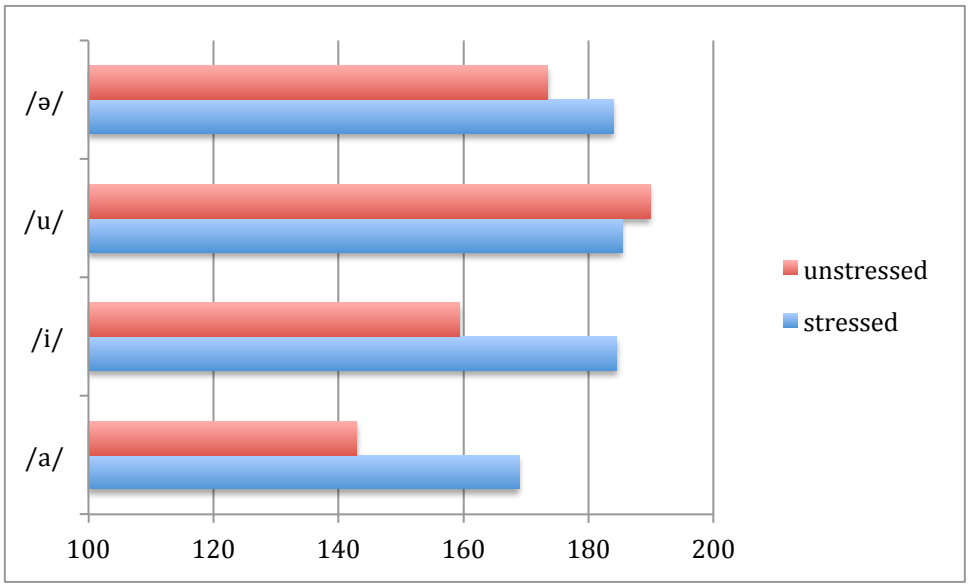
Figure 3.9. Intensity (in dB) of stressed versus unstressed vowels in the same word



While the reason for the reversal of the expected trend for the vowel /i/ is not apparent, a careful look at the measurements, token by token, show that this is true for all three speakers and each token in this set.

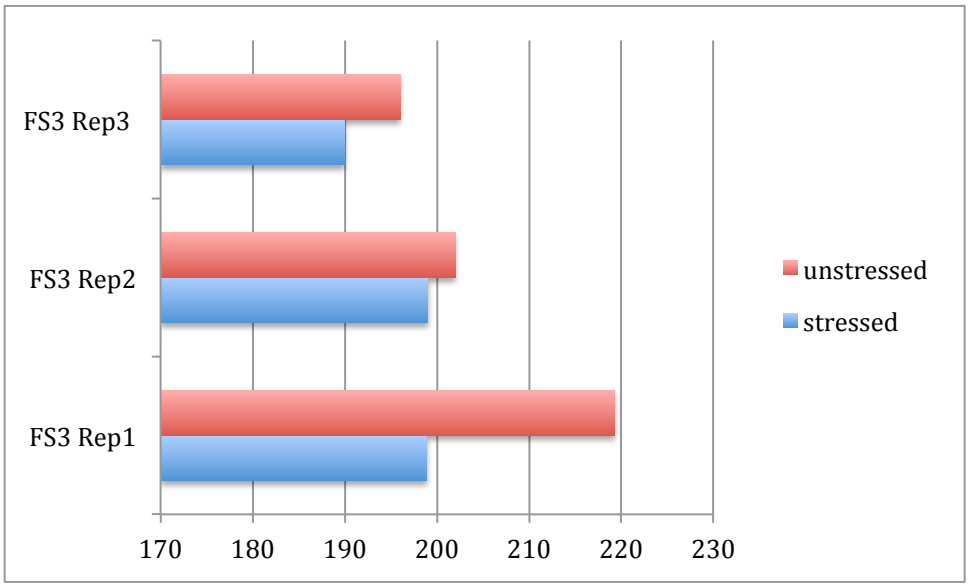
Turning, in Figure 3.10, to measurements of fundamental frequency for the same data set, differences in the average pitch between the stressed and unstressed syllables are clear for the vowels /a/ and /i/, and somewhat for /ə/, showing the expected increase in fundamental frequency for the stressed syllables. This appears to be slightly reversed for the vowel /u/ which shows a few Hertz higher f0 on average for unstressed /u/, a result which is likely not statistically significant.

Figure 3.10. Fundamental frequency (in Hz) of stressed versus unstressed vowels in the same word



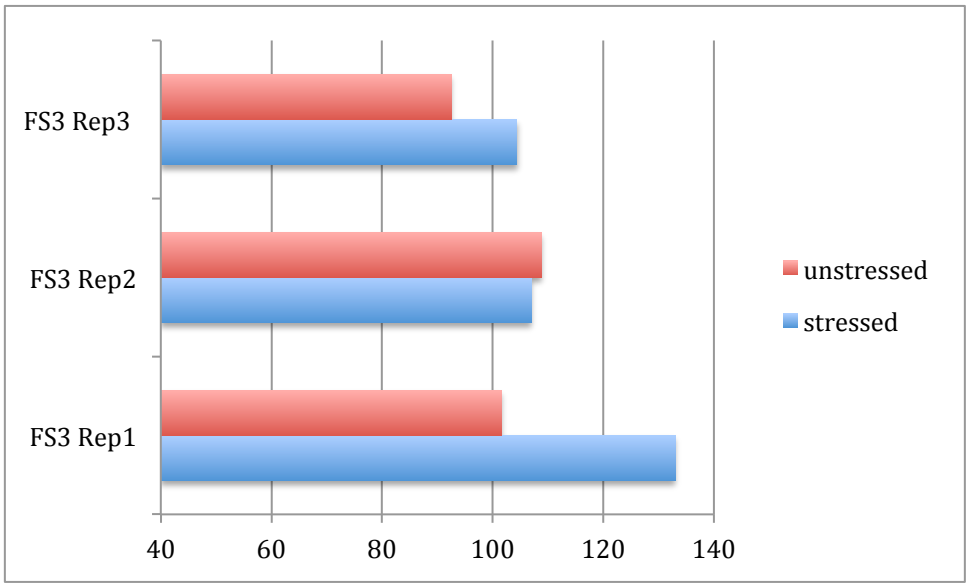
A token by token examination of the data for stressed and unstressed /u/ within a single word revealed that one of the three speakers (FS3) produced three out of six total tokens for the stressed versus unstressed /u/ comparison; she produced higher pitch on the unstressed syllables of all three of these tokens. The other two speakers produced the expected higher pitch on the stressed vowel of each word. The pitch of the /u/ tokens for speaker FS3 are presented in Figure 3.11.

Figure 3.11. Fundamental frequency (in Hz) for speaker FS3 tokens of within-word stressed and unstressed /u/



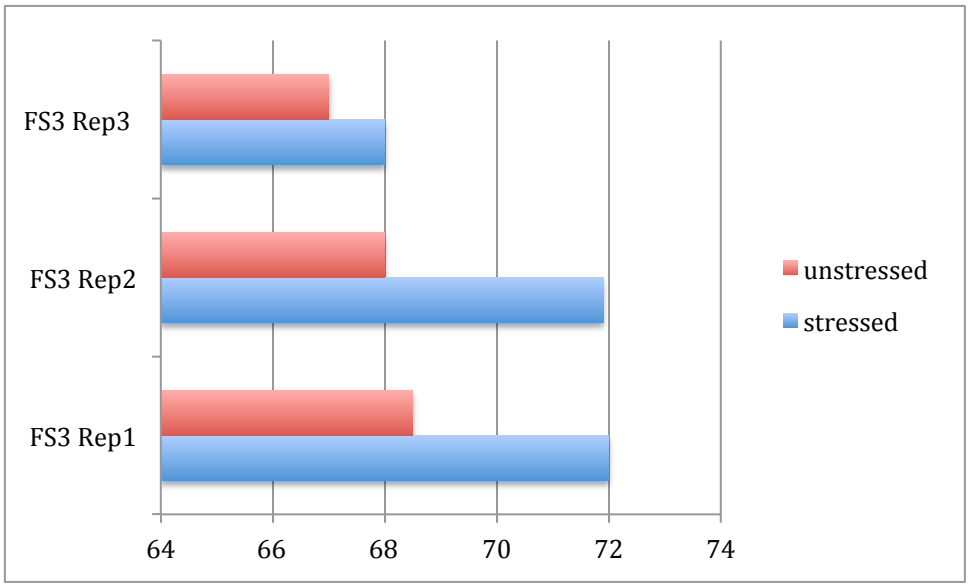
Based on a careful listening to the original recording of these tokens, I believe the conditions of the utterance, namely a correction of another speaker's mistaken or tongue-tied pronunciation, lead to this higher pitch on the unstressed syllable. However, it is interesting that while the pitch is unexpectedly higher on the unstressed syllable for these tokens, the same reversals of increased duration and intensity do not occur. Figures 3.12 and 3.13 present the duration and intensity comparisons for the same tokens.

Figure 3.12. Duration (in ms) for speaker FS3 tokens of within-word stressed and unstressed /u/



Note the very slight reversal of the expected pattern for the second repetition above.

Figure 3.13. Intensity (in dB) for speaker FS3 tokens of within-word stressed and unstressed /u/

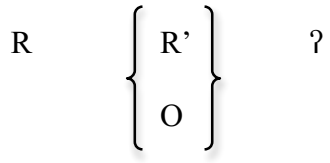


The fact that increased duration and intensity remain clear correlates of stress on these tokens for this speaker while fundamental frequency does not, may reflect either intra-speaker variation in cues to stress or more probably, in this specific case, the use of pitch for contrastive intonational purposes. The prominence associated with stress makes use of multiple phonetic cues, allowing speakers to manipulate them so that some cues can continue to indicate stress (duration and intensity, in this case) while others may be used for intonation (pitch). To date, I am unaware of further data that would confirm this theory. An interesting direction for further study would be to examine how intonation and stress interact in modulating pitch.

3.5 Sonority, schwa, and glottalization

It is clear that the stress system of Guča revolves around issues of sonority, with both the schwa and glottalization playing significant roles in reducing the sonority of rimes, and hence the weight, of syllables. The consonants of the language can be ordered along a hierarchy reflecting their likelihood of rendering a syllable heavy or light. This hierarchy is represented in Figure 3.14:

Figure 3.14. Guča Coda Consonant Hierarchy for Stress



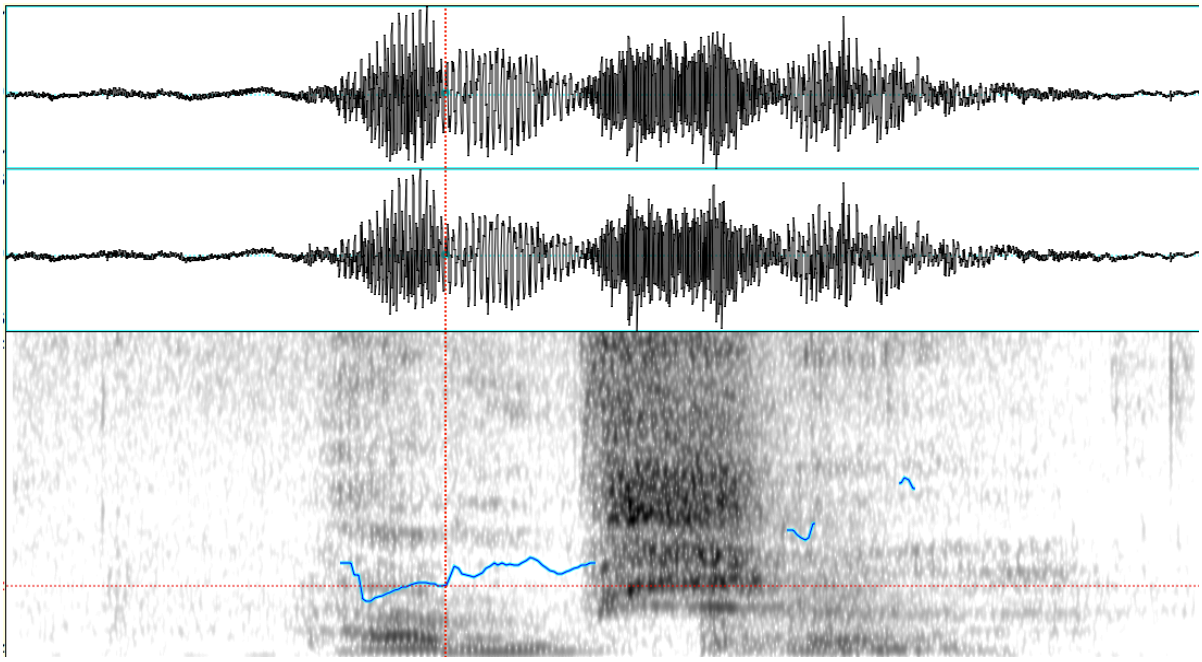
The above hierarchy represents the ways that different types of coda consonants affect the sonority and weight of the syllable nucleus. Syllables with full vowel nuclei in open syllables or followed by a consonant are normally heavy. However, the glottal stop in the coda renders them light instead. Syllables with schwa nuclei are light unless followed by plain resonants: a glottalized resonant will not render a schwa nucleus heavy. The consonant types in the middle interact with full vowels and schwas differently, rendering the syllables heavy in the case of full vowels, but light in the case of schwas. (See Section 3.4 for illustration.)

Since glottalization plays a key role in the stress system of Guča, it is helpful to consider the impact of glottalized consonants on the vowels that precede them. Glottalized resonants are normally pre-glottalized in Guča. This means that the vowel directly

preceding a glottalized resonant will be partially glottalized as a result. This is true regardless of whether the glottalized resonant is in the coda of the syllable with the preceding vowel or in the onset position of the following syllable. Figures 3.15 and 3.16 are spectrograms of the vowel [a] followed by a plain resonant and a glottalized resonant respectively.

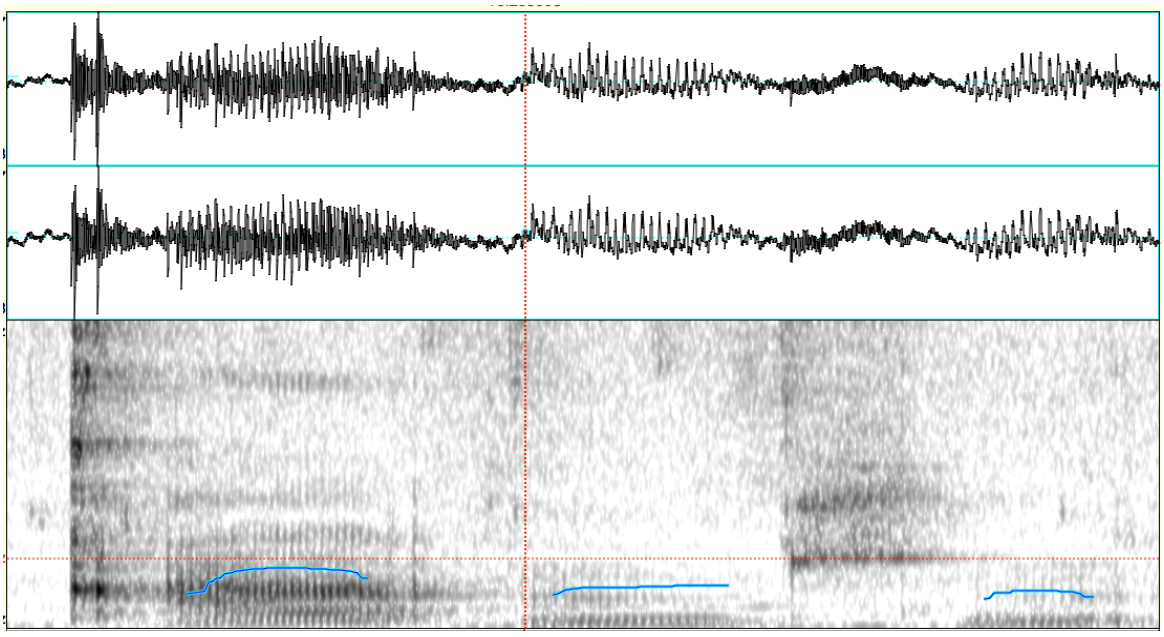
Notice that in the first spectrogram in Figure 3.15, the pitch pulses on both the [a] and [m] are at regular intervals and close together. In the second spectrogram (Figure 3.16), the pitch pulses are still fairly regular, but they are spread farther apart. There is an actual glottal stop visible between the [a] and the [m̰] in Figure 3.16. Each of the spectrograms is at approximately the same time scale, showing about 1.00 seconds of the speech signal. In each picture the vertical red line shows the transition from the vowel [a] to the following [m] or [m̰]. Although the time scale is similar, the rate of speech for the token in the second spectrogram, [am̰], is much slower.

Figure 3.15. Spectrogram illustrating plain resonant coda in the word /həm.sa/ [hám.sa] ‘pick berries’



[h á m s a]

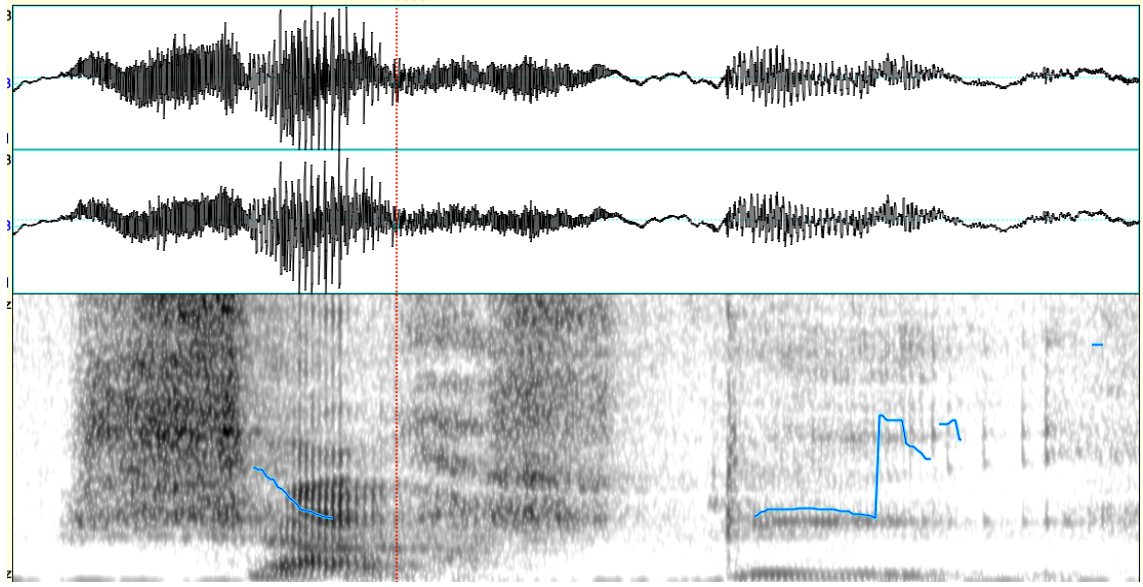
Figure 3.16. Spectrogram illustrating the glottalized resonant coda in the word /q̓aṁ̓λənc/ [q̓ám̓.λənc] 'can be found'



[q̓ a ʔ ṁ̓ λ ən]

Vowels are even more significantly glottalized when they are followed by a glottal stop. Consider the [aʔχ] sequence in Figure 3.17 which shows obvious glottal striation on the [a] and steeply falling pitch, which Praat is unable to resolve on the second half of the vowel, before a full glottal stop is reached. The red vertical line is positioned between the [ʔ] and the [χ].

Figure 3.17. Spectrogram illustrating glottal stop in coda position in the word /saʔχsdiʔ/ [saʔχsdíʔ] 'skirt'



One question that arises is how the differences in the patterns of glottalization of the vowel relate to the overall sonority of the syllable rime. The glottalization on the resonant sufficiently reduces the sonority of the rime so that the glottalized resonants pattern like obstruents rather than plain resonants. This is true regardless of whether the vowel is a schwa (in which case the syllable patterns as light, just as with other obstruents) or a full vowel (in which case, the syllable patterns as heavy, just as with other obstruents). By contrast, the glottal stop, with its fuller impact on the vowel, sufficiently reduces rime sonority to render even a syllable with a full vowel light. In order to better understand these patterns, a study of the acoustic properties of these syllables is necessary.

3.6 Acoustic correlates of syllable weight

In this section, each of the elements that impact syllable weight, as determined by the stress system, are examined with regards to their acoustic correlates. Different kinds of heavy and light syllables are measured and compared on the parameters of pitch, duration, and intensity.

The syllable rime types which were measured for comparison are presented in Table 3.1. Each of these syllable rime types was measured for the duration, pitch, and intensity of the vowel, and in cases of resonant codas, the vowel plus resonant were measured.

Table 3.1. Syllable rime types measured and compared

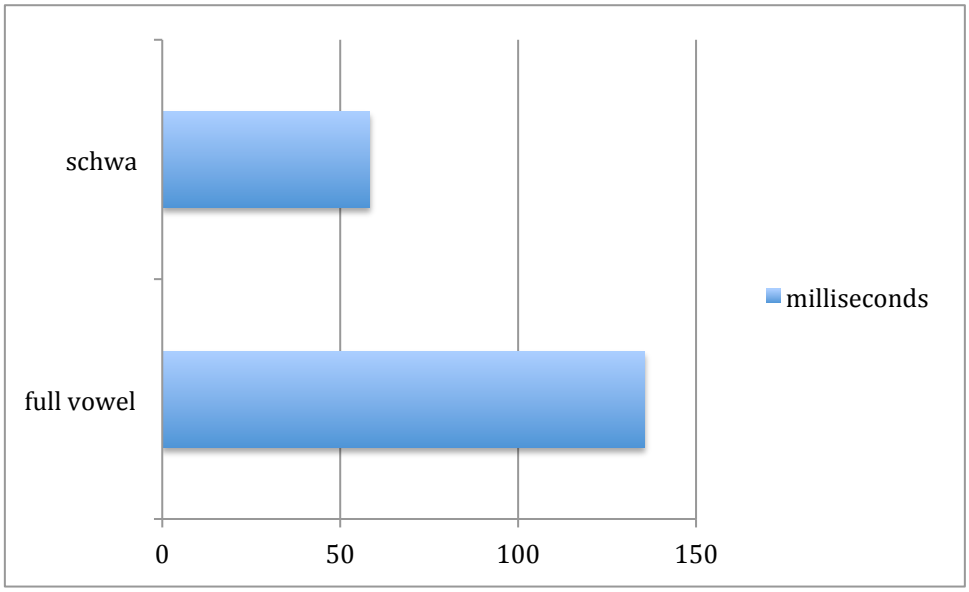
Comparisons
ə versus full V within same word
ə versus full V's (a, i, u)
əO versus VO
əR versus VR
əR' versus əR
aR' versus aR
aʔO versus aO
Vʔ versus V

Two potential types of syllables, unstressed /əʔ/ and /VR'/, were not included in the comparison because they were very rare or unattested in the data. /VR'/ only occurred in stressed syllables, while all other types were measured and compared in unstressed environments in order to avoid stress as a confound. While stressed /VR'/ cannot be directly compared to the other syllable types, the acoustic difference between syllables closed with a plain resonant versus a glottalized resonant can be compared in stressed syllables.

3.6.1 Schwa versus Full Vowels in Open Syllables

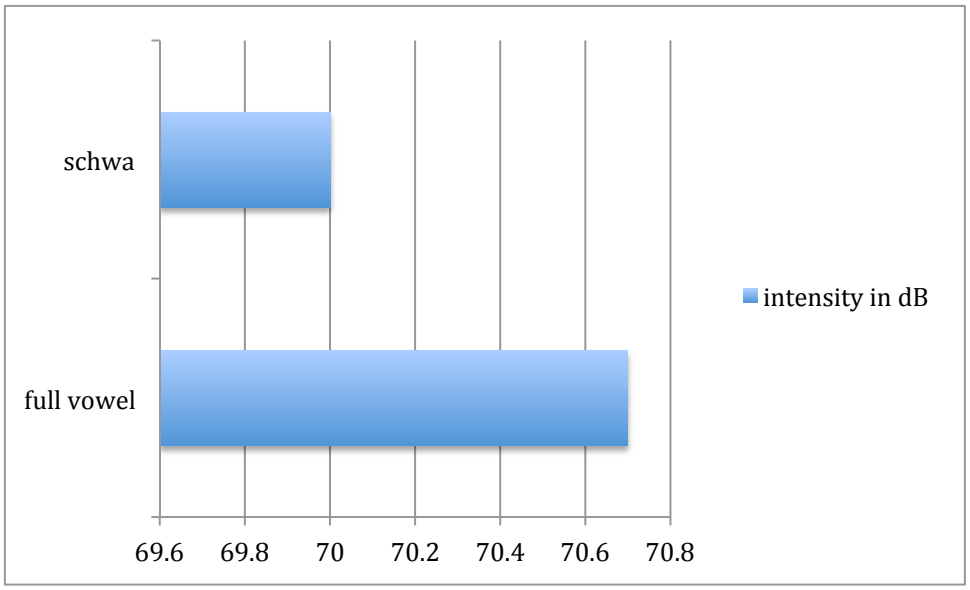
The first measurements are of a full vowel and schwa that occur in the same word and in unstressed non-final position; this was in order to control for confounds such as stress and final lengthening. The word chosen was [ʠá.ʠo.c̓ə.yu] 'crab trap', where the [o] of the second syllable and the [ə] of the third syllable can be compared. The results for the measures of duration, pitch, and intensity are presented in the graphs below, averaged across all four tokens by two speakers (FS1 and FS3).

Figure 3.18. Duration (in ms) of a full vowel versus schwa within the same word, [ʠá.ʠo.c̓ə.yu] 'crab trap'



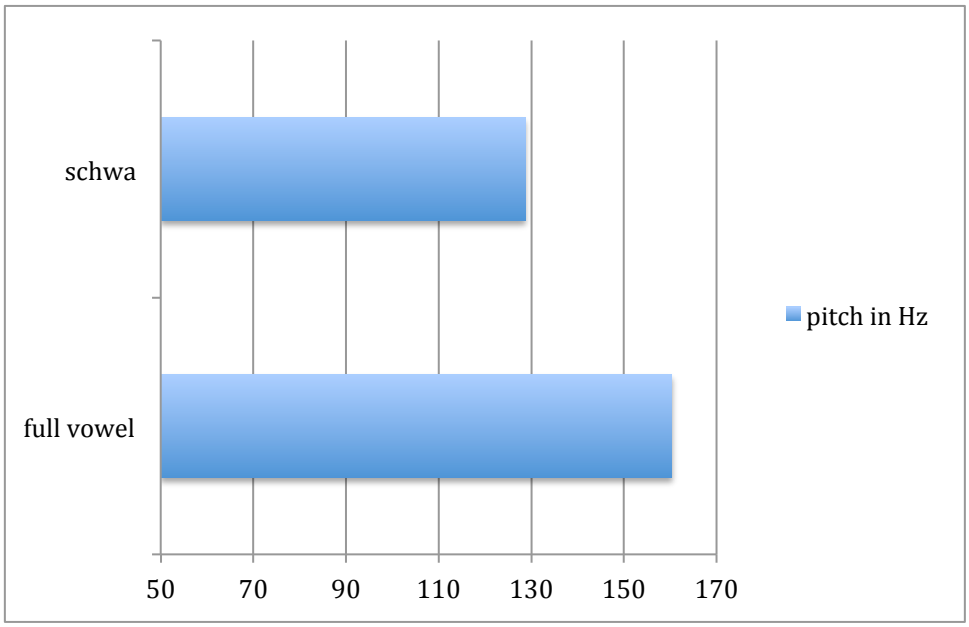
The duration difference between schwa and the full vowel is dramatic, with schwa about half the length of the vowel [o] in the same word. Intensity measurements for these same tokens are presented in Figure 3.19.

Figure 3.19. Intensity (in dB) of a full vowel versus schwa within the same word



The intensity values are consistently higher for full vowels though the averaged differences are only about .7 dB for the within-word comparison of schwa and [o]. The graph in Figure 3.20 presents pitch measurements for the same vowels.

Figure 3.20. Fundamental frequency (in Hz) of a full vowel versus schwa within the same word



The difference in f0 between schwa and full vowels in the same words is about 15Hz.

The next section investigates differences between schwa and full vowels across different words, but in similar phonological environments. Since [ʠá.ʠo.ʗə.yu] 'crab trap' was the only example with a schwa and a full vowel, both in open, unstressed, non-final syllables in a single word, the data set can be enlarged by cross-word comparison. There is one methodological problem with this, however, which is that during the recording sessions, the three speakers were seated at different distances from the microphones, and speakers also moved around the room during the recording sessions.

The targeted syllables for this study are full vowels in unstressed open syllables and schwas in unstressed open syllables. The examples measured are given in (56) below; targeted vowels are in bold and underlined:

56) Data set for full vowels in open syllables versus schwa in open syllables (unstressed, non-final)

[c̓ə́lχʷs.**ta.gi**.la]	‘make hot water’ FS1 (2 repetitions)
[x̌á.**qʷa**.tu]	‘red head’ FS1 (3 repetitions)
[lá.**kʸa**.gas]	‘toilet’ FS2 (1 repetition)
[ẃá.**ẃə.qʷa**.bəs]	‘fond of barking’ FS1 (2 repetitions)
[cé.**la**.yu]	‘bailer’ FS1 (2 repetitions)
[c̓ú.**ɬa**.tu]	‘black haired’ FS1 (3 repetitions)
[dí.**gi**.lac̓]	‘tea pot’ FS1 (2 repetitions)
[c̓ú.**χʷe**.dac̓]	‘bath tub’ FS1 (2 repetitions)
[kí.**x̌i**.nuχʷ]	‘gill net’ FS2 (2 repetitions)
[q̓ʷí.**ɬi**.da]	‘able to be crushed’ FS3 (1 repetition)
[hú.**y̓e**.ma]	‘countable’ FS1 (2 repetitions), FS3 (2 repetitions)
[n̓á.**χʷe**.da]	‘daylight’ FS1 (3 repetitions)
[q̓á.**q̓o.c̓ə**.yu]	‘crab trap’ FS1 (2 repetitions), FS3 (2 repetitions)
[n̓á.**lu**.ɬa]	‘southward, upstream’ FS1 (1 repetition)
[**c̓ə**.ẃənχ]	‘winter’ FS1 (3 repetitions), FS2 (1 repetition)
[**qə**.dəlkʷ]	‘stubborn person’ FS1 (3 repetitions)
[sú.**bə**.yu]	‘axe’ FS1 (3 repetitions)
[**mə**.ná.c̓i]	‘drum’ FS1 (1 repetition)
[**bə**.wíkʷ]	‘pregnant’ FS1 (4 repetitions)
[**nə**.qí.laχs.ta]	‘lunch’ FS1 (1 repetition)
[**sə**.ƙá.p̓ən.χʷaʔ.c̓ənχ]	‘Friday’ FS1 (1 repetition)

[də.daʔɬ.bə́s] ‘fond of laughing’ FS1 (3 repetitions)

The mean values for duration across the targeted syllables are presented in Figure 3.21 (which compares schwa with full vowels). Figure 3.22 compares the fundamental frequency of schwas versus full vowels. The figures present mean values across all examples.

Figure 3.21. Mean duration of schwas versus full vowels in open, unstressed, non-final syllables

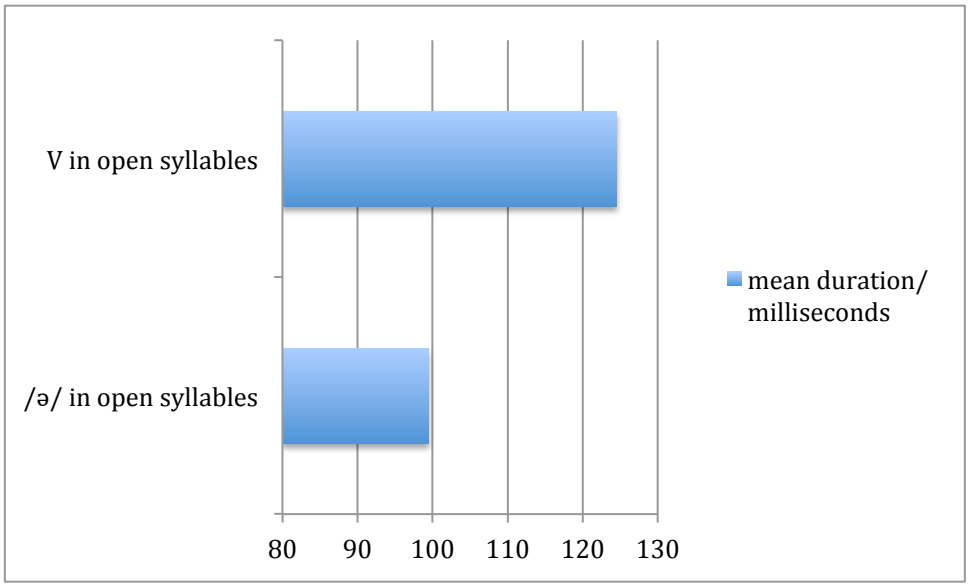
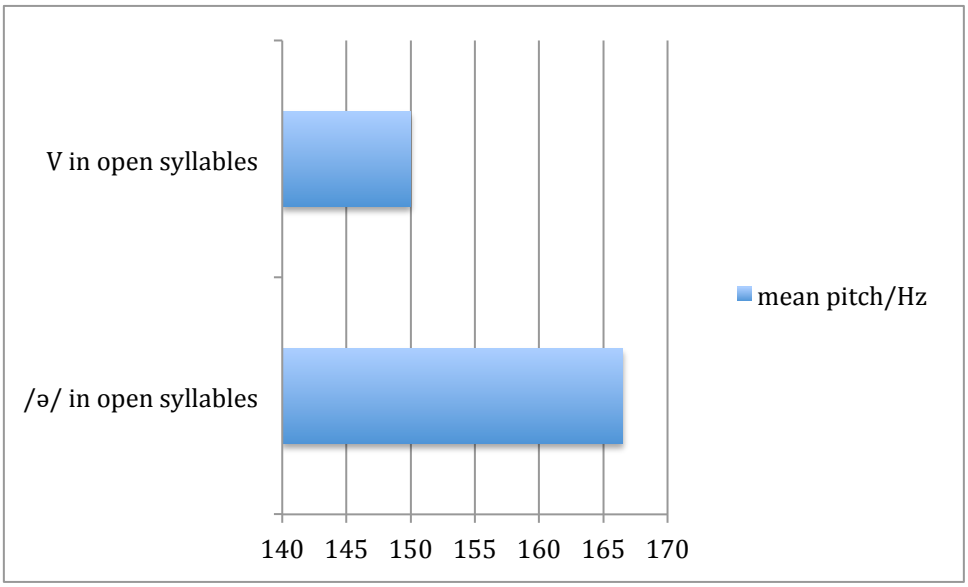


Figure 3.22. Fundamental frequency (in Hz) of schwas versus full vowels in open, unstressed, non-final syllables



Each of the above comparisons of schwa versus the full vowels shows the same pattern: the full vowels, which are treated as heavy by the stress system, are longer in duration than schwa. However, schwa is consistently higher in pitch than full vowels in similar phonological environments. This suggests that increased duration is the primary acoustic factor impacting syllable weight, as opposed to pitch.

3.6.2 Schwa versus Full Vowels in Syllables Closed by Obstruents

Next, schwa is compared to each of the full vowels in syllables closed by obstruents, typically voiceless fricatives and stops. The examples selected for this study are given in (57):

57) Data set for full vowels versus schwa in obstruent-closed syllables with various onsets/codas (unstressed, non-final)

[kʼə́l.kʼaχs.di] ‘diaper’ FS1 (3 repetitions)

[ná.Gaχs.ta] ‘dipper’ FS1 (3 repetitions)

[yá.yax.sa] ‘fast runner’ FS1 (4 repetitions)

[nə.qí.laχs.ta] ‘lunch’ FS1 (1 repetition)

[χʼá.χʼaχ.ʗə.na] ‘red hands’ FS2 (3 repetitions)

[híɬ.kuɬ.ʗə.na] ‘right hand’ FS1 (1 repetition)

[dú.duɬ.ʗə.na] ‘numb hand’ FS2 (2 repetitions), FS3 (3 repetitions)

[tá.gəɬ.ta] ‘able to be waded across’ FS2 (3 repetitions)

[ɬá.ɬəq.ʗə.na] ‘itchy hands’ FS1 (3 repetitions)

[yəχ ʷ.bə́s] ‘fond of dancing’ FS1 (3 repetitions)

[ha.qaɬ.míʔ] ‘internal swelling’ FS3 (3 repetitions)

Results comparing schwas to full vowels in obstuent-closed unstressed syllables are presented in Figure 3.24 (duration), and Figure 3.25 (pitch).

Figure 3.24. Duration (in ms) of schwas versus full vowels in closed, unstressed, non-final syllables

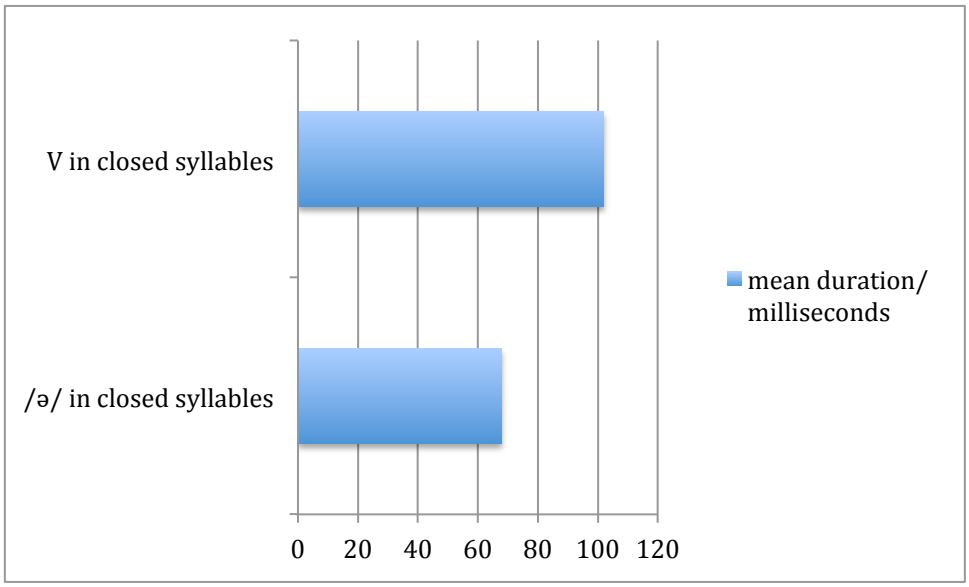
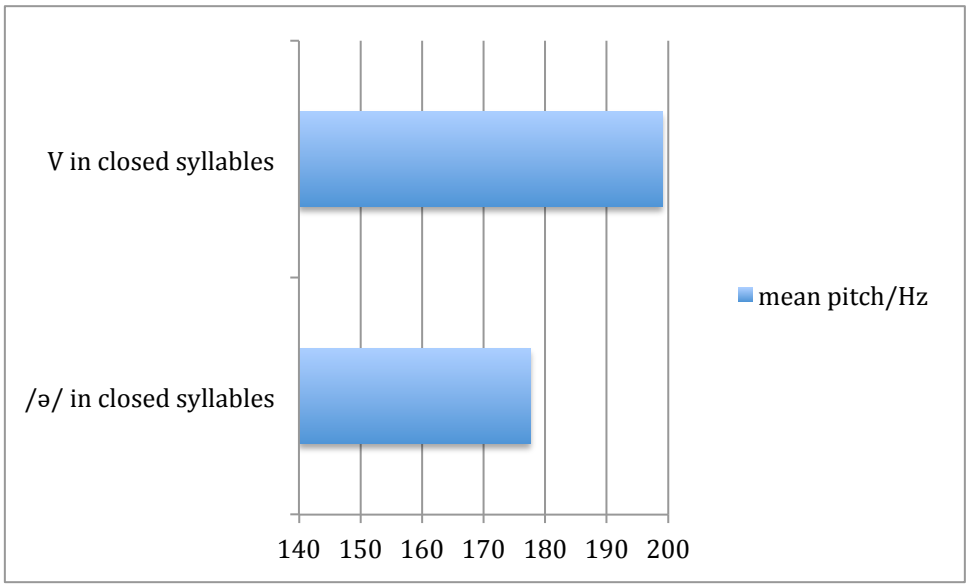


Figure 3.25. Fundamental frequency (in Hz) of schwas versus full vowels in closed, unstressed, non-final syllables



The results for full vowels compared to schwa show that increased duration is again a clear indicator of heavy syllables. The pitch measurements are about the same in the /a/ versus /ə/ comparison, but for the /u/ versus /ə/ comparison, the fundamental frequency is higher for /u/. This is different from the previous result with open syllables in which schwa was higher in pitch than each of the full vowels, even /u/. This variation in the relative pitch across syllable types is further indication that pitch is independent of the syllable weight parameters.

3.6.3 Schwas in Syllables Closed with Obstruents versus Non-Glottalized Resonants

The proceeding observation suggests that another productive comparison can be made between words with schwas closed with obstruents as opposed to those with non-glottalized resonants. This addresses the question of how a resonant coda impacts the overall sonority of the syllable. Words chosen for comparison in this section are given in the data set in (58):

58) Data set for unstressed schwas in non-final syllables with obstruent codas versus plain resonant codas

[ɬá.**ɬəq**.c̓ə.na]	'itchy hands ' FS1 (1 repetition)
[**yəχ** ^{w}.bə́s]	'fond of dancing' FS1 (3 repetitions)
[gə́n.**gənɬ**.bəs]	'fond of children' FS1 (2 repetitions)
[sə.ƙá.**p̓ən**.χ^{w}aʔ.c̓ənχ]	'Friday' FS1 (1 repetition)
[n̓ə́m.**p̓ən**.χ^{w}aʔ.c̓ənχ]	'Monday' FS1 (1 repetition)

The duration and fundamental frequency measurements are presented in Figures 3.28 and 3.29. Note that these compare the properties only of the schwa; the coda consonants are excluded.

Figure 3.28. Duration (in ms) of unstressed schwa with resonant versus obstruent coda consonant

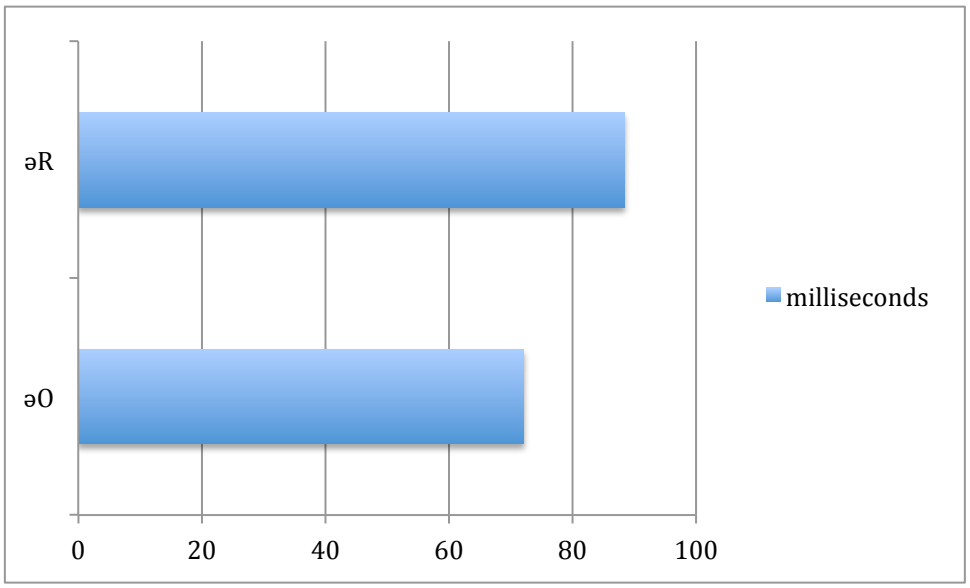
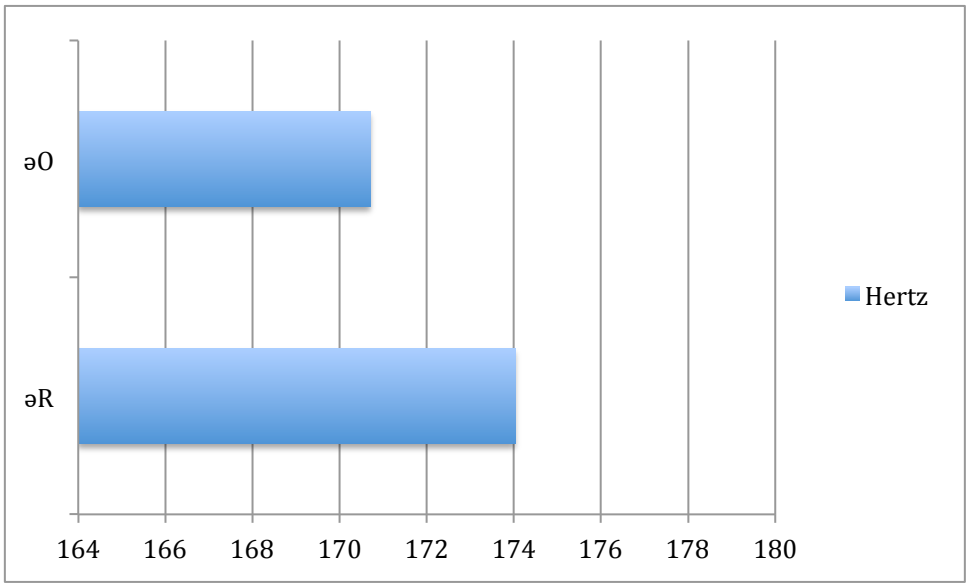


Figure 3.29. Fundamental frequency (in Hz) of schwa with resonant versus obstruent coda consonant



Both duration and pitch of schwa are greater in resonant-closed, as opposed to obstruent-closed, syllables. It appears that for syllables with schwa, both dimensions are contributing to the overall prominence of the syllable and hence to the syllable weight. This is in line with the results of Gordon et al. (2012), which found that no single acoustic measure distinguished schwa from the more peripheral vowels.

3.6.4 Rimes with Plain versus Glottalized Resonants

The beginning of Section 3.5 presented spectrograms that illustrated the partial glottalization of vowels followed by a glottalized resonant.

This section addresses the effects of glottalized coda consonants. The data in (13) are measured on the same parameters of duration and pitch as the other syllable types discussed so far. Note that though all compared syllables are unstressed, the əR' syllables

are all initial and pre-tonic because they reject stress, while the əR syllables are all medial and post-tonic. It would be ideal to compare these both in post-tonic syllables. The following two figures provide comparisons of syllables with glottalized resonant codas as opposed to plain resonant codas.

59) Data set for glottal versus non-glottal coda resonants (controlling for vowel quality and stress)

[**hə̰m̰**.xíd]	‘eat’ FS1 (1 repetition)
[**qə̰m̰**.χól.c̰ə.na]	‘left hand’ FS1 (3 repetitions)
[gə́n.**gə̰nɬ̰**.bəs]	‘fond of children’ FS1 (2 repetitions)
[sə.ƙá.**p̰ə̰n**.χʷaʔ.c̰ənχ]	‘Friday’ FS1 (1 repetition)
[ɲə́m.**p̰ə̰n**.χʷaʔ.c̰ənχ]	‘Monday’ FS1 (1 repetition)

Figure 3.30. Duration (in ms) of /əR/ and /əR'/ syllables, showing values for the vowel only and for the vowel plus resonant

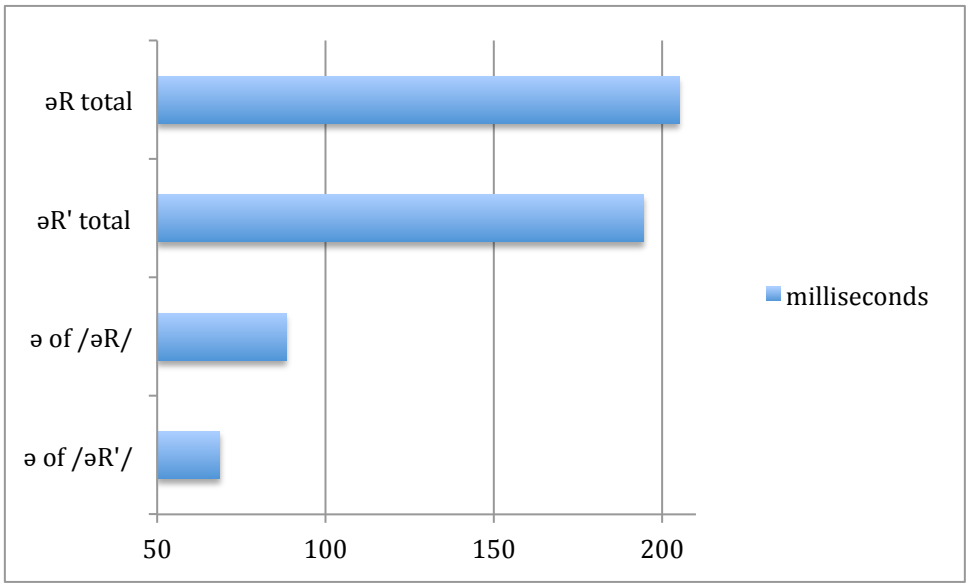
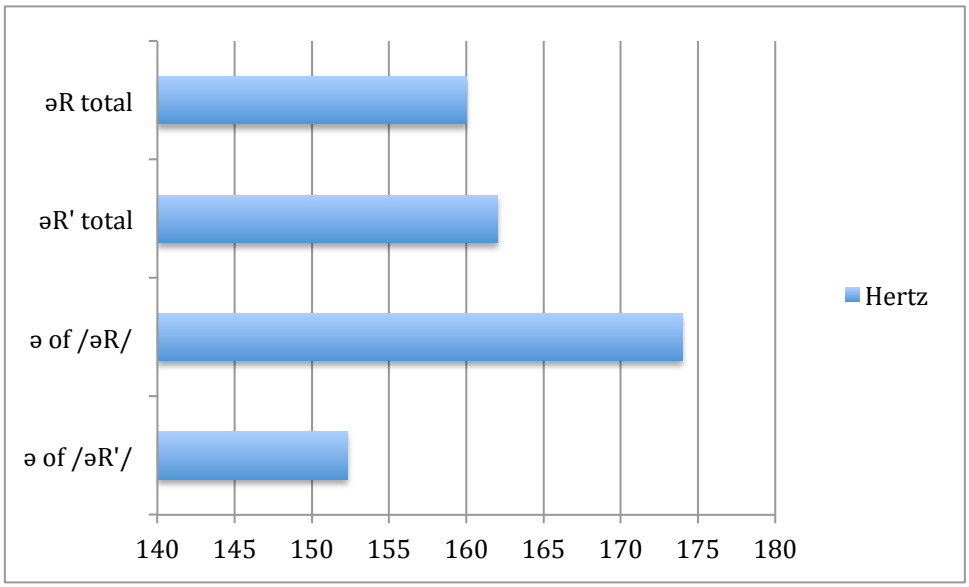


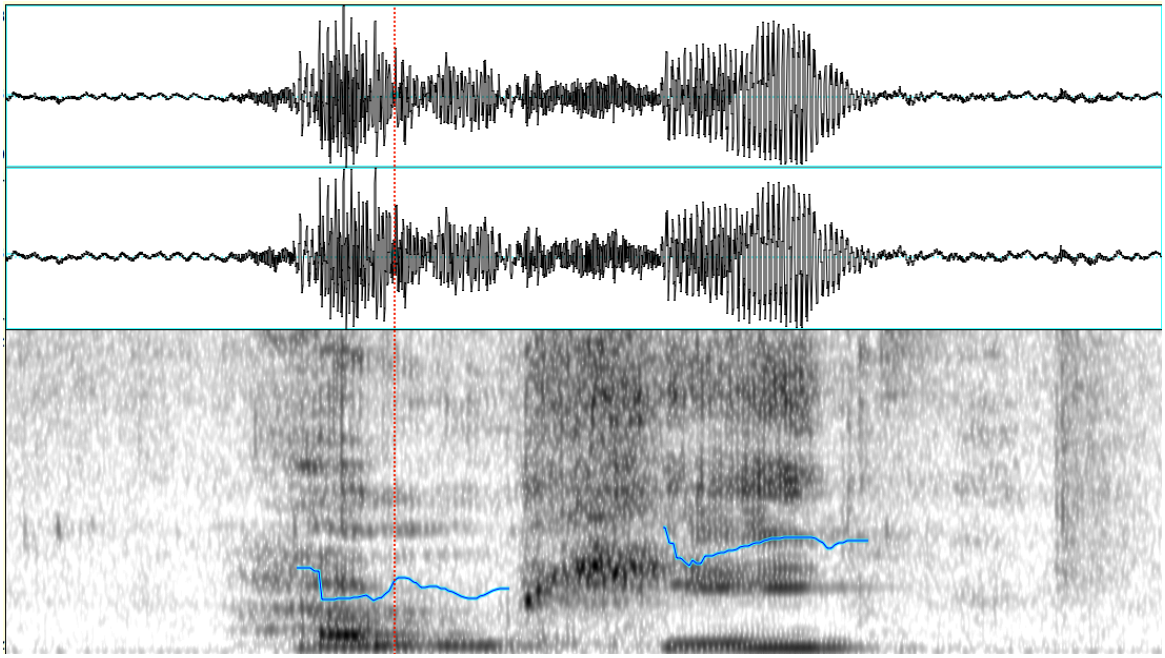
Figure 3.30 shows that the vowel-only measurements are less than half the length of the vowel plus resonant or glottalized resonant durations. The vowel portion of the schwa with plain resonant coda is longer in duration than the vowel with the glottalized resonant coda. Though not as dramatically, sequences of /əR/ are also longer than sequences of /əR'/.

Figure 3.31. Fundamental frequency (in Hz) of /əR/ versus /əR'/ syllables



The graph in Figure 3.31 is interesting because it shows that the difference in pitch on the vowels is quite different depending on the glottalization of the resonant. The schwa of the plain resonant syllables is more than 20 Hz higher on average that the schwa of the glottalized resonant syllables. Pre-glottalization of the coda resonant appears to lower the pitch of the schwa vowel. One issue confounding these readings, however, is that for some tokens, Praat does not measure pitch on the glottalized portion of the vowel. In such cases readings were only obtainable for the beginning, modal portion, which begins higher in pitch prior to a fall caused by the incipient glottalization. With the /əR/ case, this lowering does not occur, hence the differential pitch measurements. In a few examples, Praat was able to produce a pitch trace across the whole rime of a /əR'/ syllable. In the following figure, we see a marked lowering of the pitch across the glottalized vowel, then a slight rise and "bumpy" pitch trace across the resonant.

Figure 3.32. /həm̓.xid/ [ham̓.xíd] 'eat' spectrogram showing pre-glottalization of the resonant and fundamental frequency lowering over the glottalized vowel



[h a m̓ x i d]

When the whole rime is considered, /əR/ has a slightly (2 Hz) lower fundamental frequency than /əR'/.

Based on Figures 3.30 and 3.31, we see that when followed by a glottalized resonant, the schwa vowel is shorter and lower pitched than when followed by a plain resonant. This difference is much less dramatic when the resonant portions of the rimes are included in measurements. Thus, the primary way in which the glottalization of the coda consonant affects the prominence of the syllable is via its effect on the vowel.

Turning to the effects of glottal stop in syllable codas, Vʔ and VO rimes are examined based on the data set in (60).

60) Data set for glottal stop vs. other obstruent coda consonants: unstressed syllables with /a/

[də.da**ʔɬ**.bə́s] ‘fond of laughing’ FS1 (3 repetitions)

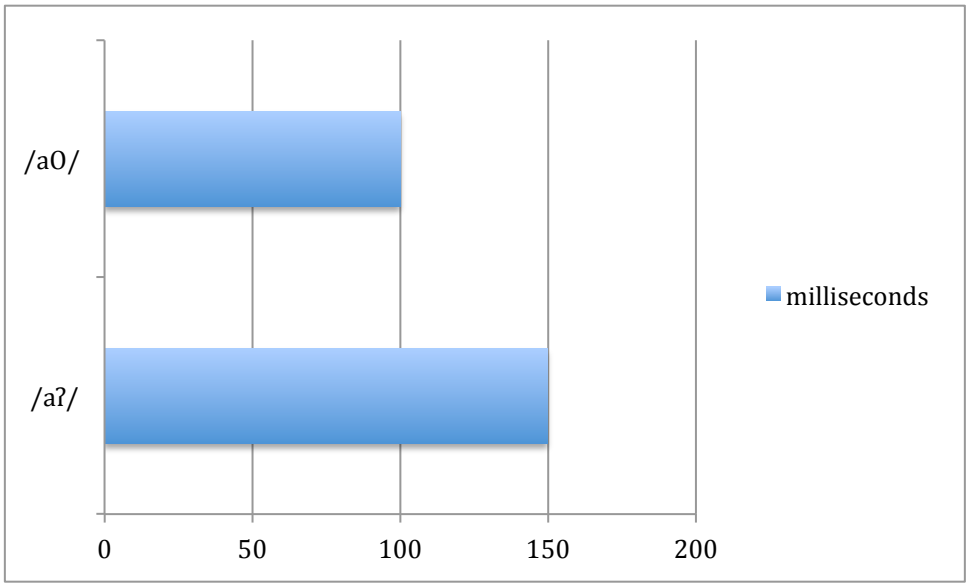
[sa**ʔχs**.díʔ] ‘skirt’ FS1 (2 repetitions)

[nə.qé.la**χs**.ta] ‘lunch’ FS1 (1 repetition)

[ná.Ga**χs**.ta] ‘dipper’ FS1 (3 repetitions)

Figures 3.33 and 3.34 present measurements of duration and pitch for the vowel /a/.

Figure 3.33. Duration (in ms) of the vowel only in /aʔ/ versus /aO/ rimes



The vowel of the /aʔ/ syllables is about 150 milliseconds long, compared to about 100 millseconds for the vowel of /aO/-type syllables, as seen in Figure 3.33. This result is somewhat surprising, since greater duration has been consistently associated with measures of stress and syllable weight.

Figure 3.34. Fundamental frequency (in Hz) of the vowel only of /aʔ/ versus /aO/ rimes

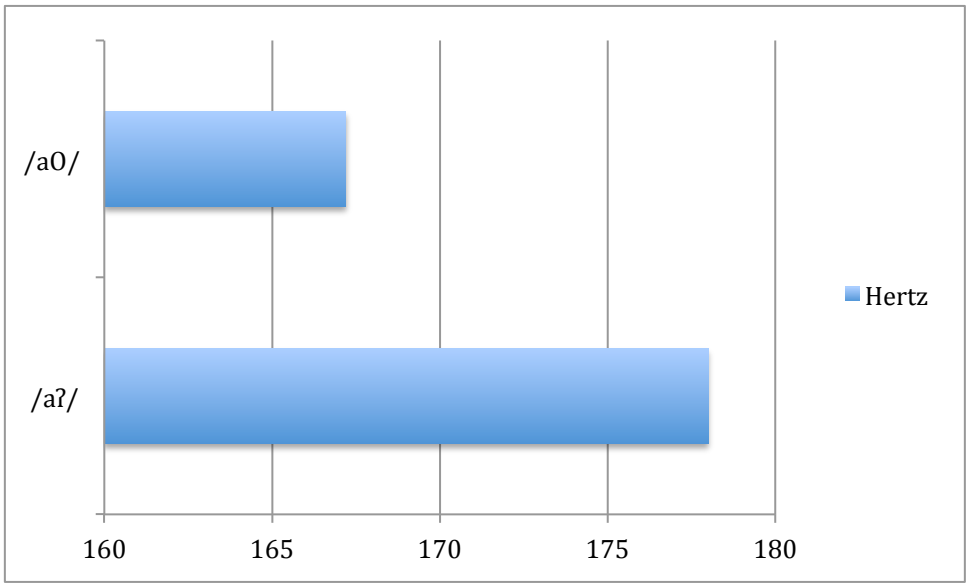


Figure 3.34 is also surprising in that it shows an approximately 10 Hz difference in pitch between the two syllable types, and again the /aʔ/ syllable, which is light for stress, measures lower than the heavy /aO/. Returning to the spectrogram in Figure 3.17 in Section 3.5, we see that glottalization is realized by sharp, separate glottal pulses and an accompanying pitch fall. Note that the pitch trace line is about one third shorter than the length of the vowel, and that as glottalization increases, the pitch is no longer visible. Thus, while the pitch on this /a/ before the glottal stop is not lowered in the averaged measurements, the measurements do not reflect the fact that glottalization actually impedes the fundamental frequency. The greater duration of syllables with a glottal stop in the coda may thus be allowing for the sufficient realization of creaky voice on the vowel.

Another interesting question is how to locate the onset of the glottal stop. In my measurements, I have been locating the onset of the glottal stop at the point where there is

an absence of voicing. However, one could also take the onset of laryngealization as the onset of the consonant (although this would be a different conceptualization of the glottal stop), in which case the durations of the vowels preceding glottal stops would all be short, explaining the categorization of these syllables as light.

3.7 Conclusions: The role of sonority in Guča phonotactics

Duration, intensity, and pitch all are cues for stressed syllables in Guča, with duration being the strongest cue. In spite of some reversals of single measurements in particular tokens, all three are normally correlated with stress. The reversals for pitch or duration that were noted can, at times, be attributed to intonation or other production factors.

As we saw in the study on the acoustic correlates of stress, vowels in stressed heavy syllables are of longer duration than those in unstressed heavy syllables. In addition, the majority of measurements found that heavy syllables had longer vowels than light syllables. This was true of schwa versus full vowels in open syllables and in syllables closed by a non-glottal obstruent. These examples strongly suggest that syllable weight is determined by vowel duration.

Before plain resonants, we again find that schwa is of shorter duration than /a/; however, both /əR/ and /aR/ pattern as heavy. In these cases, it appears that the final resonant is adding to the overall duration of the rime, making it long enough to count as heavy for the system of stress assignment. Thus, syllable weight seems to be tied to the duration of the sonorous portion of the rime.

However, duration alone cannot account for all distinctions between heavy and light syllables. Schwas in syllables closed by glottalized resonants and those closed by plain resonants do not have distinct duration measurments; however, those closed by glottalized resonants pattern as light. There is visible evidence in the spectrograms that the pre-glottalization of the vowel in anticipation of the coming glottalized resonant decreases the pitch and the modal portion of the vowel. Lowered fundamental frequency and non-modal voicing are known to reduce sonorance. This ties into Miller's (2012) theory of sonority resulting from the combination of two independent scales: the sound source and the aperture scale. Recall that Miller's sound-source scale had no source at one end of the continuum and modal voicing at the other. The glottalized resonants found here fall between these in terms of their voicing quality, suggesting that they belong in an intermediate position on the scale. In Guc̓a the phonology divides the continuum for syllable weight between the glottalized sounds and modal voicing.

When we take into consideration the aperture scale, we see that, as Gordon et al. (2012) and others have described, schwa is lighter than the more peripheral vowels. Schwa patterns as less sonorous than full vowels in Kʷaƙʷala and Guc̓a. This explains the differential behavior of /əR'/ versus /VR'/, as the former has reduction in both the sound-source scale (due to the glottalization) and the aperture scale (due to the schwa). The latter, by contrast, has the reduction in sonority at the level of the sound-source scale only. This can be contrasted, in turn, with the /Vʔ/ cases, which end in an absence of voicing, i.e., at the leftmost end of the sound-source scale—the lowest level of sonority. The sequence /Vʔ/ is highly sonorous on the aperture scale, but least sonorous on the sound-source scale. In this case the two scales clash in their ranking of sonority of the /Vʔ/ rime and the stress

patterns demonstrate that the sound-source scale outranks the aperture scale. Glottalization, through preglottalization realized on the preceding vowel, sufficiently dampens the salience and sonority of full vowels, causing them to pattern as light.

CHAPTER FOUR

Lexical suffixes

4.1 Introduction

This chapter describes a salient feature of the grammar of Guc̓a: its large set of derivational suffixes. These suffixes are semantically similar to stems or roots, and often have noun-like meanings. They display special morphophonemic behavior by affecting the final consonants of stems they attach to in unusual and phonologically unpredictable ways. Such affixes, referred to as lexical affixes – or in the case of Kʷaƛ̓ʷala and Guc̓a, lexical suffixes – are an areal feature of the Northwest Coast and northwestern North America more generally. They have received attention in the literature because of their double nature as root-like affixes and questions about their diachronic origins (e.g., in Salish as described by Gerdts and Hinkson 1996, in Bella Coola or Nuxalk as described by Mithun 1997, in Coeur d'Alene as described by Bischoff 2011).

These suffixes in Kʷaƛ̓ʷala and Guc̓a are classified according to the effect they produce on the stem: "weakening" or voicing/leniting; "hardening" or glottalizing; and "neutral" suffixes, which effect no change. This chapter will begin by discussing lexical affixes as an areal feature of the Northwest Coast, and will then turn to the semantics of the affixes, their phonological effects, and their current use and status in Guc̓a. In particular, it has been claimed (Goodfellow 1999, 2005) that these suffixes, which are dramatically distinct from English structurally, semantically, and phonologically, are prone to early loss due to pressure from English as the dominant language. The Guc̓a data, however, do not

support this claim. The literature on this subject is reviewed in the next section and I return to this again in Section 4.5, when the current use of the suffixes is discussed.

4.2 Lexical affixes as an areal feature

In the literature on the many shared phonological and grammatical features of the languages of the Northwest Coast, lexical affixes are noted as a special grammatical feature that helps define the linguistic area (Beck 2000, Bach 2004, Mithun 2015). These affixes, as noted by Levine (1980), are derivational rather than inflectional, but their meanings range from very content-ful ideas such as "mouth" or "smell," to grammatical ideas such as causation, possession, or instrumental.

In the languages of the Northwest Coast, lexical affixes only occur attached to stems or roots, whereas stems and simple roots may function alone as independent words in some languages. In Guc̓a, roots generally do not stand alone[20] but require a stem-formative suffix /–a/ or other suffix to make a word. I have used the term *stem* throughout this chapter to indicate the unit to which the lexical suffixes of Guc̓a attach, whether the stem can stand alone as a word or not. Unlike incorporated nouns, the lexical affixes of this linguistic area have little or no formal resemblance to the roots or stems with similar meanings. For example, the Guc̓a word for 'hands' is /ʔaẏəʔicuχʷ/ while the suffix 'hand' is /-(x)c̓ana/. As Mithun (1997) notes, the meaning of the affixes also tends to be much more general than that of the stems which denote the "same" idea. In keeping with their affixal and derivational nature, they often contribute unpredictable meanings to the words they help

[20] However there are a few words functioning as nouns that stand alone in their bare-root form such as [ẇap] ‘water’, [mɛʔ] ‘salmon’, and [wa] ‘river’.

make up: their meanings are highly lexicalized in combination with the stems they occur with, and so they are sometimes not freely combined in new collocations of stem and affix.

In the extensive work by Boas and Hunt on Kʷaḵʷala, it is notable that one of Boas' last publications in 1947 is entitled 'Kwakiutl Grammar with a Glossary of the Suffixes.' Indeed the language is riddled with suffixes, and their influence upon the grammatical structure of the language can hardly be overstated. The glossary of the suffixes occupies 77 of the approximately 175 pages of the book. In his description of the suffixes, Boas notes "the central position which the suffixes occupy in Kwakiutl, not only in the morphology, but also in the syntax..." (Boas 1947:301). In the grammar, Boas mentions that the suffixes of Kʷaḵʷala can be divided into two types: those that merely indicate syntactic functions of stems, and those that add "material concepts" to stems (Boas 1947:225). The second type is what is here referred to as lexical suffixes (those with lexical content as opposed to purely grammatical or functional suffixes). The effects of the suffixes upon the stems are described as tri-fold: 1) changes to the terminal stem consonant, 2) extension of the stem, and 3) changes of accent (stress) (Boas 1947:225). The suffixes are classified according to their effects upon the stem-final consonant as either indifferent (with no effect), weakening (leniting or voicing), or hardening (glottalizing) (Boas 1947:226). See Section 4.4 for a description of the consonant relationships which are elucidated by the suffix effects.

Another significant reference is Levine (1980), which discusses two morphemes (suffixes *-su?* and *-ayu*) that are translated or labeled by Boas as "passives," but which Levine refers to as "focus elements." Levine investigates these in terms of transformational grammar to determine whether they are transformationally derived or, if they are base-generated, lexically derived. Levine makes the argument that such forms are not

transformational passives, but that their passive-like function is lexically grounded; in other words, that the lexical semantics of the suffixes allow for a passive interpretation, and that they thus function similarly to passives (Levine 1980:243, 258). In the process of making this argument, Levine notes that the same suffixes which Boas labeled as passives also have much more concrete meanings, such as instrument or goal, and that they occur in a wide variety of lexical items, not only those denoting actions. For example, the instrumental suffix *-ayu* forms *mənayu* 'drumstick' from *mex-* 'strike', and forms *yaq̓əndayu* 'topic of conversation' from *yaq̓ənd-* 'talk,' which is much less transparently instrumental. Similar observations are made for the functions of *-su?*. Thus these are examples of lexical suffixes.

Mithun (1997) explores the functions and origins of lexical affixes in detail, primarily focusing on Bella Coola, or Nuxalk, a Salishan language spoken in the Northwest Coast and a neighbor to Kʷakʷala and other Wakashan languages. Mithun points out that the suffixes are clearly affixal in their formal behavior, and that in spite of their seemingly noun-like semantics, they actually behave semantically and functionally as affixes as well. One important fact about languages that contain lexical affixes is that they also contain stems or roots with similar meanings. So for example, Nuxalk contains both a suffix and a stem which are glossed 'rock' (1997:359). However, the semantics of the suffix tend to be more diffuse or disparate than the semantics of the corresponding stem. The article goes on to describe the probable path of grammaticalization for these affixes and how this path explains their formal and functional properties. The usual path of grammaticalization described for affixes conceives of them as beginning as independent words which take on a more and more grammatical function over time. Having taken on this grammatical role, they eventually lose their phonetic bulk and become fused with a co-occurring word. These

suffixes, it is proposed, have taken a different path (Mithun 1997:369). Because of the highly polysynthetic nature of the languages, the suffix, which still has a root-like meaning, becomes fused through noun incorporation or compounding to another word, then having been fused, its meaning becomes extended and generalized over time. This explanation fits well with the broadness of the class of lexical suffixes and also allows for their simultaneously concrete and abstract semantics.

4.3 Semantics

This section demonstrates the semantic range of the lexical suffixes of Guc̓a by providing examples of the suffixes and their semantic contributions to words, ranging from highly concrete to abstract. Table 4.1 presents a small but robustly attested subset of the lexical suffixes currently in use in Guc̓a. Sometimes the suffixes attach to stems that function as independent words, while other times the stem (root) is a bound morpheme, identifiable as the unchanging morpheme to which many different suffixes may attach. Suffixes preceded by an exclamation mark (!) are hardening or glottalizing suffixes, following the notation used in Boas (1947). Those preceded by a plus symbol (+) are weakening or voicing suffixes. This notation is different from the Boas sources which use an equal symbol (=).[21] The dash (-) is used to indicate neutral suffixes which have no phonetic effect on stems. The examples presented in this chapter are from my work with Guc̓a speakers. The forms and glosses of the suffixes are listed as in Boas (1947), noting where and how the Guc̓a forms differ. In Table 4.1, examples of forms with suffixes are presented in the following order: neutral suffixes, weakening suffixes, hardening suffixes.

[21] The equal symbol has been avoided because it is generally used in the linguistics literature to indicate clitic boundaries, and would thus be confusing.

The suffixes which have an (x) or other consonant in parentheses at the beginning have two forms: with the /x/ after a vowel or resonant-final stem, or without the /x/ following stems ending in obstruents.

Table 4.1. Guc̓a Lexical Suffixes

Suffix	Gloss	Examples
-(x)sila	'to take care of'	[ʔáχ.si.la] 'to take care of', [ƙá.ƙa.dʊxʷ.si.la] 'read'
-p̓a(la)[22]	'smell, taste'	[y̓áx.p̓a] 'smell bad', [ʔíx.p̓a] 'smell good'
-bəs	'fond of'	[w̓á.ʔo.kʷa.bəs][23] 'fond of barking', [gə́n.gənɬ.bəs] 'fond of children', [náχ.bəs] 'fond of drinking', [sə́n.bəs] 'fond of swearing'
-gila	'make'	[x̌í.na.gi.la] 'make eulachon oil', [dí.gi.la] 'make tea', [cə́lχʷs.ta.gi.la] 'make hot water', [kék.gi.la] 'make cake'
-(x)c̓ana	'hand'	[qəm.χoɬ.c̓əna] 'left hand', [heɬƙʸoɬc̓ana] 'right hand', [ʔa.wí.gʸəl.c̓ə.na] 'back of hand', [q̓éwχ.c̓a.na] 'splinter in hand', [séx.c̓ə.nan] 'put hand in something', [x̌á.x̌aχ.c̓a.na] 'red hand'

[22] This suffix is listed as -p̓ala in Boas (1947), but in Guc̓a, it is always [-p̓a]. When asked, speakers of Guc̓a and Kwak̓wala dialects did not seem to know the significance of the "missing" [la]. However, they did say that fewer "la"s is one of the dialect differences. Note that the suffix -gila has the same form in both Guc̓a and Kwak̓wala dialects, and Guc̓a does not apparently drop the [la].

[23] [w̓á.ʔo.kʷa] 'bark', [dí.yi] 'tea', and [x̌í.na] 'eulachon oil' are stems that can stand alone as independent words and take suffixes.

+ayu	'instrument'	[hə.má.yu] 'fork', [ci.gʷa.yu] 'shovel for clamming', [cé.la.yu] 'canoe bailer', [ḳá.ḳo.cə.yu] 'crab trap', [qʷə.dá.yu] 'knife', [sú.bə.yu] 'axe', [sí.wə.yu] 'paddle'
+ac̓(i)[24]	'vessel'	[ha.m̓ác̓] 'dish', [ní.gʷac̓] 'light', [xʸac̓] 'smoke house', [boc̓] 'womb', [ʔə́l.gʷac̓] 'blood vessel', [cú.cə.χʷa.mac̓] 'basin', [ḳa.n̓ac̓] 'sewing box'
+atu	'ear'	[χ̓á.qʷa.tu] 'red-head', [c̓ú.ɬa.tu] 'black-haired'
+əlkʷ	'having the habit of ____'	[há.m̓əlkʷ] 'eater', [qá.yəlkʷ] 'walker'
+as	'place'	[də.gí.dᶻas] 'graveyard', [ʔə́mɬ.dᶻas] 'playground', [cé.y̓as] 'place for drawing water', [ẃá.n̓as] 'hiding place'
!ənχ	'season'	[hí.ʔənχ~hé.ʔənχ] 'summer', [c̓ə.wə́nχ] 'winter', [qʷí.sə.ʔən.χə.ẃəɬ] 'last year', [má.mə.y̓a.ʔənχ] 'fishing season'
!xsd	'behind, tail end'	[c̓ə.ḱʷə́sχt] 'short person', [sáʔχs.diʔ] 'skirt', [ḱə́l.ḱaχs.di] 'diaper', [ẃə.dáχst] 'to have a cold bottom'
!ima	'able to be _____'	[hú.y̓e.ma] 'countable'

[24] The suffix *+ac̓(i)* 'vessel' (Boas 1947:319) is normally realized as [ac̓] in Guc̓a. In a few cases of careful pronunciation, a devoiced [i] can be perceived at the end. See Section 4.4.3 and Chapter 2 for further discussion of this phenomenon.

The indirectness of the meaning contributed by the suffixes can be seen by comparing examples (61) and (62). Both illustrate the suffix *-(x)sila* 'to take care of', also translated as ‘to work at’ (Boas 1947:370). In (61), the complex word is composed of the stem /ʔəχ-/ translated as 'to do, to handle' (Boas 1948) combined with *-(x)sila* 'to take care of’; the resulting word has a general meaning of taking care of something. In (62), however, the word [ƛ́á.ƛ́a.dʊxʷ.si.la] 'read' is a combination of, /ƛ́at-/ 'write' and the suffix *+kʷ* ‘passive’ plus the suffix *-(x)sila* ‘to take care of, to work at’, with initial Ca- reduplication:

61) /ʔəχ-/ 'to do, to handle'

-(x)sila 'to take care of' [ʔáχ.si.la] 'to take care of'

62) /ƛ́at-/ 'paint, write'

+kʷ ‘passive’

-(x)sila 'to take care of' [ƛ́á.ƛ́a.dʊxʷ.si.la] 'read'

The very specific meaning of 'read' is not entirely predictable from the parts 'write' plus ‘passive’ plus 'take care of, work at’; rather, the meaning is partly arbitrary and it is not clear what semantic content the suffixes contribute. Part of the problem in understanding the semantic contributions of the suffixes concerns the glosses or labels, which vastly oversimplify the semantic range and function of the suffixes. For the suffix *+kʷ*, I have followed Boas (1947) in using the label ‘passive’, but based on an analysis of the forms I recorded, ‘stative’ might be a more descriptive label. Either way, the semantics and function of this suffix are not easily described in a word or two. Similarly, the suffix *-(x)sila* ‘to take care of, to work at’, even with its more wordy gloss, is difficult to characterize semantically. According to the Boas (1948) dictionary, the root /ƛ́at-/ also means ‘to paint’, in addition to ‘to write’, which is presumably how it was used in pre-contact times. The

word 'read' [ƙá.ƙa.dʊxʷ.si.la] is translated in Boas (1947:370) as ‘to work at something written’. While this is speculative on my part, I imagine that before alphabetic writing systems were used, people used to “read” paintings on houses, poles, and canoes and that perhaps in that context, ‘taking care of painted things’ or ‘working at painted things’ was an apt description of interpreting the paintings for others.

In other cases, the suffixes seem to combine with stems in a clearly compositional way. Table 4.2 presents different stems with the suffixes *-ɲ̇a(la)* 'smell, taste', *-bes* 'fond of', and *-gila* 'make'. Here the semantic composition is rather straightforward, combining the stem semantics with the suffix semantics. Note that some of the stems in this table—*ƛ̓iṅa* 'eulachon oil' and *diyi* 'tea'—also function as independent words.

Table 4.2. Semantic combinations

Stem +	Suffix =	Word
ɲ̇ax- 'to get bad'	-ɲ̇a(la) 'smell, taste'	[ɲ̇áx.ɲ̇a] 'smell bad'
ʔik-[25] 'something good'	-ɲ̇a(la) 'smell, taste'	[ʔíx.ɲ̇a] 'smell good'
gənɬ- 'child'	-bəs 'fond of'	[gə́n.gənɬ.bəs] 'fond of children'
naq- 'drink'	-bəs 'fond of'	[náχ.bəs] 'fond of drinking'
senpa 'swear'	-bəs 'fond of'	[sə́n.bəs] 'fond of swearing'
ƛ̓iṅa 'eulachon oil'	-gila 'make something'	[ƛ̓í.na.gi.la] 'make eulachon oil'
diyi 'tea'	-gila 'make something'	[dí.gi.la] 'make tea'
c̓əlqʷ- 'hot'	-ʔsta 'into water; water; air' -gila 'make something'	[c̓ə́lχʷs.ta.gi.la] 'make hot water'
kek 'cake'	-gila 'make something'	[kék.gi.la] 'make cake'

[25] Several of the forms in Table 4.2 and this chapter exhibit spirantization of stops in coda position. See Chapter 2, Section 2.4.3 for discussion of this regular phonological process.

Turning from the clearly compositional semantics of the forms in Table 4.2 to the less direct semantic contributions that are characteristic of derivational affixes, consider the examples in Table 4.3. The examples of the suffix *-(x)ċana* 'hand' show the wide range of relationships that the 'hand' suffix can have to the stem it joins. 'Right hand' is composed of /hiɬƛ̓ut-/ 'right' and *-(x)ċana* 'hand', naming the hand in relation to the side of the body. 'Back of hand' is composed of /ʔəwigəʔ-/ 'back' and *-(x)ċana* 'hand', naming a part of the hand. 'Splinter in hand' juxtaposes the stem /q̓əkʷ-/ 'to be broken off' with *-(x)ċana* 'hand', describing the physical intrusion of the foreign object into the hand. 'Put hand in something' is composed of the stem /sa-/ 'to stretch out' and *-(x)ċana* 'hand', describing the action the hand does. The combination of /ƛ̓aqʷa/ 'red' with initial Ca- reduplication and *-(x)ċana* 'hand' forms [ƛ̓á.ƛ̓aχ.ċa.na] 'red hands', denoting the color of the hands. While these meanings are clearly based on the meanings of the component parts, there is no single systematic way in which the stem and suffix each contribute to the semantics of the whole word: the suffix can take on a number of semantic roles in relation to the stem.

Table 4.3. Semantic range of *-(x)ċana* 'hand'

Word	Stem	Semantic relationship
[héɬ.ƛ̓ʸoɬ.ċa.na] 'right hand'	hiɬƛ̓ut- 'right'	hand in relation to body
[ʔa.wí.gʸəl.ci.na] 'back of hand'	ʔəwigəʔ- 'back'	part of hand
[q̓əxʷ.ċá.na] 'splinter in hand'	q̓əkʷ- 'be broken off'	something inside hand
[séx.cə.nan] 'put hand in something'	sa- 'stretch out'	action of hand
[ƛ̓á.ƛ̓aχ.ċa.na] 'red hands'	ƛ̓aqʷa 'red'	color attribute of hand

This same range of semantic relationships between the stem and suffix can be seen for other suffixes in Table 4.1. The meanings contributed by a suffix often vary from concrete to relatively abstract, though some suffixes seem to tend toward more concrete or more abstract semantics. Example (63) [ḳaṅaċ] 'sewing box' is composed of /ḳən-/ 'to sew' and +*aċ(i)* 'vessel, container.' The +*aċ(i)* suffix usually has a very concrete function and clearly compositional semantics. Likewise, !*ima* 'able to be X', exemplified in (64), combines in a straightforward way semantically. However, !*ima*, is more semantically abstract than +*aċ(i)*.

63) ḳən- 'to sew' +aċ(i) 'vessel, container'

[ḳa.ṅaċ] 'sewing box'

64) hos- 'count' !ima 'able to be X'

[hú.ẏe.ma] 'countable'

In sum, while some of the lexical suffixes tend to have very concrete semantics, and others more abstract, most of them have a range of functions and semantic contributions, depending on the stem with which they combine.

4.4 Phonological effects upon stems

The suffixes fall into three categories based upon their phonological behavior. Those that have no effect upon the stem are described by Boas as "neutral," while those that affect final stem consonants are either "weakening" (leniting/voicing), or "hardening" (glottalizing). However these effects are often unexpected and unpredictable. Table 4.4 shows the changes effected by different classes of suffixes on stops and affricates. The

plain stops and affricates become straightforwardly ejective when glottalized, and voiced when weakened (Boas 1947:212, 226).

Table 4.4. Correspondences between plain stops and affricates, and those with hardening and weakening lexical suffixes

Plain	Hardened	Weakened
p	p̓	b
t	t̓	d
c	c̓	dᶻ
k	k̓	g
kʷ	k̓ʷ	gʷ
q	q̓	G
qʷ	q̓ʷ	Gʷ
ƛ	ƛ̓	λ

By comparison, the changes found in the fricatives and resonants are more complex, as illustrated in Table 4.5:

Table 4.5. Correspondences between plain fricatives and resonants, and those with hardening and weakening lexical suffixes

Plain	Hardened	Weakened
s	c̓ or y	dᶻ or y
x	n̓	n
xʷ	w̓	w
χ	χʔ	χ
χʷ	w̓	w
ɬ	l̓	l
l	l̓	l̓
m	m̓	m̓
n	n̓	n̓
y	y̓	y̓
w	w̓	w̓

According to Boas (1947:212, 226), when glottalized or weakened ("sonantized" in Boas' terminology), voiced stops strengthen the terminal voicing to the point of creating a schwa upon release. Similarly, all the glottalized consonants strengthen their release when glottalized or voiced, so that the release is vocalic, also a schwa.

The suffixes currently in use by Guc̓a speakers include suffixes from each of the classes described by Boas. In the section that follows, it is shown that the suffixes currently used in Guc̓a produce the expected alternations in stem consonants.

4.4.1 Neutral suffixes producing no change

Examples (65) through (68) illustrate phonologically neutral suffixes, which do not induce any change on the consonant of the preceding stem:

65) Stem ending in voiceless stop:	kuqʷ-	'to break a copper or stick'
Suffix:	-(x)c̓ana	'hand'
Word:	[kʸúχʷ.c̓ə.na]	'splinter in hand'
66) Stem ending in voiceless stop:	naq-	'to drink'
Suffix:	-bəs	'fond of'
Word:	[náχ.bəs]	'drunkard'
67) Stem ending in sonorant consonant:	n̓əm	'one'
Suffix:	-p̓ən	'times'
Word:	[n̓ə́m.p̓ən.xʷaʔ.c̓ənχ]	'Monday'
68) Stem ending in vowel:	səḵa	'five'
Suffix:	-p̓ən	'times'
Word:	[sə.ḵʸá.p̓ən.xʷaʔ.c̓ənχ]	'Friday'

Examples (65) and (66) show that stems ending in voiceless stops are unaffected by the addition of the neutral suffixes, that is they are neither voiced nor glottalized. However, each of these examples shows spirantization of stops that are parsed in coda position, a regular phonological process, unrelated to the suffix effects, discussed in Chapter 2 Section 2.4.3. In example (67), which has a resonant-final stem, and example (68), which has a vowel-final stem, there is no change to the form of the stem when the suffix -*p̓ən* is added.

4.4.2 Hardening/glottalizing suffixes

Examples (69) through (72) illustrate the effects of hardening suffixes on the consonants of the stem:

69)	Stem ending in fricative:	yaɬ-	'to dig clams'[26]
	Suffix:	!ənχ	'season'
	Word:	[yá.l̓ənχ]	'clamming season'
70)	Stem ending in fricative:	hus-	'to count'
	Suffix:	!ima	'able to be X'
	Word:	[hú.y̓i.ma]	'countable'
71)	Stem ending in affricate:	kiƛ-	'to fish with net'
	Suffix:	!inuχʷ	'person who does an act habitually'
	Word:	[kí.ƛ̓i.nuχʷ]	'gill netter'

[26] Examples (69) and (74) contain the root /yaɬ-/ (stem /yaɬ-a/) 'to dig clams' which is different from the Kʷaḵʷala dialect form of the word for 'clamming' /dᶻik-a/.

72)	Stem ending in vowel:	hi-	'that, in straight direction to distant point'
	Suffix:	!ənχ	'season'
	Word:	[hí.ʔənχ~hé.ʔənχ]	'summer'

The effects of hardening suffixes when added to stems ending in voiceless fricatives are visible in examples (69) and (70), where /ɬ/ changes to [ɬ̓], and /s/ to [s̓]. Example (71) shows the glottalization of the /x̣/ affricate to [x̣̓]. Example (72) shows that the suffix has no effect on the consonant of a vowel-final stem.[27]

4.4.3 Weakening/voicing suffixes

Examples (73) through (77) exemplify the phonological effect of weakening suffixes on the stem.

73)	Stem ending in voiceless stop:		sup-	'to chop'
	Suffix:	+ayu		'instrument'
	Word:	[sú.bə.yu]		'axe'
74)	Stem ending in fricative:		yaɬ-	'to dig clams'
	Suffix:	+ayu		'instrument'
	Word:	[yá.la.yu]		'clamming fork'
75)	Stem ending in affricate:		kix̣-	'to fish with net'
	Suffix:	+ac̓(i)		'container'
	Word:	[kí.λac̓]		'gill net boat'

[27] However, a glottal stop is inserted between the vowel of the root or stem, and the initial vowel of the suffix. I believe this is a regular process in the language to resolve hiatus.

76)	Stem ending in voiceless fricative:		qas-	'to walk'
	Suffix:	+əlkʷ		'having the habit of'
	Word:	[qá.yəlkʷ~qá.yoxʷ]		'someone who walks about, outside'
77)	Stem ending in vowel:		ta-	'to wade'
	Suffix:	+gəɬta(la)		'continued or repeated action or motion in water'
	Word:	[tá.gəɬ.ta~tá.gʸɪɬ.ta]		'waded across'

Example (73) shows the weakening or voicing effect on a voiceless stop. Example (74) shows a fricative-final stem undergoing the weakening effect. Compare (74) to (69), in which the same stem undergoes glottalization or hardening. Example (75) shows the stem-final affricate /ƛ/ becoming voiced to [λ], with the same stem, kiƛ- 'to fish with net' as in (71). Example (76) shows the weakening of stem-final /s/ to [y]. Example (77) shows no result when a weakening suffix is joined to a vowel-final stem.

There are also cases of unexpected vowel epenthesis, deletion, or coalescence. Some of these may be due to dialectal differences or recent changes, but others appear to be older and are attested in Boas (1947, 1948) as well as in Guc̓a currently. An illustrative example is given in (78):

78)	Stem:	xʸəɬ-	'to hang up to dry'
	Suffix:	+ac̓(i)	'container'
	Word:	[xʸæc~xʸac̓]	'smoke house'

In this example, it is not possible to say whether the final stem consonant has undergone the expected voicing (weakening), since the consonant has disappeared altogether and the vowels which would have preceded and followed it have merged into

one. Note that in the currently spoken Kʷaƛ̓ʷala dialect, the surface form of 'smoke house' is [xʸɛlác̓i]—the form that would be expected based on the stem and suffix combination. Another dialect difference in the forms of suffixes is visible in Example (78) and several others that have already been presented. For many suffixes, Guc̓a shortens the suffix compared to the attested forms in Boas (1947) and Hunt material and in the current Kwagiuɬ dialect. For example, the suffix /+ac̓(i)/ 'container' is normally just [ac̓] in Guc̓a; however in slow, careful pronunciation, a voiceless vowel can sometimes be heard or seen on a spectrogram.

Another interesting example is given in (79):

79)	Stem:	qʷis-	'far in space or time'
	Suffixes:	!ənχ 'season' and -ẃəɬ	'remote past'
	Word:	/qʷisəy̓ənχẃəɬ/ [qʷísəy̓ənχəẃəɬ]	'last year'

Based on the stem form and the glottalizing suffix, !*ənχ* 'season', a form such as *qʷic̓ənχẃəɬ or *qʷiy̓ənχẃəɬ would be expected; however this is not attested either in Guc̓a, or in the Boas and Hunt documentation of Kʷaƛ̓ʷala. The following two forms are listed in the Boas (1948) dictionary: *qʷesəy̓ənχẃəɬ* 'past winter' and *qʷesəy̓ənχ* 'next or preceding season'. In the recordings made of Guc̓a for this project, the form 'last year' is [qʷísəy̓ənχəẃəɬ]. The first thing to note is that there is a stem expansion in both Guc̓a and the Boas forms, taking the monosyllabic stem qʷis- and making it into two syllables before the addition of the suffixes. Referring to the chart above, note that /s/ when hardened, results in /c̓/ or /y̓/, so the stem expansion is potentially *qʷisəs-* which then undergoes the glottalizing consonant mutation induced by the suffix !*ənχ*. Additionally, in Guc̓a, there is

another epenthetic schwa introduced between the two suffixes, apparently to ease production and/or perception of the segments [χẘ].

4.5 Suffixes in use

Goodfellow (2005) found that the youngest generation of Guċa speakers (Kʷaƛʷala speakers from Quatsino) were not using these suffixes at the same rate as older speakers, both in terms of the number of suffixes used and the frequency of use. Goodfellow's claim is that the youngest generation of speakers is moving toward more analytic grammatical constructions based on the patterns of English. The Goodfellow data compare the use of specific lexical suffixes in targeted elicitation from ten speakers of different dialects of Kʷaƛʷala (some speakers are speakers of more than one dialect) and across three generations. She finds that the youngest speakers are the least likely to use lexical suffixes to translate an English word or phrase, while the oldest generation is the most likely to use the targeted suffix in translation. However, the oldest generation of speakers were all from Kingcome Inlet, while the middle and youngest generation were from Quatsino. These represent two different dialect areas and this clouds the comparison. In addition, the vast majority of the data were recorded with the oldest generation and middle generation of speakers, calling into question whether the younger generation (2 speakers and 11% of the data) might have produced more of the targeted suffixes if their contribution to the data pool had been larger. It is thus difficult to tell whether differences in the use of the suffixes are dialectal or generational.

Goodfellow (1999, 2005) focuses on the fact that in spite of the incursion of English into every aspect of life, even the youngest generation uses the suffixes in some words and

uses the language to indicate native identity. The language is highly valued and continues to be used, even if in limited contexts.

The fact that Goodfellow finds the suffixes are in various states of use among the three generations harkens toward work on grammaticalization, frequency effects, and emergence in grammar (e.g., Bybee and Hopper 2001, Hopper and Traugott 2003, and Bybee 2006, among others). In particular, the use of a highly lexicalized and frozen form does not prevent it from being simultaneously in use as a productive, non-frozen form that is available for use in new combinations. This section describes the current use of the suffixes by three generations of Guc̓a speakers and investigates the ways in which the suffixes are used both in highly lexicalized forms as well as in innovative new forms and words. Highly lexicalized forms arise from frequent collocations of the same stem and suffix combinations as a unit. Innovative forms are those that are newly made up or created rather than remembered. The following sections provide comment on particular concatenations of suffixes with stems in discourse and in elicitation, including cases of neologisms. A summary discussion follows.

There is an important differnece between my methodology and the methodology used by Goodfellow. Her study aimed to elicit specific forms, combinations of stems and suffixes as recorded in the original Boas and Hunt material. My study, on the other hand, aimed to elicit the suffixes both in forms comparable to those found in Boas (1947 and 1948), but also to elicit the suffixes in use in any other forms, including neologisms, or in connected discourse. Many times during recording sessions, speakers were originally unsure of lexical items but through discussion or listing other forms using the target suffix, speakers recalled words as in the Boas and Hunt material that contained the target suffix.

4.5.1 Examples of suffixes used in discourse

Examples (80) through (83) are taken from connected discourse and are not elicited forms.

80)	[tiχəliɬi qʷaba]	‘the fork fell to the floor’ (older generation)
	/tiq-/	‘drop’
	/-liɬ/	‘on the floor, in the house’
	/qʷaba/	‘fork’

In example (80), the suffix /-liɬ/ ‘on the floor, in the house’ is used with the stem /tiq-/. When speakers were asked about this form, they explained that the word included the concept ‘to the floor’. However, they did not identify the suffix as a distinct morpheme. This form embodies a frequent collocation of stem and suffix, likely quite lexicalized, but with the semantics still very transparent to speakers. The suffix is frequent in many other words such as [qá.sa.li.ɬa] ‘walks about inside’.

Two suffixes are added to the stem /bəkʷ-/ ‘man’ in the following example.

81)	[baƙʷəmƙa]	‘speak our language’ (middle generation)
	/bəkʷ-/	‘man’
	/-!əm/	‘real, common’
	/-(ƙ)a(la)[28]/	‘noise, vocalizing’

The example in (81), is a frequent collocation which is lexicalized and expresses the unitary concept of ‘speaking our language’. Like (80), the suffix /-(ƙ)a(la)/ ‘noise, vocalizing’ is

[28] The suffix -(ƙ)a(la) is realized [-ƙa] in Guc̓a.

frequent in other forms as well (such as [m̓á.m̓əɬ.nə.ƙa] ‘speak English’), and speakers are aware of its semantics.

(82) is an example of the very productive instrumental prefix used in the word /ƛ̓ənq̓ayu/ ‘needle.’

82)	[kəɬasi ƛ̓ənq̓ayu]	‘afraid of needle’ (middle generation)
	/kəɬ-/	‘afraid’
	/ƛ̓ənq̓/	‘poke’
	/+ayu/	‘instrument’

Like many other forms with the +*ayu* suffix that appear in the Guc̓a data, this word names a common object of daily life and is therefore likely to be a lexicalized collocation.

Example (83) contains a lexicalized example of the suffix /!ənχ/ ‘season’ in the word [yú.dʊxʷ.ʔən.χə.la] ‘three years’.

(23)	[yú.dʊxʷ.ʔən.χə.la]	‘three years’ (middle generation)
	/yudəxʷ/	‘three’
	/!ənχ/	‘season’
	/-əla/	‘continuative’

The same suffix is used in example (84) below, in a form for ‘windy season’, but it was explicitly elicited in that case.

4.5.2 Examples of elicited suffixes

When asked for the form ‘windy season’, speakers engaged in a kind of word-search, during which they explicitly discussed the feasibility of putting the suffix /!ənχ/ ‘season’ on the stem for ‘windy’. In the end, they agreed on the form in (84).

84)	[yú.gəɬ.sa.ʔənχ]	'windy season, windy time' (middle generation)
	/yəw-/	‘wind’
	/-gəɬ/	‘continued motion’
	/!s/	‘on the ground’
	/!ənχ/	‘season’

Note that the form cited for ‘windy season’ in Boas (1948:39) is *yəẃənχ*.

What is striking about the form provided by speakers after this discussion is that the same root and suffix appear as in the Boas data, but in the Guc̓a form provided, there are a couple of other suffixes as well. This is an example of the flexibility of the language and the ability of speakers to adjust their speech to the context. While not analytic in the sense that Goodfellow (1999, 2005) meant (including independent lexical items in a syntactic construction instead of the lexical suffixes), this form, provided by the middle generation of Guc̓a speakers, is analytic in that it breaks the concept of 'windy season' down into various components of meaning and supplies suffixes for each aspect. It is difficult to discern how much of the resulting form is due to the task of translating in the elicitation context, but the assumption that a form identical to the one cited in Boas is not within the speakers’ repertoire would be presumptive. Rather, forms like the one in (84) are evidence of the fact that speakers are able to flexibly manipulate many suffixes and other linguistic resources, depending on the context.

Example (85) illustrates the flexibility and productivity of some of the lexical suffixes, as they can combine with non-native borrowings.

85) [kekgila] ‘make cake’ (middle generation)

/kek/ ‘cake’ (borrowing from English)

/-gila/ ‘make’

The use of *-gila* with [kek] ‘cake’ – a borrowing from English – shows just how productive some of the lexical suffixes are in being able to freely combine in new collocations and with new stems.

4.5.3 Use of suffixes in formation of new words

Another way in which speakers creatively use the lexical suffixes is in the process of making new words, especially words for which there was no concept in the past. The youngest generation of Guc̓a speakers is quite active in both recording and understanding old words, and in creating new words according to Guc̓a ways and principles. Based on the pattern for names of appliances, 'microwave' is composed of the stem *c̓əlqʷ-* 'it is hot' plus the suffix *+ac̓(i)* 'container, vessel' yielding [c̓əlqʷidac̓]. A short list of words for appliances with their component stems and suffixes is provided in (86) through (90) as examples of how the suffixes can be purposely and creatively manipulated by speakers to find native ways to express new concepts. These forms were all provided by the youngest speaker, but only the words for ‘microwave’ and ‘computer’ were said to be newly coined by him.

86) 'refrigerator' [ẃədac̓]

ẃəd- 'to be cold' +ac̓(i) 'container, vessel'

87) 'stove' [laGʷilac̓]

ləqʷ- 'fire wood' +ac̓(i) 'container, vessel'

88)	'washing machine'	[c̓uxʷidac̓]
	c̓uxʷ- 'wash'	+ac̓(i) 'container, vessel'
89)	'microwave'	[c̓əlqʷidac̓]
	c̓əlqʷ- 'it is hot'	+ac̓(i) 'container, vessel'
90)	'computer'	[ninoɢadac̓]
	noq- 'mind, thought'	+ac̓(i) 'container, vessel'

It is interesting to note that this speaker analyzes these forms as having the ending [dac̓], meaning ‘machine’. While most of them do end in [dac̓], the origin of this ending seems to be derived from different sources. In ‘refrigerator’ the segment [d] is part of the stem ‘cold’. In ‘washing machine’ and ‘microwave’ the source of the [d] seems to be the ‘inchoative’ suffix *-xʔid*. The word ‘stove’ does not have a [d] before [ac̓], but rather an [l], which may be from the suffix *-la* ‘continuative’. The word for ‘computer’ has a [d], perhaps from the suffix *-d*/*-nd*/*-ud* ‘activizing’, or perhaps based on analogy with the other words for appliances and machines. It thus appears that although these forms originate from a variety of morphological sources, their ultimate phonological similarity has allowed for morphological reanalysis by this speaker of *+ac̓(i)* ‘container, vessel’ to [dac’] ‘machine’. This reanalysis reflects a creative process by the speaker, and this type of change is not uncommon in the history of languages. It is similar to the English case of *an apron*, which is a reanalysis of *a napron*, the latter being from the Old French word *naperon* ‘small tablecloth’.

4.5.4 Summary of the current use of the suffixes

The examples in the preceding sections have illustrated that speakers control these suffixes as they use them in a variety of linguistic tasks. They produce them automatically in connected discourse; they discuss and manipulate them consciously in elicitation tasks; and they use them productively to form words for new concepts. While Goodfellow (1999) found that the middle and youngest generations of Guc̓a speakers were likely to translate elicited forms with analytic constructions that did not involve the lexical suffixes, the speakers in my sample all use them frequently and creatively. Many of the suffixes occur in highly lexicalized forms, but those that occur frequently are still salient as suffixes to the speakers, as can be seen in their ability to discuss them explicitly as endings and to apply them to novel forms.

4.6 Conclusions

The lexical suffixes discussed in this chapter are part of a set of structural features that define the Northwest Coast linguistic area. They are also part of a broader structure in Guc̓a – a morphology and syntax that include inflectional morphology, reduplication, clitics, and word order. Every language has its own genius – the special ways of expressing ideas that set the language apart from other languages. The lexical suffixes of Guc̓a are a rich and salient feature of the language, an essential element of its polysynthetic character.

In Guc̓a the lexical suffixes number several dozen, though some are used much more frequently than others. We have seen that the semantics of the suffixes vary widely, both across the different suffixes, and among uses of the same suffix in different role relationships to the stem. Speakers of Guc̓a use the suffixes frequently: both in lexicalized

forms, whether those are new or old, and productively in connected discourse. Thus this essential feature of the language remains vital for the speakers and, following Goodfellow (1999), contributes to the maintenance of indigenous culture and identity.

CHAPTER FIVE

Conclusions

5.1 Summary

This dissertation has looked at the phonology and morphology of Guc̓a, a little-documented variety of Kʷaƛ̓ʷala. Chapter 1 looked at the historical and present context of the language, the speakers, and the typological profile of the language. In Chapter 2, the phoneme inventory, with its many consonants and few vowels, was described and exemplified, along with a discussion of the regular phonological processes affecting the phonetic realization of sounds. In Chapter 3, the phonotactics, including syllable structure, stress and weight, were discussed in detail and the phonetics of weight and sonority was investigated. The typologically unusual default-to-opposite stress system was a critical lens for this. It was found that glottal coda consonants reduce sonority and thus weight by negatively affecting the modal voicing of preceding vowels. Chapter 4 examined the phonetic effects, semantic range, and contexts of use for the lexical suffixes, an important structural resource in Kʷaƛ̓ʷala. The lexical suffixes are actively in use by all generations of speakers, and exhibit the expected phonetic effects, as documented by Boas (1947). Semantically, the suffixes combine with stems in unpredictable collocations and cover a range of concrete and abstract concepts, reflecting their status as derivational morphemes.

5.2 Contributions

This dissertation significantly enriches the documentation of Guc̓a, especially with regard to its phonetic properties and the lexical suffixes currently in use. It provides a basis for identifying dialect differences between Guc̓a and the Kwagiuɬ dialect of Kʷakʷala; these are summarized in Section 5.4 below.

The phonetic investigation of the correlates of stress and of syllable weight for the phonologically complex default-to-right stress patterns contribute to our understanding of the range and limits of stress systems cross-linguistically. The investigation of how glottal coda consonants render otherwise heavy syllable types light also connects to the literature on the phonetic basis of weight distinctions (Gordon 1999, 2002, 2006), sonority hierarchies (Miller 2012, Parker 2002), and the phonetic realization of glottalized segments, such as the glottalized resonants and the glottal stop (Gordon and Ladefoged 2001, Shaw and Campbell 2005). The finding that glottalized coda consonants reduce the sonority and weight of syllables via their impact on modal voicing of the preceding vowel suggests that glottalized consonants could be positioned similarly to breathy voice sounds on Miller's (2012) Sound-Source Scale, yeilding a scale from least to most sonorous as follows:

1) no source, 2) turbulence only, 3) breathy voice/glottalization, 4) modal voicing

Regarding the lexical suffixes, contra Goodfellow (2005, 1999) I found that all three generations of speakers, including the youngest fluent/native speaker, control the suffixes for multiple purposes, including but not limited to the expression of identity and cultural belonging, the use in frequent lexical combinations of stem and suffix, including cases of multiple lexical suffixes used together, the creation of new words, and the productive use with borrowings or new collocations of stem and suffix.

5.3 Further study

In the process of investigating the phonology and lexical suffixes of Guc̓a, several areas that deserve further study have come to light. In particular, for the various syllable types that are unattested or extremely rare, further elicitation and transcription could clarify whether these gaps are systematic or accidental. It appears that the least sonorous potential syllable type in the weighted matrix, əʔ, and the most sonorous type, VR, are not attested. If systematic, these facts and their phonetic motivation could lead to a better understanding of phonotactics in Guc̓a and in languages more generally. An investigation of these aspects of Guc̓a phonotactics in terms of moraic theory (Bach, Shaw, and Howe 2005) might offer an elegant and principled explanation for the patterns.

A related question regards the phonemic status of schwa. In particular, is the neutralization of schwa and the phoneme /a/ to phonetic [a] after /h/ and uvular consonants regular and complete? If so, what are the implications for syllable weight distinctions? If not, how might these vowels be phonetically distinguished? F1 measurements may confirm or disprove the apparent neutralization of these segments.

Concerning lexical suffixes, an examination of their use to negotiate information flow in narrative and conversation is called for as a next step in understanding their current functions. Based on other studies of lexical affixes (e.g., Mithun 2001:51-52) and on the semantic range and use of the suffixes discussed in Chapter 4, it is likely that they are used in more extended stretches of discourse to manage discourse functions. This use would be important to document for the purpose of revitalization efforts and language learning by members of the heritage language community. The discourse functions of such structures

may be difficult to acquire when learning a language without a broad speaker base and context for use.

5.4 Summary of dialect differences

Representative examples illustrating dialect differences between Guc̓a and Kwagiuɬ are given in Table 5.1.

Table 5.1. Examples of Dialect Differences

A) [dᶻəmídᶻəmi]	(Guc̓a) ‘cat’	[bú.si][29]	(Kwagiuɬ) ‘cat’
B) [c̓əx.q̓á]	(Guc̓a) 'hangover'	[c̓əx.q̓á]	(Kwagiuɬ) ‘to be sick’
C) [xʸac̓]	(Guc̓a) ‘smoke house’	[xʸɛlac̓i]	(Kwagiuɬ) ‘smoke house’
D) [dí.gi.lac̓]	(Guc̓a) ‘tea pot’	[dí.gi.la.c̓i]	(Kwagiuɬ) ‘tea pot’

Differences between Guc̓a and Kwagiuɬ are of three main types, illustrated in Table 5.1: 1) lexical differences that involve either non-cognate stems, seen in (A) in Table 5.1, or identical or cognate forms with different meanings, seen in (B) in the table; 2) differences in pronunciations of lexical items – such as vowel quality differences, metathesis, elision, coalescence of vowels across consonants resulting in diphthongs and fewer syllables, seen in (C) in the table; and, 3) for some lexical suffixes, shorter forms which appear to have dropped the last vowel or the last CV syllable, exemplified in (D) in the table.

[29] [bú.si] ‘cat’ is also used in other surrounding Wakashan and Salishan languages and is attributed to Chinook Jargon.

5.5 Final thoughts

As I have written the final chapters of this dissertation, Emma Wallas, the elder speaker with whom I worked, passed away. I know that she is greatly missed and I feel extremely fortunate to have worked with her. Her choice to speak Guċa and not English to her children and grandchildren is of lasting impact. In allowing me to record and work with her on the language, she has helped to establish a record of the language and made a contribution to human knowledge. As one of her daughters said, "[Our parents] never spoke English to us as we were growing up. They gave us the chance to have Guċa as our language." The decision to speak the language daily is a gift to her family and broader community, connecting them deeply to their history.

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