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An Intonational Description of Mayan Q'eqchi'

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ABSTRACT

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Q'eqchi' is one of many Mayan languages spoken in Guatemala, C.A. This study provides the first Tone Break and Indices (ToBI) transcription system (Silverman et al., 1992) labeling of Q'eqchi' within the Autosegmental-Metrical (AM) model of intonation (Liberman, 1975; Pierrehumbert, 1980; Ladd, 1996). As an exploratory study into the basic intonation patterns of the language, observations were made on a variety of phenomenon relating to the intonational structure and contour pattern of the language. Three native male speakers of Q'eqchi' each provided 75 spoken sentences designed to best observe the basic patterns of intonation in the language. Each spoken utterance was analyzed through the labeling of pitch accents, phrase accents, and boundary tones in accordance with ToBI transcription guidelines (Beckman & Hirschberg, 1994; Beckman & Elam, 1997). The study reinforces previous observation on the stress pattern in the language, identifies the pitch accents and boundary tones which best describe the behavior of the intonational contour of the Q'eqchi' speakers, and proves the existence of prosodic phrases which dictate the intonational patterns of speech. In addition, the different patterns observed in declarative, imperative, and interrogative sentences are exemplified and discussed along with other phenomenon observed in the spoken data.

Keywords: Q'eqchi', ToBI, intonation, pitch

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Chapter 1: Introduction

1.1. Introduction

The research and study of prosody and intonation operates within the field of phonology known often as Intonational Phonology. Despite the fact that the study of prosody and intonation has expanded and developed extensively in recent years (Nielsen, 2005) many languages still have sparse or no in-depth descriptions of their intonational structures. Much of the work in intonation and prosody is framed within the Autosegmental-Metrical (AM) model of intonational phonology (Liberman, 1975; Pierrehumbert, 1980; Ladd, 1996) and detailed and modeled using a variety of prosodic labeling systems, such as the Tone Break and Indices (ToBI) labeling system (Silverman et al., 1992). The study of prosody and its constituent parts, such as rhythm, stress, and intonation, provides a wealth of information on aspects of human language which are not specifically encoded in the traditional fields of morphology and syntax, from which many of the grammatical aspects of language are derived. While intonation may not be as prevalent a research focus as many other linguistic subfields and aspects, it nevertheless has seen its fair share of purposeful studies showing the importance prosody and intonation has in relation to many other linguistic domains (Henriksen, Geeslin, & Willis, 2010; Henderson, 2012) .

Not only is the study of prosody a worthwhile endeavor in and of itself, it also has far-reaching application throughout both the expansive field of linguistics as well as in fields only marginally related to the traditional study of language. Many studies have shown that intonation can play an important role in the fields of both morphology and syntax, with an especially strong relationship between intonation and syntax (Cresti, 1977; Beckman & Pierrehumbert, 1986; McGregor, 1997; Henderson, 2012), as well as semantics and pragmatics (Ladd, 1980; Nielsen, 2005). For example, Henderson (2012) showed that morphological alternations are triggered at

intonational phrase boundaries in K'iche'. Henderson found that the distribution of intonational phrase boundaries, governed by syntactic structure, affected stress placement which in turn derived morphological alterations in the form of allowing certain types of status suffixes on verbal complexes to appear. The suffixes were lexically specified for intonational phrase prominence, extending the concept of morphologically controlled stress. Other studies have focused on the interaction between intonation and syntax recognition in elementary-age children (Bohannon & Friedlander, 1973). Ladd (1980), in a discussion on prosody and semantics, specifies that both focus and information structure have an effect on intonation. The pragmatic uses of specific and individual tonal patterns, such as the fall-rise contour for example, have even been studied (Ward & Hirschberg, 1988). This fall-rise contour in English, which was formerly designated to convey speaker uncertainty about some proposed value, was re-examined by Ward and Hirschberg. Using empirical data, they showed that the contour pattern had not only a potential aspect of uncertainty, but also that of incredulity, and that the primary manner in which to distinguish the two was through the pitch range employed by the speaker. Intonation may also play a crucial part in the field of second-language acquisition, being an important aspect of learning a L2 and acquiring a more native-like accent in the L2 (Henriksen, Geeslin, & Willis, 2010). Providing more research on prosody is also valuable in the developing fields incorporating and combining linguistics and technology. Automatic speech recognition and the computerized generation of speech from text, as well as related voice technology fields benefit greatly from the study and application of prosody (Wightman, 2002).

The study of intonation finds not only importance in its relation to the other sub-fields of linguistics, but also to the further understanding of individual languages, language families, and relations between those languages and others. One such language family found in Mesoamerica,

the Mayan language family, is a prime candidate for the study of intonation. The large and varied group has a multitude of languages spread across Central America, ranging in size from those of over a million speakers to those that are highly endangered with few remaining speakers (Lewis, Simons, & Fennig, 2013). While the Mayan family of languages certainly have enjoyed extensive documentation as well as thorough study in many aspects of syntax, morphology, and phonology, studies of intonation has been largely neglected (Avelino, 2009), especially within the AM model of Intonational Phonology (Nielsen, 2005).

The research described in this thesis seeks to provide observations and insight into the intonational characteristics and structure of the Mayan language Q'eqchi'. Q'eqchi', and the Mayan family of languages as a whole, has a strong history of linguistic documentation and research. Despite this, in the field of intonation, they are vastly understudied. According to Nielsen (2005), none of the Mesoamerican languages had been thoroughly studied within the AM framework until her exploratory study on intonation in K'iche', a language closely related to Q'eqchi'. This research will carry out the first research on Q'eqchi' within the AM framework with acoustic language data labeled using the ToBI system of intonational labeling (Silverman et al., 1992). It is hoped that this research will expand our knowledge of the Q'eqchi' language, the Mayan family, and add to intonational descriptions of the vast collection of the languages of the world.

1.2. Research Purposes

The research described in this thesis will be for the most part descriptive and exploratory, being the first analysis of Q'eqchi' within the AM framework and labeled using the ToBI labeling system. Despite being overall descriptive in nature, there are several concrete research

purposes that the study will focus on as it explores the structure of intonation in Q'eqchi'. An analysis of the speech of three native Q'eqchi' speakers will seek to provide answers or observations for each of these questions.

The first purpose of the study is to observe the basic intonational structure of Q'eqchi'. This includes the observation of the nature of stress in Q'eqchi', verifying that there are pitch accents associated with stressed syllables, verifying that there are phrasal tones associated with prosodic phrases, and determining what intonational or prosodic units are operational in Q'eqchi'. Each of these concepts will be explained in Chapter 2 (sections 2.1 and 2.2). The manner in which these observations will be made will be explored in Chapter 3. The majority of the answers to these questions will come from the intonational labeling and analysis of the data collected from native speakers.

Once these initial characterizations of prosodic structure have been established, the labeling of the speech data will also help answer the next research purpose. This purpose will be to determine which of the established pitch accent labels and boundary tone labels (described in detail in section 2.2.2) appear in the Q'eqchi' language and the relative frequency of these pitch accents and tones when compared to each other. A wide range of sentences was prepared to try to best allow for the common intonational patterns in the language to appear, though finding every possible contour type in the language is outside of the scope of this study.

The third purpose of the study is to establish the basic patterns of the intonational contour in major sentence types. Several sentences for each speaker will be compared with data from the other speakers to determine the pattern of declarative sentences, imperatives, and interrogatives which have been split into wh-questions, polar questions, and tag questions. Finally, the interaction between sentence order shifts and the intonational contour will also be briefly

investigated. Comparisons will be made with parallel sentences where the basic VOS (verb-object-subject) word order has been changed to SVO (subject-verb-object). This configuration moves from the unmarked predicate-initial word order of Q'eqchi' to the subject-initial word order in which the subject receives more emphasis.

1.3. Outline of Thesis Structure

The ensuing research is divided into five chapters. Chapter 2 will introduce the reader to a brief summary of Intonational Phonology as well as the Autosegmental-Metrical model in which the study operates. It will also outline the intonational labeling system known as the Tone Break and Indices system. Various studies employing this method of labeling for linguistic analysis of prosody will then be briefly discussed. Finally, a description of the Mayan language family and the focal language of this study, Q'eqchi', will be provided. The section on Q'eqchi' will give a brief overview of the language as a whole before talking about prosody-related work that has been done in the language.

Chapter 3 will outline all the relevant information on how the research was performed from beginning to end. This includes information about the participants, stimuli, the manner of data collection, the elicitation procedure, recording and analysis tools, and labeling procedures. The bulk of Chapter 4 presents the information on the analysis of the speech data provided by the native speakers of Q'eqchi'. Much of this will come in the form of visual data of the utterances as well as information on the types and patterns of the intonational contours using the appropriate intonational labels. Chapter 5 will discuss the results found within each section of Chapter 4 and how those relate back to the original research purposes of the study, as well as discussing any additional observations and findings. The chapter will finish by summarizing

each of the main goals and purposes of the study, relevant findings, and provide final thoughts, including those on possible future research.

Chapter 2: Literature Review

2.1. Intonational Phonology

2.1.1. Intonational Phonology Description

Intonational Phonology is the subfield of phonology that examines the linguistic use of phonetic suprasegmental features such as pitch, intensity, and duration. Studies in intonational phonology often operate within the analytical framework known as the Autosegmental-Metrical (AM) model or theory (Liberman, 1975; Pierrehumbert, 1980; Ladd, 1996). Intonation, at its broadest, refers to "the linguistically structured distribution of suprasegmental features, particularly tonal features, at the phrase and sentence levels" (Noguchi, 2011). Similarly, Ladd (1996) refers to intonation as the use of suprasegmental phonetic features in order to convey post-lexical and sentence-level pragmatic meanings for linguistic structures. The study of intonation is not limited to languages where pitch is part of a word's lexical entry such as in Japanese (Khan, 2008), but also those languages not defined as tonal or pitch-accent languages.

Before a brief review of the AM model, some of the major features that compromise intonation should be defined. These suprasegmental features work in tandem, providing post-lexical information to an utterance (i.e., as a spoken word or statement) for a variety of semantic and pragmatic uses. Perhaps the most basic of these is the concept known as stress. Stress is the relative emphasis placed on certain linguistic units, whether they are syllables of a word, or words of a larger utterance. Stress may be an abstract property of individual syllables, determined by various principles of prosodic organization (Noguchi, 2011), but it does have acoustic correlates. Crosslinguistically, three acoustic correlates are identified with stress: intensity, duration, and fundamental frequency (Lieberman, 1967). These three acoustic correlates are used in conjunction to determine the stress of a syllable, some being more

important in certain languages than others (Berinstein, 1979). In fairly simple terms, intensity refers to the acoustic energy or power of a sound. The acoustic measurement for intensity is the decibel (dB) and relates to the physiology of the human ear and the perception of loudness. Duration refers to the temporal length or time during which a sound or segment is produced. Though pitch and fundamental frequency are sometimes used interchangeably, there are slight differences. Pitch is the perceptual correlate of the rate of vocal fold vibration formally known as the fundamental frequency (F0) of a sound wave and is essentially the psycholinguistic reflex of the F0 of a speaker's voice (Ladd, 1996). Thus, F0 describes a physical phenomenon while pitch describes a perceptual one. Along with intensity and duration, F0 can be used to convey post-lexical information such as contrastive focus, new information, surprise, or a variety of other pragmatic nuances. Pitch is a relative measure, differing from speaker to speaker (Bishop & Keating, 2010), and is taken into account for during the analysis and labeling of the intonational contour created by pitch measurements. At its core, the study of intonation involves the post-lexical and linguistically meaningful changes in pitch across an utterance (Ladd, 1996).

2.1.2. Autosegmental-Metrical Model Description

The research described in this thesis will use the AM model and theory of Intonational Phonology (Liberman, 1975; Pierrehumbert 1980; Ladd, 1996). AM reduces the pitch contour to a string of pitch targets using contrasting High and Low tonal targets (Khan, 2008). Any complex contours are combinations of these contrasting targets, targets which aren't static or fixed, but rather relative in levels of high and low when compared to adjacent tones, prosodic alignments, boundaries, and prominence relations. One of the basic tenets of the AM model is that intonation is represented by sequences of tonal features that come in the form of pitch

accents and edge tones (Noguchi, 2011). Pitch accents generally come in two forms, nuclear and pre-nuclear. A nuclear pitch accent refers to the pitch movements that are associated with final stressed syllables. Pre-nuclear pitch accents are associated with non-final stressed syllables (Henriksen, Geeslin, & Willis, 2010). It is important to remember that even though they correlate, within AM, there is a distinction between stress and pitch accent. Stress, as discussed above, is an abstract property of individual syllables (Noguchi, 2011), determined by principles of prosodic organization and correlated with the acoustic correlates of intensity, duration, and F0, while pitch accent is a prominence-lending pitch movement on a syllable. Pitch movements may be prominent or non-prominent, the former being crucial in the formation of an accent and allowing a speaker to identify a particular syllable as being more prominent or important than other adjacent syllables.

The other tonal feature examined in AM is edge tones. These are tonal movements that, instead of corresponding to stressed syllables, are considered boundary tones in that they correspond with the edge of a variety of prosodic phrases (Henriksen, Geeslin, & Willis, 2010). An edge or boundary usually occurs at the end of a phrase, such as on the last word of the sentence "I want to go home." Edges can also occur in the middle of utterances, often signaled by a pause such as in the sentence "I would try, but you aren't allowing me to do so" where, depending on how the sentence is realized by a speaker, an edge could be found at the end of the word "try" as well as at the end of the utterance.

Within the AM framework there exist hierarchical structures of prosodic units or intonational structures. The hierarchical structure is based on the established and accepted prosodic structure model originally proposed by Selkirk (1986). This model consists of several prosodic units, moving from highest to lowest in this order: utterance, intonational phrase,

phonological phrase, prosodic word, foot, and syllable. The research described in this thesis will mainly focus on the levels above the prosodic word and thus they merit definition: utterance, intonational phrase, and phonological phrase. Within intonational phonology, these units above the prosodic word are defined only by intonation (Nielsen, 2005).

The intonational and phonological phrases are contained within an utterance, which ranges from a longer statement to a single word. An intonational phrase (IP), sometimes referred to as a phonological phrase, is the largest prosodic unit into which an utterance can be divided. It consists minimally of at least one syllable with phrasal stress and ends with a boundary tone (Pierrehumbert & Hirschberg, 1990). For example, the utterance "he did it" consists of one IP with a boundary or edge tone coming at the end of the word "it" and a phrasal stress possibly falling on any of the three words depending on the illocutionary force or intention of the speaker. Since languages behave differently in most respects, intonation included, it has been argued that the phonological phrase or IP can be split into two distinct phrase types, an Intermediate Phrase (ip) and an Accentual Phrase (AP). Each of these phrases behaves much like an IP, requiring some form of a prominent tone correlated with stress and a boundary tone depending on the language in question. The ip behaves much like the IP, differing in the fact that the cues for its boundaries, such as lengthening, perceived disjuncture, and boundary tones are not as prominent or strong as those of an IP (Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986). The AP has a similar relation to the ip as an ip has to the IP, with even weaker cues of disjuncture. If present in a language, an AP is usually defined as at least a single stressed content word, optionally including function words or clitics depending on the language (Nielsen, 2005). It is interesting to note that an AP is very similar to the Prosodic Word. Prosodic words are characterized as being the domain of word stress as well as other phonotactic and segmental word-level rules

(Peperkamp, 1999). The original version of the Prosodic Hierarchy (Selkirk, 1978) only included one level of phonological phrase, but subsequent work showed that a larger variety of phrase types existed (Selkirk, 1996). While Selkirk and Tateishi (1988) distinguished a Major Phrase and Minor Phrase, two phrases dubbed as the Accentual and Intermediate Phrases were specified by Pierrehumbert and Beckman (1988). While the domain of primary stress has been labeled different by various researchers, including Accentual Phrase and Prosodic Word (Jun & Fougeron, 2002), this thesis will use the Accentual Phrase as specified by Pierrehumbert and Beckman (1988) without attempting to dissect the possible similarities or differences between the Accentual Phrase and the Prosodic Word.

For a certain language, both or only one of these prosodic units (i.e., ip or AP) might be in operation. The ip is seen as a higher-level prosodic unit than the AP and both phrase types fall underneath the IP, the largest of the prosodic units within an utterance. Figure 2.1 details the relation and structure of the three prosodic units discussed in this section: the IP, ip, and AP. Each prosodic unit can contain one or more of a lower-level prosodic unit. At the lowest level of the structure resides the prosodic word, here labeled as W.

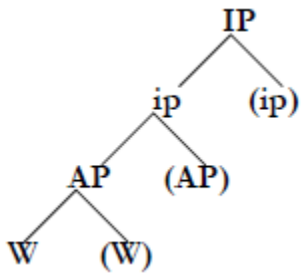

Figure 2.1: Representation of High-Level Prosodic Structure (Nielsen, 2005).

This introductory overview of the prosodic divisions within an utterance will be a key component of how the analysis in this thesis is carried out. In sections 4.1.2 and 5.1.2 these structures will be more fully explored, specifically in relation to their operation and existence (or possible lack thereof) in Q'eqchi' and how they affect the intonational analysis and labeling process of Q'eqchi'.

Metrical theories of stress assume a hierarchically organized prosodic structure and the projection of stress from a lower-level prosodic category to a higher-level prosodic category (Liberman & Prince 1977; Hayes, 1995). It is in this manner that stress and pitch accent are mapped to each other, stress coming from a lower-level category such as the syllable. The pitch accent is then associated with a higher-level structure such as an Intonational, Intermediate, or Accentual Phrase. As formalized in the Strict Layer Hypothesis (Selkirk, 1984), every prosodic constituent is dominated by one of the immediately higher level in the hierarchy. Thus, a lower-level prosodic phrase (AP) does not exist without a dominating ip or IP. Having briefly explored the theory behind intonation, we can now move towards employing a labeling system designed to capture the intricacies of the intonational contour and the prosodic structures defined and developed within AM.

2.2. Intonational Labeling

2.2.1. ToBI: Tone Break and Indices Description

The Tone Break and Indices (ToBI) system is a set of labeling conventions first developed as a standard by which English prosody could be transcribed (Silverman et al., 1992). The system is based on and works within the analytical framework of AM and Intonational Phonology (Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986). The creation of ToBI was

motivated by the desire of those working with speech from a variety of fields to have a common and established method for transcribing and representing prosody (Jilka, Möhler, & Dogil, 1999). When it was first introduced in 1992, its sole use was with English, but it has since been extended and applied to several languages and used in fields ranging from linguistics to systems engineering (Wightman, 2002). The intuitive way in which the ToBI system works has led to the ease of its adaptation for the varying intonational structures of the languages of the world.

One of the reasons for the efficacy of ToBI is that it represents prosody in categorical terms that are closely connected with not only the acoustic speech signal, but also the text and discourse structures of utterances (Jilka, Möhler, & Dogil, 1999). Its labeling conventions were created so as to best represent the tonal features most important within the AM framework, pitch accents and edge or boundary tones. These features compromise the tone part of ToBI. Used in conjunction with break indices, which will be explained shortly, the hierarchical prosodic structures of intonation, namely the Intonational Phrase, the Intermediate Phrase, and the Accentual Phrase, can be accurately defined and described. ToBI does not seek to define or label every part of the intonational contour created by the pitch. Rather, it focuses on the points of prominence, labeling pitch accent and edge tone using contrasting High and Low targets as well as combinations of the two (Silverman et al., 1992; Khan, 2008). ToBI attempts to describe the intonational contour similar to how humans use the prominent events of an intonational contour in a sentence to figure out the intended meaning rather than analyzing the exact pitch and movement found on every word in an utterance (Wightman, 2002). These tonal targets do not correspond to fixed levels in a speaker's overall pitch range, but rather in relative levels that are affected by many factors including prominence relations of words within a phrase, other adjacent

tones, alignments, boundaries, and a variety of paralinguistic phenomena such as surprise and emphasis among many others (Khan, 2008).

2.2.2. ToBI: Annotation Conventions

The labeling conventions for ToBI are both flexible and clearly outlined and can be found in a variety of online sources and tutorials (see Beckman & Hirschberg, 1994; Beckman & Elam, 1997). The need for flexibility is apparent not only when applying the labeling conventions to other languages, but also for the fact that the transcription of intonation can often be difficult and subjective in how a particular researcher labels and analyses a particular utterance (Hedberg et al., 2006a). Full ToBI transcriptions, however, have built-in components which allow for the annotation of both uncertainty and notes when it comes to labels which may be disputed.

There are six fundamental parts to a ToBI transcription as outlined in the ToBI annotation conventions created by Beckman & Hirschberg (1994). The first two consist of the audio recording of the speech and the accompanying record of the F0 contour, which is usually superimposed on a spectrogram or waveform (Khan, 2008). The other four parts consist of transcription tiers, each of which holds specific information relating to the recorded utterance and its F0/pitch contour. As part of the flexible nature of the system, more tiers may be added for additional information useful to the language at hand or to the specific purposes and aims of the transcription. The first of the four main tiers consists of a word tier for the orthographic representation of the utterance. The tone tier is used for the labeling of the distinctive tonal events of pitch accents and boundary tones. A break index tier includes the break indices, whole number integers corresponding to the perceived juncture between the words of the utterance. Finally, the miscellaneous tier includes additional information and notes on the labels employed.

A comprehensive explanation of all the annotation labels and conventions will not be given here. They can be found in online tutorials and courses (see Beckman & Hirschberg, 1994; Beckman & Elam, 1997). A brief overview of the labels will suffice.

The tone tier marks both pitch accents and boundary tones. Pitch accent tones are marked on every accented or stressed syllable in the utterance. The basic set of pitch accent tones, which may be modified upon depending on language, consists of a peak high accent (H*), low accent (L*), scooped accent (L*+H), and rising peak accent (L+H*). These each describe the condition of the F0 contour for the duration of a stressed syllable. The latter two are bitonal tones with the starred (*) member reflecting which of the two tones lends more prominence to the pitch accent and are used when the high peaks and low valleys do not align closely to the middle of a stressed syllable of a word. High pitch accents may also be labeled with an accompanying (!) signaling downstep. Downstep, or catathesis, was first proposed for English by Pierrehumbert (1980) and is a natural process which compresses and lowers the pitch range in certain circumstances (for example, as an utterance goes on and a speaker begins to run out of their breath thus causing the relative pitch to lower). Without catathesis a theory of intonation would need to posit six or seven phonemically distinct tone levels for English (Beckman & Pierrehumbert, 1986).

The phrasal tones associated with the boundaries of the Intermediate (ip) or the Intonational Phrase (IP) also reside in the tone tier. The ip is labeled with one of two basic phrase accents, (L-) or (H-). An utterance is made up of one or more IPs which in turn consists of one or more ips. Accordingly, the end of an IP is by definition also the end of an ip, and thus an IP boundary has two final tones (Jilka, Möhler, & Dogil, 1999). For this reason, the IP adds upon the ip labels by adding a final boundary tone. These include the labels (L-L%), (H-H%),

(L-H%), (H-L%), among others modified by the downstep label described above. These labels describe, first, the relative pitch prominence from the last accented syllable of the utterance (L- or H-), and, second, the behavior of the F0 contour as the utterance ends (H% or L%). An example of the difference in behavior can be found in the difference between Wh-questions (H* L-L%) and yes/no questions (L* H-H%) in English (Jilka, Möhler, & Dogil, 1999). Wh-questions in English tend to begin with a high pitch and end in a falling pitch while yes/no questions begin with a lower pitch and a perceptible rise in pitch as the utterance ends, used to indicate that despite the lack of a Wh-question word, the utterance is indeed a question.

The break index tier, while somewhat redundant in the case of ip and IP marking, serves to label the degree of juncture perceived between each word in the utterance, as well as the final word in the utterance with the ensuing silence. The break indices are whole integers ranging from 0 to 4, each indicating a larger juncture than the previous. In the original ToBI developed for English, the number 0 represents a juncture that has essentially been erased, such as the combination of words through phonetic processes such as the palatalization that can occur between 'did you' or a flap essentially connecting two words such as 'hit it' in English. A 1 represents a normal disjuncture between words. A 2 signals a stronger than normal disjuncture, but one without any tonal mark disruptions. It essentially marks a pause or virtual pause that does not display the expected tonal marks of an intermediate phrase. A 3 is always associated with the end of an ip and its phrase accent in the tone tier. Finally, a 4 signals the end of an IP and is always accompanied by a boundary tone in the tone tier. To account for disfluencies, the letter 'p' may be attached to the break indices 1, 2, or 3, signaling various hesitations, elongations, and cutoffs. The break indices can be modified for use with other languages.

The miscellaneous tier may be used as needed by the transcriber to provide additional notes on the transcription. As discussed earlier, the marking of intonation can be subjective, and ToBI was accordingly modified to optionally include an alternative tier for the marking of uncertainties or alternative interpretations of a pitch accent or boundary tone. In the case of uncertainty, the tone tier may contain labels such as (X*?), (*?), (X-?), and (X-H%) to indicate uncertainty about a specific tone with possible suggestions marked in the alternative tier. Break indices can also have uncertainty added to them with the addition of a hyphen (-) to the end of the number. Figure 2.2 illustrates a typical English ToBI transcription from the MIT ToBI course which uses many of the conventions described in this section.

In summary, the ToBI transcription system is designed to serve a variety of research fields, research purposes, and personal interests in prosodic transcription. ToBI is a flexible system so as to allow the researcher to best transcribe their material while still functioning within an established and recognized standard. Most importantly, perhaps, is that these factors have allowed ToBI to accurately label the prosodic characteristics of not only English, but a variety of vastly different languages across the world.

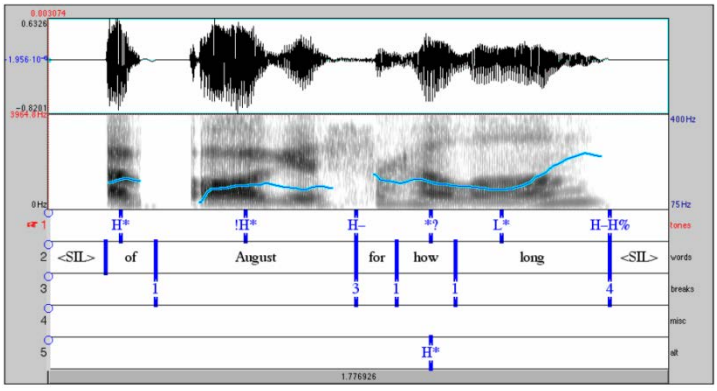

Figure 2.2: Example of a ToBI Transcript (Veilleux, Shattuck-Hufnagel, & Brugos, 2006).

2.3. Studies in Intonation

2.3.1. Intonation in the Languages of the World

The purpose of this section is to emphasize the fact that the study of prosody and intonation is by no means an uncommon and limited field within linguistic and phonological research. The study of intonation extends well beyond the most common and well-studied languages within the field of linguistics, many of those well-studied languages being Indo-European languages. The expansion of intonational studies from the commonly-studied languages, such as Spanish (Henriksen et al., 2010), to less-studied languages, such as intonational descriptions of Kwak'wala (Noguchi, 2011) and Chickasaw (Gordon, 2005), is a welcome sight since intonation and prosodic organization differ from language to language, and sometimes even from dialect to dialect (Nielsen, 2005). While many of the same principles may apply, any given language should have its own description of its particular prosodic organization. Before looking at some of the few studies on intonation done with Mayan languages we will explore studies of intonation that have involved either the use of existing ToBI labeling conventions or the development and modification of the system for use in a new language.

2.3.2. ToBI-based Analyses in the Languages of the World

This section will highlight several of many studies using ToBI without going into in-depth detail on each, so as to exemplify that the system can be used for a variety of research questions, provide useful information, and be adapted to be used in any language as will be done in the research of this thesis. ToBI was originally developed for English (Silverman et al., 1992), but the inherent flexibility and adaptability of the system has allowed it to be employed in a

much greater context. This section exemplifies that ToBI has both great depth and breadth in its application, both in English and beyond.

ToBI has enjoyed use in many studies on English prosody. Studies such as these have provided valuable information on intonational patterns, such as observing that topic completion is signaled by final lowering, and providing the basic patterns of declaratives and Wh-questions (H* L-L%), polar questions (L* H-H%), and confirmation questions (H* H-H%) among others (Jilka, Möhler, & Dogil, 1999). Some studies have focused heavily on question intonation patterns, including studies looking at meanings associated with contours for over a hundred polar questions (Hedberg et al., 2006a) and others comparing the intonational patterns of five distinct syntactic types of questions in English (Hedberg et al., 2006b). In the exploration of the properties of bitonal tones (Dilley, Ladd, & Schepman, 2005), it was found that within a bitonal segment, such as (L+H*), the two tones are aligned with respect to a segmental string rather than with respect to each other. Comparing the intonational structure of two languages can also be achieved using ToBI. Using labeling conventions previously developed for use in Japanese and English (Beckman & Pierrehumbert, 1986), Campbell (1995) noted that for English and Japanese "the precise nature of accent is not identical in the two languages; there is a fundamental likeness in that it involves an association between some well-defined pitch shape in the melody." Comparing the two, Campbell (1995) found Japanese to only have six patterns of pitch accent shapes, compared to the richer set found in English, despite the fact that Japanese is classified as a pitch-accent language while English is not.

ToBI has been and is being adapted into use for many languages besides English. An English dialect known as Glasgow English has its own ToBI system, known as GlaToBI (Mayo et al., 1997). Its adaptation on the system involves the fact that the two original ToBI rises

(L+H* and L*+H) do not adequately describe the Glasgow pitch rise and have has thus been replaced by one compound pitch accent (L*H). A version of ToBI develop for Greek adds several new tiers to allow for special stress and juncture annotations, adapted to the prosodic organization of the Greek language (Arvaniti & Baltazani, 2000). In addition, the simplicity and adaptability of ToBI allowed for the creation and modification of certain pitch accent labels to better characterize and describe the prosodic system of Greek. K-ToBI, a system used for the standard Seoul dialect of Korean, specifies for the AP and ip phrases and uses phonological and phonetic tone tiers to accommodate the tonal complexities of APs in Korean (Jun, 2000). Several other languages also have fully or partially developed ToBI systems including Cantonese (Wong et al., 2005), Spanish (Beckman et al., 2002), Japanese (Beckman & Pierrehumbert, 1986), and German (Grice & Baumann, 2002; Fery, 2012). Many others without a full description still employ the labels, tiers, and conventions used in ToBI, such a study on intonation in Bengali (Khan, 2008), and a few studies within the Mayan language family (Nielsen, 2005; Avelino, 2009). A closer look at these studies within the Mayan languages, as well as a few others, will be detailed in following sections. In summary, ToBI has shown itself to be a useful tool from which a wealth of prosodic knowledge can be derived in a wide variety of languages.

2.4. The Mayan Languages

2.4.1. Description of the Mayan Family

At the heart of the Mesoamerican Linguistic Area, the vibrant Mayan language family is spoken by over six and a half million speakers today (Lewis, Simons, & Fennig, 2013). The Mayan languages are spoken predominantly in Guatemala, Southern Mexico, and Belize (see

Figure 2.3). The Mayan language family contains around thirty contemporary spoken languages, ranging from a few highly endangered to thriving languages in communities where the Mayan language functions as the primary mode of communication. Mayan has a robust and long history of linguistic documentation, classification, and study, including both that of ancient hieroglyphic inscriptions to the modern-day languages stemming from a common proto-Mayan ancestor.

Figure 2.3: Geographical Distribution of the Mayan Language Family (Law, 2011).

A wide range of literature from many of the Mayan languages has established some of the general linguistic characteristics of the family as a whole. Mayan languages are head-marking, mildly agglutinative, and are morphologically synthetic (Law, 2013; Suaréz, 1983). Word order is flexible with the unmarked order in the majority of the languages being VOS or VSO (England, 1991) and a variety of other configurations are possible, used to express different pragmatic and semantic senses or discourse-related phenomena. Factors such as animacy also have an effect on allowable and preferred word orders (Caz Cho, 2004). The Mayan languages tend to exhibit both morphological and syntactic ergativity, though nominative-accusative

patterns may be exhibited in certain languages under various contexts such as aspects, syntactic contexts, or person (England, 1983; Law, 2013). Some of the Mayan languages also have well-developed systems of numeral and noun classifiers and the family as a whole makes heavy use of a positional word class. Positionals are CVC roots that refer to physical states and positions that can be taken by both animate and inanimate objects and also includes information such as shape, orientation, aperture, suspension, and light-reference (Knowles, 1984).

The current family tree for the Mayan languages has been relatively unchanged since its proposal and subsequent revisions by Terrence Kaufman in the late 1960s and early 1970s (Campbell & Kaufman, 1985; Law, 2013). While the specific relations between each language may yet be uncertain and occasionally disputed, there exists broad agreement concerning the major subgroups of the family. The Mayan language family is split into the five main groups of Huastecan, Yucatecan, Cholan-Tzeltalan, K'ichean-Mamean, and Q'anjob'alan-Chujean (Campbell & Kaufman, 1985). The latter four may be classified together under a Yucatecan-Core Mayan classification distinct from the smaller Huastecan branch (Lewis, Simons, & Fennig, 2013).

2.4.2. Intonation Studies in Mayan

Many of the Mayan languages have abundant documentation and long traditions of scholarly work. However, this does not hold as true for research dealing with intonation and prosody (Avelino, 2009). While there haven't traditionally been many dedicated studies on the intonational characteristics of the Mayan languages, more studies have arisen in the last decade. Some of these studies were helpful in the construction of the methodology for the research on Q'eqchi' discussed in this thesis. Some of these studies will be briefly explored in this section

and subsequently brought up again in relation to the methodology and results of the research performed in this thesis in the subsequent chapters.

Yucatec Maya, spoken in southern Mexico, has received some recent attention for its tonal features (Archibald, 1996; Gussenhoven & Renske, 2008; Avelino, 2009). Avelino (2009) examined the intonational patterns found in the varying word orders found in Yucatec Maya, specifically comparing those of the unmarked VOS structure and the topic and focus constructions of a SVO structure. He found that the LH* pattern was the most common pitch accent and that it was often aligned to the right edge of a prosodic phrase in both broad and narrow focus constructions, as well as in general topic-focused constructions. His data also showed, however, that for some speakers the alignment was relaxed and the peak prominence was not always aligned to the edge of a prosodic boundary. In an exploratory description of Tseltal (Shklovsky, 2011), phrasal tones and pitch accents were examined in a variety of declarative, interrogative, and imperative sentence types. The utterance-final pitch events were found to be associated with the phonological phrase rather than phonological words, varying from how many other languages operate, and further evidence was provided showing that tone was indeed tied to the phrase rather than the word. Other interesting observations relating to stress and the lengthening of syllables as well as the fact that all noun phrases (NPs) found in initial position projected their own intonational phrase may come into play in analysis of the Q'eqchi' data.

Of last mention are a few studies in K'iche', the most widely spoken Mayan language in Guatemala, and one of the closest relatives to Q'eqchi', the language analyzed in this thesis. Henderson (2012) provides strong phonological evidence for the late insertion of morphemes, these corresponding with phrase boundaries. Henderson argued that several morphological

alternations occurred at the right edge of IP boundaries in K'iche'. The alternations occurred in order to ensure the optimal host for the prominence peak which was required at the rightmost edge of the IP. The exhaustive analysis explored the syntax-phonology-morphology interface in K'iche' through an analysis of intonational behavior. Even studies on children have been done in K'iche', showing that higher pitch in baby-focused talk is not universal (Ratner & Pye, 1984).

Perhaps the most valuable study in relation to the research of this thesis is an exploratory description of intonation in K'iche within the AM framework (Nielsen, 2005). The study presents one of the first, if not the first (Nielsen, 2005), analyses of a Mayan language specifically using the AM model. Nielsen found the language to contain both APs and ips below the highest-level IP. After determining the nature of stress in the language, the study went on to examine and label several of the most common sentence types and many of the results of this K'iche' study will be useful to compare with the Q'eqchi' data of this study as the results are discussed. Nielsen's study only went as far as labeling the pitch accents and edge tones, concluding that the next step towards making full use of the ToBI transcription system was to add break indices, expanding upon the initial tonal labeling, and using a wider array of sentence types and additional speakers of the language. The research in this thesis will use this study as a reference and comparison several times in the subsequent sections and chapters.

2.4.3. Q'eqchi'

The language employed in this thesis, Q'eqchi' (ISO 639-3: kek), holds its place among the Mayan languages as being one of the largest geographically spread (Kahn, 2006; Romero, 2012), being one of the largest Maya linguistic groups in size, and having one of the largest percentage of monolingual speakers. Q'eqchi' is part of the K'ichean branch of the K'ichean-

Mamean subgroup of the Mayan language family. Separated perhaps the furthest from the other members of the K'ichean branch (Campbell & Kaufman, 1985), it has the second largest speaker population of the branch, second only to K'iche' (Law, 2013). Q'eqchi' employs 23 phonemic consonants, ten standard vowels, and four diphthongs, as is demonstrated in the consonant vowel inventory found in Table 2.1. Most of the stops and affricates have a contrasting ejective counterpart, with the bilabial stop contrasting with an implosive stop rather than an ejective stop.

Table 2.1: Phonemic Inventory (IPA) of Q'eqchi' (adapted from Caz Cho, 2004).

	Bilabial	Alveolar	Postalveolar	Velar	Uvular	Glottal	Vowels	
Stops	p ɓ	t t'		k k'	q q'	ʔ	a	aː
Nasals	m	n					e	eː
Affricates		ts ts'	tʃ tʃ'				i	iː
Fricatives		s	ʃ	X		h	o	oː
Trills		r					u	uː
Laterals		l					ai	ei
Semi-Vowels	w		j				oi	ui

Q'eqchi', much like its close relative K'iche', employs an ergative-absolutive agreement system without case marking on nominals. With no nominal case marking, it is a pro-drop language, possessing only emphatic pronouns (Henderson, 2012). The basic word order is VOS (Caz Cho, 2004) and a variety of other word orders are allowed, SVO being the most common of the alternate word orders. Inflectional morphology, as well as tense, aspect, and mood marking are achieved through verbal prefixes and clitics, while derivational morphology is suffixed to the verb root (Henderson, 2012). Verb roots lie at the core of the language and verb classes are marked with status affixes depending on how they are classified according to tense/aspect/mood, transitivity, and whether or not they are verb roots or derivations thereof. Despite having a large

and growing speaker base, many being monolingual, Q'eqchi' has not been studied as much as some of its contemporary and neighboring Mayan relatives.

The Q'eqchi' language originates in Guatemala, specifically in the north-central department of Alta Verapaz. While the heart of Q'eqchi' culture and population lies in and around Cobán, the capital of Alta Verapaz, the Q'eqchi' have been expanding into other territories since the beginning of Spanish conquest in the middle 16th century (Bierman, 1960). For dispossession of land, tributes, and other varying modern economic reasons, Q'eqchi' has certainly become the most rapidly expanding indigenous language in the Americas (Romero, 2012). Today Q'eqchi' can be found all across Alta Verapaz and extending up into the northern department of Petén. Diaspora communities can also be found in the neighboring countries of Belize and El Salvador. The Q'eqchi' language is steadily growing not only in geographical extension, but in speaker population as well, with more than 823,000 speakers (Lewis, Simons, & Fennig, 2013), the vast majority residing in Alta Verapaz and extending into southern Petén and Belize.

Dialectal variation is minimal in the two dialect groups of Q'eqchi', the Western dialect and the Eastern dialect. The Western dialect, also considered to be the prestige dialect, is spoken in the western areas of Alta Verapaz, namely Cobán, Carchá, and Chamelco. The Eastern dialect is spoken in the eastern Alta Verapaz areas of Lanquín, Cahabón, Senahú, Panzós, and Tucurú (Becker & Cauec, 1994) and extends into the Petén department and into Belize. Dialectal differences fall predominantly within the sphere of phonological and lexical differences (Caz Cho, 2004), and have not been identified to have any major prosodic or intonational ramifications. Table 2.2 and 2.3 highlight a few phonological and lexical differences between the two dialects. These lexical differences most likely exist due to both the geographical

distance between the dialect groups and the lack of an abundance of written material that could have existed to standardize certain uses.

Table 2.2: Phonological Isoglosses Defining Western & Eastern Q'eqchi' (Becker & Cauec, 1994).

Western	Eastern
w > kw/ _V	w
y > ty / _V	y
t	/t/ > tʃ, c / _V
ɓ	/ɓ/ > 0 / _#

Table 2.3: Some Lexical Differences between Western & Eastern Q'eqchi' (Becker & Cauec, 1994).

Western	Eastern	Gloss
A:q	Kuy	Pig
Haʔax	Kuʃ	Throat
Kaʃlan	Ti:lan	Chicken

A mixture of the dialects is common, especially in many lowland villages, as inhabitants of various regions migrate and conglomerate together (Romero, 2012). Thus, lexical choice and phonological variations are common within each dialect from township to township. The three speakers from whom the data of this thesis originates all hail from the same region, specifically the municipality of Senahú, Alta Verapaz, which falls within the sphere of the Eastern dialect of Q'eqchi'. Since there appear to be no documented dialectal differences in intonation and because overall differences between dialects is quite minimal, observations made from these three speakers could hold true to Q'eqchi' in general, rather than to a specific dialectal group. However, further research including speakers from the Western dialect would be needed to confirm this.

Many of the Mayan languages, Q'eqchi' included, have long histories of linguistic documentation, beginning with the interactions between the native inhabitants of Central America and European explorers and missionaries. Modern-day linguistic work in Q'eqchi' has focused in the areas of morphology, syntax, semantics, and anthropological linguistics. Q'eqchi', as other Mayan languages, is mildly agglutinative and possesses rich morphology. Work on various morphological phenomena in Q'eqchi' includes the interaction of ergative clitics and possession (Freeze, 1976), aspectual marking (DeChicchis, 1996), and complex systems for inalienably possessed items (Kockelman, 2007a). In syntax, existentials and locatives (Freeze, 1992) and modal clitics (Kockelman, 2006), among other syntactic phenomena, have been investigated. In the field of semantics, DeCormier (1979) outlined how a certain particle used in varying contexts and situations can denote special timing and special relations between interlocutors. Kockelman (2003) detailed the interjections used in Q'eqchi' and how each was employed in reaction to social contexts. Many interesting studies in the field of anthropological linguistics, which studies the relation between the language and culture, detail fascinating information that shows how important culture is to the use and development of the accompanying language (Boremanse, 2000; Kockelman, 1999; 2007b).

As we move towards the study of intonation in Q'eqchi', we must first acknowledge the tradition of phonological work that has occurred in Q'eqchi', intonation being a subset of the whole within the field of phonology. Much of the Q'eqchi' work in the field of phonology has been carried out by Campbell. In his work, Campbell (1974) described many of the phonological rules operating in Q'eqchi' such as consonant-cluster simplification through deletion, vowel lengthening and shortening, voicing alternations, and consonant fortition or lenition. Though the intonational analysis that is forthcoming does not overly concern itself with

the individual sounds produced, some of the phonological alternations may have interactions with intonational tone boundaries and patterns. Though not as abundant as research in the previously mentioned fields, further work in phonology and phonetics can be found on topics such as stress perception and duration (Berinstein, 1979) and the production of ejectives by both native and L2 speakers of Q'eqchi' (Wagner & Baker-Smemoe, 2013).

2.4.4. Prosody in Q'eqchi'

Work in prosody, specifically intonation, in Q'eqchi' is virtually non-existent, with what little description that exists focused on word and sentence stress rather than the working of the intonational contour. Q'eqchi' has fixed word-final stress with very few exceptions (Stewart, 1980). While most borrowings from Spanish are modified to fit this stress pattern, usually by the dropping of the final vowel and lengthening of the penultimate where the stress in Spanish occurs (Wichmann & Hull, 2009), a few borrowings escape this modification and retain stress in a position other than word-finally. Kockelman (2003) also noted an interjection, '*uyaluy*', which is a reduplicative interjection formed through a nonstandard morphological form and has a syllable-initial stress. This study on interjections is one of the few studies in Q'eqchi' that makes mention of the intonational contour. It only does so in passing reference as to what type of an intonational contour a certain interjection seems to be paired with and whether or not it carries its own stress, specifically citing that the interjection differed from one use to the other when spoken with a rising intonational contour. Acoustic parameters such as amplitude, peak F0, and peak intensity have been found to correlate well with stress in Q'eqchi' (Berinstein, 1979).

Berinstein (1979) compared English, Spanish, and Q'eqchi' vowel duration and stress perception. She found that duration was not a cue for stress in Q'eqchi' seeing that the average

durational difference between the stressed and unstressed vowels was statistically insignificant. Compared to English which uses both position and duration of vowels to indicate stress, in Q'eqchi' only position is of import, with vowel duration not showing any signs of having an effect on stress perception (Berinstein, 1979). She hypothesized that duration already had a high functional load in Q'eqchi', being used for phonemic contrasts, and thus was not employed to indicate or signal stress. The vowel system in Q'eqchi' employs ten vowels, five of them being phonemically lengthened variants of the other five (Caz Cho, 2004). Her observations seem to hold true as the phonemically lengthened vowels do not usually occur in the word-final position where the stress is located, showing that the length of a vowel is not what leads to perception nor attraction of the stress in Q'eqchi'.

This lack of study and data on Q'eqchi' prosody warrants the need for such studies to be undertaken. The methods of the AM model and the accompanying labeling system provided by ToBI allows for a robust intonational description of the language, helping to answer, at least in part, the questions posed by this thesis. The application of AM and ToBI will provide empirical data and evidence showing the basic stress and tonal patterns of Q'eqchi' and which types of intonational phrases are operational in the language. Further exploration and labeling of spoken Q'eqchi' will reveal many of the common pitch accents, tone boundaries, and tonal patterns used in common sentence types such as declaratives, interrogatives, and imperatives. Some of the strongest underlying motivations of the research in this thesis are to provide intonationally labeled language data and to shed further light on the intonational properties of Q'eqchi'. Hopefully, the results and observations of this research will merit further exploration of the subject in the future.

Chapter 3: Methodology

3.1. Data Collection

This section focuses on the data collection process for the language data needed to engage and attempt to answer the research purposes of the study. This chapter discusses the participants in the study, the formation and rationale behind the stimuli that were employed, the method in which these stimuli were elicited from the participants, and the method of data analysis. In totality, the language data samples used for the study consisted of a collection of 225 total utterances coming from the native Q'eqchi' participants and recorded on an Olympus DM-620 voice recorder at a 48,000 Hz sample rate.

3.1.1. Participants

Three native speakers of Q'eqchi' were utilized in this study. The foremost reason why only three speakers were used was the limited availability of native speakers outside of Guatemala and Belize. A larger participant pool would have necessitated an international trip to gather this data. The three speakers were all Guatemalan citizens, having lived in Murray, Utah for the last five years. The participants, ages 35, 35, and 28, were all from the Senahú municipality in Alta Verapaz, Guatemala, with two of the speakers from the town of Senahú and one from a neighboring village, Seococ. Each of the speakers was male, this limitation again partly due to the limited access to native speakers of Q'eqchi' and partly for ease of comparison between the speakers without having to account for gender differences in pitch. The participants were all fluent in Spanish as a second language. Their English proficiency was elementary, being able to understand some English phrases and vocabulary, but not being able to speak it outside of some limited vocabulary items. A very brief questionnaire indicated that Q'eqchi'

was still used frequently amongst themselves as they all lived together as well as being used with family at home through telephone communication. While only three speakers were recorded, intonational studies, especially those on smaller and less-common languages, are often carried out with only three to five speakers (Avelino, 2009; Henriksen, Geeslin, & Willis, 2010; Shklovsky, 2011) and sometimes as few as only one language consultant (Nielsen, 2005). Certainly, any claims and observations made by this study will benefit from a more in-depth study with a larger number of participants of each gender, a wide age range, and with participants currently living in the context of their own language and culture with little to no possibilities of interference from other languages.

3.1.2. Stimuli

The analysis of all the prosodic and intonational patterns and subtleties of a language can be daunting, and therefore it was determined that the optimal manner to address the research purposes of the study was to initially focus on patterns detectable in different sentence types. The stimuli used for the study were crafted so as to best serve this focus. The most basic sentence types studied in intonation studies are normal declarative sentences, interrogative questions, and imperative commands. Making these a focal point of the study allows for interesting comparisons with other languages such as English (Hedberg et al., 2006a; 2006b) and more importantly with other more similarly-structured Mayan languages such as K'iche' and Yucatec (Nielsen, 2005; Avelino, 2009). Declarative sentences were constructed in the predicate-initial unmarked word order exhibited in most Mayan languages (Shklovsky, 2011; Caz Cho, 2004). Interrogatives were divided into three types, wh-questions, polar (yes/no) questions, and tag questions.

Sentences also differed in terms of word order. In an analysis of Yucatec intonation, Avelino (2009) focused on the effect of word order shifts from the unmarked Yucatec word order to other allowable word orders in the language. Following that pattern, several additional utterances were modified from existing declaratives and interrogatives in which the unmarked VOS Q'eqchi' word order was shifted to SVO so as to be able to observe any effects this would have on the intonational patterns. Since the preverbal space is often used for the emphasis of a subject cross-linguistically (Caz Cho, 2004), it may be possible to see if the SVO configuration displays any differences in how the utterance is produced from the unmarked VOS form which puts no particular emphasis on any of the constituents of the utterance.

Sentences also differed in terms of length, ranging from as small as a monosyllabic word to utterances with as many as seven to nine words and thirteen to fifteen total syllables. Most roots in Q'eqchi', and many Mayan languages, are monosyllabic but increase in syllable count as various morphemes are added, especially for verbs which are modified by a variety of affixes and clitics to convey the needed tense, mood, and aspect distinctions. A variation in sentence length for each type of sentence allowed for analysis of the higher-level prosodic units such as the intermediate phrase and to observe the pitch accent and boundary tone patterns found in different contexts. Additionally, sentences were constructed using as many voiced sounds as possible, allowing for easier tracking of pitch so as to be able to facilitate accurate labeling of the intonational contour. Table 3.1 contains total count of how many declarative, imperative, and interrogative sentences were used. The table also lists how many sentences used SVO order instead of the predicate-initial and default VOS order used for all other sentences. The full list of stimuli including the Q'eqchi' sentence and their corresponding English glosses can be found in Appendix A.

Table 3.1: Stimuli Categories and Token Counts

Stimuli Type	Total Tokens (75)
Declarative	31
Imperative	9
Interrogative: Wh-Question	9
Interrogative: Polar Question	12
Interrogative: Tag Question	3
Declarative: VOS → SVO	8
Interrogative: VOS → SVO	3

3.1.3. Elicitation Technique

The manner and form of elicitation varies from study to study depending on the ultimate research goals of a particular research study. Finding the correct balance between the spontaneity of language and acquiring the data needed while still aiming to capture speech production representative of natural speech can be a difficult task (Swerts & Collier, 1992). Various researchers have examined which are the best methods for elicitation, attempting to ascertain the optimal elicitation methods. Warkentyne (1972) explains that there are several methods for acquiring data for intonational analysis, ranging from a researcher utilizing their own usage patterns, to the assembly of large corpora of unprompted speech. The former would be impractical for any study other than an examination of one's own speech while the later might be impractical in many situations due to the sheer enormity of such a task. In many cases a "method of deliberate elicitation" is required (Warkentyne, 1972). One of the bigger challenges of collecting data for a study dealing with the acoustic properties of intonation is that to be able to examine speech in a controllable and consistent manner, the language data will in some senses be restricted in both "nature and quantity" (Swerts & Collier, 1992). Though not employed in this study after some deliberation, the naturalistic production of a story by a participant can be an

effective way to elicit many of the components of natural speech (Southwood & Russell, 2004; Khan 2008). Southwood & Russell (2004) found, in a comparison of data generated for children's speech, that story generation yielded maximum performance when compared to other techniques such as conversation and free play. It, however, also generated larger and more complex data sets, perhaps not optimal for an exploratory study on intonation patterns.

The general consensus on speech elicitation was that a study should employ the best method possible to find proper balance and to facilitate the exploration of the research goals of the study (Warkentyne, 1972; Southwood & Russell, 2004). It was the aim of this research to find a balance in both of these aspects, attempting to elicit natural-sounding sentences albeit their construction taking into account things such as an abundance of voiced sounds to best allow for proper pitch tracking. Elicited conversation-style speech may be in nature more restricted than a collection of purely spontaneous speech samples, but for the purposes of this research, elicitation of controlled sentences aimed at mimicking natural speech allowed for more consistency in analysis and ease of comparison between participants that produce the same set of data.

A common practice in many intonation studies (Nielsen, 2005; Khan, 2008; Zheng & Pierrehumbert, 2010) is to present the participant with a set of data and allow them to familiarize themselves with what is to be said and in what manner it is to be done. This is of significant importance, as there are noticeable differences between speech that is spoken and speech that is read (Mayo et al., 1997). These differences could potentially have effects on the intonation contour produced as well as the fluidity and naturalness of the speech samples. Thus following methods of previous research, in this study the participants were allowed to read and familiarize themselves briefly with each utterance in a section before recording began. The participant and researcher both situated themselves close to the recorder and the stimuli were uttered by the

participant to the researcher so as to best simulate a real-life use of each utterance in the context of a conversation rather than simply being read off of a list. Each stimulus was recorded three times to ensure the capturing of each utterance with a clear and identifiable pitch throughout in case of anomalous interference with the recording software or other unforeseen difficulties. The first of the three recordings was used unless the sentence had been uttered incorrectly or the pitch tracking did not capture it correctly.

3.2. Data Analysis

After the completion of the data collection, acoustic analyses of the data were completed using Praat version 5.3.37 (Boersma & Weenink, 2013). The majority of this analysis was composed of a detailed ToBI-styled labeling of each utterance produced by the three participants[1]. The analysis was performed by a visual observation of the waveform and accompanying spectrogram with the accompanying pitch tracking of each utterance. There are a wide variety of acoustic properties of speech that are of utmost importance in observing the intonational patterns in a language, namely pitch measurements, durational properties of syllables, and other perceived pauses and separations between the different elements of an utterance. These various properties can be labeled and described by using the aforementioned labels and diacritics of a ToBI-style labeling system.

The majority of the remainder of this section will describe the specifics of the labeling procedure and the minor adjustments made in adapting the original ToBI labeling protocol (Beckman & Hirschberg, 1994) so as to best represent and highlight the important prosodic structure of Q'eqchi'. As no such analysis of Q'eqchi' exists, observations from the data generated by this study as well as methods from other languages were used as inspiration for the

[1] The full annotated set of data can be accessed at: http://linguistics.byu.edu/thesisdata/Wagner-QeqchiIntonationData.zip

Q'eqchi' labeling, especially those used in other closely-related Mayan languages such as used by Nielsen (2005) for K'iche'.

3.2.1. ToBI: Organization of Labeling Tiers

ToBI was initially developed with four main tiers for capturing all the relevant intonational data of a particular utterance (Beckman & Hirschberg, 1994). These consist, as explained in section 2.2.2, of a tone tier, an orthographic tier, a break index tier, and a miscellaneous tier. Optionally, the alternative tier is introduced in case of ambiguity in tone labeling. Various other languages employing ToBI modify some of these tiers to best fit the language, such as the stress and juncture tiers in Greek ToBI (Arvaniti & Baltazani, 2000) and the phonological and phonetic tiers to accommodate tonal complexities in the Korean K-ToBI system (Jun, 2000). The labeling of the Q'eqchi' data called for no special considerations that warranted the addition of additional tiers, but employing the otherwise almost empty miscellaneous tier, a basic gloss into English was added to aid in the understanding of the structure and components of the Q'eqchi' sentences.

3.2.2. ToBI: Labeling of Tones

Section 2.2.2, in addition to describing the labeling tiers, details a variety of tone labels used within ToBI. Since the tone labels are what effectively describe the behavior of pitch throughout an utterance, most of the effort in a ToBI transcription is put towards marking pitch accents correctly. Not all types of pitch accent tones are used in each language, and language-specific implementations of ToBI modify or create tones to best describe the pitch movements of that language as has been discussed previously in section 2.3.2 (Mayo et al., 1997; Arvaniti &

Baltazani, 2000; Jun, 2000). Not all tones manifested themselves in the 75 unique Q'eqchi' utterances that were elicited from the three participants. The pitch accent tones realized came in the form of a low, a high, and a rising tone. The high and rising tones also had a downstepped variant marked with the '!' symbol. In addition, an upstepped variant of the pitch accents, upstepping being defined as the "expansion of the pitch range that raises subsequent tones" (Beckman et al., 2002) and working in the opposite manner as downstep, was indicated with the '^' symbol. The L+H* label, marking a rising peak accent with prominence given to the high tone, was represented as simply LH*, mainly for ease of labeling and simplicity. Table 3.2 details the tones used for the labeling of the data.

Table 3.2: Pitch Accent Labels in Q'eqchi'

Label	Description
H*	High Tone
L*	Low Tone
LH*	Rising Tone (with prominence given to the High)
!H*	Downstepped High Tone
L!H*	Downstepped Rising Tone
^LH*	Upstepped Rising Tone

The Q'eqchi' data was labeled according to a system which employs the three high-level prosodic phrases, the Intonational Phrase (IP), the Intermediate Phrase (ip), and the Accentual Phrase (AP). The existence of APs in the language was made evident from the data, explored in Chapter 4 and Chapter 5, and is corroborated by the existence of the AP in the closely-related K'iche' (Nielsen, 2005). Each of the three high-level prosodic phrases is often characterized by the lengthening of the final syllable or segment, and this is seen cross-linguistically (Khan, 2008). Each of the high-level prosodic phrases also comes with its own boundary tones, an IP having

the strongest or most perceptible one, and an AP having the weakest, or least perceptible one. The lengthening that can occur at the end of the prosodic phrase is also related in a similar fashion, with an IP's lengthening being longer than that of an ip, and an ip's lengthening longer than that of an AP's. The IP ends in a full boundary tone indicated by the % symbol, L-L% being an example of a falling intonation pattern. The ip boundary is not as pronounced; only receiving the L- symbol as an indication of a falling tone at the ip boundary, but not a boundary tone either as low in the pitch range or falling as much as that of an IP. The AP had a conditional high edge tone. Table 3.3 details the boundary tones used for the labeling of the data.

Table 3.3: Boundary Tone Labels in Q'eqchi'

Label	Description
H-H%	High & Rising IP boundary
L-L%	Low & Falling IP boundary
H-L%	High plateau IP boundary
L-H%	Mid-Low plateau IP boundary
H-	High ip boundary
L-	Low ip boundary
Ha	High AP boundary (used only if LH* is not at the right edge)

3.2.3. ToBI: Labeling of Break Indices

Adding corresponding break indices to supplement the tone and boundary labels completes a ToBI transcription. The break indices, as discussed in section 2.2.2, serve to indicate the levels of disjuncture between the words of the utterance and effectively label where the AP, ip, and IP occur. There are a multitude of phonetic cues which can indicate disjuncture size, some being pauses, syllable duration, voice quality, segmental allophony, and tones (Khan,

2008). Some of these can be observed visually using a waveform and spectrogram, while others are perceived only through listening intently to the utterance. The break index numbers used in many ToBI systems, such as the original American English version of ToBI was slightly modified in its implementation so as to best describe the disjunctures in Q'eqchi'. Table 3.4 details the boundary tones used for the labeling of the data.

Table 3.4: Break Indices in Q'eqchi'

Label	Description
0	Word-Clitic Boundary
1	Word Boundary
2	Accentual Phrase Boundary
3	Intermediate Phrase Boundary
4	Intonational Phrase boundary
-	Added to indicate hesitation/elongated pauses
p	Added to indicate other disfluencies

The break indices 3 and 4 remained the same, indicating ip and IP boundaries respectively. Instead of using 2 for strong disjunctures or disfluencies unrelated to the pitch, the 2 indicated each AP boundary. Strong disjunctures of mismatches can be labeled with other diacritics, the diacritic 'p' being used to do so here. The '–' diacritic was used to indicate longer-than-normal hesitations that made it somewhat unclear as to which break index should be used. The break index 1 was still used to indicate a normal word disjuncture that did not coincide with any higher-level disjunctures. The break index 0 indicated a word-clitic boundary within an AP instead of representing phonetic processes that combine words such as in the English ToBI. These break index conventions align with those used for other languages whose prosodic systems include an Accentual Phrase (Khan, 2008). Lastly, when two types of boundaries occur

in the same place, the higher-level one took precedence. For example, though many short one-word utterances were composed of an AP, and ip, and an IP, only the IP break index of 4 was marked, overriding the others.

This chapter has explained the data collection process, the participants, the stimuli, and the labeling conventions that were used in the research. Chapter 4 will provide information on the patterns found in the data as well visual representations of many of the utterances. Chapter 5 will then discuss the results presented in Chapter 4 and seek to characterize the nature of intonation in Q'eqchi'.

Chapter 4: Results

This chapter has been split into three sections that roughly correspond to the three main research purposes of this thesis. The first section will display the results most relevant to the characterization of intonational structure in Q'eqchi'. This includes stress patterns, the intonational phrases, and tone alignment. The second section focuses on the intonational labels used in describing the pitch contour and its behavior in Q'eqchi'. The third and final section of the chapter displays the results relating to the behavior of the different sentence types that were produced by the native speakers for analysis and comparison. Discussion on the results will be done in Chapter 5. All data and corresponding results come from the 225 sentences produced by the three native speakers, 75 sentences from each speaker. Of these utterances (i.e., spoken word or sentence), thirteen were discarded either due to mispronunciations or failure of the recording device to capture the pitch correctly. Thus from the 75 unique sentences, 212 total productions from the three speakers were used for the analysis. A complete listing of all sentences, with their pitch accents, boundary tones, and break indices for each speaker can be found in Appendix B.

4.1. Intonational Structure in Q'eqchi'

Out of the 75 unique stimuli sentences, the first sixteen sentences (see Appendix A) were constructed specifically to make observations on the intonational structure of the language while also doubling as additional examples for declarative sentences and polar questions that are detailed in sections 4.3 and 5.3. These sentences were formed using similar methods used by Nielsen (2005) and Shklovsky (2011) as they analyzed the intonational characteristics of K'iche' and Tseltal respectively. Using these sentences allowed for observations on the nature of stress, the intonational phrases, and phrasal tone alignment in Q'eqchi'.

4.1.1. Stress Generalizations

Since metrical theories of stress assume a hierarchically organized prosodic structure and the projection of stress from a lower-level prosodic category to a higher-level prosodic category (Liberman & Prince 1977; Hayes, 1995), ascertaining some of the basic characteristics of stress in Q'eqchi' was a crucial first step in the analysis of intonational structure since the location of the stress signals where the pitch accents in Q'eqchi' occur. Figure 4.1 shows the stress pattern that was observable in all sentences produced. The syllables receiving primary stress are marked with a red circle around the accompanying pitch accent and underlined in the orthographic word. The pitch accents will be discussed later in this chapter in section 4.2.1. Stress always fell on the last syllable of content words, with the exception of a small number of words which will be discussed in section 5.1.1. Primary stress location was determined mainly perceptually and according to the well-attested fact that stress is word-final (Berinstein 1979; Stewart 1980; Caz Cho, 2004). A rise in pitch also verified the stress location and it was consistently found on the final syllable of content words such as verbs, nouns, adjectives, and adverbs.

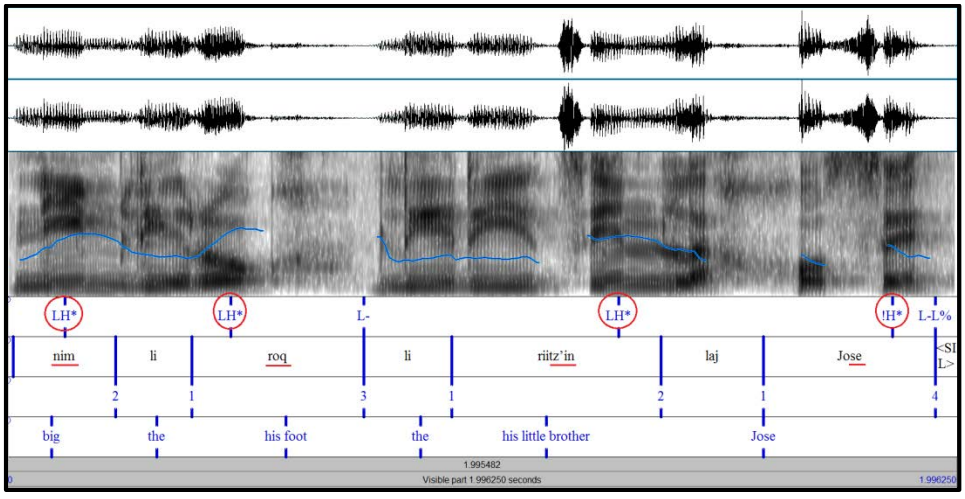

Figure 4.1: Stress on the Final Syllables of Content Words

Sentence 25: *Nim li roq li riitz'in laj Jose*. 'Jose's brother is tall' as produced by speaker 2.

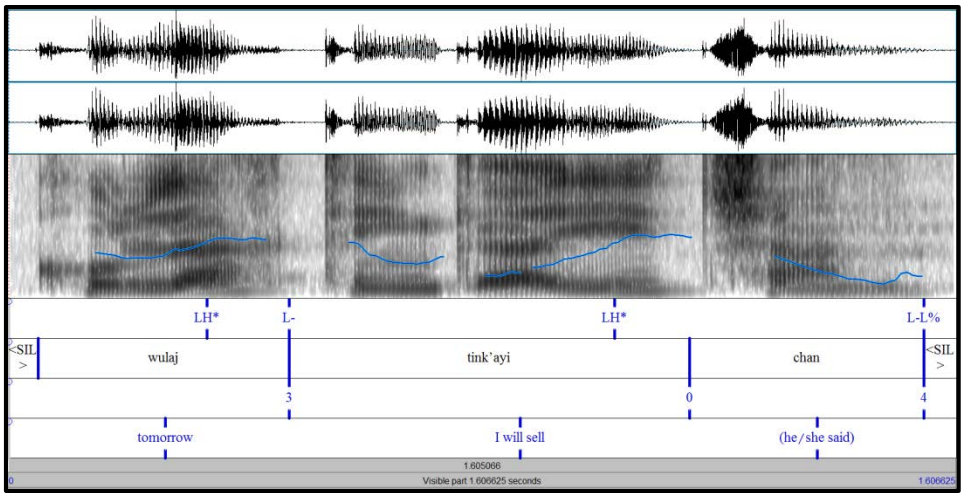

Figure 4.2: Post-clitic Remains Unstressed

Sentence 5: *Wuulaj tink'ayi chan*. 'I will sell it tomorrow, said he/she.' as produced by speaker 1.

Since stress always falls on the final syllable of content words, this leaves non-final syllables of content words, clitics, articles, and other function words unstressed. In Figure 4.2 the sentence ends with a quotative particle *chan* which indicates that what comes before was stated by another speaker. The quotative is not stressed and the pitch falls steadily from the last stressed syllable of the sentence located on the final syllable of the word preceding the quotative *chan* until the end of the sentence.

4.1.2. Intonational Constituents

After initial observations on stress had been made, the next step was to ascertain which of the high-level prosodic units were operational in Q'eqchi'. The three levels of intonational phrases that were expected to be seen in the data were those of the Accentual Phrase (AP), the Intermediate Phrase (ip), and the Intonational Phrase (IP). Each of these phrases was observable by similar criteria, such as requiring a certain amount of pitch accents within the phrase and accompanying phrase accents and boundary tones that described the behavior of the pitch at the

end of each phrase, as well as having perceivable disjunctures within an utterance. The nuances for each of these phrases will be discussed further in section 5.1.2.

The Intonational Phrase

The highest-level phrase, the IP, was observable in every spoken utterance. An IP could be as small as one word, seen in Figure 4.3, or encapsulate a larger utterance containing multiple clauses such as seen in Figure 4.4. In both of these figures the entire utterance is encapsulated in one IP and the IP is marked by the break index 4 and the final phrase accent and boundary tone combination which is circled.

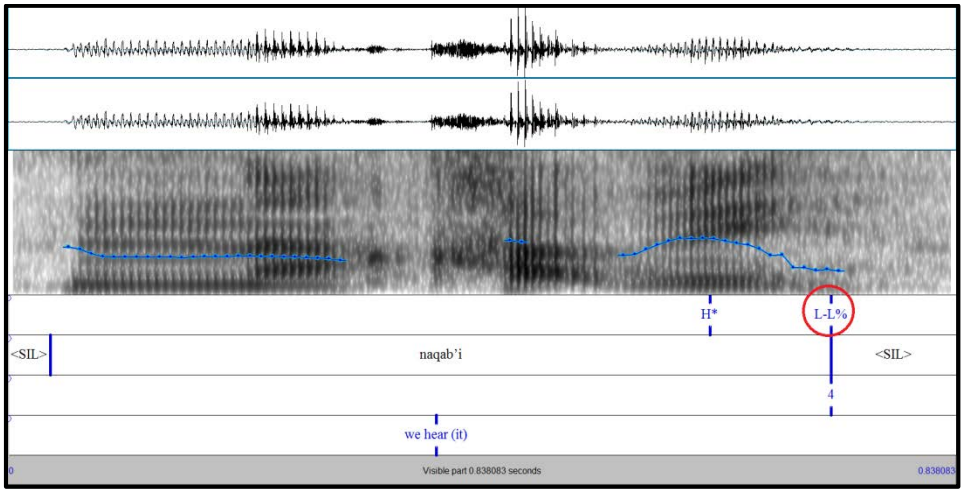

Figure 4.3: Intonational Phrase Consisting of a Single Word

Sentence 13: *Naqab'i*. 'We hear it.' as produced by speaker 1.

The most important element of the IP is an accompanying boundary tone which characterizes the behavior of the pitch at the end of an utterance. Boundary tones for IPs were marked by the combination of a phrase accent and a final boundary tone, the four possible combinations being L-L%, L-H%, H-L%, and H-H%. All IPs were also indicated by the break

index 4 in the break index tier. A total of 212 IPs were marked, one for each sentence produced, though this need not always be the case as a spoken utterance may have multiple IPs if uttered in a slow and emphatic manner (Shklovsky, 2011).

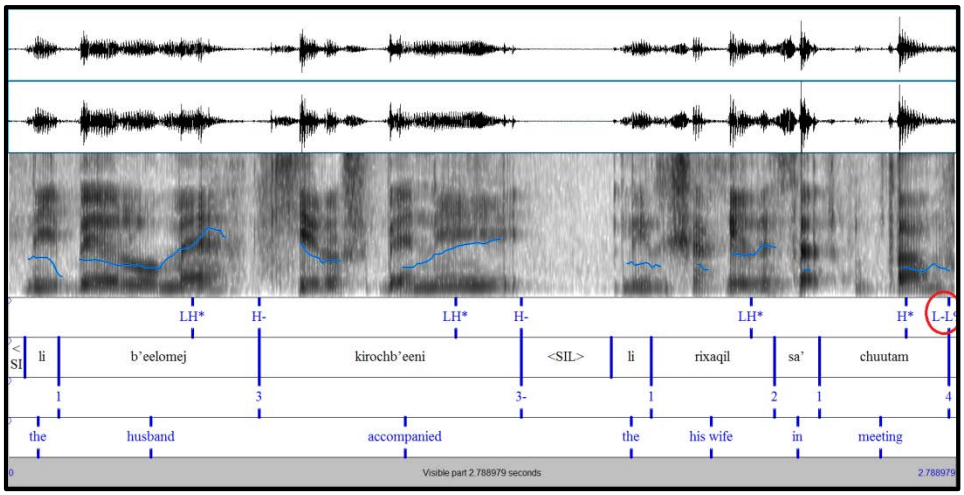

Figure 4.4: Intonational Phrase Consisting of Multiple Clauses

Sentence 72: *Li b'eelomej kirochb'eeni li rixaqil sa' chuutam*. 'The husband accompanied his wife to the meeting.' as produced by speaker 3.

The Intermediate Phrase

Below the IP in the hierarchical prosodic structure comes the ip. In the 212 utterances labeled, an ip was marked 88 times. The ip was more sporadically used than the IP. The ip effectively splits a larger intonational phrase into smaller prosodic units, sometimes apparently triggered by syntactic constituents or used to set certain groups of words apart. The presence of an ip is often noticeable as a perceptual and temporal disjuncture between words, perhaps in the form of a pause, that disjuncture being smaller than the disjuncture of an IP. This disjuncture could be observed by temporal hesitations between words, lengthening of ip-final syllables, and the behavior of the intonational pitch contour. The manifestation of the ip in the data was mostly

a pause and phrase accent, but its significance and pragmatic use in Q'eqchi' will be discussed in section 5.1.2. In Figure 4.5 an ip, marked by the phrase accent H- and the break index 3, can be found between the two clauses of the sentence. The evidence for the existence of the ip in Q'eqchi' is that the disjuncture, signaled by both the pitch and the hesitation between words is not quite as strong as the disjuncture created by an IP. This is shown by the phrase accent used for an ip, the phrase accent H- without a final boundary tone (H%) in this case. This can be seen in the figure as the high tone indicated by the blue pitch tracking is slightly lower at the end of the word *najt* occurring at the ip as compared to the pitch at the end of *toob'eek* which is the end of the sentence and the IP. The high ip accent does not rise as high as that of the IP and conversely, an L- ip accent would not fall as low as the L-L% of an IP.

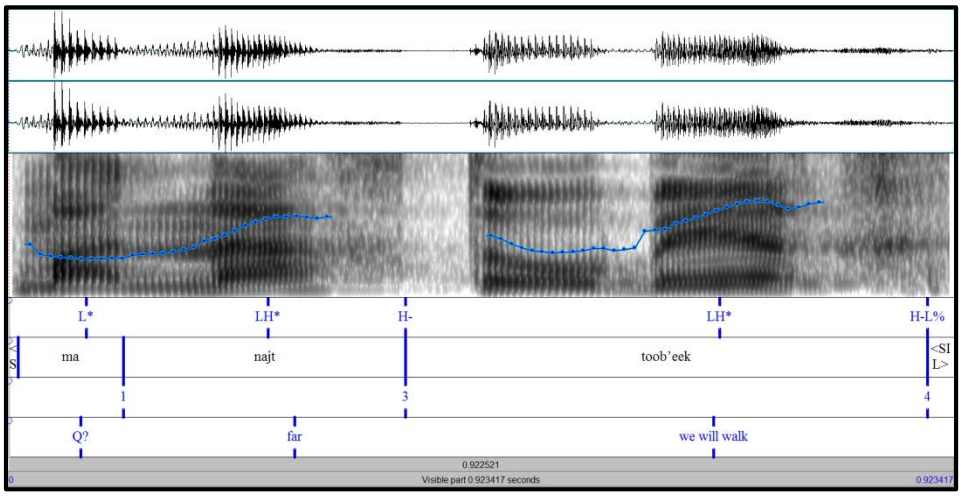

Figure 4.5: Intermediate Phrase vs. Intonational Phrase

Sentence 44: *Ma najt toob'eek?* 'Will we walk far?' as produced by speaker 2.

The Accentual Phrase

The final prosodic phrase type exhibited in the data was the AP. The AP appears to be the most basic and fundamental phrase in Q'eqchi'. Each sentence consists of minimally one AP,

and most utterances contain multiple APs. An AP consists of at least one content word with stress and may consist of more than one morphological word, where a morphological word indicates a root plus the bound affixes (Gordon, 2005). Unstressed function words and clitics may also be included with a word to form an AP. This will be discussed further in section 5.1.2 Figure 4.6 displays an utterance with three APs consisting of content words and accompanying function words. The words included in each AP are indicated by the red boxes for clarity.

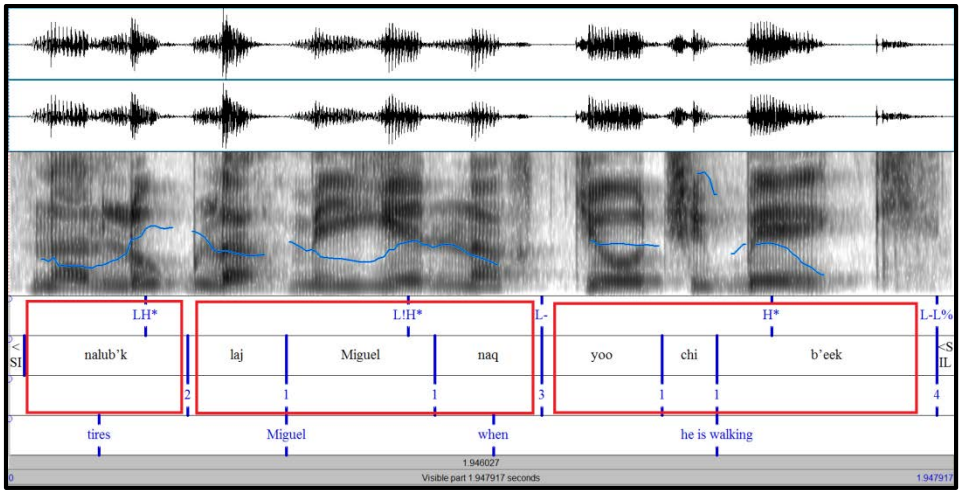

Figure 4.6: The Accentual Phrase

Sentence 18: *Nalub'k laj Miguel naq yoo chi b'eek.* 'Miguel tires when he is walking.' as produced by speaker 2.

Each AP is marked by the break index 2 unless it coincides with an ip and the break index 3 takes precedent, it being a higher-level prosodic unit. Likewise, the IP takes precedent over an ip when their boundaries coincide and the break index 4 is used instead of a 3. Thus, even though only one AP is marked by the break index 2 in Figure 4.6, there are a total of three APs, two of them being trumped by an ip and IP boundary. A total count of the number of APs in the data was not made but each utterance was composed of at least one AP and longer utterances had as many as four APs per sentence. Each of these prosodic phrases appears to

serve to segment an utterance into smaller units, perhaps as an interaction with the syntactic structure of the utterance. More will be made of the AP and each of the prosodic phrases in section 5.1.2

4.1.3. Tone Alignment

The next step in this analysis was to verify that there were boundary tones which aligned to prosodic phrases instead of to lexical words. This was examined by having the speakers produce several sentences and then repeating the same sentence with additional words added at the end of the sentence. A set of three polar questions exemplifies this phenomenon suitably. The question was produced ending in a verb, then again with a demonstrative pronoun added, and once again with a following adverb also added. Figures 4.7 & 4.8 show the first two of these sentences. Whereas the boundary tone is found on the verb in Figure 4.7, it has moved to the pronoun in Figure 4.8. If the boundary tone was tied to the word, it would have remained on the verbal complex *taab'aanu* in Sentence 11 shown in Figure 4.9. The boundary tone, however, moves with the IP, showing that the tone aligns to prosodic phrases and not to words.

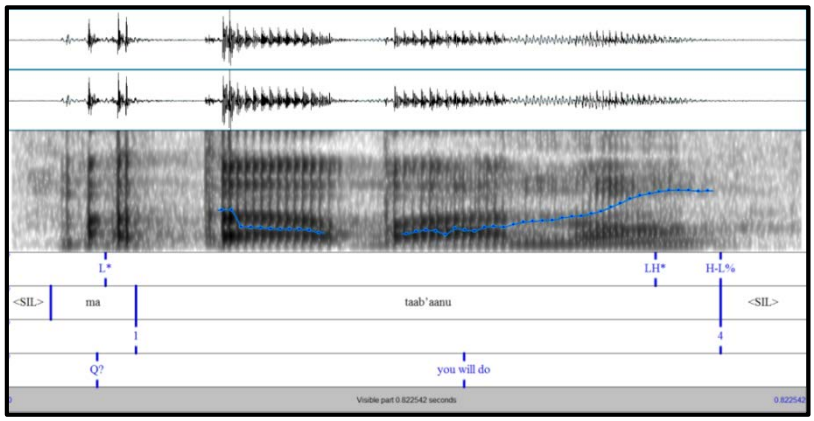

Figure 4.7: Tone Tied to the phrase

Sentence 10: *Ma taab'aanu?* 'Will you do it?' as produced by speaker 1.

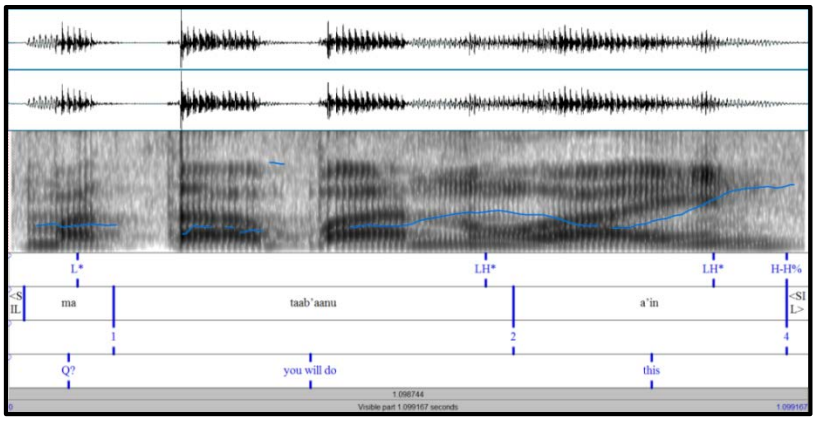

Figure 4.8: Tone tied to the Phrase

Sentence 11: *Ma taab'aanu a'in?* 'Will you do this?' as produced by speaker 1.

4.2. Intonational Labels

The basic intonational structure of Q'eqchi' having been observed in the first section, this second section will focus on the particular pitch accent, phrase accent, and boundary tone types that appear in Q'eqchi'. This section will exemplify each type of pitch accent and boundary tone found in the data, as well as showing downstepped and upstepped versions. The pitch accents, phrase accents, and boundary tones function together to describe the general behavior of the pitch contour throughout an utterance. It is possible to use the same labels for different speakers because the highs and lows indicated by H and L labels are relative to the pitch of the utterance itself and not to a predefined target.

4.2.1. Pitch Accents

Pitch Accents were marked on the syllable carrying the primary stress of each content word. Some non-content words carried stress as well, such as the question marker *ma*, and a pitch accent was marked on those instances accordingly. The question marker only has one specific function, and a very pragmatically one at that, and it may be for this reason that it is

signaled by something as important as pitch. For nearly all words, as noted in 4.1.1, the stress fell on the final syllable of the word. In the 212 labeled sentences, 512 total pitch accents were marked. Table 4.1 shows the distribution of pitch accents, which came in the form of LH*, H*, and L*. There was an interesting interaction between pitch accents and boundary tones, and thus the pitch accents were divided into two main categories: non-final pitch accents, and final pitch accents that coincided with an IP (and sometimes an ip). The realization of the pitch accents when co-occurring with these prosodic phrases was often altered from the normal behavior of the pitch contour when no such interaction occurred. This interaction and the general observations made about each pitch accent and its behavior will be discussed in section 5.2.2.

Table 4.1: Pitch Accent Counts

[2]**Pitch Accents**									
Type	**Label**	**Count**	**%**	**Label**	**Count**	**%**	**Label**	**Count**	**%**
Non-Final (319)	LH*	263	82.5%	H*	9	2.8%	L*	47	14.7%
Final IP (193)	LH*	58	30.0%	H*	131	67.9%	L*	4	2.1%
Total (512)	LH*	322	62.9%	H*	139	27.1%	L*	51	10.0%

The data only manifested three distinct pitch accents, LH*, H*, and L*. Since this study is exploratory in nature, further analyses may determine finer distinctions, especially pertaining to nature of the bitonal rising LH* tone so predominant in Q'eqchi'. While individual variation certainly existed for how the pitch contour was realized between the three speakers, the patterns and general tendencies were unmistakable in the majority of cases.

[2] L* had six instances that were not found on sentence-initial question marker *ma*, four of which were "utterance-final" tones. There were two more potential pitch accents (?*), though it was very questionable if they were stressed and they were not included.

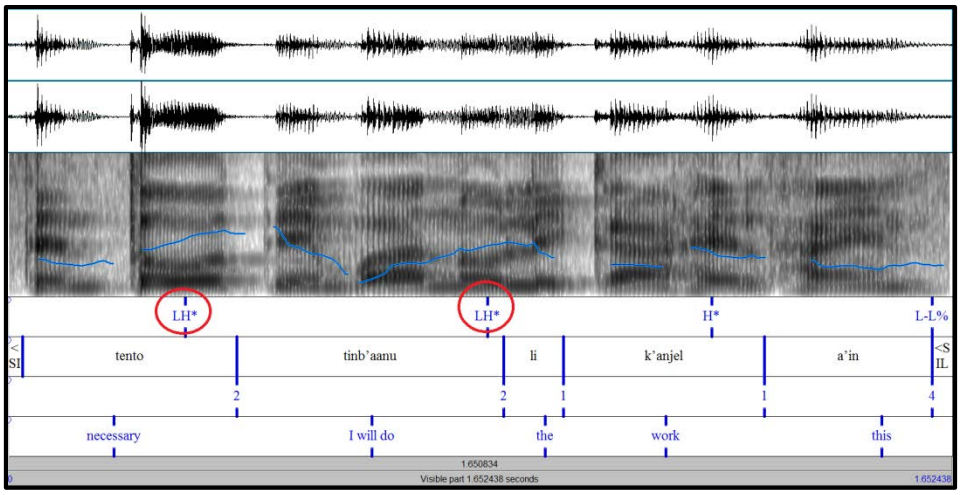

Figure 4.9: Low to High Rise Pitch Accent: LH*

Sentence 26: *Tento tinb'aanu li k'anjel a'in.* 'I have to do this work.' as produced by speaker 3.

In the utterance found in Figure 4.9 two examples of the LH* pitch accent can be seen. The behavior of the pitch contour differed slightly depending on other contextual factors such as rate of speech, length of the stressed syllable, and the types of consonants preceding or following the stressed syllable. These small, but potentially interesting, distinctions will not be analyzed here. The basic pattern seen in LH* pitch accents was a steady rise in the pitch throughout the stressed syllable, with the H* peak arriving towards the end of the syllable and sometimes slightly after. The exact placement of the peak seemed to be rather relaxed and perhaps varied due to contextual factors such as vowel length, speech rate, and the type of consonants surrounding the vowel. The prominence, making it stand out more to a listener, was always given to the high rather than the low, and hence the '*' was marked on the H rather than the L.

Whereas LH* appears to be the dominant and default pitch accent in the language, the other two pitch accents, L* and H*, each appeared in specific contexts. The low pitch accent was employed by speakers at the beginning of polar questions which employed a specific

morpheme to signal that the utterance is a question. Figure 4.10 demonstrates the L* tone accompanying the question marker *ma* at the beginning of the sentence.

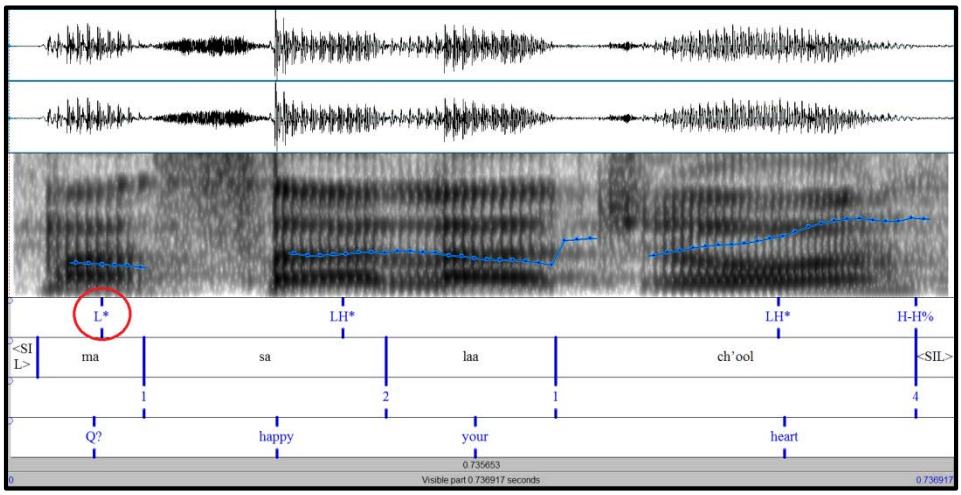

Figure 4.10: Low Pitch Accent: L*

Sentence 38: *Ma sa laa ch'ool?* 'How are you (Is your heart happy)?' as produced by speaker 3.

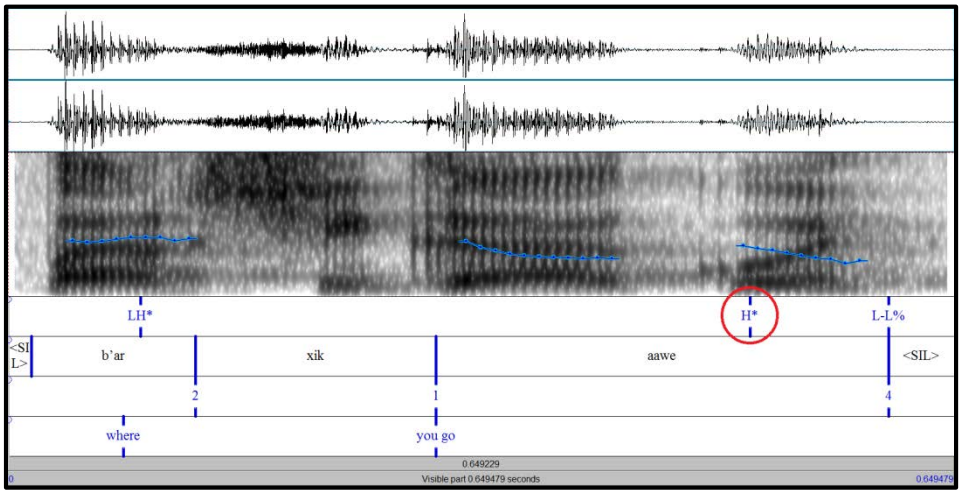

Figure 4.11: High Pitch Accent: H*

Sentence 34: *B'ar xik aawe?* 'Where are you going?' as produced by speaker 2.

The H* pitch accent occurred 140 times, though only in a very specific context as exemplified in Figure 4.11. The LH* default tone used normally on the stressed syllables in the language appeared to be modified in many cases when the stress co-occurred with a tone boundary. Most of these interactions included the common L-L% tone boundary that was found in most of the utterances. Instead of allowing a LH* rise throughout the stressed syllable, the highest point occurred near the beginning of the syllable and from there the tone boundary seemingly took precedence. This effect was observable with both ip and IP phrase accent and tone boundaries, though more so with the IP boundary. There were 193 cases of a final stress co-occurring with the IP boundary, 58 instances (30%) of them being LH*, 4 instances (2.1%) being L*, and 131 (67.9%) being realized as H*. There were also nine such interactions with an ip where the default LH* was realized as H*. This effect was much less frequently observed with the ip than the IP, as 79 instances (89.7%) of LH* occurred with an ip, while only 9 (10.3%) where realized as H*. The rationale behind marking these syllables as H* instead of just marking the tone boundary as well as the interaction with the IP and ip will be discussed in 5.2.1.

4.2.2. Phrase Accents & Boundary Tones

Each utterance provided by the native speakers was comprised of one IP and the accompanying phrase accent and boundary tone combination was labeled for each. While an utterance can certainly consist of multiple IPs, none of the sentences were spoken in a manner so as to have more than one IP. Many of the sentences, especially as they introduced more elements into the utterance, also potentially had more than one ip, each one labeled by an accompanying phrase accent, though no boundary tone accompanied these. Consequently, a

total of 212 IP boundaries and 88 ip boundaries were found and labeled in the data. Table 4.2 shows the total count of each type of phrase accent and boundary tone.

Table 4.2: Phrase Accent & Boundary Tones Counts

Phrase Accents & Boundary Tones				
Phrase Type	**Break Index**	**Label**	**Count**	**%**
IP	4	**L-L%**	146	68.9%
IP	4	**L-H%**	16	7.5%
IP	4	**H-L%**	35	16.5%
IP	4	**H-H%**	15	7.1%
	Total:		**212**	
ip	3	**L-**	43	48.9%
ip	3	**H-**	45	51.1%
	Total:		**88**	

As shown in Table 4.2, the L-L% pattern was much more prevalent than any other IP boundary tone. However, these numbers and percentages mean little while looking at the data set as a whole, being much more applicable when looking at what patterns manifest themselves in different sentence types and making observations on speaker intent and attitude in relation to the behavior of the pitch contour at the crucial edges of the IP and ip phrases. Observations and discussions concerning these matters will be covered in sections 4.3 and 5.3. The remainder of this section exemplifies each of the four IP phrase accent and boundary tone combinations and can be seen in Figures 4.12 – 4.15. The behavior of the pitch at the end of each utterance is captured by the combination of the phrase accent and the boundary tone, circled in each of the figures, and conveys information on the intonational contour of the utterance as well as possibly containing information on things such as the propositional attitude of the speaker and pragmatic

details. For example, the L-L% boundary (Figure 4.12) seems to indicate finality to an utterance while the H-L% and H-H% (Figure 4.14 and 4.15) indicate questions that require answers. The L-H% boundary (Figure 4.13) may be indicative of hesitation or non-finality. The characteristics of each IP type will be discussed more in section 5.2.2.

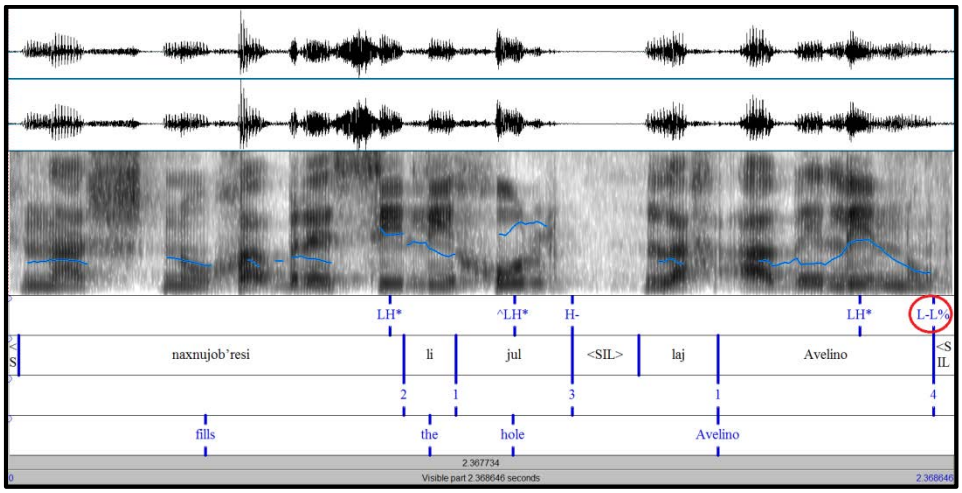

Figure 4.12: Phrase Accent & Boundary Tone: L-L%

Sentence 21: *Naxnujob'resi li jul laj Avelino.* 'Avelino fills up the hole.' as produced by speaker 2.

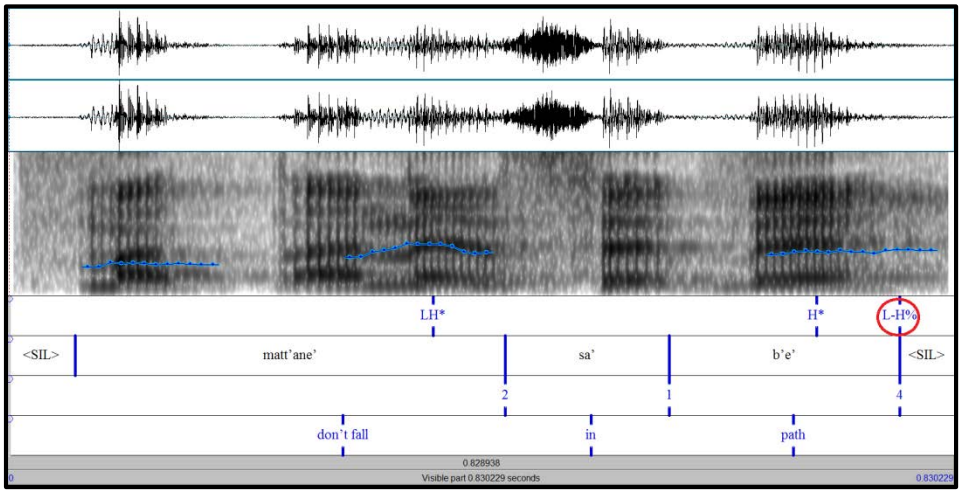

Figure 4.13: Phrase Accent & Boundary Tone: L-H%

Sentence 59: *Matt'ane' sa' b'e'.* 'Don't fall on your way.' as produced by speaker 3.

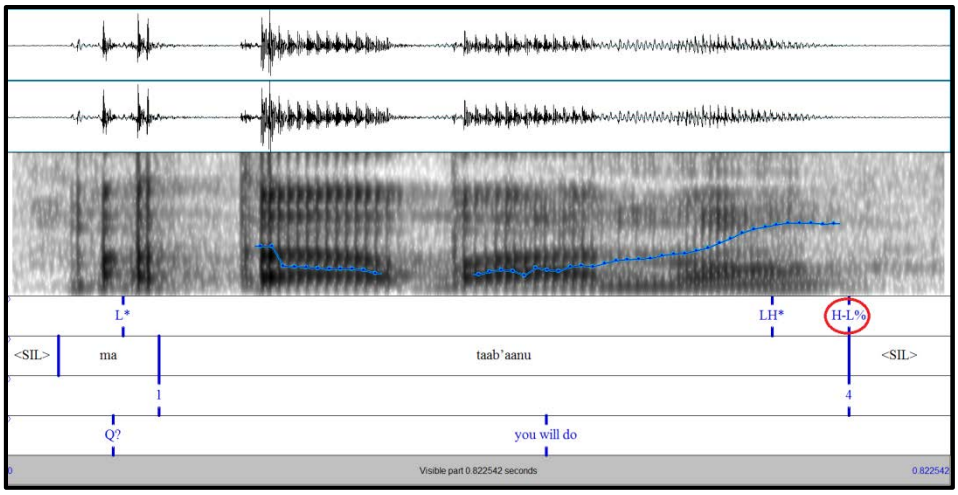

Figure 4.14: Phrase Accent & Boundary Tone: H-L%

Sentence 10: *Ma taab'aanu?* 'Will you do it?' as produced by speaker 3.

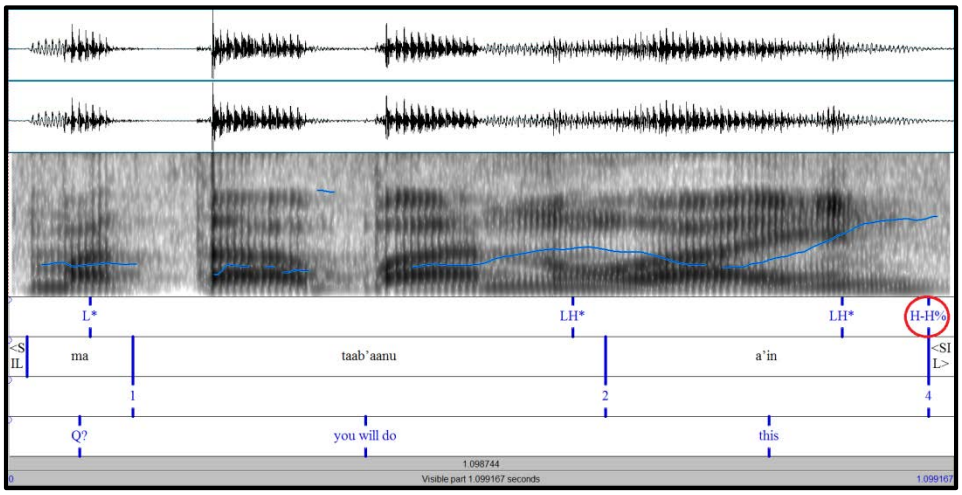

Figure 4.15: Phrase Accent & Boundary Tone: H-H%

Sentence 11: *Ma taab'aanu a'in?* 'Will you do this?' as produced by speaker 3.

4.2.3. Downstepping & Upstepping

The downstepping of pitch was observed in the data. Downstep, being a compression or lowering or the pitch range (Pierrehumbert, 1980), is a fairly normal phenomenon in speech, often occurring as a speaker begins running out of breath and the relative pitch consequently

lowers (Beckman & Ayers, 1994). Both LH* and H* pitch accents had downstepped versions, labeled as L!H* and !H*. There were eleven instances of L!H* and 31 instances of !H*. Figure 4.16 shows one such example where the second LH* is produced at a lower pitch than the first.

In addition to downstepped pitch accents, upstepped variants of the pitch accents were also found. Working in a manner practically opposite that of downstepping, upstepping involves the expansion of the pitch range that raises a subsequent pitch accent (Beckman et al., 2002). Seeing upstepped pitch accents occurring, and in some common patterns at that, had not been expected. Upstep was, however, clearly observed in at least twelve cases and was marked accordingly with the ^LH* label. Figure 4.17 shows an upstepped LH*, produced higher in the pitch range than the preceding pitch accent. While downstepping appeared to be a natural by-product of how phonation works, upstep seemed more deliberate as it required the speaker to perform the functions that raise the pitch.

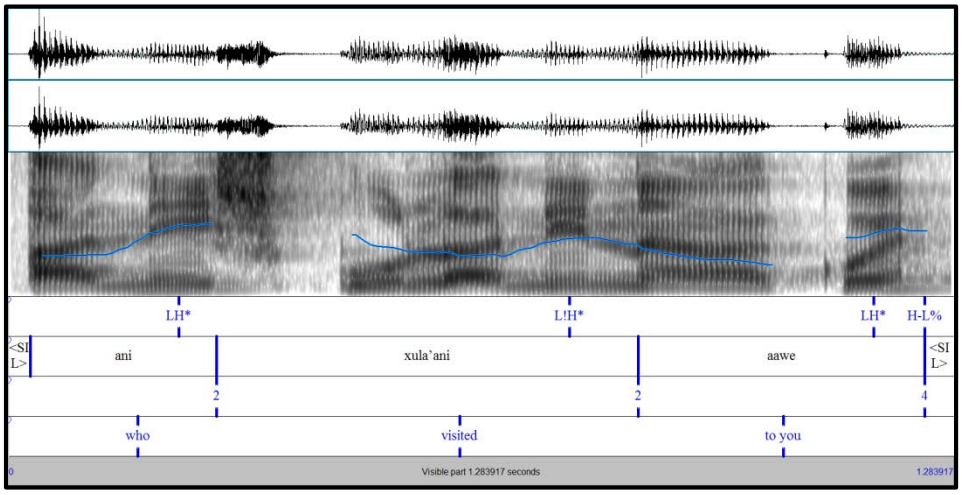

Figure 4.16: Downstepping

Sentence 29: *Ani xula'ani awee?* 'Who visited you?' as produced by speaker 3.

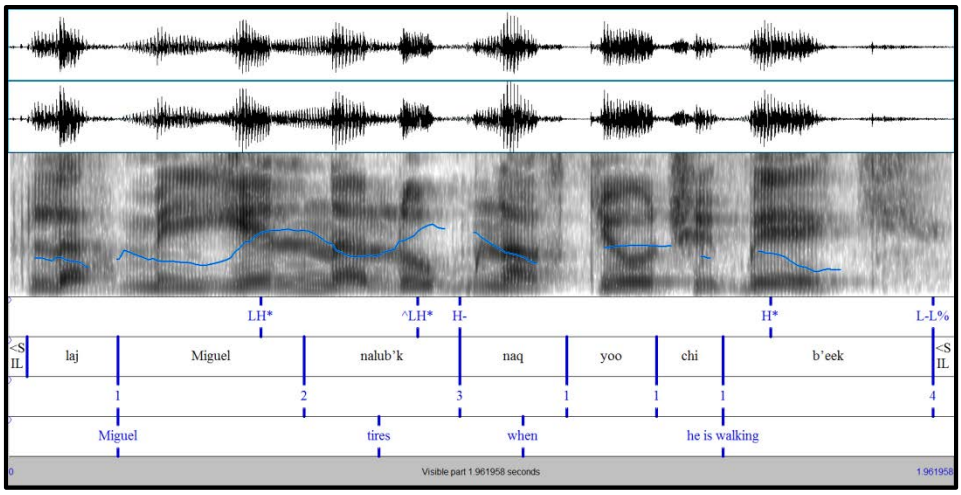

Figure 4.17: Upstepping

Sentence 65: *Laj Miguel nalub'k naq yoo chi b'eek.* 'Miguel tires when he is walking.' as produced by speaker 3.

4.3. Intonational Contour

The final research purpose dealt with the observations of the patterns of the intonational contour in a variety of sentence types in Q'eqchi'. Knowing the intonational structure and the specific pitch accents and boundary tones that can occur in a language means little without knowing in what configurations they exist to add meaning to the utterances of the language. This final section of the chapter will briefly present each of the sentence types used in the research of this thesis. Each sentence type will be shown, accompanied by a table of the patterns produced by each speaker. Sentence numbers can be cross-referenced in Appendix A. All discussion on the patterns, similarities, and differences of the sentence types as well as any other observations noted during the analysis and labeling of the utterances will be carried out in section 5.3.

The most important aspect to examine in identifying intonational differences between sentence types was how the IP ended, especially as the default pitch accent at every other point in an utterance was LH* in Q'eqchi' and the fact that only at the end of the IP could one find

final boundary tones. Pragmatically it also makes sense that it is at the edges of utterances that such information is often found.

Table 4.3: Boundary Tone Patterns for All Sentence Types

Declaratives												
Final Accent	**IP**	**Count**	**%**	**IP**	**Count**	**%**	**IP**	**Count**	**%**	**IP**	**Count**	**%**
LH*	L-L%	3	2.8%	L-H%	3	2.8%	H-L%	1	0.9%	H-H%	0	0%
H*	L-L%	76	71.8%	L-H%	3	2.8%	H-L%	0	0%	H-H%	0	0%
L*	L-L%	4	3.8%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
No Final	L-L%	11	10.4%	L-H%	0	0%	H-L%	5	4.7%	H-H%	0	0%
Total: 106				**Dominant: H* L-L%**					**Secondary: L-L%**			
Imperatives												
LH*	L-L%	0	0%	L-H%	1	3.7%	H-L%	0	0%	H-H%	0	0%
H*	L-L%	23	85.2%	L-H%	1	3.7%	H-L%	0	0%	H-H%	0	0%
L*	L-L%	0	0%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
No Final	L-L%	2	7.4%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
Total: 27				**Dominant: H* L-L%**					**Secondary: L-L%**			
Interrogative Wh-Questions												
LH*	L-L%	1	3.7%	L-H%	2	7.4%	H-L%	2	7.4%	H-H%	0	0%
H*	L-L%	19	70.4%	L-H%	2	7.4%	H-L%	0	0%	H-H%	0	0%
L*	L-L%	0	0%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
No Final	L-L%	1	3.7%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
Total: 27				**Dominant: H* L-L%**					**Secondary: None**			
Interrogative Polar Questions												
LH*	L-L%	0	0%	L-H%	2	4.65%	H-L%	24	55.8%	H-H%	15	34.9%
H*	L-L%	2	4.65%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
L*	L-L%	0	0%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
Total: 43				**Dominant: LH* H-L%**					**Secondary: LH* H-H%**			
Interrogative Tag Questions												
LH*	L-L%	1	11.11%	L-H%	0	0%	H-L%	3	33.33%	H-H%	0	0%
H*	L-L%	3	33.33%	L-H%	2	22.22%	H-L%	0	0%	H-H%	0	0%
L*	L-L%	0	0%	L-H%	0	0%	H-L%	0	0%	H-H%	0	0%
Total: 9				**Dominant: LH* H-L%**					**Secondary: H* L-L%**			

Table 4.3 shows the utterance-final pattern for all 212 sentences, as divided into five different sentence categories: declaratives, imperatives, Wh-questions, polar questions, and tag questions. The first column shows the pitch accent (L*, H*, LH*, or none) that was found on the sentence-final stress and thus interacted heavily with the IP boundary. Furthermore, the IP boundary type that was used in conjunction with each pitch accent can be found. With the exception of the tag questions and polar questions, each sentence type had a dominant pattern which is also specified in the table.

4.3.1. Declarative Sentences

A declarative sentence is the most basic of the sentence types, usually defined as a simple statement or proposition being either true or false. Being seen as the most common or default type of speech utterance, declaratives sentences were used more than any other type of sentence in this research. Table 4.4 lists all declarative sentences, a total of 36, and their accompanying patterns. This table shows a variety of information related to how the declarative sentences were produced, attesting that there are both discernible patterns for how a declarative is produced as well as that variation certainly exists. These variations range from the use, or lack thereof, of upstep or downstep to the presence and location of phrase disjunctures. It is from the overall composite of these sentences that generalizations about the sentences were made. These are discussed in section 5.3.1. Figure 4.18 displays a normal declarative sentence with the dominant pattern, the most crucial factor being the presence of at least on stressed syllable with its accompanying LH* pitch accent and the final tone boundary at the end of the sentence.

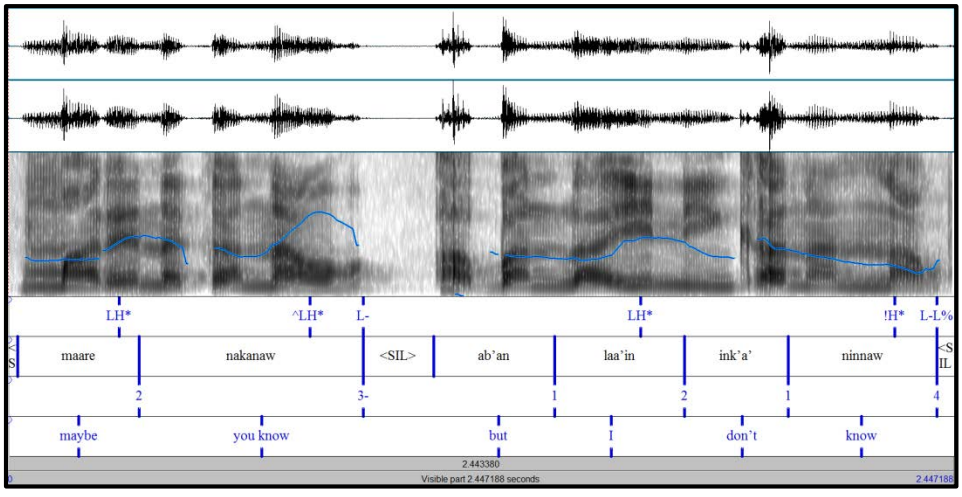

Figure 4.18: Declarative

Sentence 9: *Maare nakanaw, ab'an laa'in ink'a' ninnaw.* 'Maybe you know, but I don't know.' as produced by speaker 2.

Table 4.4: Compilation of Intonational Contour Patterns for Declaratives

#	Speaker 1	Speaker 2	Speaker 3	Composite[3]
1	LH* Ha LH* L!H* L-L%	LH* Ha LH* L!H* L-L%	LH* L!H* L!H* L-L%	**LH*** Ha **LH* LH* L-L%**
2	LH* H-L%	LH* L-L%	L* H-L%	LH* H-L%
3	LH* H-L%	LH* L-L%	L* H-L%	LH* H-L%
4	LH* L- (H* L-L%)	LH* L- (H* L-L%)	LH* H- LH* H-L%	**LH*** L- (H* L-L%)
5	LH* L- LH* L-L%	LH* L- LH* L-L%	LH* H- LH* L-L%	**LH*** L- **LH* L-L%**
6	LH* LH* H- (H* L-L%)	LH* LH* H- (H* L-L%)	LH* LH* H- (H* L-L%)	**LH* LH* H- (H* L-L%)**
7	LH* ^LH* H- LH* (!H* L-L%)	LH* ^LH* L- LH* (!H* L-L%)	LH* ^LH* H- LH* (!H* L-L%)	**LH* LH* H- LH* (H* L-L%)**
8	LH* ^LH* H- LH* (!H* L-L%)	LH* ^LH* H- LH* (!H* L-L%)		**LH* LH* H- LH* (H* L-L%)**
9	LH* LH* H- LH* (!H* L-L%)	LH* ^LH* L- LH* (!H* L-L%)		**LH* LH*** X- **LH* (H* L-L%)**
13	(H* L-L%)	(H* L-L%)	(H* L-L%)	**(H* L-L%)**
14	LH* (LH* L-L%)	LH* (LH* L-H%)	LH* (!H* L-L%)	**LH*** (LH* L-L%)
15	LH* (!H* L-L%)	LH* (H* L-L%)	LH* (!H* L-L%)	**LH* (H* L-L%)**
16	LH* LH* LH* (H* L-L%)	LH* ^LH* L- LH* (H* L-L%)	LH* LH* LH* (H* L-L%)	**LH* LH* LH* (H* L-L%)**
17	LH* (!H* L-L%)	LH* H- (LH* L-L%)	LH* (H* L-H%)	**LH*** (H* L-L%)
18	LH* LH* L- (LH* H-L%)	LH* L!H* L- (H* L-L%)	LH* LH* L- (H* L-L%)	**LH* LH* L-** (H* L-L%)
19	(H* L-) (H* L-L%)	LH* (!H* L-L%)	LH* (!H* L-L%)	LH* **(H* L-L%)**
20	LH* ^LH* H- (!H* L-L%)	LH* LH* L- (H* L-L%)	LH* LH* (LH* L-H%)	**LH* LH*** X- (H* L-L%)
21	LH* LH* L- LH* L-L%	LH* ^LH* H- LH* L-L%	LH* H- LH* Ha LH* L-L%	**LH* LH*** X- **LH* L-L%**
23	LH* LH* L- (H* L-L%)	LH* LH* L- (H* L-L%)	LH* LH* H- (H* L-L%)	**LH* LH*** L- **(H* L-L%)**
24	LH* LH* L- LH* L- (H* L-L%)	LH* H- LH* LH* H- (H* L-L%)	LH* LH* H- LH* H- (H* L-L%)	**LH* LH*** H- **LH*** H- **(H* L-L%)**
25	LH* LH* L- LH* (!H* L-L%)	LH* LH* L- LH* (!H* L-L%)	LH* LH* L- LH* (!H* L-L%)	**LH* LH* L- LH* (H* L-L%)**
27	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**
49	(H* L-L%)	(H* L-L%)	(H* L-H%)	(**H*** L-L%)
50	(H* L-L%)	(H* L-L%)	(H* L-H%)	(**H*** L-L%)
51	LH* (H* L-L%)	LH* (!H* L-L%)	LH* (!H* L-L%)	**LH* (H* L-L%)**
52	(H* L-L%)	(H* L-L%)	(L* L-L%)	(H* **L-L%**)
53	(L* L-L%)	(H* L-L%)	(L* L-L%)	(L* **L-L%**)
54	(H* L-L%)	(H* L-L%)	(LH* L-L%)	(H* **L-L%**)
55	(H* L-L%)	(H* L-L%)	(L* L-L%)	(H* **L-L%**)
65	LH* LH* H- (H* L-L%)	LH* ^LH* H- (H* L-L%)	LH* L!H* H- (H* L-L%)	**LH* LH* H- (H* L-L%)**
66	LH* (!H* L-L%)	LH* L- (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**
67	LH* (!H* L-L%)	LH* L- (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**
68	LH* (!H* L-) (LH* L-H%)	LH* (H* L-) (H* L-L%)	LH* (!H* L-) (H* L-L%)	**LH* (H* L-)** (H* L-L%)
69	LH* ?* (H* L-L%)	LH* L- LH* (H* L-L%)	LH* ?* (H* L-L%)	**LH*** ?* **(H* L-L%)**
71	LH* H- LH* H- (H* L-L%)	LH* H- LH* H- (H* L-L%)	LH* H- LH* (H* L-L%)	**LH* H- LH*** H- **(H* L-L%)**
72	LH* H- LH* LH* H- (H* L-L%)	LH* H- LH* LH* H- (H* L-L%)	LH* H- LH* H- LH* (H* L-L%)	**LH* H- LH* LH*** H- **(H* L-L%)**

[3] When a pitch accent occurs on the same syllable as an IP they are surrounded with parentheses (e.g., (H* L-L%)). Likewise, if the H* co-occurs with an ip a similar convention is used. For the composite column the dominant pitch accent, phrase accent, or boundary tone used in each location was generated from the composite of the three speakers. If there was complete consistency between the three speakers (downstep and upstep disregarded), the pitch accents, phrase accents and boundary tones are in bold.

4.3.2. Imperative Sentences

The next sentence type that was analyzed was that of imperatives. Imperative sentences are those used mainly for commands, orders, and requests. While the majority of the tokens were regularly-formed commands, there were also two different imperative constructions used, the optative and the prohibitive forms. The patterning of these three varying imperatives will be discussed in 5.3.2. Table 4.5 contains the patterns of the nine imperative sentences. When compared to the declarative sentences in Table 4.4, there was a substantially higher amount of uniformity between the speakers for the imperative sentences, this most likely due to the imperative sentence being, for the most part, much shorter sentences, often only consisting of one or two words. As the length of an utterance increases, the variability and complexity also naturally increases.

Table 4.5: Compilation of Intonational Contour Patterns for Imperatives

#	Speaker 1	Speaker 2	Speaker 3	Composite
56	(H* L-L%)	(H* L-L%)	(H* L-L%)	**(H* L-L%)**
57	LH* L-L%	LH* L-L%	LH* (LH* L-H%)	**LH*** L-L%
58	(H* L-L%)	(H* L-L%)	(H* L-L%)	**(H* L-L%)**
59	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-H%)	**LH* (H*** L-L%)
60	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**
61	(H* L-L%)	(H* L-L%)	(H* L-L%)	**(H* L-L%)**
62	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**
63	(H* L-L%)	(H* L-L%)	(H* L-L%)	**(H* L-L%)**
64	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)	**LH* (H* L-L%)**

Figure 4.19 displays the visual representation of the common pattern shown in the imperatives. The imperatives were perhaps the easiest sentence type to analyze due to the lower word count in each sentence and each only containing one clause. There was no question that the imperatives were characterized by a falling pitch contour as the sentence ended.

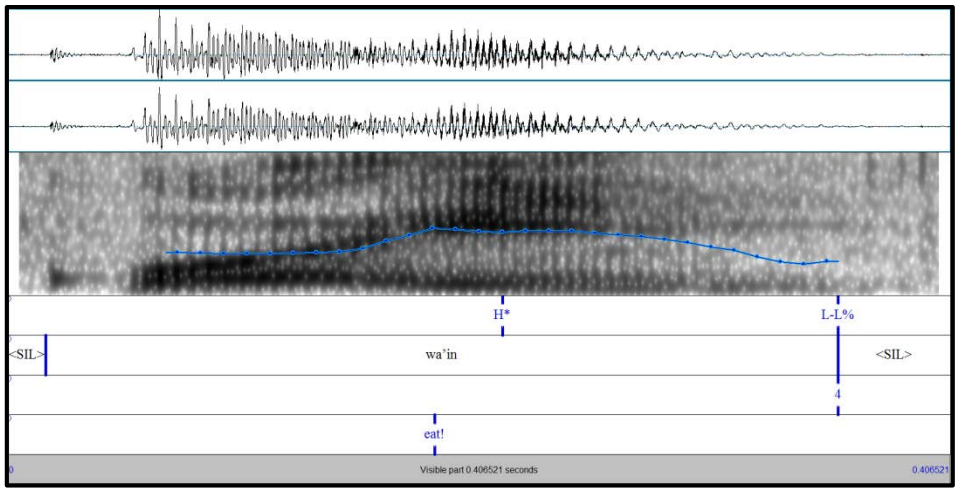

Figure 4.19: Imperative

Sentence 56: *Wa'in!* 'Eat!' as produced by speaker 2.

4.3.3. Interrogative: Wh-Questions

Interrogative sentences were divided into three types, the first being Wh-questions. Named after the wh-words used in English to form questions that seek a more detailed answer than a simple yes or no, these questions were split from polar yes/no questions and tag questions to find out if any differences existed, as has been exhibited in other languages such as English (Hedberg et al., 2006b). In this study on question types in English, Wh-questions and polar questions were differentiated because of their structural difference. This structural difference is operational in Q'eqchi' as well, with a Wh-question essentially moving a subject or object into sentence-initial position before the predicate that usually comes before both the object and subject in Q'eqchi' (Caz Cho, 2004). Table 4.6 contains the patterns and variations of the nine Wh-questions produced by the speakers. Figure 4.20 shows the pattern found in most of the Wh-questions and which patterned very similarly to declaratives and imperatives in respect to the falling pitch at the end of the utterance.

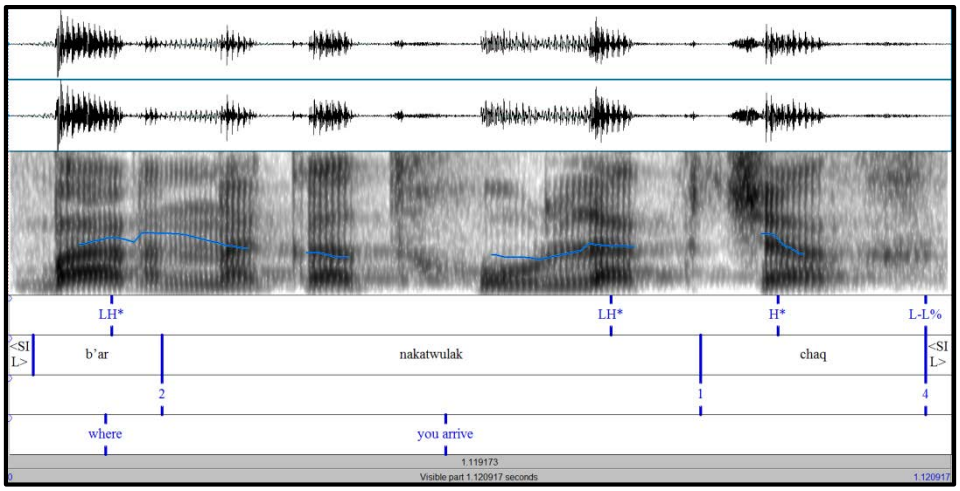

Figure 4.20: Wh-question

Sentence 33: *B'ar nakatwulak chaq?* 'Where are you coming from?' as produced by speaker 2.

Table 4.6: Compilation of Intonational Contour Patterns for Wh-questions

#	Speaker 1	Speaker 2	Speaker 3	Composite
28	LH* (H* L-L%)	LH* (LH* L-H%)	LH* (!H* L-H%)	**LH*** (H* L-H%)
29	LH* LH* (H* L-L%)	LH* L!H* (LH* H-L%)	LH* L!H* (H* L-H%)	**LH* LH*** (H* X-X%)
30	LH* (LH* H-L%)	LH* (!H* L-L%)	LH* (H* L-L%)	**LH*** (H* L-L%)
31	LH* L!H* (!H* L-L%)	LH* L!H* H- (H* L-L%)	LH* LH* H- (LH* L-L%)	**LH* LH*** H- (H* **L-L%**)
32	LH* LH* (H* L-L%)	LH* LH* (!H* L-L%)	LH* LH* (!H* L-L%)	**LH* LH* (H* L-L%)**
33	LH* LH* (H* L-L%)	LH* LH* (H* L-L%)	LH* LH* L-L%	**LH* LH*** (H* **L-L%**)
34	LH* (LH* L-H%)	LH* (H* L-L%)	LH* (H* L-L%)	**LH*** (H* L-L%)
35	LH* (!H* L-L%)	LH* (!H* L-L%)	LH* Ha (!H* L-L%)	**LH* (H* L-L%)**
36	LH* LH* L- (H* L-L%)	LH* L!H* L- (H* L-L%)	LH* Ha LH* L- (H* L-L%)	**LH* LH* L- (H* L-L%)**

4.3.4. Interrogative: Polar Questions

Having no specific content word to indicate that it is a question, the polar questions in Q'eqchi' employ the morpheme *ma* at the beginning of a sentence to indicate the interrogative nature of the utterance. Out of all the different sentence types, the polar questions displayed the most unique patterns as well as the highest amount of variation in the IP boundary selection. The polar questions, a total of 15 unique sentences, and the patterns produced by each speaker can be seen in the Table 4.7.

Table 4.7: Compilation of Intonational Contour Patterns for Polar Questions

#	Speaker 1	Speaker 2	Speaker 3	Composite
10	L* (LH* H-L%)	L* (LH* H-L%)	L* (LH* H-L%)	**L* (LH* H-L%)**
11	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-H%)	**L* LH*** (**LH*** H-L%)
12	L* LH* LH* L- (LH* H-H%)	L* LH* LH* L- (LH* H-L%)	L* LH* H- (H* L-L%)	**L* LH*** LH* L- (**LH*** X-X%)
37	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	**L* LH* (LH* H-L%)**
38	L* LH* (H* L-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-H%)	**L* LH*** (LH* X-X%)
39	L* LH* LH* (LH* H-H%)	L* LH* LH* (LH* H-H%)	L* LH* L- LH* (LH* H-H%)	**L* LH* LH* (LH* H-H%)**
40	L* (LH* H-L%)	L* (LH* H-H%)	L* (LH* H-L%)	**L*** (**LH*** H-L%)
41	L* LH* L- (LH* H-H%)	L* LH* L- (LH* H-H%)	L* LH* L- (LH* H-L%)	**L* LH* L-** (**LH*** H-H%)
42		L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	**L* LH* (LH* H-L%)**
43	L* (LH* H-H%)	L* (LH* H-H%)	L* (LH* H-H%)	**L* (LH* H-H%)**
44	L* LH* H- (LH* H-L%)	L* LH* H- (LH* H-L%)	L* LH* H- (LH* H-L%)	**L* LH* H- (LH* H-L%)**
45	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	**L* LH* (LH* H-L%)**
73	L* LH* (LH* L-H%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	**L* LH*** (**LH*** H-L%)
74	L* LH* LH* L- (LH* H-H%)	L* LH* LH* L- (LH* H-H%)		**L* LH* LH* L- (LH* H-H%)**
75	L* LH* L- (LH* L-H%)	L* LH* H- (LH* H-H%)	L* LH* H- (LH* H-L%)	**L* LH*** H- (**LH*** H-H%)

The polar questions all began with a low tone on the question marker followed by a rise culminating in an IP boundary tone that was located relatively high in the speakers' pitch range. As compared to the other sentence types, there was no definitive dominant IP boundary tone, with both the H-H% rise and H-L% high plateau being used, seen in Figure 4.21 and 4.22. Sentence length did not appear to be a factor as short sentences, such as Sentence 43 *Ma najt* (see Figure 4.21; Table 4.7), and much longer sentences, such as Sentence 39 *Ma nakawab'i li raatin lix Maria* (see Table 4.7), both saw the H-H% final tone boundary used by each speaker. Each speaker, however, used the H-L% tone bounadry enough times to disallow characterizing its appearnce as an abnormality produced by the elicitation conditions. The possible meanings and uses of these bounary tone endings will be discussed in section 5.2.2. Finally, some of the LH* pitch accents found in many of the polar questions also seemed more subdued than in many other sentences, perhaps as a reaction to the initial low tone introduced by the question marker.

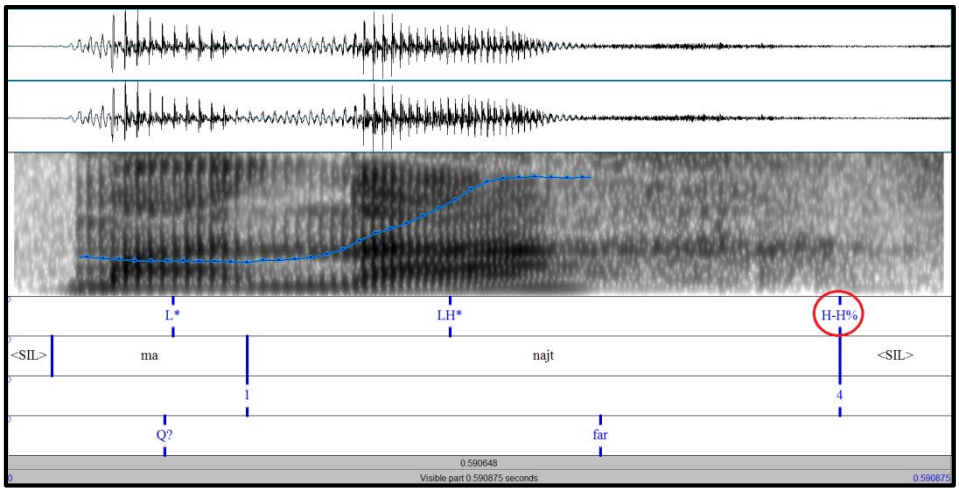

Figure 4.21: Polar Question: H-H%

Sentence 43: *Ma najt?* 'Is it far?' as produced by speaker 2.

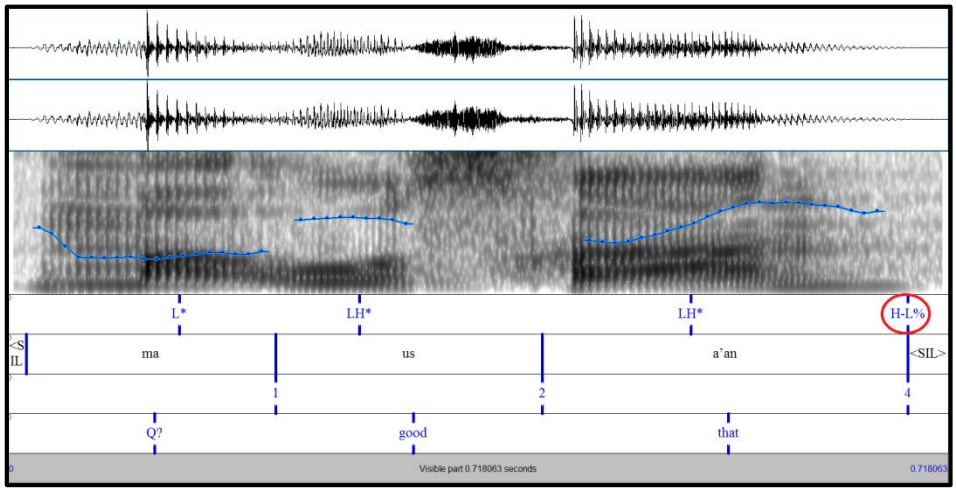

Figure 4.22: Polar Question: H-L%

Sentence 45: *Ma us a'an?* 'Is that okay?' as produced by speaker 2.

4.3.5. Interrogative: Tag Questions

The last of the interrogative question types was the tag question. A tag question comes in the form of a small phrase added to the end of a declarative sentence so as to ask about the content of that sentence. The two following sentences in English, for example, both contain a

tag question: “you are going, right?” and “you would like that, wouldn’t you?” Some languages, such as English, have a variety of tag question types. In Q’eqchi’, tag questions are formed by adding the words *pe’ yaal* which together mean ‘isn’t it true’. Table 4.8 contains the quite varying patterns that were produced by the speakers. With a low amount of tokens, only three different sentences, it made it even more difficult to pinpoint any true and generalizable pattern. Though each speaker varied from each other in what tone boundary was used, as seen in Figure 4.23, the speakers were fairly consistent in using a similar pattern across the three tag questions. Speaker 3 seemed to emphasize the question aspect while speaker 2 emphasized the declarative nature of the sentence the tag question accompanies. Speaker 1 showed some hesitation, perhaps leading to a less decisive pattern of the raising or lowering of the final tone boundary.

Table 4.8: Compilation of Intonational Contour Patterns for Tag Questions

#	Speaker 1	Speaker 2	Speaker 3	Composite
46	LH* H- (H* L-H%)	LH* H- (H* L-L%)	(H* L-) (LH* H-L%)	LH* H- (H* X-X%)
47	LH* (H* L-) (H* L-H%)	LH* ^LH* H- (H* L-L%)	LH* (H* L-) (LH* H-L%)	**LH*** (H* L-) (LH* X-X%)
48	LH* (H* L-) (LH* L-L%)	LH* ^LH* H- (H* L-L%)	LH* (H* L-) (LH* H-L%)	**LH*** (H* L-) (LH* L-L%)

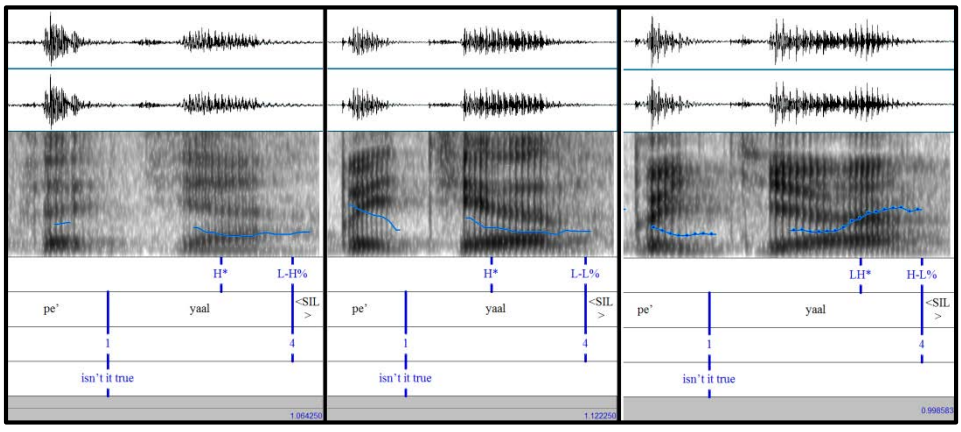

Figure 4.23: Tag Question Differences

End of sentence 47: ...*pe’ yaal?* ‘..isn’t it true?’ as produced by speaker 1, 2, and 3 respectively.

4.3.6. Topic-focused SVO Sentence Order

The final task of the analysis was to compare parallel sentences with shifts in word order to see if the order had any effect on the intonational patterns. These sentences included a shift from the default and unmarked VOS word order to the subject-initial SVO order which puts slight emphasis on the subject of the sentence (Caz Cho, 2004). Any findings will be discussed in 5.3.6. However, an example of the shift can be seen in Figure 4.24 and 4.25. Both of these display sentences with the same subject, object, and verb. However, in Sentence 71 (see Figure 4.25) the subject of the sentence, *li b'eelomej* meaning 'the husband', has been moved from the end of the sentence to the beginning. For this speaker, the movement of the subject to the beginning of the sentence caused him to create another ip which is circled in Figure 4.25

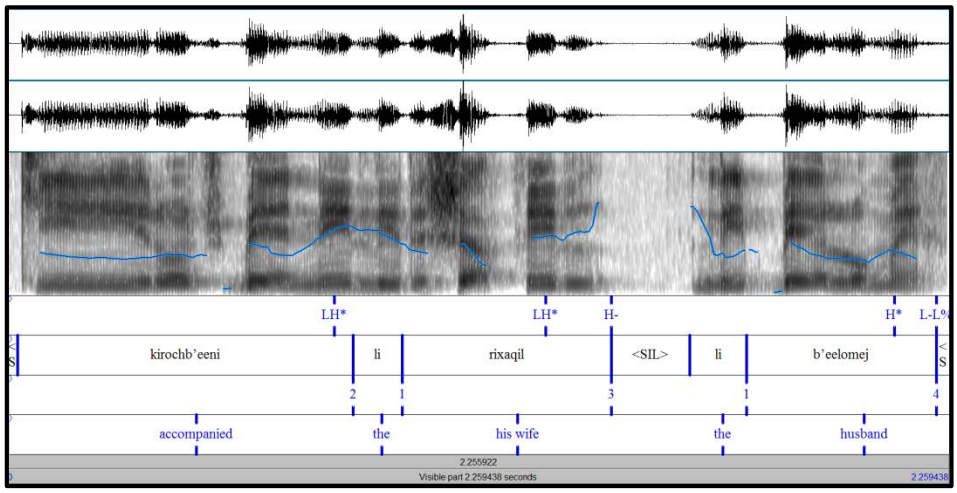

Figure 4.24: Declarative: VOS

Sentence 23: *Kirochb'eeni li rixaqil li b'eelomej.* 'The husband accompanied his wife.' as produced by speaker 2.

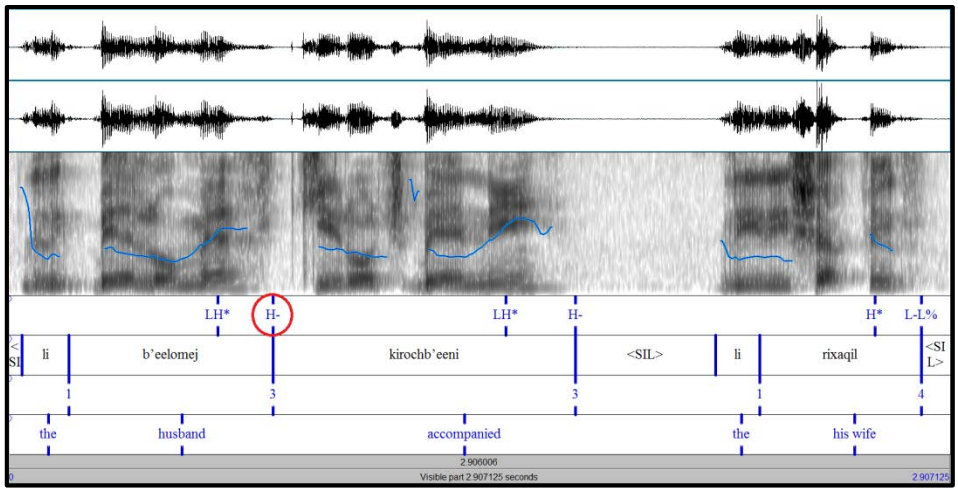

Figure 4.25: Declarative: SVO

Sentence 71: *Li b'eelomej kirochb'eeni li rixaqil.* 'The husband accompanied his wife.' as produced by speaker 2.

4.4 Conclusion

This chapter has shown, without discussing in detail, the patterns that emerged from the spoken data provided by the three native speakers of Q'eqchi'. The patterns shown in the figures and tables will be referred to in Chapter 5 as they are discussed more fully. The chapter began by showing that stress fell on the final syllables of content words and that pitch accents aligned to the stress. Evidence for the existence of the IP, ip, and AP were shown in 4.1.2 and the alignment of tones tied to these intonational phrases was shown in 4.1.3. Section 4.2 showed the patterns and characteristics of the pitch accent, phrase accent, and boundary tone labels used to describe the pitch contour and intonational phrases in Q'eqchi'. The chapter ended by looking at the patterns found in declarative, imperative, and interrogative sentences as well as showing a brief look at the syntactic word order shift from VOS to SVO. Chapter 5 will discuss each of these topics more fully.

Chapter 5: Discussion and Conclusion

This final chapter mirrors Chapter 4 in the majority of its sections and its focus will be to discuss the results highlighted in the previous chapter and thus many of the tables and figures therein will be referred to again. Additional observations of interest that came to light as a result of the analysis of the Q'eqchi' data will also be discussed in this chapter. In addition, brief comparisons to previous work in intonation, especially in the related Mayan languages will be made for each relevant section. The chapter will conclude by summarizing the findings of this thesis and their relations to the original research purposes.

5.1. Intonational Structure in Q'eqchi'

5.1.1. Stress Generalizations

Determining the nature and location of stress was the initial step in the intonational labeling of Q'eqchi'. Stress location was of utmost importance as the location of stress in the language signaled where the pitch accent labels describing the intonational contour were located. This is because metrical theories of stress assume hierarchically organized prosodic structures and the projection of stress from a lower-level prosodic category to a higher-level prosodic category (Liberman & Prince 1977; Hayes, 1995). At the same time, the data once again confirmed many previous observations on the location and characteristics of stress in the language (Campbell 1974; Berinstein, 1979; Stewart 1980; Caz Cho, 2004; Wichmann & Hull, 2009). Some of these characteristics will be described in this section.

The most salient observation about stress placement in Q'eqchi' is that it did indeed occur on the last syllable of all content words and this is consistent with all other sources on the primary stress pattern of the language (Campbell, 1974; Stewart, 1980; Caz Cho, 2004).

Furthermore, such stress patterns are validated further by other closely related languages such as K'iche'. Some studies have emphasized that stress in K'iche' is always word-final (Larsen, 1988). However, it can be difficult to qualify anything pertaining to language with the word always. Henderson (2012) notes that in K'iche' stress falls on the final syllable of a prosodic word unless that final syllable is light non-root material, in which case stress transfers to the final root syllable of the word. The Q'eqchi' data also showed two exceptions to the general stress rule, one of which will be discussed later in this section. Figure 4.2 showed the first such exception, those being clitics. While being a separate word in its own right, *chan* also functions as clitic material, attaching to the final word of an utterance and thus may be classified as light non-root material as noted by Henderson (2012).

Every sentence was evidence as to the location of stress in Q'eqchi'. Some sentences were also evidence to other research on stress in the language. Berinstein (1979) concluded that the major correlates of stress in Q'eqchi' were amplitude, F0, and intensity. Syllable duration, however, was not a cue for stress. Though none of these were measured and quantified in this research, visual observation seemed to confirm these observations.

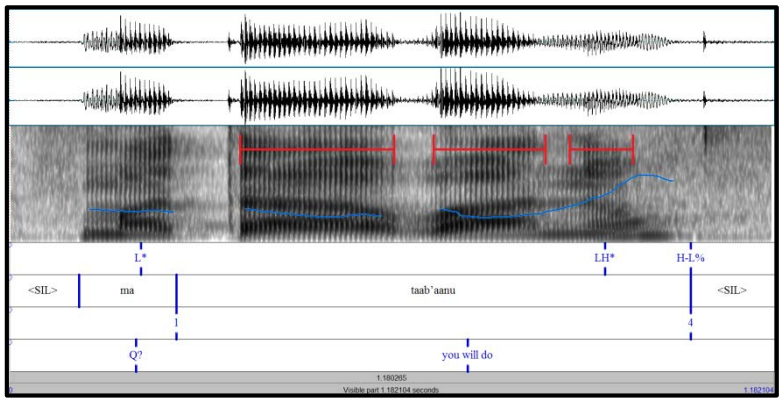

Figure 5.1: Syllable Duration not Correlated with Stress

Sentence 10: *Ma taab'aanu?* 'Will you do it?' as produced by speaker 2.

The sentence in Figure 5.1 shows exceptionally well that syllable duration has little to do with stress in Q'eqchi'. In Figure 5.1, the duration of each of the three syllables of the verbal complex *taab'aanu* has been roughly marked. The stress clearly falls on the last syllable as indicated by the pitch and can be perceived as one listens to the sentence. However, of the three syllables, it is without a doubt the shortest. One good reason for duration perhaps not being associated with stress as it might be in English (Berinstein, 1979) is that vowel length is phonemic in Q'eqchi' (Caz Cho, 2004) and thus has other important uses. Data also showed the rise of F0 as the most important indicator of stress, with LH* or H* accents marking each stress in the language, though a few counterfactual examples of L* occurred on stressed syllables. These interesting uses of L* will be discussed in section 5.2.1.

The final interesting observation about stress placement, and the second exception to the general stress rule, comes by looking at the few foreign borrowings found in the data. Q'eqchi' has always been a prolific borrower from the other languages of the Mesoamerican language area and more recently from Spanish (Wichmann & Brown, 2003). When adopting Spanish words into the language, several adaptations have historically been made. These include the replacement of foreign phonemes with native ones (such as /p/ for /f/, *café* → *kape* 'coffee'), the reduction of polysyllabic words to the preferred monosyllabic morphemes of Q'eqchi' (*limeta* → *meet* 'bottle'), and the dropping of final vowels (often accompanied by lengthening of the vowel) to satisfy the preference for closed syllables (*iglesia* → *iglees* 'church') among others (Wichmann & Hull, 2009). These adaptations allow these foreign borrowings to behave much like any other word in Q'eqchi'. The last of these adaptations has the most important effect on stress, allowing it to stay word-final rather than occurring on the penultimate syllable as in Spanish. However, some loanwords have not undergone this adaptation for a variety of factors.

Two such borrowings could be found in the data. The name *Avelino* and the word *ángel* both retained their penultimate stress. Figure 5.2 shows that the LH* pitch accent occurred on the penultimate syllable rather than the final syllable of the word. The fact that each of these words occurred at ip and IP boundaries masks what would occur on the final syllable. Further data with a variety of loanwords in different positions would allow for further effects of loanwords on the general intonation pattern in the language. It is possible that they could have a similar effect as in Tseltal Mayan, where the grammar of loanword stress realization prevented a final rise boundary tone in some instances (Shklovsky, 2011).

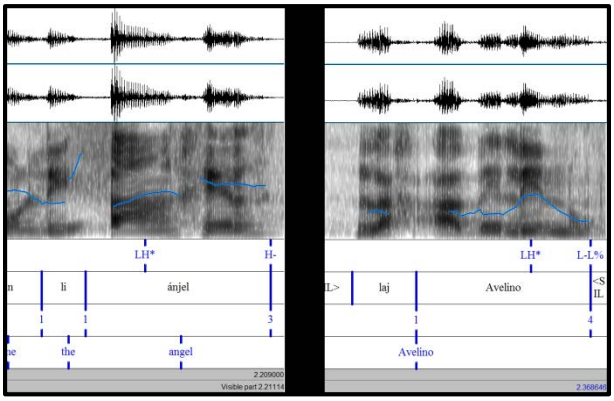

Figure 5.2: Non-Final Stress Pattern Seen in Some Foreign Borrowings

Foreign Borrowings: *ángel* 'angel' and *Avelino* 'Avelino' as produced by speaker 2.

All the patterns here discussed can be summarized in three points that characterize stress in Q'eqchi'. These three points show namely that in Q'eqchi' (1) stress is always word-final (with the exception of a few borrowings), (2) there are no minimal pairs in terms of stress in the language, and that (3) post-clitics do not change the locus of stress from the last syllable of the content word to which it attaches. Each of these points similarly hold true for K'iche' (Nielsen, 2005). Stress is never used to differentiate words in Q'eqchi' unlike in English where minimal

pairs can depend on stress location, the location of the stress often signaling the difference between parts of speech (REfuse (N) vs. reFUSE (V)). The fact that Q'eqchi' has fixed stress with a consistent final-syllable locus of stress made predicting and locating the placement for pitch accents fairly easy. Due to the nature of the stress, pitch accents in Q'eqchi' are only associated with acoustically stressed syllables whereas in French or Indonesian, pitch accents can also appear on non-stressed syllables (Ladd, 1996; Nielsen, 2005).

5.1.2. Intonational Constituents

In section 4.1.2 evidence for the existence of the three high-level prosodic phrases in Q'eqchi' was shown: the IP, the ip, and the AP. Each of these displayed unique characteristics and patterns that were observable throughout the data that will be discussed in this section. Figure 5.3 shows the alignment of the three intonational phrases and how they effectively divide an utterance into segments at levels above the word using Sentence 25 *Nim li roq li riitz'in laj Jose* 'Jose's brother is tall', which was uttered in the exactly same manner by all three speakers.

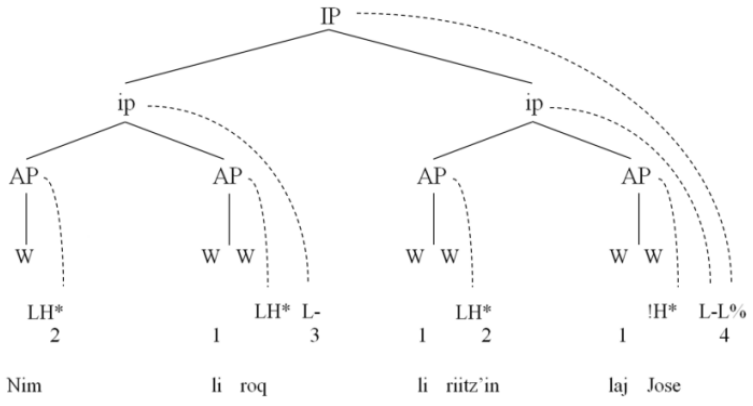

Figure 5.3: Hierarchical Representation of the Intonational Phrases

The Intonational Phrase

The IP in Q'eqchi' serves as the top-level prosodic phrase much like in every other language in that it consists minimally of at least one syllable with phrasal stress and ends with a boundary tone (Pierrehumbert & Hirschberg, 1990). As was shown in Figure 4.3 and 4.4, the IP can encapsulate one lone stressed words or a combination of words forming a larger utterance. Not much remains to be said of the IP in and of itself, its most defining characteristic being the presence of the final phrase accent and boundary tone combination at its right edge. What occurs within the IP relates to the lower-level prosodic phrases found therein, the ip and the AP (see Figure 5.3). These tone endings will each be discussed later in this chapter in section 5.2.2.

The Intermediate Phrase

The ip, being the next phrase in the hierarchical order, serves to divide an IP into smaller pieces for a variety of reasons. Figure 4.5 exemplified the difference between the IP and the ip. The ip was accompanied by an utterance-medial disjuncture and possible lengthening of the syllable occurring at that disjuncture. The disjuncture and lengthening of an ip is not as strong or prominent as that of an IP. It is for this reason that only a phrase accent label is assigned to the ip instead of a phrase accent and boundary tone combination which characterizes the behavior of the pitch at the end of an IP (Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986). An obvious question to ask is what motivates such sentence-medial junctures.

In the data, 88 instances of an ip were recorded. This number only counts occurrences of an ip when it did not align with the IP. The edge of an ip aligns with that of an IP and thus essentially every IP ending is also an ip ending. However, in those locations, the IP takes precedence over any characteristics displayed by an ip. Though complete consistency across

speakers was not found in all cases of the ip, there were some general patterns that seemed to motivate the necessity of an ip. One of the most intuitive uses for an ip would be to separate clauses from each other. Several of the stimuli sentences consisted of utterances with multiple clauses and did indeed use ips to separate the clauses. In sentences 7, 8, 9, 18, and 24, among others, the speakers divided each of the clauses into its own ip. Figure 4.17 and 4.18 both visually show examples of this occurring, clauses being split by the ip indicated by the break index 3 and a phrase accent L- or H- in the tone tier. Figure 5.4 shows how these sentences were divided into multiple ips, using Sentence 9 *Maare nakanaw, ab'an laa'in ink'a' ninnaw* "Maybe you know, but I don't know" as spoken by speaker 1.

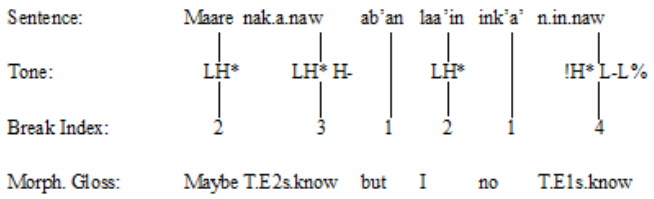

Figure 5.4: Multiple Clauses Separated by Intermediate Phrase[4]

An ip did not always have to correlate with sentence clauses. In sentences 4 and 5, for example, all three speakers separated the adverb from the following verbal complex (and accompanying clitic in 5) using a disjuncture that was perceived as an ip. Figure 4.5 shows the same thing happening in a question, the question marker and adverb separated from the verbal complex with an ip. The same occurred in Sentence 12 when the adverb followed the verb. Speaking in terms of clauses, these last examples show that an ip can also divide parts of an

[4] Morphemes are separated by periods in the sentence and the morphological gloss.
Morphological Gloss Key:
1 – 1st person, 2 – 2nd person, s – singular, E – ergative, A – absolutive, T – Voice/Aspect/Tense Marker

utterance without multiple clauses and thus is not simply used to delineate clauses within a sentence. This does not appear to be abnormal as an ip can occur on any accented syllable in a phrase, not just a final pitch accent, with durational lengthening or a stark contrast with the next tone being possible cues for an ip break (Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986).

Finally, the ip seemed sometimes to be used to group the different parts of speech, namely subject, object, and verb together, though not always in the same manner. If there is some relationship between subject, object, and verb that is reinforced by prosodic phrases such as the ip, it is hard to tell what that exact relationship is. The majority of sentences were constructed in the default VOS word-order of Q'eqchi', while the remainder were SVO. Seemingly every type of configuration can be seen in how the speakers split these three major sentence constituents. The following configurations were attested in the data, with the | indicating an ip phrase boundary: V|OS, V|S, VO|S, S|V, S|VO, S|V|O. There was no clear preference as to which two constituents tended to group together. To determine if and how the ip divides up the predicate from the arguments a more focused study would be required. As for differences between the three speakers, speaker 2 spoke more clearly and deliberately than the other two and was more prone to create an ip than were the other two. It is very possible that speech rate can have an effect on ips as they do with APs (Khan, 2008). The slower and more deliberate speech rate of speaker 2 led to higher levels of disjuncture resulting in additional ips. A rushed speaker will tend to push words and clauses closer together, negating many disjunctures that could occur as a sentence is produced at a slower pace. A study comparing speech rate and its effect on the intonational contour and the prosodic phrases, especially the ip and the AP would certainly be of great interest.

The Accentual Phrase

The final and lowest-level prosodic phrase operational in Q'eqchi' was the AP. The AP has traditionally been defined as consisting of at least one stressed morphological word, a morphological word indicating a root and its bound affixes (Gordon, 2005). An AP may also include neighboring unstressed function words and clitics. Nielsen (2005) also notes, while describing the K'iche' AP, that two content words that appear very frequently together can often form one AP together as they essentially function as one compound word. The AP in Q'eqchi' seems to function in a similar, perhaps identical pattern. Q'eqchi' has many potential candidates for words that appear together commonly and Figure 5.5 shows one such found in the dataset. Together, *chan li ru*, means 'how' and despite being composed of two potentially stressed words and an unstressed article, only form one AP. Interestingly, each speaker produced these differently. Speaker 1 produced *chan ru*, placing the stress on only *chan*. Speaker 2 combined the words into *chanru*, placing the stress on the second syllable. Finally, speaker 3 used another common form including the article *li* in the middle and only stressing *chan*.

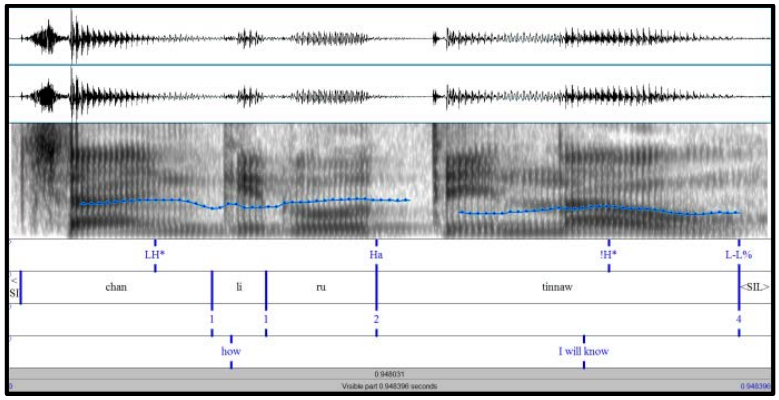

Figure 5.5: Accentual Phrase (Ha) Boundary

Sentence 35: *Chan li ru tinnaw?* 'How will I know?' as produced by speaker 3.

Figure 5.5 also exemplifies the other defining characteristics of the AP. The AP in both K'iche' and Q'eqchi' seems to require a LH* tone at its right edge, which is usually the end of a content word (Nielsen, 2005). Sometimes a non-stressed post-clitic may be part of an AP, and if so, the tone remains high through the post-clitic as well and can be indicated by Ha, which is the AP equivalent of a tone boundary. If the AP ends with the LH*, then the Ha is not required. The AP may contain additional tones such as L* and H*, but these do not form APs themselves without the bitonal LH*. There is always potential for variation in the production of each AP of the language as several factors can influence the phrasing and production of APs, some of them being speech rate, word length, and focus (Khan, 2008). The data thoroughly attested to the dominance of the LH* pitch accent in the language (see Table 4.1) which bolsters the argument that the AP is defined by the LH*. The only stressed syllables where LH* did not appear were on the sentence-initial question marker, which did not form an AP of its own, and on the stressed syllables which co-occurred with ip and IP phrase accents and tone boundaries (see section 5.2.2).

5.1.3. Tone Alignment

The final part of the first research purpose, which was to find the general intonational structure of Q'eqchi', was to verify that tones were tied to the prosodic phrases, and not to lexical items. This was done by following the simple methodology used by Shklovsky (2011) and adding words to the end of a sentence and seeing the final boundary tone accordingly stay aligned to the right edge of the phrase instead of staying on the same word. The results of this was shown in section 4.1.3, where additional words were added to Sentence 10 (Figure 4.7) to form Sentence 11 (Figure 4.8) and Sentence 12 (not pictured). The final tone stayed at the right edge, not remaining on the word *taab'aanu* which ended Sentence 10. Evidence can be seen

throughout all the data that the phrase accents were tied to the ip and that the boundary tones were tied to IP, occurring on stressed and non-stressed words, content words and function words. While pitch accents do indeed map to the primary lexical stress of a word, the phrasal accents and boundary tones were never particular to a specific word or to a specific word type. Even if the final word of an utterance was unstressed, the tone boundary inherent to the IP was still present.

5.2. Intonational Labels

This section will focus on describing the material and data presented in section 4.2. The main focus of the section are the tone labels which appear in the tone tier of a ToBI transcription and carry the burden of describing the actual behavior of the pitch which compromises the intonational structure of the sentence (Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986). Having already exemplified the pitch accents, phrase accents, and boundary tone types that appear in Q'eqchi', as well as providing some quantitative data on their proportional use as found in the dataset in the previous chapter, any additional observations can now be discussed.

5.2.1. Pitch Accents

In section 4.2.1 it was shown that three different tones manifested themselves in Q'eqchi', these three tones represented by the LH*, H*, and L* pitch accents. Pitch accent inventories in other languages are not always limited to only three different types. The ToBI annotation conventions (see Beckman & Hirschberg, 1994; Beckman & Elam, 1997) describe some additional pitch accents that were not found in Q'eqchi'. These two additional pitch accents used for English were L*+H and H+!H*.

The L*+H, named the scooped accent, is the counterpart to L+H* (labeled as LH* in this thesis). In these multi-tone pitch accents, the * is assigned to the tone that receives the higher prominence. The L*+H would have indicated a low tonal target on the accented or stressed syllables followed by a sharp rise to the peak of a speaker's pitch range. The L+H* describes the rise that occurs through the stressed syllable in Q'eqchi' much better. An additional possibility that was employed in Glasgow English was to incorporate a L*H label which signified that prominence was not given to either tone and that it was the rise itself that was the defining characteristic of the pitch on stressed syllables (Mayo et al., 1997). The LH* pitch accent, however, looks to be the best fit for Q'eqchi' and is supported by other Mayan languages also using a LH* label (see Nielsen, 2005; Avelino, 2009). The other pitch accent, H+!H*, is described as "a clear step down onto the accented syllable from a high pitch which itself cannot be accounted for by a phrasal tone ending the preceding phrase or by a preceding H pitch accent in the same phrase" (Beckman & Hirschberg, 1994). The annotation conventions also specify that the label is only appropriate when the preceding syllable is unstressed and clearly high-pitched. In the Q'eqchi' data, a similar pattern that an H+!H* describes could be seen. However, several observations argue against this being the accurate description of these stressed syllables.

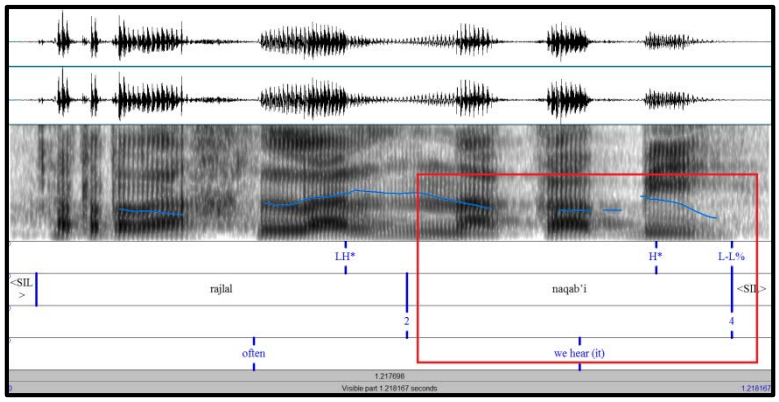

Figure 5.6: Interaction of Phrase Accent and Final Boundary Tone

Sentence 15: *Rajlal naqab'i* 'We heat it often' as produced by speaker 2.

Figure 5.6 helps in describing what is actually happening on these syllables that show a pattern quite contradictory to the other stressed syllables of Q'eqchi'. The vast majority of the stressed syllables in Q'eqchi' are characterized by the LH* pitch accent which is also the essential component of an AP as has been discussed. The last syllable of the word *naqab'i*, highlighted in Figure 5.6, is not only stressed, but is also coincident with the IP boundary, which is also an ip and AP boundary. Instead of the expected LH* pitch accent, the highest pitch comes at the beginning of the stressed syllable and then falls throughout as the sentence ends (H* L-L%). All the APs that do not overlap with an IP or ip have a LH* pitch accent, as seen in the first word of the sentence. However, in many of the APs that do overlap with a higher-level phrase, the LH* is not always observed, especially when the boundary tone is low. Two points serve to negate this as being labeled as H+!H*. First, the syllable previous to the stressed syllable is unstressed and does not have a high tone. Second, the initially high and then falling pitch seems to be caused by the IP tone overriding the AP tone and thus is most likely the main cause of the pattern. In other non-final APs, the LH* tone operated as normal. One could ask whether it was even necessary to label a pitch accent on the final syllables and only use the final tone instead. In the next section, the rationale for labeling the pitch accent as well is explored.

Finally, one very interesting observation on the usage of the low tone L* was revealed in the data. Almost without question, the rising LH* appears to be the default pitch accent in Q'eqchi'. On all stressed syllables where IP tone boundaries did not interfere, 82.5% of all pitch accents were realized as LH*. Even more telling and supporting of the dominance of LH* is that all the all the H* tones occurred in conjunction with ip interference, and all the L* tones, with the exception of six instances, were only found sentence-initially on the question marker. It is the

manifestation of these six instances of the L* tone that allow us to best observe how the variation of pitch accents may have pragmatic use in the language.

Each of these six seemingly strange L* tones crucially co-occurred with an IP boundary and this may have allowed them to exist as an AP without the LH* pitch accent. Five of the occurrences came from speaker 3, and one from speaker 1. Figure 5.7 and 5.8 provide the best example for the realization of these pitch accents. This pattern was seen in the production of single-word utterances of some of the most frequently used words in Q'eqchi': *ink'a'*, *hehe'*, and *maji'*, meaning 'yes', 'no', and 'not yet' respectively. In Figure 5.7 the expected production of two of these words can be seen with the initial lower tone usually manifested on the unstressed syllables of a word in Q'eqchi', with the following higher tone on the stressed syllable, here a H* rather than LH* because of the IP tone boundary interaction.

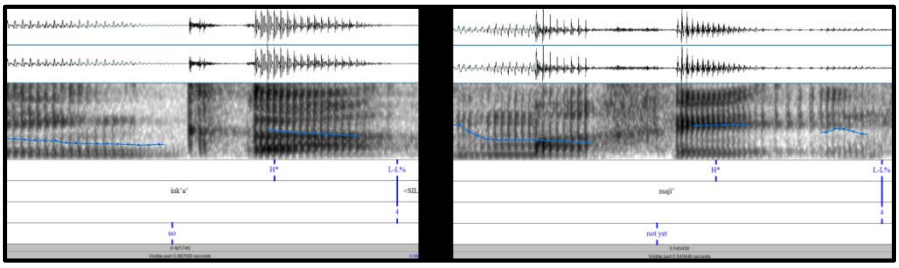

Figure 5.7: H* Pitch Accent Variation

Sentence 52: *Ink'a.* 'No.' & Sentence 55: *Maji'* 'Not yet.' as produced by speaker 1.

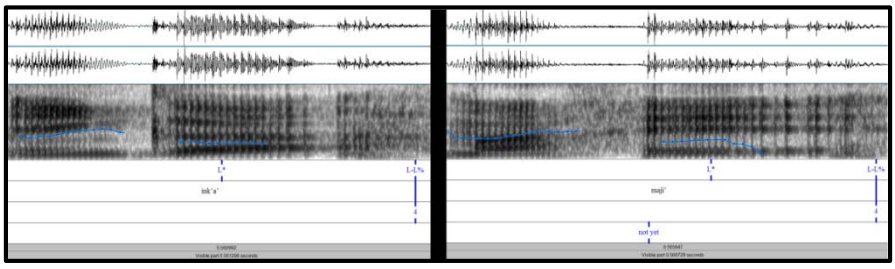

Figure 5.8: L* Pitch Accent Variation

Sentence 52: *Ink'a.* 'No.' & Sentence 55: *Maji'* 'Not yet.' as produced by speaker 3.

Figure 5.8 shows how the L* was used by speaker 3 in sentences of this type. The drop from the higher pitch on the initial syllable, which still crucially remains unstressed, does not appear to simply be the L-L% tone boundary taking precedence over the pitch accent. A visual observation of the pitch tracking shows that it is a more jarring drop than a gradual lowering towards the L%. Even better evidence comes from hearing the sentence spoken aloud and the drop in pitch is obvious and quite dissimilar from the otherwise common gradual lowering of the pitch at ip and IP boundaries. To ascertain why this phenomenon occurs, more spoken data would be required, preferably data from real-world contexts. From only anecdotal experience of living amongst the Q'eqchi' for nearly two years, this pattern can actually be found and heard fairly often. With a negation word such as *ink'a'*, it seems to have pragmatic uses such as perhaps adding some form of incredulity to the response. Additionally, it could even be a dialectal pattern, perhaps being heard in some locales and not in others. While it is certainly a very interesting observation gleamed from the data, additional research would be needed to speculate further on the use of a low tone in these instances. However, having observed these verifies that the L* pitch accent is not solely confined to the sentence-initial question marker of polar questions and can be employed in stressed syllables usually carrying high and rising tones.

5.2.2. Phrase Accents & Boundary Tones

Compared to the fairly specific and predictable patterns of pitch accent usage, phrase accents and boundary tones showed a good amount of variation, despite still making some overall patterns fairly clear. As a brief recap of information already covered in several previous sections, phrase accents (L-, H-) are tones tied to the ips which exist within an IP. An ip requires at least one stressed syllable and a phrase accent (Pierrehumbert & Hirschberg, 1990). The IP

also requires at least one stressed syllable, a phrase accent, and also a final boundary tone (L%, H%). This makes sense since the IP is essentially also an AP (which requires the stressed syllable) and an ip (which requires the phrase accent) with the final tone boundary signaling the end of the spoken utterance and thus only applied to the IP (see Figure 5.3).

There is not much to add about the phrase accents L- and H- as they appear with only an ip. The data in Table 4.2 shows that of the 88 occurrences of an ip, 48.9% were labeled as a low L- and 51.1% as a high H-. Subjectivity has always been present in ToBI labeling, and the phrase accent was one of the harder elements to label in Q'eqchi', especially when followed by a voiceless stop, ejective, or fricative. Even accounting for labeling error, with such a 50/50 split, it is hard to determine if one or the other is the preferred or default phrase accent. There may be a factor of speaker preference as speaker 2 produced L- phrase accents more frequently than the others who used the H- phrase accent more. Speaker 2, as noted previously, also spoke in a more enunciated and clear manner so as to produce more ips. The phrase accent becomes more interesting as it combines with a boundary tone to indicate the end of an IP.

The rest of this section will focus on the combination of the phrase accent and boundary tone at the end of IPs, though their relation to different sentence types will be saved for section 5.3. Taking a look at Table 4.2 again, it is made clear that of the four combinations, L-L% is by far the most common in the data with 68.9% of all boundary tones exhibiting this pattern. This number is obviously somewhat skewed, with declarative sentences accounting for much of the data and different combinations taking precedent in different sentence types. However, declarative sentences are explained as the most neutral types of sentences that possess the default intonation pattern of a language, described by Noguchi (2011) as "the intonation of an all-discourse-new sentence without contrastive focus." If this is indeed the case, then the default

intonation pattern in Q'eqchi' is summarized as any number of LH* rises on all stressed syllables in an utterance and ending with the fall of pitch indicated by L-L%.

Each of the IP boundary tones was exemplified in the previous chapter, specifically in Figures 4.12 – 4.15. The first of these, L-L%, can be characterized in the same manner as in other languages making use of the same ToBI label. The L-L% begins to describe the pitch starting from the final pitch accent (also correlated with the final stressed syllable) of the utterance. The phrase accent L- indicates that from the pitch accent, the pitch begins to decline. The boundary tone L% indicates what happens at very end of the utterance, essentially stating that this sentence continues in a decline until it is over. This was seen in Figure 4.12 but can also be seen below in Figure 5.9 where the second syllable of *wa'in* has the default LH* pitch accent which is then followed by a gradual decline in the pitch (L-) which continues through the end without an upward spike (L%).

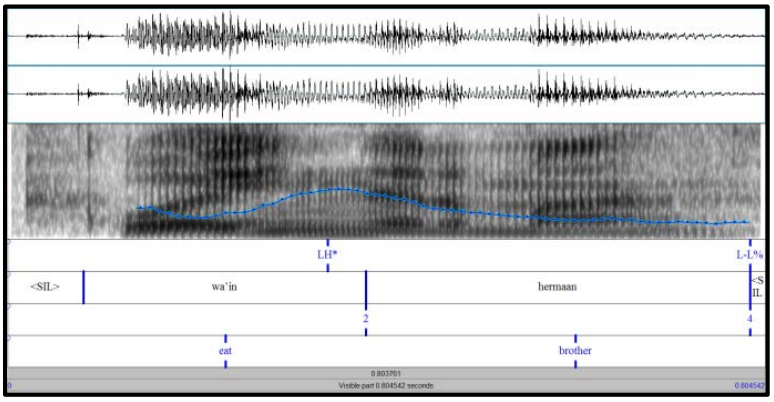

Figure 5.9: Overriding of Final Pitch Accent by Final Boundary Tone

Sentence 57: *Wa'in hermaan!* 'Eat, brother!' as produced by speaker 1.

Figure 5.9 also draws attention to the discussion in 5.2.1 which asked if it was really necessary to mark the pitch accents of utterance-final syllables since they interact so heavily with

the IP tones. In most of the sentences that have been shown, one can see a clear rise in the pitch from the previous unstressed syllables (see Figure 5.7). Even though the default LH* is not always produced, being realized as an H* instead, this differs from what was seen when unstressed words appeared utterance-finally (see Figure 4.2). In Sentence 57 shown in Figure 5.9 there is no rise on what is supposed to be a stressed syllable in the Spanish borrowing for 'brother' or 'sister', *hermaan*. The same sentence, when produced by the other two speakers did have the rise in pitch. Perhaps in principle all utterance-final pitch accents are influenced by the IP boundary, but since discernible patterns in the pitch contour could be seen, labeling those pitch accents that weren't completely overridden such as in Figure 5.9 seemed to be the most accurate way to represent the intonational pattern of Q'eqchi'.

Describing the opposite pitch movements from L-L% boundary tone, H-H% boundaries were also accounted for in the data. Seen in polar questions, such as shown in Figure 4.15, the H-H% describes the pitch being brought to the highest range of a speaker rather than to the lowest range. The phrase accent H- indicates that from the final pitch accent, the pitch either begins to rise or continues its rise in the case of the rising LH* already occurring on the last syllable. The boundary tone H% indicates that this rise continues all the way to the end of phonation. Interestingly, H-H% did not seem to cause the appearance of an H* as L-L% often did. This may be because since the LH* defines a rise, it was easily incorporated in the continuous rise of the H-H%. The same was observable with the H- phrase accent occurring at ips and in the H-L% boundary tone. It would thus appear that the L- phrase accent, and not the L% boundary tone is what triggers the overriding of LH* with an H* and that H- does not trigger the same condition.

The final two IP boundary toners, H-L% and L-H% were substantially harder to identify in some cases. Since the IP boundary often coincided with the final stressed and pitch accented syllable of the sentence, there was an abundance of pitch movement and variation at the end of sentences in Q'eqchi'. Making this even more difficult to characterize is the simple fact that pitch tracking software often becomes irregular at the end of an utterance. Sometimes this causes spurious peaks and irregularities that can be incorrectly identified as the rise or lowering of pitch. Gordon (2005), in a study on Chickasaw, noted this difficulty as well when observing that the fall from H to L in the H-L% boundary occurred relatively late in the final syllable (as almost all the boundary tones in Q'eqchi' do). In cases where the pitch fall is imperceptible it could be regarded as a by-product of the phonation occurring utterance-finally rather than actual boundary movement. Most of these, however, can be identified as false signals when listening to a sentence and having an ability to actually perceive deliberate pitch movements. As with L-L% and H-H% the phrase accent and boundary tone describes the behavior of the pitch as the utterance ends. In the case of H-L%, this puts the pitch higher in a speaker's pitch range but does not keep rising, but rather plateaus. Similarly, the L-H% indicates a falling pitch starting from the last pitch accent, but again it does not keep falling and rather plateaus. Nielsen (2005) found similar results for the patterns of these boundaries in K'iche'. The same patterns seem to describe the intonational contour at the end of utterances in Q'eqchi'. Figure 5.10 presents a schematic on the relation of the four IP boundary tones to each other.

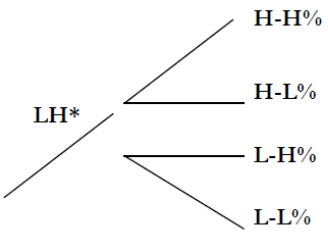

Figure 5.10: Schematic on the Interaction between Pitch Accent and Phrasal Tones (Nielsen, 2005).

As can be seen here, the four boundary types can usually be characterized in relation to each other and the relation to their final position in the pitch range. This may even be a better indicator than their actual behavior, many times obscured by the many concurrent events at the end of the utterance. Noted not only here, but also in other reference material on ToBI labeling, H-L% and L-H% are not as extreme as the other two, often appearing flat (Beckman & Hirschberg, 1994; Beckman & Elam, 1997). The research in this thesis could also additionally add to this schematic the observation that the boundary tones accompanied with L- phrase accents have the potential to modify the LH* rise into a H* peak and negating the rise. Further and more comprehensive analyses on the IP boundary tones in Q'eqchi' could lead to even more specific characterizations such as done for the complex final movements in Greek (Arvaniti & Baltazani, 2000). In the Greek ToBI labeling, the presence of downstep (!) showed even more complex types of rises and falls which indicated stylized contours with specific pragmatic meanings.

5.2.3. Downstepping & Upstepping

As was shown in the previous chapter, both downstepped and upstepped variants of the pitch accents were produced by the speakers, and they merit short mention here. Downstep, being a natural process which compresses and lowers the pitch range as a speaker runs out of air (Pierrehumbert, 1980), actually occurred less than expected. Downstep was marked on a pitch accent in relation to the previous LH* or H* within the same ip. Thus, in sentences consisting of more than one ip, downstep was not carried across the ip boundary. It is plausible that entire ips could have been produced in a downstepped manner in relation to the previous ip, but this was not a phenomenon that was looked at. Interestingly, the process of downstepping was rarely one

of a gradual downstep from the first pitch accent to the last. The last stressed syllable of the sentence was often a downstepped variant, even if all the other stressed syllables remained fairly similar in pitch. A few sentence types showed no instances of downstep. Those will be indicated in the next section which focuses on the different sentence types analyzed.

While it had far less occurrences in the data, upstep had a more discernible pattern than that of downstep. Examples of upstepped ^LH* accents can be seen in Figure 4.17 and 4.18. In the case of all twelve instances of upstep, the peak of a subsequent LH* pitch accent was produced substantially higher than that of the preceding one. In addition to this, all the cases of upstep occurred at the right edge of an ip. The ip did not seem to necessarily require its own high tone as three of these were marked with a low L- phrase accent, while nine of them were marked with the high H- phrase accent. The next logical question would be to ask what purpose upstepping has in Q'eqchi'. With only a few samples available it might be unwise to assume that this is the only context in which upstepping happens. However, from the data available, upstep had some sort of relationship with signaling that an utterance was not yet finished. Since the dominant pattern of the pitch contour at the end of sentences appears to be L-L%, bringing the pitch to the lower levels of a speaker's range, perhaps raising the pitch signals to other speakers that a sentence or topic has not concluded. Both downstep and upstep occur regularly in Q'eqchi', though only the latter showed any indication of a possible pragmatic purpose.

5.3. Intonational Contour

This final section before the conclusion focuses on the behavior of the intonational contour as related to specific sentence types in Q'eqchi'. Section 4.3 covered the results of the analysis of these sentence types, and this section will discuss those results and any other

observations that were pertinent to the realization of the intonation patterns in different sentence types. Declarative, imperative, and interrogative sentences compromised the stimuli set for the purpose of observing the different patterns these produce. Additionally, the interrogatives were split into three separate groups to see if they displayed significant differences. Finally, several SVO sentences were created, mirroring some of the declarative and interrogative sentences with the default VOS sentence order.

5.3.1. Declarative Sentences

The declarative sentences in the stimuli set, 36 in total, showed the greatest amount of variation both between speakers and across sentences, though this was most likely due to the greater complexity and length of these sentences as compared to the other types. Despite showing variation, it was also fairly easy to discern the predominant intonational contour pattern. Following the dominant cross-linguistic pattern (Pierrehumbert & Hirschberg, 1990; Gordon, 2005; Nielsen, 2005) declarative sentences were defined with a lowering of the F0 or pitch as the sentence came to a conclusion. A rise in pitch at the end of a declarative sentence is comparatively rare, as noted by Gordon (2005) after observing that in Chickasaw, speakers usually ended statements in such a manner. Thus, the L-L% IP boundary tone discussed in 5.2.2 is without a doubt the preferable way to produce declarative sentences as was shown in Table 4.3. This agrees with previous observations that Q'eqchi' has declarative falling intonation (Shklovsky, 2011).

The discussion on declaratives would be done were it not for the occasional appearance of L-H% and H-L% boundary tones. As compared to the 94 instances of L-L% in declaratives, six instance of L-H% and six instances of H-L% were produced. It is not quite

clear why the L-H% contour was used, but it gave of a sense of incompleteness as the sentence ended. These cases might have been abnormalities that were realized as a by-product of the elicitation procedure and environment, but if they weren't, perhaps the raising of the pitch showed the unwillingness of the speaker to affirm the sentence as a complete sentence that they were committed to. This could be a plausible option as it seems the lowering of the pitch indicates a sense of finality and completeness since it is the predominant pattern for such statements.

The H-L% boundary, if not an abnormality, may have had more to do with the semantic meaning of the words it occurred with. Sentences 2 and 3 were both ended in an H-L% by two of the three speakers and actually sounded more natural than speaker 2 who ended them in L-L%. This may have been because both sentences ended with special modal clitics that encode the status of the speakers' commitment to the event they are describing (Kockelman, 2006). Figure 5.11 shows the production of sentence 2 by one of the speakers.

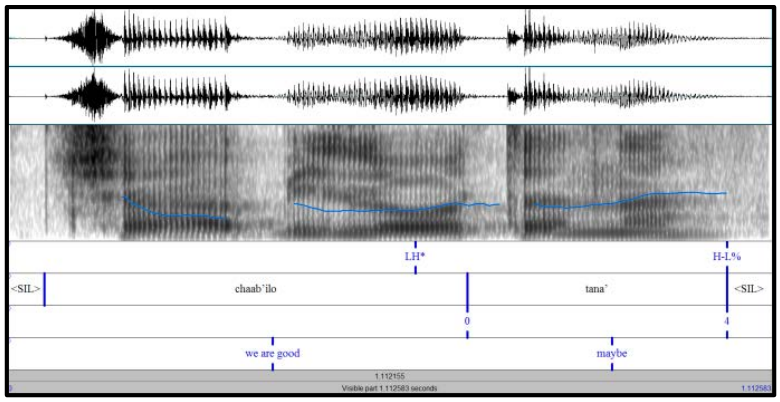

Figure 5.11: H-L% Boundary in Declarative Sentence

Sentence 2: *Chaab'ilo tana'*. 'We might be good.' as produced by speaker 1.

This sentence ended with the unstressed clitic *tana'* and instead of a falling L-L% boundary tone, the high-plateau H-L% is clearly seen. This clitic signals that the speaker is committed to the proposition in a possible world, hence the translation being essentially that it is possible that we are good, but that may not be the case. In Sentence 3 the same speakers also use the H-L% with another clitic, this one signaling negation. These small observations may point to that H-L% and L-H% can serve special pragmatic or semantic functions within a declarative sentence to differentiate it from a normal statement. For K'iche', Nielsen (2005) also found H-L% tones on a few sentences ending in clitics and noted that this was very similar to a LH* + Ha boundary that would be found on an AP ending in a post-clitic. It could very well be that the H-L% is caused by a post-clitic keeping the tone higher than usual rather than the semantic or pragmatic information of the clitic itself being the cause. Further investigation of this would certainly be interesting.

5.3.2. Imperative Sentences

The production of the imperative sentences was more uniform from sentence to sentence and between speakers than any other sentence type. This may be partially related to the relatively low complexity and short length of the imperative utterances. Table 4.3 showed that 25 of the 27 imperatives ended with an L-L% boundary, the same pattern as was seen in the declarative sentences. Within the set of nine unique imperatives, three different types existed. Since they all showed the same pattern they were not divided into distinct categories as the interrogatives were and which are discussed in the next section. Seven sentences employed the standard imperative which is formed by simply using the root of a verb without any inflectional affixes or clitics attached. One of the imperatives, Sentence 59, could be classified as a

prohibitive, indicating negative desire and prohibition (Caz Cho, 2004). It is most likely related to the dehortative modality which discourages or urges against some action. This imperative is formed in the same manner as other inflected words, requiring the prohibitive mood marker *m-* and the inflectional clitics to indicate person. Mirroring this was Sentence 60, an imperative formed using the optative mood marker, indicating a wish or hope. This mood is similar to both the cohortative and subjunctive moods. This was formed in the same manner as the prohibitive, using a *ch-* mood marker instead. For K'iche', Nielsen (2005) only had one example of an imperative which happened to end with an L-H% boundary tone. The Q'eqchi' data, with far more data to work with, showed imperatives ending with an L-L% boundary tone and containing no instances of downstep.

5.3.3. Interrogative: Wh-Questions

Being an exploratory description of intonation in Q'eqchi', the interrogatives were split into three basic categories, though finer distinctions and more in-depth analyses could certainly reveal more on the how intonation interacts with the many meanings questions can encode. Some of these more complex meanings encoded in a question include are speaker and addressee commitment to a proposition, the potential assertive force of a question, and the anticipated answers that questions are intended to elicit (Hedberg et al., 2006b). The research of this thesis began by simply looking at question types in terms of structural differences, namely Wh-questions, polar questions, and tag questions.

Nine Wh-questions were produced by the speakers and featured five distinct Wh-question words: *ani* 'who'*, k'a'ru* 'what'*, jo'q'e* 'when'*, b'ar* 'where'*,* and *chanru* 'how'. Among the three question types, the Wh-questions were the least similar to the other two. While polar

questions generally had a rising intonation contour throughout, the Wh-questions showed no such trend. Wh-questions showed similar patterns to declaratives and imperatives, ending in L-L% for the most part. Though a few sentences ended in L-H% or H-L% (see Table 4.5), there were no apparent explanations for this sporadic change. It didn't appear that the tone boundary ending the sentence was indicative of the general trend of the pitch throughout the entirety of the question as was seen in polar questions. A final difference between the question types was that the Wh-questions allowed downstepped pitch accents while none were observed in the other question types. A falling contour in Wh-questions appears to be common in other languages as well, English being one example (Hedberg et al., 2006b).

5.3.4. Interrogative: Polar Questions

In the case of English, the presence of a Wh-word signals a question and thus a rising intonation may not be required as it is in polar questions where there is no other indication that an utterance is meant to be a question. The same seems to hold true for the Wh-questions in Q'eqchi'. However, in Q'eqchi' there is also clear indication at the beginning of a polar question that the sentence is a question and yet, the polar question still seemed to require a rise in pitch. All polar questions began with the question marker *ma* which always carried a low tone marked by the L* pitch accent. The general tendency after this initial low was a gradual rise in pitch throughout the entire question until the question ended in one of the two boundary tones found in the higher end of the pitch range. Figures 4.21 and 4.22 demonstrated polar questions with this pattern. Nielsen (2005) noted that in K'iche', polar questions also began with a question marker with a low tone and contour that rose throughout the sentence. This low to high had an effect on the APs of the sentence, making their LH* rising tones not quite as pronounced and leaving the

contour on a more gradual rise throughout rather than a series of valleys and peaks until sentence end. This phenomenon seemed to behave similarly in Q'eqchi'. On a related note, not a single instance of downstep was found in the polar questions. This makes sense as downstepping would not allow for a continually rising contour.

While also showing the most interesting and dynamic intonational contour of all the sentences, there was no absolute and clear indication of which boundary tone was dominant. In a total of 43 analyzable polar questions, 34.9% ended in H-H% while 55.8% ended in H-L%. These were sometimes quite hard to distinguish from each other, especially since they co-occurred with the LH* rising pitch accent which was found on the final syllable of each question. Four instances ended in L-H% or L-L%, but they seemed quite unnaturally produced as a question when compared to the others and were most likely caused by the elicitation process. Though H-L% was certainly more common than H-H%, all other sentence types showed a much more dominant phrase accent and boundary tone combination. A brief perusal of Table 4.6, which shows all the patterns produced in the polar questions, shows that even for the same question, there was often discrepancies between the speakers. Only eight of the fifteen questions had all three speakers producing the same boundary tone at the end. There could be a multitude of different reasons for using H-H% instead of H-L% and vice versa, reasons which likely cannot hope to be answered with such few speakers and tokens. It may be that the choice between the two could have to do with the more complex meanings attached to the utterance mentioned earlier such as are speaker commitment to a proposition and relative levels of certainty or uncertainty (Hedberg et al., 2006b). It is clear, however, that a polar question is signaled by the rise of pitch, whether that be simply to the mid-upper range (H-L%) or to the highest range possible (H-H%).

5.3.5. Interrogative: Tag Questions

A small set of the final interrogative type, tag questions, were also analyzed as part of the study. In K'iche', Nielsen (2005) found that tag questions ended with an H-L% boundary tone. The Q'eqchi' data was much harder to interpret. In K'iche', a tag question is indicated by a simple tag question clitic *pa'*. As discussed in 5.3.1, for one reason or the other, clitics tended to show an H-L% boundary tone pattern and this demonstrates another case of such. In Q'eqchi', however, a tag question is marked by a slightly longer combination, *pe' yaal*, which adds the word 'true' to the clitic *pe'*. This apparently obfuscated the comparatively simpler results found in K'iche'. The only similarity to the polar questions was the lack of any downstepped tones, though with more examples it certainly might have occurred. In Figure 4.22 the end tag question from the sentence was shown to be produced differently by all three speakers. The only consistency that was seen was that the speakers tended to use the same pattern each time. Speaker 1 produced falling boundary tones in the form of two L-H% and one L-L%, speaker 2 produced three L-L% boundary tones, and speaker 3 produced three H-L% tones. Since the three sentences would have been declarative without the presence of the tag questions, it's possible that the first two speakers aligned more to the declarative aspect of the sentence while speaker 3 emphasized that it was intended as a question.

5.3.6. Topic-focused SVO Sentence Order

The final goal of this research was to briefly observe any intonational patterns that emerged in Q'eqchi' when sentences shifted from the default VOS word order (Caz Cho, 2004) to a SVO word order which emphasizes the subject of the sentence. The preverbal space functions like this in several languages and is often used to indicate topic and focus when

occupied by sentence argument (Henderson, 2012). A limited set of the VOS sentences were given a SVO counterpart which brought the subject into the pre-verbal space, namely sentences 65-75 (see Appendix A). Unfortunately, the data did not reveal many differences between the productions of the two word orders. A larger set of data focused specifically on the matter would most likely allow for a more substantial analysis of the word order shift. The one example given in section 4.3.6 did show that the movement of the subject to the pre-verbal space caused the speaker to divide the sentence into one more ip (compare Figure 4.24 and 4.25). There is a possibility that this extra ip could have been randomly implemented. However, Avelino (2009) showed that in Yucatec Mayan the same word order shift also created extra pauses or hesitations between the constituents. Additionally, a topic marker clitic lengthened the pause. It was concluded that broad focus, narrow focus, and topicalization had an effect on prosodic phrasing. A few of the sentences in Q'eqchi' showed that this might be a possibility in Q'eqchi' as well, though a more robust study focusing on the phenomenon would certainly be needed to make any substantial claims.

5.4. Conclusion

5.4.1. Research Purpose 1

The first research purpose of this thesis was to provide the first ToBI labeling of spoken Q'eqchi' and observation on the intonational structure of Q'eqchi' within AM. This process included verifying the basic stress pattern of Q'eqchi', determining which prosodic phrases were operational in the language, and verifying the existence of tones tied to prosodic phrases rather than to lexical words. Chapter 3 explained the methodology used to gather the data necessary to answer each of these questions, as well as the questions in the subsequent research purposes.

Chapter 4 showed the results for each of these and finally, Chapter 5 added a discussion on each topic.

Stress was verified to fall on the final syllable of all content words, with the exception of a few foreign borrowings which retained the penultimate stress of Spanish. No matter where the stress fell, all stressed syllables were assigned a pitch accent for the purpose of describing the behavior of the intonational contour during the stressed syllables. Q'eqchi' was shown to be a language which employs not only Intonational Phrases (IP) and intermediate phrases (ip) as the high-level prosodic phrases, but also Accentual Phrases (AP). The AP was composed of a stressed content word with accompanying unstressed function words and clitics and was characterized by a rising LH* tone at its right boundary, an additional Ha tone assigned to the right boundary if an unstressed post-clitic or function word existed. The next prosodic phrase was the ip, found between the AP and the IP, which required at least one AP and an accompanying phrase accent H- or L-. The highest-level prosodic phrase, the IP, required at least one ip and an accompanying final boundary tone, comprised of the combination of a phrase accent and a boundary tone L% or H%. The existence of an ip and IP, and the fact that phrasal tones (i.e., phrase accents and boundary tones) aligned to the right edges of these phrases rather than to specific lexical items verified that tones were tied to phrases and not words.

5.4.2. Research Purpose 2

The second research purpose was to ascertain which of the ToBI pitch accents, phrase accents, and boundary tones would be required to describe the pitch contour in Q'eqchi'. This process was the bulk of the analysis as it included a thorough labeling of 212 sentences produced by three native speakers of Q'eqchi'. Each of the sentences was analyzed in Praat by the

creation of four accompanying tiers that encapsulated all the intonational information provided by a ToBI transcription. This included a tone tier, an orthographic tier, a break index tier, and a miscellaneous tier that was essentially repurposed as a gloss tier with a rough English translation of each of the Q'eqchi' words.

Three different tones were found in the sentences produced by the speakers. These were represented by the pitch accents L*, H*, and LH*. The rising LH* pitch accent was found to be the predominant and default tone in Q'eqchi', usually being the tone associated with stressed syllables in the language. It was also observed that when interacting with the phrasal tones of an ip or IP, the LH* was often realize as a simple H*. Both LH* and H* tones showed downstepped variants !H* and L!H*, common towards the end of a sentence as the speaker began running out of air and the pitch range was compressed. The LH* also showed an upstepped version ^LH* which was observed to always occur in conjunction with an ip boundary. The low L* was found at the beginning of polar questions, accompanying a specific morpheme used to indicate a question in Q'eqchi'. The ip was accompanied by either a high H- or low L- phrase accent tied to the ip itself. Four different final boundary tones were used to indicate the end of an IP which always encapsulated an entire utterance: L-L%, H-H%, L-H%, H-L%. Each of these boundary tones was found to have precedence in certain sentence types as well as providing pragmatic and semantic information that was conveyed through either intonation alone or in conjunction with the semantic content of words.

5.4.3. Research Purpose 3

The final research purpose was to establish the basic pattern of the intonational contour for a variety of sentence types in Q'eqchi', as well as making any additional observations on

peculiarities displayed by these sentences. The sentence types that were analyzed were declaratives, imperatives, and interrogatives. In addition, sentences with word order shifts from VOS to SVO were also looked at. The main factor in determining the differences in the intonational patterns of the varying sentence types was the final boundary tones used in the sentence as there was no significant difference on the word level since the default tone for all stressed syllables in Q'eqchi' was LH*.

Declarative sentences were the most represented type of sentence in the research, ranging from one-word sentences to more complex sentences involving multiple clauses. They were characterized by a falling L-L% intonation at the end of the sentence. The occasional L-H% and H-L% boundary tones were speculated to signal other specialized meanings. Imperatives patterned similarly to declaratives, predominantly produced with the falling L-L%. Interrogative questions were split into three categories: Wh-questions, polar questions, and tag questions. While Wh-questions also used the L-L% falling intonation, polar questions ended with the pitch in the upper half of the pitch range. Polar questions were the most unique, starting with a low L* tone not usually observed in any other context and rising steadily throughout, ending with either the super high H-H% or the high plateau H-L%. Tag questions were sparsely represented and no observable and generalizable pattern was found. Each separate speaker, however, used a similar pattern for each instance, either staying in the lower end of the pitch range, much as a declarative, or staying high in the pitch range and patterning after the polar questions. Finally, a comparison of VOS and SVO sentences revealed little except perhaps an effect on additional sentence breaks being employed. Further study on the sentence types that did not reveal definitive patterns would likely find interesting intonational patterns specific to the sentence type.

5.4.4. Conclusion

The overall purpose of this thesis was to provide the first ToBI description of Q'eqchi' within the Autosegmental-Metrical model of intonation. A robust set of 75 unique sentences were designed to create optimal contexts from which the intonational patterns of the language could be observed. With the help of three native speakers of Q'eqchi', this stimulus set was turned into spoken speech examples that could be labeled using the ToBI transcription system. With the ability provided by ToBI to modify the inventory of tones, break indices, and labeling tiers, a successful initial production of Q'eqchi' intonation was accomplished. This being only an exploratory description, further research and improvements to more accurately capture the specific of intonation in Q'eqchi' are certainly hoped for.

Limitations

The observations of the study came from three native speakers, all of the same gender, approximate age, and who came from the same geographical area. This was perhaps the greatest limitation of the study, but a necessary one due to the difficulty of finding native speakers without necessitating international travel. While being a good start, this small and rather homogenous set of speakers certainly needs to be expanded to include different ages, genders, and greater geographical diversity to more fully explore the intonation patterns of the language. While the stimulus set was composed of a variety of structures and sentence types to cover many of the most important aspects of intonation, they were all constructed sentences and not novel utterances. Speech taken from natural discourse could reveal many things that isolated utterances might not have been able to. The final limitation is one inherent to ToBI labeling and the identification of intonation patterns. The pitch contour can often be hard to decipher, and

even when the software provides perfect tracking, human subjectivity can come into play when patterns become harder to identify. Despite these limitations of the study, the intonational patterns observed and the knowledge gained from the analysis appeared to be robust with the speech data as witness to the claims and observations of the study.

Future Research

The possibilities of what can still be done with intonation in Q'eqchi' are seemingly limitless. All of the research purposes of this thesis were explored and many of them answered to some extent while displayed interesting details relevant to Q'eqchi' and other related Mayan languages. However, much more can be said about even the most fully-explored details of Q'eqchi' intonation presented in this thesis. Comparative studies with other Mayan languages as well as further studies with Q'eqchi' would be would be of great interest so as to see how the assertions of this research hold up. Future research can and should focus to further identify the intricacies of the pitch accents, boundary tones, and prosodic phrase features of the language, one example being determining possible causes of variations seen in the boundary tones. Additionally, it was made quite apparent in this research that an AP required a LH* pitch accent in all cases except when a boundary tone occurred on the same syllable. Further investigation into this interaction between the pitch accent and boundary tone would be most enlightening; especially when it comes to the case of an unusual low tone being used such as was shown in section 5.2.1. Future research should also delve into the relation between intonation and the morphosyntax of Q'eqchi' as well as the sentence structures found within the language. In addition, future studies could certainly focus on the behavior of intonation in Q'eqchi' in relation to things such as surprise, trepidation, uncertainty, and many other paralinguistic factors that can

be expressed through intonation. It is hoped that this thesis has not been valuable only to the linguistic exploration of Q'eqchi', but that it has added to the rich field of intonation of the world's languages.

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Appendix A – List of Stimuli

The following table is a collection of the seventy-five utterances that were presented to the three participants providing the language data for this thesis. They are divided into groups depending on the main purpose the utterance held in relation to answering the research purposes. Some of the utterances in the first group, used to observe some of the basic of Q'eqchi' prosodic structure, pattern with the sentence types of the following groups, and were thus also used in conjunction with those when exploring that particular sentence type and its characteristics. Each sentence is written in the standard Q'eqchi' orthography as well as an English gloss. A conversion chart for those characters which do not already match their IPA equivalent has been provided.

IPA Conversion: Q'eqchi Letter = IPA

x = ʃ	**ch = tʃ**	**w = kw/k^{w}**	**b' = ɓ**	**' = ʔ**	**j = x**	**y = t^{y} (word initially)**	**t', k', q' = ejectives**

Utterances to Determine the General Intonational Properties (Declaratives)

1. K'a'ru li na'leb' li kolb'ileb' wi'?	'Through what idea are they saved?'
2. Chaab'ilo tana'.	'We might be good.'
3. Moko chaab'ilo ta.	'We are not good.'
4. Wuulaj tink'ayi.	'I will sell it tomorrow.'
5. Wuulaj tink'ayi chan.	'I will sell it tomorrow, said he.'
6. Wan jun li ánjel sa' choxa.	'There is an angel in heaven.'
7. Maawa'in li na'b'ej, a'an b'an li n'abej.	'I'm not the mother, she, however, is the mother.'
8. Aran wan laa we ut arin wan li we.	'There is yours and here is mine.'
9. Maare nakanaw, ab'an laa'in ink'a' ninnaw.	'Maybe you know, but I don't know.'
10. Naqab'i.	'We hear it.'
11. Naqab'i toj le'.	'We hear it over there.'
12. Rajlal naqab'i.	'We hear it often.'
13. Rajlal naqab'i li raatin laj Lu.	'We often listen to Pedro's words.'

Utterances to Determine the General Intonational Properties (Interrogative)	
14. Ma taab'aanu?	'Will you do it?'
15. Ma taab'aanu a'in?	'Will you do this?'
16. Ma taab'aanu a'in wulaj?	'Will you do this tomorrow?'

Declarative Sentences	
17. Nalub'k laj Miguel.	'Miguel tires.'
18. Nalub'k laj Miguel naq yoo chi b'eek.	'Miguel tires when he is walking.'
19. Na'oso' li tumin.	'The money runs out.'
20. Na'oso' li tumin sa' junpaat.	'The money runs out quickly.'
21. Naxnujob'resi li jul laj Avelino.	'Avelino fills up the hole.'
22. Naxnujob'resi li jul laj Avelino wulaj wulaj.	'Avelino fills up the hole every day.'
23. Kirochb'eeni li rixaqil li b'eelomej.	'The husband accompanied his wife.'
24. Kirochb'eeni li rixaqil li b'eelomej sa' chuutam.	'The husband accompanied his wife to the meeting.'
25. Nim li roq li riitz'in laj Jose.	'Jose's brother is tall.'
26. Tento tinb'aanu li k'anjel a'in.	'I have to do this work.'
27. Chal re li hab'.	'It's about to rain.'

Interrogative Sentences (Wh-Questions)	
28. Ani laa k'ab'a'?	'What is your name?'
29. Ani xula'ani awee?	'Who visited you?'
30. K'a'ru nekeraj?	'What do you want?'
31. K'a'ru nekeraj naq tinb'aanu?	'What do you want that I do?
32. Jo'q'e toxik Senahú?	'When are we going to Senahú?
33. B'ar nakatwulak chaq?	'Where are you coming from?'
34. B'ar xik aawe?	'Where are you going?'
35. Chanru (naq) tinnaw?	'How will I know?'
36. Chanru tinnaw xyeeb'aal?	'How will I know how to say it?'

Interrogative Sentences (Tag Questions)	
37. Lub'lukat, pe' yaal?	'You're tired, aren't you?'
38. Nawulak chawuu, pe' yaal?	'You like it, don't you?
39. Nawulak chawuu, pe' yaal?	'It's written in the book, isn't it?'

Interrogative Sentences (Polar Yes/No Questions)	
40. Ma yaal a'an?	'Is that the truth?'
41. Ma sa laa ch'ool?	'How are you (lit. *Is your heart happy*)?'
42. Ma nakawab'i li raatin lix Maria?	'Do you hear Maria's words?'
43. Ma ajel li ru?	'Is it important?'
44. Ma ajel li ru naq tinb'aanu?	'Is it important that I do it?'
45. Ma ajel li ru naq tinb'aanu?	'Are you feeling content?'
46. Ma najt?	'Is it far?'
47. Ma najt toob'eek?	'Will we walk far?'
48. Ma us a'an?	'Is that okay?'

Short Utterances (Declaratives)	
49. Naru.	'It is possible'
50. Moko naru ta.	'It is not possible.'
51. Naru tinb'aanu	'I can do it.'
52. Ink'a'.	'No.'
53. Hehe'.	'Yes.'
54. Us.	'Okay.'
55. Maji'.	'Not yet.'

Imperative Sentences

56. Wa'in!	'Eat!'
57. Wa'in hermaan!	'Eat, brother!'
58. Seeb'a aawib'!	'Hurry up!'
59. Matt'ane' sa' b'e'!	'Don't fall on your way.'
60. Chaawab'i li waatin!	'Listen to my words.'
61. Kim!	'Come.'
62. Kim arin!	'Come here.'
63. Ayu!	'Go.'
64. Ayu le'!	'Go over there.'

VOS to SVO Word Order Shift

65. Laj Miguel nalub'k naq yoo chi b'eek.	'Miguel tires when he is walking.'
66. Laj Miguel nalub'k.	'Miguel tires.'
67. Li tumin na'oso'.	'The money runs out.'
68. Li tumin na'oso' sa' junpaat.	'The money runs out quickly.'
69. Laj Avelino naxnujob'resi li jul.	'Avelino fills up the hole.'
70. Laj Avelino naxnujob'resi li wulaj wulaj.	'Avelino fills up the hole every day.'
71. Li b'eelomej kirochb'eeni li rixaqil.	'The husband accompanied his wife.'
72. Li b'eelomej kirochb'eeni li rixaqil sa' chuutam.	'The husband accompanied his wife to the meeting.'
73. Ma a'an li yaal?	'Is that the truth?'
74. Ma raatin lix Maria li nakawab'i?	'Do you hear Maria's words?'
75. Ma toob'eek chi najt?	'Will we walk far?'

Appendix B – Full List of Labeled Tokens

1 K'a'ru li na'leb' li kolb'ileb' wi'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* Ha LH* L!H* L-L%	LH* Ha LH* L!H* L-L%	LH* L!H* L!H* L-L%
Break Indices:	1 2 2 1 0 4	1 2 2 1 0 4	2 1 2 0 4

2 Chaab'ilo tana'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* H-L%	LH* L-L%	L* H-L%
Break Indices:	0 4	0 4	0 4

3 Moko chaab'ilo ta			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* H-L%	LH* L-L%	L* H-L%
Break Indices:	0 0 4	0 0 4	0 0 4

4 Wuulaj tink'ayi			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* L- (H* L-L%)	LH* L- (H* L-L%)	LH* H- (LH* H-L%)
Break Indices:	3 4	3 4	3 4

5 Wuulaj tink'ayi chan			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* L- LH* L-L%	LH* L- LH* L-L%	LH* H- LH* L-L%
Break Indices:	3 0 4	3 0 4	3 0 4

6 Wan jun li ángel sa' choxa			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* H- (H* L-L%)	LH* LH* H- (H* L-L%)	LH* LH* H- (H* L-L%)
Break Indices:	2 1 1 3 1 4	2 1 1 3 1 4	2 1 1 3 1 4

7 Maawa'in li na'b'ej, a'an b'an li n'ab'ej			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* ^LH* H- LH* (!H* L-L%)	LH* ^LH* L- LH* (!H* L-L%)	LH* ^LH* H- LH* (!H* L-L%)
Break Indices:	2 1 3- 1 2 1 4	2 1 3- 1 2 1 4	2 1 1 3- 2 1 4

8 Aran wan laa we ut arin wan li we			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* ^LH* H- LH* (!H* L-L%)	LH* ^LH* H- LH* (!H* L-L%)	
Break Indices:	2 1 1 3 1 2 1 1 4	2 1 1 3- 1 2 1 1 4	

9 Maare nakanaw ab'an laa'in ink'a' ninnaw			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* H- LH* (!H* L-L%)	LH* ^LH* L- LH* (!H* L-L%)	
Break Indices:	2 3 1 2 1 4	2 3- 1 2 1 4	

10 Ma taab'aanu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* (LH* H-L%)	L* (LH* H-L%)	L* (LH* H-L%)
Break Indices:	1 4	1 4	1 4

11 Ma taab'aanu a'in			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-H%)
Break Indices:	1 2 4	1 2 4	1 2 4

12 Ma taab'aanu a'in wulaj			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* LH* L- (LH* H-H%)	L* LH* LH* L- (LH* H-L%)	L* LH* H- (H* L-L%)
Break Indices:	1 2 3 4	1 2 3 4	1 0 3 4

13 Naqab'i			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-L%)
Break Indices:	4	4	4

14 Naqab'i toj le'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (LH* L-L%)	LH* (LH* L-H%)	LH* (!H* L-L%)
Break Indices:	2- 1- 4	2 1 4	2 1 4

15 Rajlal naqab'i			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-L%)	LH* (H* L-L%)	LH* (!H* L-L%)
Break Indices:	2 4	2 4	2 4

16 Rajlal naqab'i li raatin laj Lu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* LH* (H* L-L%)	LH* ^LH* L- LH* (H* L-L%)	LH* LH* LH* (H* L-L%)
Break Indices:	2- 2 1 2 1 4	2 3 1 2 1 4	2 2 1 2 1 4

17 Nalub'k laj Miguel			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-L%)	LH* H- (LH* L-L%)	LH* (H* L-H%)
Break Indices:	2 1 4	3 1 4	2 1 4

18 Nalub'k laj Miguel naq yoo chi b'eek			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- (LH* H-L%)	LH* L!H* L- (H* L-L%)	LH* LH* L- (H* L-L%)
Break Indices:	2 1 1 3 1 1 4	2 1 1 3 1 1 4	2 1 1 3 1 1 4

19 Na'oso' li tumin			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-) (H* L-L%)	LH* (!H* L-L%)	LH* (!H* L-L%)
Break Indices:	3 1 4	2 1 4	2 1 4

20 Na'oso' li tumin sa' junpaat			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* ^LH* H- (!H* L-L%)	LH* LH* L- (H* L-L%)	LH* LH* (LH* L-H%)
Break Indices:	2 1 3 1 4	2 1 3 1 4	2 1 2 1 4

21 Naxnujob'resi li jul laj Avelino			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- LH* L-L%	LH* ^LH* H- LH* L-L%	LH* H- LH* Ha LH* L-L%
Break Indices:	2 1 3 1 4	2 1 3 1 4	3 1 1 2 4

22 Naxnujob'resi li jul laj Avelino wulaj wulaj			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:			
Break Indices:			

23 Kirochb'eeni li rixaqil li b'eelomej			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- (H* L-L%)	LH* LH* L- (H* L-L%)	LH* LH* H- (H* L-L%)
Break Indices:	2 1 3 1 4	2 1 3 1 4	2 1 3 1- 4

24 Kirochb'eeni li rixaqil li b'eelomej sa' chuutam			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- LH* L- (H* L-L%)	LH* H- LH* LH* H- (H* L-L%)	LH* LH* H- LH* H- (H* L-L%)
Break Indices:	2 1 3 3 1 4	3 1 2 1 3 1 4	2 1 3 1 3 1 4

25 Nim li roq li riitz'in laj Jose			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- LH* (!H* L-L%)	LH* LH* L- LH* (!H* L-L%)	LH* LH* L- LH* (!H* L-L%)
Break Indices:	2 1 3 1 2 1 4	2 1 3 1 2 1 4	2 1 3 1 2 1 4

26 Tento tinb'aanu li k'anjel a'in			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:			
Break Indices:			

27 Chal re li hab'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)
Break Indices:	1 1 2 1 4	1 1 2 1 4	1 1 2 1 4

28 Ani laa k'ab'a'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (LH* L-H%)	LH* (!H* L-H%)
Break Indices:	2 1 4	2 1 4	2 1 4

29 Ani xula'ani awee			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* (H* L-L%)	LH* L!H* (LH* H-L%)	LH* L!H* (H* L-H%)
Break Indices:	2 2 4	2 2 4	2 2 4

30 K'a'ru nekeraj			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (LH* H-L%)	LH* (!H* L-L%)	LH* (H* L-L%)
Break Indices:	2 4	2 4	2 4

31 K'a'ru nekeraj naq tinb'aanu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* L!H* (!H* L-L%)	LH* L!H* H- (H* L-L%)	LH* LH* H- (LH* L-L%)
Break Indices:	2 2 1 4	2 3 1 4	2 3 1 4

32 Jo'q'e toxik Senahú			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* (H* L-L%)	LH* LH* (!H* L-L%)	LH* LH* (!H* L-L%)
Break Indices:	2 2 4	2 2 4	2 2 4

33 B'ar nakatwulak chaq			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* (H* L-L%)	LH* LH* (H* L-L%)	LH* LH* L-L%
Break Indices:	2 1 4	2 1 4	2 0 4

34 B'ar xik aawe			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (LH* L-H%)	LH* (H* L-L%)	LH* (H* L-L%)
Break Indices:	2 1 4	2 1 4	2 1 4

35 Chan(li)ru (naq) tinnaw			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-L%)	LH* (!H* L-L%)	LH* Ha (!H* L-L%)
Break Indices:	2 1 4	2 1 4	1 1 2 4

36 Chanru tinnaw xyeeb'aal			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* L- (H* L-L%)	LH* L!H* L- (H* L-L%)	LH* Ha LH* L- (H* L-L%)
Break Indices:	2 3 4	2 3 4	1 1 2 3 4

37 Ma yaal a'an			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)
Break Indices:	1 2 4	1 2 4	1 2 4

38 Ma sa laa ch'ool			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* (H* L-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-H%)
Break Indices:	1 2 1 4	1 2 1 4	1 2 1 4

39 Ma nakawab'i li raatin lix Maria			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* LH* (LH* H-H%)	L* LH* LH* (LH* H-H%)	L* LH* L- LH* (LH* H-H%)
Break Indices:	1 2 1 2 1 4	1 2 1 2 1 4	1 3 1 2 1 4

40 Ma ajel li ru			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* (LH* H-L%)	L* (LH* H-H%)	L* (LH* H-L%)
Break Indices:	1 1 1 4	1 1 1 4	1 1 1 4

41 Ma ajel li ru naq tinb'aanu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* L- (LH* H-H%)	L* LH* L- (LH* H-H%)	L* LH* L- (LH* H-L%)
Break Indices:	1 1 1 3 1 4	1 1 1 3 1 4	1 1 1 3 1 4

42 Ma k'ojk'o laa ch'ool			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:		L* LH* (LH* H-L%)	L* LH* (LH* H-L%)
Break Indices:		1 2 1 4	1 2 1 4

43 Ma najt			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* (LH* H-H%)	L* (LH* H-H%)	L* (LH* H-H%)
Break Indices:	1 4	1 4	1 4

44 Ma najt toob'eek			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* H- (LH* H-L%)	L* LH* H- (LH* H-L%)	L* LH* H- (LH* H-L%)
Break Indices:	1 3 4	1 3 4	1 3 4

45 Ma us a'an			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)
Break Indices:	1 2 4	1 2 4	1 2 4

46 Lub'lukat, pe' yaal			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* H- (H* L-H%)	LH* H- (H* L-L%)	LH* (H* L-) (LH* H-L%)
Break Indices:	3 1 4	3 1 4	3 1 4

47 Nawulak chawuu, pe' yaal			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-) (H* L-H%)	LH* ^LH* H- (H* L-L%)	LH* (H* L-) (LH* H-L%)
Break Indices:	2 3 1 4	2 3 1 4	2 3 1 4

48 Tz'ib'anbil sa' hu, pe' yaal			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-) (LH* L-L%)	LH* ^LH* H- (H* L-L%)	LH* (H* L-) (LH* H-L%)
Break Indices:	2 1 3 1 4	2 1 3 1 4	2 1 3 1 4

49 Naru			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-H%)
Break Indices:	4	4	4

50 Moko naru ta			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-H%)
Break Indices:	0 0 4	0 0 4	0 0 4

51 Naru tinb'aanu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (!H* L-L%)	LH* (!H* L-L%)
Break Indices:	2 4	2 4	2 4

52 Ink'a'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(L* L-L%)
Break Indices:	4	4	4

53 Hehe'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(L* L-L%)	(H* L-L%)	(L* L-L%)
Break Indices:	4	4	4

54 Us			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(LH* L-L%)
Break Indices:	4	4	4

55 Maji'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(L* L-L%)
Break Indices:	4	4	4

56 Wa'in			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-L%)
Break Indices:	4	4	4

57 Wa'in hermaan			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* L-L%	LH* L-L%	LH* (LH* L-H%)
Break Indices:	2 4	2 4	2 4

58 Seeb'a aawib'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-L%)
Break Indices:	0 4	0 4	0 4

59 Matt'ane' sa' b'e'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-H%)
Break Indices:	2 1 4	2 1 4	2 1 4

60 Chaawab'i li waatin			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)
Break Indices:	2 1 4	2 1 4	2 1 4

61 Kim			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-L%)
Break Indices:	4	4	4

62 Kim arin			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)
Break Indices:	2 4	2 4	2 4

63 Ayu			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	(H* L-L%)	(H* L-L%)	(H* L-L%)
Break Indices:	4	4	4

64 Ayu le'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (H* L-L%)	LH* (H* L-L%)	LH* (H* L-L%)
Break Indices:	1 4	1 4	1 4

65 Laj Miguel nalub'k naq yoo chi b'eek			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* LH* H- (H* L-L%)	LH* ^LH* H- (H* L-L%)	LH* L!H* H- (H* L-L%)
Break Indices:	1 2 3 1 1 1 4	1 2 3 1 1 1 4	1 2 3 1- 1 1 4

66 Laj Miguel nalub'k			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-L%)	LH* L- (H* L-L%)	LH* (H* L-L%)
Break Indices:	1 2 4	1 3 4	1 2 4

67 Li tumin na'oso'			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-L%)	LH* L- (H* L-L%)	LH* (H* L-L%)
Break Indices:	1 2 4	1 3 4	1 2 4

68 Li tumin na'oso' sa' junpaat			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* (!H* L-) (LH* L-H%)	LH* (H* L-) (H* L-L%)	LH* (!H* L-) (H* L-L%)
Break Indices:	1 2 3 1 4	1 2 3 1 4	1 2 3 1 4

69 Laj Avelino naxnujob'resi li jul			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* ?* (H* L-L%)	LH* L- LH* (H* L-L%)	LH* ?* (H* L-L%)
Break Indices:	1 2 1 1 4	1 3 2 1 4	1 2 1 1 4

70 Laj Avelino naxnujob'resi li jul wuulaj wuulaj			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:			
Break Indices:			

71 Li b'eelomej kirochb'eeeni li rixaqil			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* H- LH* H- (H* L-L%)	LH* H- LH* H- (H* L-L%)	LH* H- LH* (H* L-L%)
Break Indices:	1 3 3 1 4	1 3 3 1 4	1 3- 2 1 4

72 Li b'eelomej kirochb'eeeni li rixaqil sa' chuutam			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	LH* H- LH* LH* H- (H* L-L%)	LH* H- LH* LH* H- (H* L-L%)	LH* H- LH* H- LH* (H* L-L%)
Break Indices:	1 3 2 1p 3 1 4	1p 3 2 1 3 1 4	1 3 3p 1 2 1 4

73 Ma a'an li yaal			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* (LH* L-H%)	L* LH* (LH* H-L%)	L* LH* (LH* H-L%)
Break Indices:	1 2 1 4	1 2 1 4	1 2 1 4

74 Ma raatin lix Maria li nakawab'i			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* LH* L- (LH* H-H%)	L* LH* LH* L- (LH* H-H%)	
Break Indices:	1 2 1 3 1 4	1 2 1 3 1 4	

75 Ma toob'eek chi najt			
	Speaker 1	**Speaker 2**	**Speaker 3**
Tones:	L* LH* L- (LH* L-H%)	L* LH* H- (LH* H-H%)	L* LH* H- (LH* H-L%)
Break Indices:	1 3 1 4	1 3 1 4	1 3 1 4

Appendix C – IRB Approval

Institutional Review Board
for Human Subjects

Brigham Young University
A-285 ASB Provo, Utah 84602
(801) 422-3841 / Fax: (801) 422-0620

February 10, 2014

Karl Olaw Christian Wagner
746 N. 1250 E.
Provo, UT 84606

Re: A Intonational Description of Mayan Q'eqchi'

Dear Karl Olaw Christian Wagner

This is to inform you that Brigham Young University's IRB has approved the above research study.

The approval period is from 2-10-2014 to 2-9-2015. Your study number is E14012. Please be sure to reference this number in any correspondence with the IRB.

Continued approval is conditional upon your compliance with the following requirements.

1. A copy of the 'Informed Consent Document' approved as of 2-10-2014 is enclosed. No other consent form should be used. It must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject must be given a copy of the signed consent form.

2. All protocol amendments and changes to approved research must be submitted to the IRB and not be implemented until approved by the IRB.

3. The enclosed recruitment advertisement has been approved. Advertisements, letters, Internet postings and any other media for subject recruitment must be submitted to IRB and approved prior to use.

4. A few months before this date we will send out a continuing review form. There will only be two reminders. Please fill this form out in a timely manner to ensure that there is not a lapse in your approval.

If you have any questions, please do not hesitate to call me.

Sincerely,

Allen Parcell, PhD., Chair
Sandee M.P. Munoz, Administrator
Institutional Review Board for Human Subjects