2 Phonetics and Phonology

In this chapter I describe the segmental and suprasegmental categories of CLZ phonology, both how they are articulated and how they fall into the structures of syllable and word. I also deal with phono-syntactic and phono-semantic issues like intonation and the various categories of onomatopoetic words that are found. Other than these last two issues this chapter deals only with strictly phonetic and phonological issues. Interesting morpho-phonological details, such as the details of tonal morphology, are found in Chapters 4-6. Sound files for most examples are included with the CD.

I begin in §2.1 and §2.2 by describing the segments of CLZ, how they are articulated and what environments they occur in. I describe patterns of syllable structure in §2.3. In §2.4 I describe the vowel nasalization that occurs in the SMaC dialect. I go on to describe the five tonal categories of CLZ and the main phonetic components of tone: pitch, glottalization and length in §2.5. Next I give brief discussions of stress (§2.6), and intonation (§2.7). During the description of segmental distribution I often mention that certain segments have a restricted distribution and do not occur in some position except in loanwords and onomatopoetic words. Much of what I consider interesting about loanwords has to do with stress and is described in §2.6 but I also give an overview of loanword phonology in §2.8. Onomatopoetic words are sometimes outside the bounds of normal CLZ phonology both because they can employ CLZ sounds in unusual environments and because they may contain sounds which are not phonemic in CLZ. I describe these words separately from the rest of CLZ phonology in §2.9, where I divide onomatopoetic words in CLZ into three types depending on the extent to which they conform to the rules of phonology found in ordinary words in CLZ.

I expect that information given in this chapter will be of special interest to phonologists interested in the interaction between consonant segments and tone, and to those interested in the phonology of loanwords. Those interested in tone should also consult Chapters 4-6 for information on tonal morphology.

2.1 Consonants

The consonant inventory of CLZ is shown in Figure 7 where I show the practical orthography used in subsequent chapters of this grammar, alongside Americanist phonetic symbols (<¢> = IPA t͡s), with marginal phonemes in parentheses. CLZ has three obstruent series which contrast with each other at the various places of articulation. Voiceless or "fortis" obstruents occur in both plosive and fricative[1] manners of articulation. One voiceless stop is also post-glottalized. Voiced or "lenis" obstruents are always fricatives. There are also three types of sonorant consonants: nasals, liquids and glides. The nasals are numerous and occur at several places of articulation, effectively acting as a fourth series that contrasts with each of the obstruent categories. Glides and liquids are not very numerous and only occur at two places of articulation each. If nasals and liquids are considered together as a single type, then the contrast with obstruents takes place at each place of articulation. Notably, nasals and liquids to not overlap with each other at any place of articulation. Unlike Robinson (1963) I do not posit a prenasalized stop series (represented by voiced stop symbols in his orthography). These sounds typically occur at the beginning of complex lexical items and I analyze them as

[1] I use the term "plosive" to include both stops and affricates. In the world of Linguistics terminology this use of the term is not unique but it is apparently non-standard. It is convenient to use the term this way in order to have a category that includes both stops and affricates.

separate segments because of their apparent historical and synchronic morphological status. In certain phonological and morphological environments the sequences can be broken up, which I take as evidence of their clusterhood.

Figure 7: The CLZ consonant inventory presented in the practical orthography

	Labial	**Dental**	**Alveolar**	**Palatal**	**Retroflex**	**Velar**	**Labiovelar**
Voiceless plosives	p /p/	t /t̪/	tz /¢/[2]	ty /t^{y}/	ch /c̣/	k /k/	kw /k^{w}/
Voiceless post-glottalized stop		t[7] [t̪$^{(ə)ʔ}$]					
Voiced fricatives	b /β/	d /ð/	z /z/		zh /ẓ/	g /ɣ/	
Voiceless fricatives	(f) /ɸ/	th /θ/	s /s/		x /ṣ/	j /x/	
Nasals	m /m/	n /n̪/		ñ /ñ/		nh /ŋ/	
Liquids			r (rr) /ɾ, (r̃ ˳ /		l /ḷ/		
Glides	w /w/			y /y/			

One cannot write about Zapotec consonants, particularly obstruents, without addressing the famous fortis:lenis contrast. I find it necessary and useful to use the terms fortis and lenis in order to make reference to historical and comparative correspondences with other Zapotec languages. However, these terms often cloud synchronic description. Their relevance as descriptive phonetic terms is debatable and their meaning is unclear as the terms are used by different linguists to refer to different sets of phonetic properties. The obstruent phonemes of CLZ have indeed developed from an earlier two-way contrast (see Swadesh, 1947; Fernández de Miranda, [1965] 1995, Suárez, 1973; Benton, 1988;

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[2] IPA /t͡s/.

and Kaufman, 1993), but the modern CLZ obstruent inventory is developing into a 3-way contrast as can be seen above in Figure 7.

According to all PZ reconstructors except Fernández de Miranda (1965), the fortis:lenis contrast in Proto-Zapotec was a geminate:single contrast. Swadesh, the first reconstructor of PZ, thought PZ geminates had arisen from earlier clusters. Fernández de Miranda, influenced by the overwhelming number of modern Zapotec languages with a voiceless:voiced realization of the fortis:lenis contrast, reconstructed a similar voiceless:voiced system for PZ. I follow the majority in considering the fortis:lenis contrast to have originally been geminate:single, as it still is to some extent in conservative languages like SJZ and IZ. In CLZ length is not a factor in the contrast (though some have been given this impression by the orthography used by Robinson, 1963).

Synchronically, among CLZ obstruents the fortis:lenis contrast has primarily become one of voicing, but to some extent it is also a contrast in manner of articulation. Most formerly long or "fortis" obstruents are realized as plain voiceless stops and affricates here, including one segment which was formerly not a plosive (**ss*[3] > /¢/, i.e. <tz>). Formerly short or "lenis" consonants are here realized as voiced fricative phonemes. The third set of obstruent phonemes in modern CLZ is the set of voiceless fricatives. A variety of historical events is responsible for this third set of phonemes, some of which only occur marginally in the language. These events include borrowing from Spanish and possibly another Zapotec language, and conditioned sound changes. This set of evolving phonemes is turning the traditional two-way contrast into a three-way obstruent contrast.

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[3] Where not otherwise noted, PZ reconstructions are as in Kaufman (2003).

This series can be thought of as fortis because the sounds are voiceless and because the sounds not borrowed from Spanish are reflexes of earlier geminate or “fortis” consonants.

2.1.1 Voiceless plosives

This series includes six stops and two affricates. The alveolar /¢/ and the retroflex /ȼ/ affricates can occur in either onset or coda position. In root-initial position they may be preceded by a prefixed consonant, but they do not occur as prefixes themselves. /¢/ can have a following /y/ when the initial segment of certain verb roots (see §4.1.2 and §4.2.1). Retroflex sounds in CLZ including /ȼ/ have a fronter articulation than retroflex sounds in other well-known languages such as Hindi, but the articulation is not so far front as (alveo-)palatal sounds such as those of Spanish.

Voiceless affricates	**/¢/**	**/c̆/**
(2.1) Initial before a vowel:	*tzo*[7]	*chúk*
	[¢o̅́ʔ]	[ȼúk^{h}]
	espalda	saliva
	back	saliva
(2.2) In the onset before /y/:	*tzya*[7]	------
	[¢ya̅́ʔ]	
	P-romperlo	
	P-break (vt)	
(2.3) Non-initial affricates in clusters:	b*tzo*[7]	*sche*[7]
	[ɸ¢o̅́ʔ]	[sȼe̅́ʔ]
	pared	cena
	wall	dinner
(2.4) Final affricates	*ndâtz*	*nzhăch*
	[n̪n̪â¢]	[n̪^{d}ž̆ăȼ]
	pie	nanche
	foot	nanche (type of fruit)

Three of the six stops are marginal and the other three are common. The more common /p, t̪, k/ are usually heavily aspirated [p^h, $t̪^h$, k^h] in word-final position, often to the point of affrication [$p^ɸ$, $t̪^θ$, k^x]. However, /p/ is just as often unreleased in word-final position[4].

/p/ is rare in onset position except in Spanish loans and onomatopoetic words such as *pí,* the sound of opening a carbonated drink. There are no known CLZ words with /p/ in the onset preceded by a prefixed consonant. The exceptional native words which have initial /p/ are mostly question words: *pól* '¿cuándo?; when?', *pă* '¿dónde?; where?' and *pló* and *plă* both meaning '¿cuánto?; how many?'. There is one other[5] p-initial word which is not a definite Spanish loan or question word. The only other possible p-initial native word is *pĭt (tĕ yà bdo[7])* meaning 'cogollo tierno del platanar; rolled up young leaf of a banana tree.' In Coatecas Altas, another Southern Zapotec language, /p/ has the same distribution and is only found in the onsets of three native words, all question words.

While there do exist a small number of words which have *p* or *t* as the initial member of a consonant cluster, a position typically associated with a prefix consonant, k only occurs in this position in two onomatopoetic words preceding *r* which is itself a sound that outside of onomatopoeia only occurs in Spanish loans and a few function words. In ordinary native words *k* does not occur as the first member of a cluster.

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[4] When phrase final (such as in an elicitation context) one can sometimes hear a glottal release with air coming out the nose as breathing is resumed following production of the word but labial closure may be maintained during this time. This is not the same as the "lenis glottal stop" described below.

[5] Before I had also listed here the word *pĕnch* which means 'huérfano; orphan'. I did not know of an etymon but *pĕnch* looked suspiciously like a loan because of the complex coda, which is rare in non-borrowed CLZ words. According to Joe B. Bateman (p.c.) *penco* is "a rural Spanish word for an orphan lamb" which is even used by English speakers in Colorado and probably came there from the Spanish of northern New Mexico.

Main voiceless stops	**/p/**	**/t̪/**	**/k/**
(2.5) Main initial stops before vowels:	*pă*	*tô*	*ka^{7}n*
	[pă:^{ʔ}]	[t̪ô]	[kā̋ n̪ʔ]
	¿dónde?	tos	de lado
	where?	cough	on the side
(2.6) Main initial stops in clusters:	*plă*	*tnìx*	*kros kros...*
	[pl̥ă:^{ʔ}]	[t̪n̪ìx̌]	[kɾo̥s kɾo̥s...]
	¿cuánto?	varilla	Sonido de zapatos que tienen agua por dentro
	how many?	rebar	Sound of walking in soggy shoes
(2.7) Main non-initial stops in clusters:	------	*stúb*	*mkóz*
		[st̪úβ^{ʔ}]	[mkóz^{ʔ}]
		otro	luciérnaga
		other	lightning bug
(2.8) Main final stops:	*mbgùp*	*làt*	*lăk*
	[mbɣùp(^{h})]	[làt^{h}]	[lăk^{h}]
	armadillo	llano	igual
	armadillo	plains	equal

There are three less common voiceless stops which all involve some secondary articulation: /t̪^{ʔ}, t^{y}, k^{w}/. For historical reasons each of these has a somewhat marginal distribution.

/t̪^{ʔ}/ is a phoneme which I have only found in the dialect of Santa María Coatlán. However, according to Dow Robinson's field notes from the late 1950's, /t̪^{ʔ}/ then also existed in the variety of San Miguel Coatlán, where I have failed to find it in the late 1990's and 2000, and also in Santo Domingo Coatlán, a variety which purportedly still has speakers, whom I have unfortunately not yet met. /t̪^{ʔ}/ only occurs word-finally.

Furthermore, its occurrence is restricted to words with low, rising, or glottal tone. The phonetic difference between this and the /t̪/ phoneme is the lack of aspiration and the existence of a glottal stop following the release of the dental stop. At times there is an audible, short epenthetic vowel, usually [ə] or [a], varying from voiced to voiceless, between the release of the dental stop and the glottal stop.

I count /t̪ˀ/ as a single phonemic segment because it contrasts with the plain /t̪/. I prefer this analysis to the alternative which would be to count this as a sequence of two phonemes /tʔ/. If the latter type of analysis were adopted this would mean counting as phonemic a type of glottalization which occurs predictably following all voiced (i.e. lenis) obstruents in CLZ (see §2.1.2) and which is distinct from a second, different kind of glottalization which I do analyze as contrastive (see §2.5.2). The glottal stop portion of /t̪ˀ/ is present when in a pre-pausal position or phrase-medially in slow or careful speech. This pre-pausal glottal stop is a feature of lenis obstruents in CLZ but is normally a secondary cue for lenisness since most lenis obstruents in CLZ are voiced fricatives. Because certain sound changes played out differently in Santa María Coatlán than in other varieties of CLZ (Beam de Azcona, 2001 and forthcoming a), this dialect retains one lenis voiceless stop, which because it is not a voiced fricative, can only be recognized as lenis due to the presence of the pre-pausal glottal stop. Therefore, in this one instance I analyze the pre-pausal glottal stop as a distinctive feature of this segment, which is a reflex of PZ *t^{y}.

A related and also marginal segment is CLZ /tʸ/. The articulation of this sound is similar to that of /t̪/ but with a [ʸ] offglide. This segment is the reflex of what has been

reconstructed as a palatalized stop *t^y by Benton (1988) and Kaufman (1993). Reasons for analyzing *ty* as a separate phoneme in CLZ have to do with /t^y/'s synchronic morphological distribution.

/t^y/ can only occur in root-initial position, i.e. in an onset preceding a vowel. It does not occur as a prefix, nor does it occur word-finally. Most instances of CLZ /t^y/ occur medially following a prefix. The only instances of initial /t^y/ occur in the potential mood form of verbs with *ty*-initial roots. This is perhaps due to analogy since in most of the paradigm there are TAM-marking prefixes while in the potential there is a zero marker. Alternatively, an earlier prefix may have provided the correct environment before being lost itself. In other cases, e.g. in unprefixed noun roots, the initial reflex of PZ *t^y is /t̪/. Although /t^y/ is the reflex of a lenis stop, it might be considered part of a set of synchronic fortis sounds on phonological grounds since like other fortis obstruents /t^y/ is a voiceless stop. However there is synchronic morphological and phonotactic evidence which points to /t^y/'s status as a lenis stop.

All verbs with /t^y/ are class A (see §4.1.2) and intransitive. In this class many intransitive verbs begin with lenis consonants and have related transitive verbs that begin in the corresponding fortis consonant. Many *ty*-initial intransitive verbs have transitive partner verbs or other derived forms which begin in *t*, the reflex of fortis *tt^y.

One might argue that t^y is underlyingly a stop-glide sequence. There are a handful of verbs with other initial coronal obstruents which show an unpalatalized:palatalized transitive:intransitive alternation where I am not claiming phonemic status for the palatalized variants. Synchronically, this makes my analysis of t^y as a separate phoneme a bit inconsistent. One possibility is that the unpalatalized:palatalized alternation for

transitive/intransitive verbs has developed through analogy to the *t:ty* pattern which came about through regular sound change. There is also one case of a class A unpalatalized:palatalized alternation coming about through metathesis, as appears to have happened more regularly in class B (see Chapter 4).

In addition to historical and morphological evidence there are phonological grounds to support my analysis of *t*^{y} being a unique phoneme and not a sequence of *t* and *y*. Modern CLZ /y/ is realized as a voiced palatal fricative before front vowels where it has merged with the palatalized reflex of **k*. /t^{y}/, in contrast, is not articulated any differently before front vowels than before back vowels. If this were a /ty/ sequence one might expect the glide to have the usual conditioned allophone before front vowels, as does indeed happen when *y* follows the habitual marker *nd*. The argument for analyzing *ty* as a sequence of phonemes /t̪y/ is stronger than the corresponding argument for analyzing *t*^{7} as a sequence /t̪ʔ/ because there is a phoneme /y/ whereas the glottal stop is not a phonemic segment. However, since the palatal portion of *ty* does not behave in the way that /y/ does before front vowels, I reject this argument in favor of analyzing *ty* as a complex segment.

/k^{w}/ is restricted to root-initial position, though it may either be word-initial or follow a prefixed consonant. It cannot occur before round vowels. In such cases as historically underlying /k^{w}o/ or /k^{w}u/ sequences there was dissimilation throughout Zapotec, resulting in the loss of the glide portion of the segment. /k^{w}/ always occurs in pre-vocalic position except in two onomatopoetic words in which it occurs before /ɾ/, a rare phone. /k^{w}/ is a historically fortis segment, as can still be seen by its appearance in the potential of certain class D verbs which take /β/ in the habitual form (see 4.3.2), and by the fact

that /k^{w}/ is the initial segment in many class A transitive verbs which have intransitive partners with initial /β/ or /w/ (see §4.1.1 and §6.1.1). The fact that /w/ cannot follow other voiceless plosives in CLZ is synchronic evidence for /k^{w}/'s phonemic status. /w/ can follow the /ɣ/ phoneme, most often with preceding /ŋ/ in a completive aspect-marked verb or animacy-marked noun. I do not analyze the /ɣw/ sequence as a single segment because it only occurs where there is complex morphology. While /k^{w}/ occurs in many monomorphemic words, /ɣw/ does not. This is further evidence of /k^{w}/'s phonemic status.

Stops with secondary articulation:	**/t^{ʔ}/ (SMaC)**	**/t^{y}/**	**/k^{w}/**
(2.9) Initial:	------	*tyo^{7}l* [t^{y}õ̰l̰ʔ] P-resbalarse P-slip	*kwàl* [k^{w}ə̀l̰ː^{ʔ}] frío cold
(2.10) In clusters:	------	*mtyë`tz* [mt$^{y}$æ`¢] camarón shrimp	*bkwa^{7}n* [ɸk^{w}ã̰́n̰ʔ] IMP-despertarlo IMP-wake up
(2.11) Final:	*dǒt^{7}* [ðǒt̰^{ʔ}] resina resin	------	------

2.1.2 Voiced fricatives

CLZ voiced fricatives are the reflexes of earlier lenis stops and fricatives. Although synchronic analysis now shows all of these segments to be underlying fricatives, each segment has a plosive realization when following a homorganic nasal. When preceded by homorganic nasals /m, n̰, ŋ/, /β, ð, ɣ/ are realized as stops [b, d̰, g]. /z/ and /z̰/ are usually

realized as phonetic affricates when preceded by /n̪/, the transition between nasal and fricative resulting in an epenthetic [d̪]. Non-homorganic nasals do not produce these changes and the orthography distinguishes the homorganic sequence *ng* [ŋg] from the heterorganic sequence *n-g* [nˀɣ].

Of this set of fricatives, only /β/ occurs alone as a prefix. When /β/ occurs before a voiceless obstruent it wholly or partially devoices, becoming [ɸ].

/ɣ/, or rather **k*, is nearly always lost word-finally. The exceptions to this are so few that I suspect them as being borrowings from Miahuatec languages. Where it has survived, /ɣ/ has merged with /y/ before front vowels and so /ɣ/ can only now occur before the vowels /a, ɔ, o, u/ in most environments. However, the merger of /ɣ/ and /y/ before front vowels does not take place when /ɣ/ is preceded by the homorganic nasal /ŋ/, where /ɣ/ is realized as a stop [g]. In SMaC the merger of /ɣ/ and /y/ only took place before non-low front vowels and so [ɣ] can also occur before /æ/ in that variety. When preceding a back rounded vowel /ɣ/ is often heavily labialized, sometimes sounding more like [w] than [ɣ], though speakers recognize such words as beginning in /ɣ/.

When word-final before a pause all voiced fricatives are followed by light glottal closure and release, sometimes with an epenthetic vowel preceding the glottal stop. This glottal stop is much softer than the contrastive glottal stop (which I analyze as a tone in §2.5.2) and is sometimes not audible on recordings. Echoing the behavior of /p/, /β/ occasionally ends in labial closure rather than glottal closure. When present, the epenthetic vowel following lenis obstruents tends to have the quality of [ə], and is

typically short and sometimes voiceless. Other times no such vowel is audible, only the release of the glottal stop. The epenthetic vowel is more common in SMaC than in the other varieties. Robinson (1956-58) transcribed a final glottal stop following voiced fricatives in at least some words in every variety for which he recorded data except San Jerónimo Coatlán. In Santa María Coatlán this lenis-marking glottal stop only occurs in words with low, rising, or glottal tone. In the other documented dialects it occurs in words with any of CLZ's five tones.

When a pre-pausal word ending in a lenis obstruent happens to have the glottal tone, the fricative segment is phonetically sandwiched between glottal stops and loses its voicing. Voicing returns if the same word is not pre-pausal since the pre-pausal glottal stop will not be present. This kind of devoicing is more common in the Loxichas since an epenthetic schwa is often inserted before the pre-pausal glottal stop in the Coatlanes. However, sibilants are frequently devoiced pre-pausally in SMaC whether or not there is any glottalization (phonemic or non-phonemic) present.

Voiced fricatives	**/β/**	**/ð/**	**/z/**	**/ẓ/**	**/ɣ/**
(2.12) Before voiced C	*bdûd* [βðûðˀ] IMP-enrollarlo IMP-roll.up (vt)	------	------	------	------
(2.13) Before voiceless C	*bcha^{7}n-é* [ɸc̣āⁿ̃ʔn̥é] IMP-dejarlo=3i IMP-put.down=3i	------	------	------	------
(2.14) Pre-vocalic	*bô* [βô] nudo knot	*dà* [ðàːˀ] petate mat	*zèd* [zèðˀ] sal salt	*zhúl* [ẓúl̥] pollito chick	*ga^{7}y* [ɣā́y̱ʔ] cinco five

(2.15) After homorganic N	*mbe*^{7}	*ndô*	*nzâ*	*nzhâ*	*ngǐd*
	[mbɪ̋ʔ]	[n̪d̪ô]	[n̪^{d}z̪â]	[n̪^{d}z̪â]	[ŋgɪ̌ðʔ]
	luna	cara	frijol	oreja	gallina
	moon	face	bean	ear	chicken
(2.16) Heterorganic cluster	*nbǎn*	*mbdo*^{7}	*wza*^{7}	*bzhu*^{7}	*n-gàb*
	[n$^{(ə)}$βàn̪ːʔ]	[mb$^{(ə)}$ðō̋ʔ]	[w$^{(ə)}$zā̋ʔ]	[β$^{(ə)}$z̪ū̋ʔ]	[n̪^{ə}ɣàβʔ]
	vivo	santo	P-dar	carbón	H-tumbar
	alive	saint	P-give	coal	H-lower
(2.17) Final w/ glottal tone	*yi*^{7}*b*	*gu*^{7}*d*	*la*^{7}*z*	*di*^{7}*zh*	------
	[ɟɪ̋ʔɸʔ]	[ɣ^{w}ū̋ʔθʔ]	[l̪ā̋ʔsʔ]	[ðɪ̋ʔs̪ʔ]	
	fierro	blando	nido	palabra	
	metal	soft	nest	word	
(2.18) Final w/ other tones	*yìb*	*gâd*	*lâz*	*yêzh*	*yèg*
	[ɟìβʔ]	[ɣâðʔ]	[l̪âzʔ]	[ɟîz̪ʔ]	[ɟɪ̀ɪɣʔ]
	cuerda	siete	cuerpo	pueblo	sereno
	cord	seven	body	town	frost

Returning to the issue of the (non-)phonemic status of [ɣw], there are some points on either side of the argument but I regard such a sequence as a cluster rather than a segment. Just as I analyze [w] following [k] as a single phoneme /k^{w}/ rather than a stop-glide sequence /kw/ for the historical and synchronic reasons given in §2.1.1, one might argue that [w] following /ɣ/ is also a single labiovelar phoneme /ɣ^{w}/. Just as [w] can follow no stop other than [k], it can follow no voiced fricative other than [ɣ]. This may mean that /ɣ^{w}/ is emerging as a new phoneme, but while /k^{w}/ is the true reflex of an earlier fortis labiovelar sound, the reflex of the lenis counterpart of that sound is /β/, not [ɣw]. In fact, [ɣ^{w}] or the allomorphic variant [g^{w}] only occurs in prefixes, allomorphs of the completive, imperative, and animacy markers which were all historically **ko-*. The occurrence of *w* in these prefixes is the reduction of a pre-tonic vowel. For comparison, the completive of ‘comer; eat’ is *ngwdà* in CLZ and *guto* in SJZ (Bartholomew, 1983).

The reasons for not analyzing what occurs in the completive and imperative markers and in animal names as a separate phoneme with secondary articulation /ɣ^{w}/ are not only historical. There are several variants of the completive marker and the markers related to it. *Ngw-* is realized as [ŋgw] when preceding voiced consonants. [ŋgw] also occurs before some vowel-initial verb roots but philological work suggests these verb roots were historically consonant-initial. Before other vowel-initial roots the marker is [ŋgu] or [ŋgo] with the [u] or [o] replacing the initial vowel of the root. Before roots with initial voiceless consonants the variant of *ngw* is [ŋw]. Since these four variants of the completive marker are all one morpheme, if I proposed a phoneme /ɣ^{w}/ I would be pressured to say that the [w] in [ŋw] is an allophone of /ɣ^{w}/, and I would have to find a synchronic explanation for the [ŋgu] and [ŋgo] allomorphs, none of which is appealing. The explanation for these alternations is historical deletion and reduction in the conditioning environments described. To try to provide a synchronic explanation becomes difficult since there are separate phonemes /ɣ, w, o, u/. These difficulties do not arise in the analysis of /k^{w}/ since that phoneme occurs initially in roots while the would-be /ɣ^{w}/ only occurs in a prefix. For these reasons I analyze the fullest form of the completive prefix as a sequence of three segments /ŋɣw/.

2.1.3 Voiceless fricatives

The set of voiceless fricatives is an emergent class of sounds in CLZ. Only /ṣ/ (spelled <x>) is actually the reflex of an earlier voiceless fricative, but through borrowings and

conditioned sound changes a symmetrical inventory of voiceless fricatives is forming. However, each of these sounds except /ṣ/ has a restricted distribution in CLZ.

/ɸ/ may have the same bilabial articulation as the native Zapotec phoneme /β/ for most speakers, but it only occurs in Spanish loanwords which have a labiodental /f/ in the lending language. One possible exception to the Spanish loanword rule for /ɸ/ is *chúfné* ‘naguas; slip’ which is of unknown etymology.

/θ/ is the reflex of PZ **tt* and only occurs finally in CLZ except in one phonologically unusual word *tlătha*[7] ‘la mitad; half.’ The first portion of this compound word, *tlă,* means ‘centro; middle,’ making *th* the initial segment of a cranberry morpheme.

In native words other than onomatopoeia /s/ is restricted morphologically as it occurs almost exlusively in one prefix. It cannot be analyzed as merely a devoiced allophone of /z/ because it is voiceless even when preceding voiced segments. Other than in the future prefix, which when added to numbers also means ‘other,’ /s/ also occurs in one CLZ pronoun (*sâ* the first person exclusive), one fossilized compound verb (-ástê ‘levantarse; to rise’) and in Spanish loanwords.

Retroflex /ṣ/ (<x>) occurs in all possible positions for consonants in native words and in a few early loanwords which now have /x/ (<j>) in Spanish, e.g. ‘jícama’ *xgàm.* In native words earlier fortis **ṣṣ* and lenis **ṣ* have merged into this one voiceless phoneme.

/x/ (written <j>) occurs in many onomatopoetic words and in Spanish loanwords which contain either /x/ or some labial, usually /f/, sound in Spanish. Presumably /f/ > /x(w)/ loans are earlier than /f/ > /ɸ/ loans, although local Spanish still has [x] for many words that are in standard Spanish /f/. The contrast between loans like ‘Refugia’ > *Júj* or

'Rafael' > *Jwǎy* and loans like 'Ranulfo' > *Núf* and 'fiesta' > *fyěst* is evidence of Zapotec speakers' increasing familiarity with Spanish phonology. However, there are native Zapotec words containing /x/. The origins of this phoneme in native words are unclear. In one case it appears as a reflex of **tt*, not the regular reflex of this phoneme which is /θ/. In this case it may be a special conditioned variant or a borrowing from San Agustín Loxicha Zapotec where this is the regular reflex. However, in other native words with *j*, **tt* is not reconstructed. In any case this phoneme is marginal.

Voiceless fricatives	**/ɸ/**	**/θ/**	**/s/**	**/ʂ/**	**/x/**
(2.19) Initial in cluster	*Flór*	------	*stúb*	*xgǎl*	*Jwěltz*
	[ɸl̥ór̃]		[st̪úβ^{ʔ}]	[ʂɣǎlː^{ʔ}]	[xwěl̥¢]
	Flora		otro	sombra	Félix
	Flora		another	shade	Felix
(2.20) Initial & prevocalic	*fámíl*		*sâ*	*xàn*	*Jǐn*
	[ɸámíl]		[sâ]	[ʂàn̪ː^{ʔ}]	[xìn̪ː^{ʔ}]
	familia		1e	parte debajo[6]	Regina
	family		1e	base	Regina
(2.21) Medial	*chúfné*	*tlǎtha*[7]	*Básǐl*	*nhwxa*[7]*k*	*líjér*
	[ɕúɸn̪é]	[tlǎθā́ʔ]	[βásǐl̥ː^{ʔ}]	[ŋwʂ̆aʔk^{h}]	[l̥íxe̞r̃]
	nagua	la mitad	Basilio	C-parecersele	ligero
	skirt	half	(name)	C-appear	light

2.1

[6] Though this word can also translate with the preposition 'debajo' or 'abajo' it is actually a noun. It refers to the bottom part of something and typically refers to the base on which something rests. Not all things have a *xàn*. For example chairs and tables do not have *xàn* but rather have *ndâtz* 'pies; feet.' Books do not have *xan*, I'm guessing because they may not be thought of as occurring in a fixed position, e.g they can stand upright or be laid down or be held open reading. It seems like something has to have a wide base on which it rests or which is at the bottom when the object is in its expected position. People do not have a *xàn* but their feet do. Bottles, my usb microphone (with a base), and water jugs are some other things which have a *xàn.* In the case of a water jug the bottom is rounded so it cannot rest on its *xàn* but here *xàn* refers to the bottom part which is always supported by something else. Contrasting the bottoms of chairs, human feet and water jugs it seems that *xàn* should be a part that is continuous with the whole that possesses it, and which is typically as wide or wider than the part above it, with no angles making it jut in or out sharply from the rest of the object.

(2.22) Final	*Chóf*	*nîth*	*bás*	*bîx*	*yàj*
	[ɕóɸ]	[n̪îθ]	[βás]	[βîʂ]	[yáx]
	Crisóforo	caña	vaso	tomate	nopal
	Crisóforo	(sugar) cane	drinking glass	tomato	cactus

2.1.4 Nasals

Before focussing on nasal segments a few words about sonorant consonants in general are in order. Some Zapotec languages (see for example Butler, 1980; or Bartholomew, 1983) have a fortis:lenis contrast among sonorant consonants, defined primarily by a length distinction[7]. CLZ sonorants lack such a fortis:lenis contrast, although phonetic length is exploited in marking tonal distinctions. All sonorants are lengthened and followed by an epenthetic glottal stop in CLZ when each of four conditions are met: 1. the sonorant is word-final; 2. the sonorant is root-final; 3. the word is pre-pausal; and 4. the word bears a low or rising tone. Pre-pausal sonorants that are clitics are not affected by these processes. As noted by Nelson (2004) for SJMZ and other Zapotec languages (QZ: Regnier, 1993 and Black, 1995; IZ: Marlett and Pickett, 1987; and Yatée: Jaeger and VanValin, 1982) in CLZ sonorant consonants can precede obstruents in the onset and in this position do not count as a separate syllable because they do not bear tone.

CLZ has four nasals in its phoneme inventory: /m, n̪, ñ, ŋ/. /ñ/ is the apparent newcomer but despite its likely Spanish origin it is found in a few core native vocabulary items, e.g. *ña*^{7} ‘milpa,’ and is even used to mark potential mood on some *n*-initial verbs which make use of a *ñ~ny~n* alternation to mark different aspects. /m/ is rare in Zapotec but apparently occurs in the word for ‘animal’ in several Zapotec languages. Swadesh

(1947) for one thought that other occurrences of /m/, such as in the SZ word for ‘gente; person’ *měn*, were assimilations of labial obstruents to **n* elswhere in the word. In CLZ /m/ is rarely seen in word-final or word-medial position, except in loanwords, but is very common in prefixes. It is the initial segment in many words for animals and supernatural beings, perhaps as a prefix shortened from the classifiers *má* ‘animal’ and *mě* ‘gente; person.’ /m/ also is the initial segment in the most common completive prefix in SZ, *mb-*. /ŋ/ is also rare and in native words only occurs in the irrealis and completive aspect markers, in one pronoun, and in some animal words where the classificatory prefix *m-* has undergone homorganic nasal assimilation. /ŋ/ also occurs finally in one possible native word and in many loanwords since the regional Spanish used by CLZ speakers has final [ŋ] for /n/ when stress falls on the ultima. /n̰/ is the most common nasal in CLZ and can occur in initial, medial, or final position.

Except for /ñ/, each of the nasals can be found in homorganic nasal-obstruent clusters. In such clusters the nasals are short and do not count as syllabic since they may not bear tone in this position, however there are no vocalic segments breaking up the nasal-obstruent sequence and thus the nasals may be phonetically reminiscent of syllabic nasals, although they are not very long. These sequences should not be analyzed as a series of prenasalized phonemes since there is morphological evidence showing that, for example, /mb/ is two phonemes and not one /^{m}b/. Prefixes of the form *mb-* come from two earlier prefixes and reduce to *m-* preceding voiceless consonants. When *m-* is added to /β/-initial roots the result is [^{m}b]. Thus this is a cluster and not a segmental unit.

2.2

[7] According to Julie Nelson Hernández (personal communication) in San Juan Mixtepec Zapotec there is

Nasals	**/m/**	**/n̰/**	**/ñ/**	**/ŋ/**
(2.23) In a prefix	*mbìth*	*ndëz*	------	*nhwxî*
	[mbìθ]	[n̰d̰ëz^{ʔ}]		[ŋwsî̱]
	zorrillo	tlacuache		chichatlao
	skunk	possum		black widow
(2.24) Root-initial	*măn*	*nhna^{7}-ɾ*	*ña^{7}n*	*nhó*
	[màn̰ː^{ʔ}]	[ŋn̰ā́ ʔì̱]	[ñā́ n̰ʔ]	[ŋó]
	animal	IRR-lavarse=2f	no hay	1i
	animal	IRR-wash=2f	there isn't	1i
(2.25) Final	*xgàm*	*ta^{7}n*	------	*yŏnh^{8}*
	[si̱ɣàmː^{ʔ}]	[t̰ā́ n̰ʔ]		[yòŋ̰ː^{ʔ}]
	jícama	cosa		mezquino
	jicama	thing		type of skin fungus

2.1.5 Liquids

CLZ has two rhotic sounds and one lateral. Unlike in other modern Zapotec languages, rhotic sounds are rare in native words in CLZ. In fact, the distribution of [r̃] and [ɾ] in CLZ is almost exactly as in Spanish phonology. The two sounds contrast only when intervocalic. For this reason, in both Spanish and CLZ orthography the digraph <rr> is only used between vowels. When not in this position, [ɾ] follows syllable-initial consonants, and [r̃] occurs in word-initial and word-final position. A word-final trill tends to be short and may be devoiced as in Mexican Spanish but may be lengthened and glottalized according to tone, as with other sonorant consonants in CLZ. Excluding onomatopoetic words, rhotic sounds are found in 11 native or at least nativized words not

also a fortis:lenis contrast on sonorants but which is indicated by whether the preceding vowel is rearticulated (before lenis consonants) or checked (before fortis consonants).

known to be from a non-Zapotec source. Of these, /r̃ / only occurs initially in one word and in the coda of seven words. The three remaining words have a flap rather than a trill and the sound is in medial position: once between vowels, once between a glide and a vowel, and once between /β/ and a vowel. The two rhotic sounds are mostly found in Spanish borrowings, but also in a handful of onomatopoetic words. It is possible some or all cases of *r* in native Zapotec words are borrowings from other Zapotec languages since most modern Zapotec languages, unlike CLZ, have an *r* reflex for PZ **ty*.

The lateral phoneme of CLZ is retroflex. When in word-final position it shows the usual length differences according to tone, but the shorter versions of /l̩/ are actually pretty long themselves, giving them a very distinctive sound compared to a typical coda lateral in other languages. /l̩/ occurs preconsonantally as a prefix in three recorded words: once before a glide and twice before sibilants.

Liquids	**/r̃/**	**/ɾ/**	**/l̩/**
(2.26) Initial and preconsonantal	------	------	*lwê* [l̩wê] ala wing
(2.27) Initial and prevocalic	*rójwá* [r̃óxwá] nagua slip	------	*lǔzh* [l̩ǔz̩ˀ] lengua tongue
(2.28) Post-consonantal	*Énrr̃k* [ɛn̪r̃ɪkʰ] Enrique Henry	*brèl* [βɾɛ̀l̩ːˀ] redondo round	*blë7* [βl̩ɛ̄ ´ʔ] almácigo plant nursery

[8] This is the SBL form. The SMigC form is *yùnh*.

(2.29) Intervocalic	*kárré-lˆ*	*kárə̆*	*álámbré*
	[kə̃rél̩ˆ]	[kárə̆:ʔ]	[á l̩ámbɾé]
	¡apúrate![9]	verás	alambre
	hurry up!	(emphatic particle)	wire
(2.30) Final	*ár*	------	*mbë[7]l*
	[ə̆r̃]		[mbæ̃l̩ʔ]
	3hf		culebra
	3hf		snake

2.1.6 Glides

Both /w/ and /y/ can occur as pre-vocalic root-initial segments, and as root-final segments. /y/ may follow root-initial consonants when marking certain verbs for morphological categories. /w/ occurs in prefixes by itself or following velar /ŋ/ or /ɣ/ (see §2.1.2 for an explanation of why I don't analyze the latter sequence as a single segment /ɣ^{w}/), and following sibilants in some roots, but /w/ cannot follow the fricatives /β/ or /ð/. /y/ also occurs as the post-vocalic realization of the 3i enclitic in some varieties of CLZ.

When root-final and pre-pausal, the normal sonorant-lengthening which takes place with the low and rising tones means that /w/ and /y/ turn into phonetic vowels, since the main phonetic difference between vowels and glides is in fact one of length. /w/ tends more towards [o] than [u], especially when following a non-high vowel. Although under these circumstances /w/ and /y/ are phonetically vowels, they still act as consonants. For example, CLZ has both clitic and free forms of pronouns which follow verb and noun roots. Clitic pronouns follow vowel-final roots while free pronouns follow consonant-final roots. Clitic pronouns following glides are ungrammatical.

2.1 ———————————

[9] Though this means '¡apúrate!; hurry up!' I suspect that it is borrowed from Spanish *¡corre!* meaning 'run!.'

/y/ merged with /ɣ/ before front vowels in CLZ except when /ɣ/ followed /ŋ/. Phonologically, former /ɣ/ has become /y/ in this environment, but phonetically former cases of both /ɣ/ and /y/ are now a conditioned allophone [ʝ] when occurring before front vowels. In the case of earlier /ɣ/ this was assimilation and in the case of earlier /y/ this merger was dissimilation. /y/ is simply [y] before non-front vowels. However, what constitutes a front vowel varies slightly according to dialect. In Santa María Coatlán /ɣ/ and /y/ are still distinct before /æ/ although not before /i/ or /e/, while in the other three well-documented dialects the merger has taken place before all three vowels.

Glides	**/w/**	**/y/**
(2.31) Preconsonantal	*wxên* [wsɛ̃n̪] ancho wide	------
(2.32) Postconsonantal	*xwàn* [sˌwàn̪ːˀ] dueño owner	*byôn* [βyôn̪] yerba buena peppermint
(2.33) Word-initial before a vowel	*wàch* [wàcˌ] iguana iguana	*yìch* [ʝìcˌ] pelo hair
(2.34) Root-final	*xnèw* [sˌn̪eoːˀ] anona soursop	*báy* [βáy] pañuelo kerchief

2.2 Vowels

CLZ has 6-7 vowels in its inventory depending on the dialect. The Loxicha dialects lack /ɔ/ (<ö>) and have six vowels while the Coatlán dialects have all seven vowels shown in Figure 8. The quality of the two mid front vowels varies according to environment and dialect as I discuss below. There is no phonemic length difference but there is a phonetic length difference on vowels and there are also differences in phonation type and pitch. All three of these factors are dependent on tone and will be covered in §2.5. In the SMaC dialect only, there is vowel nasalization which I describe in §2.4. There are no VV clusters as I analyze any would-be surface vowel clusters as vowel-glide diphthongs, which seems, from my limited experience with SVCZ, to be a salient difference between CLZ and its sister language. Virtually all combinations of diphthongs occur, with the following exceptions. /i/ is only followed by /y/ when the latter is a clitic, and is only followed by /w/ in the rare loanword. I have not found /ɔ/ preceding /y/, though it probably exists, due to the rarity of the vowel and the fact that I have worked less with the dialects which have this vowel. The round vowels /o/ and /u/ are never followed by /w/ except in onomotopoeia, although the low rounded vowel /ɔ/ is found preceding /w/.

Figure 8: The CLZ vowel inventory

	Front	Central	Back rounded
High	i /i/		u /u/
Higher-mid	e [e ~ ɪ]		o /o/
Lower-mid	ë [ɛ ~ æ]		ö /ɔ/
Low		a /a/	

Vowel-initial words are extremely rare in CLZ. However such words do exist. They are most frequently Spanish loanwords, followed by onomatopoetic words, followed by a handful of function words. /a/ is the vowel most likely to occur initially in function words. Some vowels only occur initially in loanwords or onomatopoeia. Again due to scarcity I have no examples of initial /ɔ/. All vowels can occur word finally or with a following coda.

The six vowels of the Loxicha dialects can take any of the five tones of CLZ. I do not expect tonal restrictions on /ɔ/ but since it is still a rare phoneme I may not have examples with each of the five tones.

In (2.35) I give examples of /i/ in different positions. /i/ has probably had the greatest effect of any vowel on nearby consonants and vowels in the history of Zapotec languages. Many /i/'s and other vowels which conditioned sound changes have now been deleted in SZ however. Such post-tonic *i*'s have been the cause of umlaut in Zapotec (Beam de Azcona, 1999), the merger of fortis and lenis **ty(:)* with the corresponding fortis or lenis **¢(:)* in many SZ and other Zapotec languages, though not in CLZ (Beam de Azcona, forthcoming a), and of palatalization of certain consonants in some SZ and other Zapotec languages (Beam de Azcona, 2001 and forthcoming a). The tonic /i/ which remains in CLZ conditions the [j̩] allophone of /y/ discussed above. /i/ is only found initially in one word (shown in 2.35), which happens to be onomatopoetic. The only diphthongs /i/ is found in appear to be loanwords, with the exception of *i*-final roots followed by the inanimate pronoun clitic *–ý*.

/i/	Initial	In a diphthong	Before a consonant	Final
(2.35)	*ính*	*níw*	*nîk*	*mbì*
	[íŋ]	[n̪íw]	[n̪îk^{h}]	[mbì:^{ʔ}]
	Sonido de sancudo	nigua	gargantilla	aire
	sound of a mosquito	sandflea	necklace	wind

In (2.36) I give examples of /e/ in different positions. /e/ is raised and closer to [ɪ] when followed by a consonant but [e] when word-final. /e/ occurs word-initially in five Spanish loans and one onomatopoetic word. Other than these, /e/ occurs word-initially in one native word which is shown in (2.36) below, and which to my knowledge is found only in the dialect of San Miguel Coatlán.

/e/	Initial	In a diphthong	Before a consonant	Final
(2.36)	*êd yîd*	*mbèw*	*mbèk*	*sche*[7]
	[îð ɟîð^{ʔ}]	[mbèò^{ʔ}]	[mbɪk^{h}]	[sc̣ẽ́ʔ]
	huarache (SMigC)	javalí	perro	cena
	sandal	peccary	dog	dinner

In (2.37) I give examples of <ë> in different positions. <ë> is a phoneme that tends more towards [æ] in the Loxichas and more towards [ɛ] in the Coatlanes, although either realization is possible in all dialects. It is only found initially in one word I know of, which happens to be an onomatopoetic word. Looking at the various reconstructions of PZ it seems that the origin of CLZ /æ/ in most or all cases is an earlier tonic /e/ preceding a now-deleted post-tonic /a/.

/æ/	Initial	In a diphthong	Before a consonant	Final
(2.37)	*ë`j ë`j ë`j ë`j*	*ndë`y*	*mbë`z*	*lëˆ*
	[æx æx æx æx]	[ndæì^{ʔ}]	[mbæz^{ʔ}]	[l̤æ̂]
	grito del burro (SMigC)	diente	costoche	tolín
	call of the donkey	tooth	fox	craving

In (2.38) I give examples of /a/ in different positions. /a/ is found initially in a number of Spanish loans and onomatopoetic words, and in at least four native words. Most native words with initial /a/ are function words: two adverbs, a pronoun, and a quantifier. It is interesting to note that in three of these four native function words /a/ is a rare pretonic syllable. In all four words /a/ takes high tone, the rarest of the five tones but the tone always found on pretonic syllables, such as in compounds.

/a/	Initial	In a diphthong	Before a consonant	Final
(2.38)	*áyo^{7}*	*ga^{7}y*	*kwàl*	*Lă*
	[áyō ʔ]	[ɣāˊy̰ ʔ]	[k^{w}àl̤:^{ʔ}]	[l̤ă:^{ʔ}]
	cien	cinco	frío	Oaxaca
	hundred	five	cold	Oaxaca

In (2.39) I give examples of /ɔ/ in different positions. /ɔ/ is rare and only occurs in the Coatlanes. It occurs in only six words currently listed in the dictionary though it surely occurs in more words as yet unrecorded. Of these six words, three are reconstructed by Kaufman (1993) with **a* and two of the three with a following **w*. Indeed, other Zapotec languages such as SAMZ have /aw/ corresponding to Coatlán /ɔ/. The development of /ɔ/ in CLZ makes the Coatlán vowel inventory more symmetrical than the Loxicha vowel inventory which lacks /ɔ/ in opposition to /æ/.

/ɔ/	Initial	In a diphthong	Before a consonant	Final
(2.39)	------	*yà ndö̂w*	*yö⁷j*	*ndö̀*
		[yàndɔ̰̂w]	[yɔ̃́ʔˀx]	[ndɔːˀ̀]
		palo de zapote	renacuajo	H-comer
		zapote tree	tadpole	H-eat

In (2.40) I give examples of /o/ in different positions. /o/ is found initially in one onomatopoetic word and one other native word as well as a few loanwords.

/o/	Initial	In a diphthong	Before a consonant	Final
(2.40)	*ówìzhta⁷*	*nzóy*	*gôn*	*gó*
	[ówìzn̰tā́ʔ]	[n̰zóy]	[ɣôn̰]	[ɣó]
	mediodía	cacao	limosna	2r
	noon	cocoa	offering	2r

There are some phonetic instances of [o] which I analyze as /w/, e.g. the SBL word for ‘anona; soursop’ in (2.34) above and ‘javalí; peccary’ in (2.36) below. These are *w*-final words with low tone which causes lengthening of final /w/. Since the difference between a glide and a vowel is essentially one of length, a much lengthened glide is phonetically a vowel. The problem here is that since the vowel equivalents of glides are usually high vowels, one would expect /w/ to here be realized as [u] rather than [o].

Benton (1988) reconstructs only **o* and not **u* for Proto-Zapotec. In Beam de Azcona, (1999) I also suggested that only **o* should be reconstructed, based on a longer unpublished study in which I found that of the words reconstructed by Fernández de Miranda (1995 [1965]) and an earlier version of Kaufman (2003) with **u* all but two instances could be explained by either **i* in a following syllable or an adjacent palatal glide **y* or palatalized **ty* or **tty* (Fernández de Miranda’s **r* and **ch*). In the longer

study I also found sporadic cases of fossilized modern /o/ in words reconstructed with **u*, especially in some Southern Zapotec languages but also elsewhere.

If earlier Zapotec had only /o/ and not /u/, perhaps a lengthened /w/ would be perceived as a vowel and pronounced [o]. In this case one might want to argue that these words have modern vowel clusters with /o/ and not diphthongs with /w/. However, I still analyze these words as having /w/ and not /o/ because the length accounting for the vowel is predicted by the tone, because *w*-final words behave like consonant-final words with respect to clitic selection, and because these would be the only words in the language with vowel clusters if analyzed that way. In any case, since lip rounding is more essential to the articulation of [w] than tongue height, an [o] allophone of /w/ is less problematic than, say, an [e] articulation of /y/ (which does not occur).

In (2.41) I give examples of /u/ in different positions. /u/ is found initially in at least two Spanish loanwords. The only native word listed in the dictionary with initial /u/ is an alternant pronunciation of the only native word listed with initial /o/.

/u/	Initial	In a diphthong	Before a consonant	Final
(2.41)	*úwìzhta*[7]	*mtzuǔy*	*zhúl*	*ngû*
	[úwìz̤t̤ā̤ʔ]	[mɕùíʔ]	[z̤úl̤]	[ŋgû]
	mediodía	C-hacerle cosquilla	pollito	huevo
	noon	C-tickle	chick	egg

2.3 Syllable and word structure

Most native CLZ words consist of a single syllable due to pre- and post-tonic vowel deletion historically. The syllable structure of loanwords is covered in §2.8.3. In very few cases are vowel-initial words and syllables allowed outside of borrowings and

onomatopoeia. The minimal syllable consists of a consonant followed by a vowel, but codas are found in most words and many words have complex onsets resulting from prefixation. Excluding loanwords, onomatopoeia, polysyllabic compounds, and the few vowel-initial words, the structure of a typical CLZ word is as shown here:

(2.42) CLZ word structure (C)(C)(C)CV(=)(C)(=V)

A post-vocalic consonant in this template may be an enclitic or part of the root. An enclitic consisting of a single vowel may also follow a root or may follow a consonantal enclitic. This template shows the maximal structure of a word in CLZ. The main difficulties in defining the notion of 'word' have to do with endoclisis, which is discussed in §2.3.2, §2.5.4, and §8.1.2, and compounding, which is considered in §7.2.

More at issue here is the definition of 'syllable.' One possible definition is that the syllable is the tone-bearing unit, with only one tonal category marked per syllable, counting contour tones as single tones. This definition enables us to not count as syllabic sonorants of complex onsets which bear no tone, such as the nasals and glide found in words like *mbgùp* 'armadillo' and *ngwzi*^{7} 'rayo; lightning,' since these onset sonorants do not bear tone. I describe the complex onset clusters of CLZ, and the analysis of homorganic nasal-obstruent sequences in §2.3.1 below.

If the definition of a syllable, or even of a word, is tonal, the main issue becomes how to count consonantal enclitics which do bear tone, as described in §2.5.4. Is an encliticized word like *ndó-nˆ* 'mi cara; my face' really disyllabic?

Since the tonal definition of the syllable is problematic, an easier solution is to say that there is a syllable for each vowel in the language, and so if there is only one vowel in a word, encliticized or not, that word is monosyllabic. The enclitic issues are still tricky since even though the word *ndó-nˆ* cited above would sound like a monosyllable to most linguists, a similar word with glottal tone like *xdo^{7}-nˆ* [s̪ðoʔn□] ‘mi amante; my lover’ might not. I consider the syllabic status of enclitics below in §2.3.2. If the definition of “syllable” depends on the vowel count, which does seem to be a better solution than relying on the tone count, the analysis of diphthongs as not being vowel clusters is especially important. Diphthongs are discussed in §2.3.2 below.

Other than the issues of enclitics and diphthongs, codas are not very complicated in CLZ. Any consonant in the language other than /t^{y}/ and /k^{w}/ can occur in coda position. The onset is the most segmentally complex part of the CLZ syllable, which I will address now.

2.3.1 Onset structure

Outside of loanwords and onomatopoeia, any consonant may occur in an onset except /t^{ʔ}/ and /x/, though /x/ does occur in the onset in loans like *Jwěl* ‘Rafael’ (see §2.8.3). /θ/ only occurs in an onset in one morpheme, the postposed marker *tha^{7}* which seems to mean something like ‘just’ and which occurs in several compounds, usually following vowels.

While most consonants other than /t^{ʔ}, x, θ/ frequently occur in the onset, there are restrictions on the combinations of consonants that can occur in a complex onset. There are actually six slots (the sequence NDw counts as three of these) shown further below in

(2.43) where different types of consonants may occur in the onset, but I have never found an example of an onset with more than four consonants. All complex onsets reflect complex morphology, either synchronic and productive or ancient and opaque. The types of clusters that occur are dependent on the types of segments that occur in affixes and the order they concatenate in.

In this section I refer to a "core consonant" which is to the onset what the syllable nucleus is to the rime. This is the consonant which occurs in the one obligatory slot in the template given in (2.43) and is the closest consonant to the rime except for intervening *–y-* (though *y* may be the core consonant itself if it is root- or stem-initial). The core consonant is usually the initial consonant of the root or stem or base. In cases of vowel-initial roots, such as some verbs, a prefix consonant fills this slot and meets the requirement that all words and syllables have onsets (a requirement which is only violated by loanwords, onomatopoeia, and a small handful of function morphemes).

Onset structure is dictated by morphology. The core consonant may only be followed by *y*, which might be regarded as an infix and is involved in marking intransitivity and perhaps some not yet analyzed derivational processes. The core consonant may be preceded by zero to two prefixes, however some prefixes are complex, consisting of up to three consonants.

Immediately preceding the core consonant there may be a derivational or inflectional prefix. The form of this prefix may be a single consonant *p-*, *s-*, *b-*, *w-*, *t-*, or *l-*, or a prefix may occur in this slot which reflects the melding of two earlier morphemes and now consists of a homorganic nasal-obstruent cluster sometimes followed by *w* (the reduced form of an earlier prefix vowel). Nasal-initial complex prefixes include animacy markers

which are derivational and TAM markers which are inflectional. Under predictable phonological and morphological conditions these complex prefixes may reduce to a single nasal *m, n* or *nh* ([ŋ]). The prefix *ngw-* reduces to *nhw-* in one environment.

Note that other than *t*, whose tentative status as a prefix is discussed below, all CLZ prefixes contain either a fricative or a sonorant. We might unite these under a term "continuant" if we alter the definition of this word to include any continuous air flow even if nasal rather than oral. As recognized by Regnier (1993), Nelson (2004) and others, Zapotec languages, and particularly SZ languages, go against our expectations of having more sonorous segments closer to the nucleus and less sonorous segments towards the syllable margins. In Zapotec languages we find single syllables in which an initial sonorant is followed by a voiceless obstruent preceding the vowel. Word-initial sonorants in CLZ often sound the same as syllabic sonorants in English or other languages, or even have a short schwa-like vowel intervening between the initial sonorant and a following obstruent. Nevertheless, as Nelson points out, these initial sonorants are analyzed as being part of the the onset rather than forming a separate syllable because they do not bear tone, or by my definition simply because they are not vowels. Though initial nasals in onset clusters count as part of the onset when in utterance-initial position and when following consonant-final words, they do syllabify with the preceding word if it is vowel-final.

Many Otomanguean languages have words beginning in homorganic nasal-obstruent strings. Different linguists working with different languages alternatively analyze these as clusters (e.g. Paster & Beam de A., 2004 on Mixtepec Mixtec; Jamieson, 1988 on Chiquihuitlán Mazatec; Munro & Lopez et al., 1999 on San Lucas Quiaviní Zapotec;

Lastra, 1997 on Ixtenco Otomí) or as single segments (e.g. Macaulay, 1996 on Chalcatongo Mixtec; Bradley, 1970 on Jicaltepec Mixtec; Stark et al., 1986 on San Juan Colorado Mixtec; Anderson & Roque, 1983 on Cuicatec). I analyze these as clusters in CLZ for several reasons.

First, in some derivational pairs we find a *b~mb* correspondence, e.g. *bëˆl* [βæˆ̣] ‘llama; flame’ and *mbëˆl* [mbæˆ̣] ‘estrella; star.’ At first glance such pairs seem to show that *m*- is an animacy-marking prefix and that when added to /β/ the result is a cluster that is phonetically [mb], i.e. /β/ is [b] following a homorganic nasal. In Chapter 6 I describe animacy marking as having two layers, an ancient *b*- prefix and a more recent *m*- added in front of *b*- in some words. I expect that the initial *b* in ‘flame’ may be there due to the older animacy prefix but it could just as easily be true that ‘flame’ did not take this prefix, just happens to have initial /β/, and that this initial fricative deletes when a /^{m}b/- prefix is added. Unfortunately none of these nasal~non-nasal derivational pairs begin in non-bilabial consonants. Thus, this pattern of derivation is not enough to support a cluster analysis on its own.

Stronger evidence is the fact that prefixes consisting of NC clusters have allomorphs consisting of single nasals. The habitual prefix *nd*- reduces to *n*- before obstruents. The completive marker that is *mb*- before voiced consonants is *m*- before voiceless consonants. /m/ and /n̥/ are phonemes on their own and can occur in the same environment as NC clusters, e.g. *măn* ‘animal’ and *mbăn* the completive form of ‘revivirse; to be revived,’ so it is not desireable to claim that [m] is an allophone of the same phoneme as [^{m}b].

According to my historical analysis of animacy marking in Chapter 6, earlier animacy markers *pe-* and *ko-* became *b-* and *gw-* in CLZ and the classifiers *mĕ* ‘human’ and *má* ‘animal’ reduced to *m-* in many animacy-marked words, producing complex prefixes *mb-* and, via homorganic nasal assimilation, *ngw-*. Historically at least, each of the two consonants in a nasal-obstruent cluster not only come from different phonemes but from different words.

When single nasals in prefixes are added to a root that happens to have a homorganic consonant, the cluster is phonetically identical to every other case of the same sequence in the language. The irrealis marker has the form /ŋ-/ before obstruents. When added to a verb root with initial /ɣ/ the result is [ŋg]. The habitual marker has the form /n̪-/ before obstruents (and /w/) and when added to a root with initial /ð/ the result is [n̪d̪]. While fuller forms of these prefixes before sonorants are *ng-* and *nd-*, it would be awkward to say that the obstruents in these prefixes delete before all obstruents except homorganic voiced fricatives, which then delete in the presence of the prefix. However, the completive marker *mb-* has a different distribution, only reducing to *m-* before voiceless obstruents. When *mb-* is added to a /β/-initial root the result is [mb] and not [mbβ].

All of these facts taken together may leave enough doubt for someone else to propose that there is a separate series of prenasalized phonemes in CLZ. However, I believe that the evidence indicates the cluster analysis as the better one, although these clusters are perhaps on their way to becoming a separate series of phonemes in the future---if the language survives that long.

The only consonant which may precede prefixes including those with nasal-obstruent clusters is a possessive prefix *x-* (see §6.7). This prefix may also be added to the bare root.

(2.43) shows what consonants can occur in what position in the onset, where N means 'nasal,' D means 'voiced obstruent,' and C means 'any consonant' including glides.

(2.43) (*x-*) ({ *p-* *s-* *b-* *w-* N(D)(w)- *l-* *t-* }) C (*-y-*)

While I have presented CLZ onset structure according to a morphological template, in reality there are some onset clusters which do not result from affixation. The most prevalent examples are loans from Spanish, discussed below in §2.8.3. Some of these, e.g. *mbál* 'compadre,' are highly nativized and perfectly resemble the onset structure found in native words. Though I have listed *l-* and *t-* above in (2.43) as prefixes, they are rare in this position and the main evidence for their status as prefixes is the fact that they occur preceding other consonants in complex onsets. Since these two segments are rare cluster-initially it may just as well be the case that there were some words in earlier Zapotec without root-initial stress in which there were pre-tonic syllables in the root. However, the fact that such words also have codas, e.g. *lzàn* 'consuegro; in-law' and *tnìx* 'fajilla; board,' suggests that they were originally trisyllabic words and therefore *l* and *t* did most likely belong to prefixes. Another possibility, doubtful for *lzàn* but quite possible for *tnìx,* is that an onset cluster has resulted from an early loan from Spanish or

another language. Outside of loanwords, *t* is initial in a cluster only in one other word: *tlă* ‘centro; center.’ Another rare prefix is *p-* which occurs in question words, usually preceding *l*.

Having provided an outline of the maximal structure of CLZ onsets, I will now proceed to describe the types of onsets which actually occur in the language. Minimally an onset can consist of any single consonant, including a glide.

(2.44)	*tô*	*tzô*	*dà*	*xìt*	*măn*	*Lă*	*ya*^{7}
	boca	tamaño	petate	tío	animal	Oaxaca	mano
	mouth	size	mat	uncle	animal	Oaxaca	hand

There are two types of two-consonant onsets. In one the core consonant is followed by *–y-* and in the other it is preceded by a single consonant prefix which is one of the simple prefixes listed in (2.43) or is a single nasal that is the reduced form of a complex prefix. Only coronal consonants may be followed by *–y-*. There are *Cy* clusters in which the initial member is not coronal but in each case the initial consonant is one of the possible prefix consonants. A CC cluster may consist of two sonorants, an obstruent and a sonorant (in either order), or two obstruents but only if one is a fricative. There are no clusters consisting of two stops or a stop and an affricate.

In Figure 9 I show the possible combinations of consonants in onset clusters with two consonants. I have omitted sounds which never occur in onsets like *t*^{7} and sounds which only occur in clusters in loanwords like *r*. The phoneme /ñ/ never occurs in clusters and so is also omitted. Note that *s*, *m,* and *nh* only occur as the initial member of a CC cluster, i.e. as a prefix consonant and not as a root consonant. The only exceptions to this are *sme*^{7} ‘otro poco; another little bit,’ and the loanword *smán* ‘semana; week.’ I have

highlighted in bold the consonants which occur as prefixes, and *y* which occurs as an infix. While in Figure 9 I have only included consonants which occur in onsets of native words, if two consonants listed here only occur together in loanwords I mark the combination with L. Other onset clusters not shown here exist in loanwords and are described in §2.8.3. For the other combinations shown here R means that a combination is rare (I have found fewer than five examples), C means that a cluster is found in the Coatlán dialects only, a + means that it is fairly common and a – means that it does not occur. Note that *ty* and *kw* are analyzed as single segments rather than clusters.

Figure 9: CC onset cluster combinations

1/2	s	m	nh	p	t	tz	ty	ch	k	kw	b	d	z	zh	g	x	n	l	w	**y**
kw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
k	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L
g	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
zh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ty	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
z	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
t	-	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	R	L	-
p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-
l	-	-	-	-	-	-	-	-	-	-	-	-	R	-	-	-	-	-	R	+
b	-	-	-	-	+	+	+	+	+	+	-	+	+	+	+	+	+	+	R	+
w	-	-	-	-	+	+	-	+	+	-	-	+	+	+	+	+	+	+	-	+
s	-	R	-	L	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+
x	-	L	-	-	+	-	-	-	+	+	+	+	-	-	+	-	+	+	+	+
m	-	-	-	-	+	+	+	+	+	+	+	C	C	C	C	+	R	C	C	C
n	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+
nh	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-
	s	m	nh	p	t	tz	ty	ch	k	kw	b	d	z	zh	g	x	n	l	w	**y**

Ignoring the rare prefixes t-, *p-*, *l-*, and concentrating on the more common *b-*, *s-*, *x-*, *m-*, *n-*, *nh-*, and *w-*, there are certain gaps noticeable in the table above. None of these prefixes occurs before *s, nh,* or *p,* because there are no roots that begin in these consonants. Root-initial *m* is extremely rare. All other consonants listed here on the horizontal axis do occur root- and stem-initially following prefixes so gaps where a particular prefix does not occur before *t, tz, ty, ch, k, kw, b, d, z, zh, g, x, n l, w,* or *y* may have a phonological explanation. Most gaps have to do with the prefix consonant being too phonologically similar to the core consonant. The prefix *b-* does not occur before *b* (or is not noticeable before it) and is rare before the labial glide *w*. Likewise the prefix *w-* does not occur before any of the labial consonants *kw, b,* or *w*. It also does not occur before *ty,* perhaps due to morphological rather than phonological distribution (*w-* is a verbal prefix in classes where no *ty*-initial stems occur).

The prefix *s-* occurs before all common root-initial consonants except the voiced sibilants *z* and *zh*. When the future is marked on verbs beginning in one of these consonants the result is not an *s*-initial cluster but rather the voiceless counterpart of the root-initial consonant. For example, the future of *–zh-o*^{7}*b* ‘desboronarse; crumble’ is *xo*^{7}*b*, and the future of *–z-èn* ‘agarrar; grab’ is *sèn*.[10] This is a synchronic assimilatory process in which an underlying sibilant cluster which differs in voicing will result in a single surface sibilant, identical to the prefix in voicing but to the stem-initial consonant

2.1

[10] For those interested in historical Zapotec phonology, note that this is not fortition resulting from an underlying consonant cluster like what happens with the potential prefix **k-*. The consonants *s* and *z*, and *x* and *zh* are not reflexes of historical fortis:lenis pairs. **¢ > ẓ* in CLZ and **¢¢>ç* (not *ṣ*). **s>z* in CLZ and **ss>¢* (not *s*). The future prefix contained a vowel historically and by the time it was deleted and caused resulting consonant clusters in CLZ the sound changes affecting these consonants had already taken place. Thus, this is a modern assimilatory process and not fortition reflecting earlier geminates or consonant clusters.

in place of articulation. When *s-* precedes the voiceless sibilant *x* there is no such cluster simplification, e.g. the future of *-xǐtz* ‘espantar; scare’ is *sxǐtz*.

The other voiceless sibilant prefix *x-* is not as productive as *s-*. The fact that *x-* does not occur before *ty* may be due to this factor rather than phonology. All the other consonants not found after *x-* though are stridents, either the sibilants *z, zh, x*, or the affricates *tz, ch*. This prefix is mostly added to obligatorily possessed nouns, like body parts and kin terms, and so there is often no variation in the noun paradigm. Based on Kaufman’s (2003) reconstruction of the words ‘spouse,’ ‘kinsman,’ ‘intestine,’ and ‘arm,’ which are words we can suspect of being candidates for the *x-* prefix without absolutely knowing whether it would have been marked this way historically, it would seem that we have no examples of a change taking place when a word begins in (the ancestor of) CLZ *ch, tz,* which are fortis consonants, and *x*, which can reflect either fortis **ṣṣ* or lenis **ṣ*. So, we don’t know if the words *chë^{7}l* ‘esposo; spouse,’ *tzâ* ‘hermano, compañero; sibling, companion,’ and *xìk* ‘brazo; arm,’ are marked with *x-* historically or underlyingly but if they are there is no change from what consonant would be present in the root without such marking. It may simply be that *x-* cannot occur before synchronic or historical affricates, or (discernably) before *x*.

However, the word ‘intestine’ is reconstructed with initial lenis **s* but has fortis *tz* in CLZ *tzi^{7}*. It is possible that *x-* added to **s* produced a fortis consonant at the place of articulation of the root-initial C, in this case the earlier fortis consonant would have been **ss*, which has the CLZ reflex *tz* we see in ‘intestine.’ This is not the same as the earlier rule seen with *s-* where the result is a voiceless version of the stem-initial lenis consonant. While *s* is the voiceless version of *z* in terms of phonetics, *tz* is the historical fortis

counterpart of *z*. Based on this example we do not have strong evidence of the *tz* reflex in 'intestine' being a result of prefixed *x*-. However, if this hypothesis is true it would mean that this prefix lost its vowel at an earlier stage than the future prefix, since any fortition caused by the prefix here affected the older lenis consonant rather than the modern one.

The gaps found for nasal prefixes are phonologically and morphologically predictable. Each of these usually occurs as a reduced allomorph of a fuller morpheme containing a homorganic obstruent following the nasal. The prefix *m*- is a reduced form of *mb*- which occurs before voiceless obstruents in the Loxicha dialect and before all obstruents in the Coatlán dialects. It is rare before *n* because there are few *n*-initial roots. The prefix *n*- can occur as the stative prefix or as a reduced form of the habitual prefix *nd*- and occurs before all of the common core consonants except *n* (where it is simply indistinguishable, i.e. *nn* → *n*) and *l*. The prefix *nh*- is a reduced allomorph of *ng*-. The fuller form *ng*- occurs before vowels and glides and *nh*- occurs before all other stem-initial consonants. The velar nasal *nh* does occur preceding the glide *w* in a reduced form of the prefix *ngw*- but in this case the *nhw*- allomorph always precedes another consonant and so there are no two-consonant onsets with *nhw*.

(2.45) provides examples of different CC and Cy clusters.

(2.45)	*dyî*	*xla*^{7}	*nwǐx*	*lwê*	*mna*^{7}	*wlè*
	P-rendir	olor	antojo	ala	C-lavarlo	ciego
	P-yield	odor	craving	wing	C-wash (vt)	blind
	mtye7n	stzi7l	xbì	lzàn	blô	wyê
	libélula[11]	comida	alma	consuegro	hueco	fuerte
	dragonfly	lunch	soul	in-law	hollow	strong

[11] Consultants actually glossed this word in Spanish as *vivelula* which seems to be a folk etymology based on the third person singular form of the verb *vivir* 'live.'

The habitual aspect prefix *nd-* reduces to *n-* before obstruents, even voiced ones. When *n-* precedes a voiced sibilant *z* or *zh*, there is an epenthetic [^{d}] in the transition. For example, the habitual form of *–zô* ‘pararse; be standing’ is *nzô* which is phonetically [n̤^{d}zô]. I do not regard this as an instance of phonemic *d* even though that sound is part of the fuller habitual morpheme, because unlike the phonologically similar completive morphemes *mb-* and *ngw-*, the habitual morpheme *nd-* does not retain its obstruent portion before other voiced obstruents, and the occurrence of [^{d}] here is easily explainable on phonetic grounds. Thus, [n̤^{d}z] and [n^{d}z̤] count as CC and not as CCC clusters.

There are four types of onset clusters with three consonants. The core consonant may be both followed by *–y-* and preceded by a prefix consisting of a single consonant (the rare *t-* and *l-* have never been found in such a cluster). The core consonant may be preceded by a homorganic nasal which is itself preceded by the possessive morpheme *x-*. The core consonant may be preceded by a complex prefix consisting of a nasal-obstruent cluster which are homorganic to each other but heterorganic to the core consonant. If the core consonant is a voiceless obstruent it may be preceded by the completive or animacy-marking allomorph *nhw-* which is a reduction of the fuller allomorph *ngw-*. Examples of CCC clusters are provided in (2.46).

(2.46)	*nzyàn*	*xngû*	*mbzhǎzh*	*nhwtza^{7}*	*wzya^{7}b*	*btzya^{7}n*
	H-parir	POS-huevo	AN-lechuza	C-rommperlo	huérfano	sereno
	H-birth	POS-egg	AN-owl	C-break (vt)	orphan	frost

There are two types of four-consonant clusters in CLZ onsets. If the core consonant is followed by *-y-* it may be preceded by a complex nasal-obstruent prefix. The other

possibility is the full *ngw-* prefix preceding a voiced core consonant which is the stem-initial segment. Examples are given in (2.47).

(2.47)	*mbdyî*	*ngwdà*	*mbzya^{7}l*	*ngwlo^{7}*	*ngwzi^{7}*
	C-rendir	C-comer	C-perderse	C-sacar	rayo
	C-yield	C-eat	C-get.lost	C-take.out	lightning

Some hypothetical combinations of clusters that could occur following the onset template in (2.43) in fact do not occur. One type of gap in particular is of morphological interest. I have mentioned here that the habitual aspect is marked *nd-* before vowels and sonorants other than /w/, and that the pre-consonantal completive markers are *mb-* and *ngw-* when preceding voiced consonants and *m-* and *nhw-* preceding voiceless consonants. I have also mentioned that *–y-* is used to derive intransitive verbs and possibly in other functions. Verbs which take this infix belong to classes A, B, and Ch (see Chapter 4). Verbs with *–y-* belonging to classes B and Ch show this palatalization in the habitual but not in the completive form. Classes B and Ch mark the completive with *ngw-*, the only tri-consonantal prefix. Verbs with *–y-* belonging to class A have this palatalization throughout the paradigm except in the infinitive. Class A verbs take the completive marker *mb-*. The fact that there is no *–y-* in the completive form of verbs that mark the completive with *ngw-*, means that there are no five-consonant onsets in CLZ.

2.3.2 The rime and the phonological status of enclitics

CLZ syllables contain a single vowel which may optionally be followed by a single consonant. Any consonant other than *ty* and *kw* can occur as the coda. This lone coda consonant may occur as the final member of a root or as an enclitic attached to a vowel-

final root. Coda consonants are often realized in interesting ways as described in §2.1 and §2.5.2-4. They are followed by pre-pausal glottal stops if lenis and/or if in words with certain tones. They are also realized somewhat differently if they are clitics than if they are root-final. The main issues relating to CLZ rimes that are not covered elsewhere relate to diphthongs and encliticized words. These are the topics I focus on in this section.

In my view of CLZ phonology there is only one vowel per syllable, and likewise only one syllable per native root. Syllables (and roots) may end in a single coda consonant, including the glides *y* and *w*. Thus a rime may consist of a diphthong. No CLZ root ends in a vowel cluster. The *–á* 2r enclitic may occur following vowel-final words but in this case counts as a separate syllable. Even so, this is one of the only cases where two vowels become adjacent in the language other than an instance of a vowel-initial loanword (or the rarer vowel-initial function word) following a vowel-final native root. Other than these rare disyllabic and bimorphemic cases there are no vowel clusters in CLZ, and certainly not in any monomorphemic word.

From a phonetic perspective, the difference between glides and high vowels is one of length. From a phonological perspective what is phonetically a vowel in a particular instance may be categorized as a glide and vice versa in a given language. In CLZ when an uncliticized word has high, falling, or glottal tone in CLZ, the root-final sonorant is relatively short. The phonetic nature of *y* and *w* in such words corresponds well with the phonological category ‘glide’ to which these segments belong. However, in words with low or rising tone root-final sonorants are lengthened, as described in §2.1.6 and §2.5.3. Phonetically, glides in these words are in fact vowels. I analyze them as glides phonologically because the lengthening is predictable and because roots in this language

are overwhelmingly monosyllabic, with only one vowel each. (2.48) gives phonetic transcriptions for differently-toned words ending in diphthongs.

	high	**low**	**falling**	**rising**	**glottal**
(2.48)	*twáy*	*mbày*	*ndâw*	*nbă̌w*	*mba^{7}w*
	[twáý]	[mbàiˀ]	[n̪d̪áw̰]	[n̪ʱβàóˀ]	[mbāẃʔ]
	toalla	bueno	zapote	H-afilarlo	C-afilarlo
	towell	fine	zapote	H-sharpen (vt)	C-sharpen (vt)

The analysis of longer vowel-like sounds in words like *mbày* and *nbă̌w* is more complicated when there is a clitic boundary in between a root-final vowel and a glide in an enclitic. The clitic form of the third person inanimate pronoun consists of a single vowel following consonants (*-é* in SBL but *–á* in the Coatlanes) and begins in or consists of a glide when following vowels (*-ý* in SBL and SMigC but *–yá* in SMaC). That the allomorph *–ý* is a glide and not a vowel *–í*, is suggested by its distribution. If it were permissible to have a vowel allomorph following a vowel-final root, there would be no phonological motivation for having different allomorphs of this morpheme. While the vowel allomorph *–é* or *–á* takes the would-be coda of the root and steals it for its own onset, forming a separate syllable, in theory the glide allomorph *–ý* becomes the coda of the syllable containing the root. However, there are some interesting phonetic differences between roots ending in diphthongs and vowel-final roots that are followed by the glide clitic *–ý*.

High-toned words are rare. One instance of *–ý* following a high-toned word is when it follows the full form of the first person inclusive pronoun *nhó*. In this example the

resulting *nhó-ý* sounds the same as if there were no clitic boundary and there was a monomorphemic word *nhóy*.

When *-ý* follows a falling-toned root as in *blâ-ý* ‘¡déjalo!; put it down!’, the result is similar to a falling-toned word ending in a diphthong in terms of length and lack of glottalization but with the pitch pattern changing to a flat or rising pattern at the end rather than falling throughout the word.

When *-ý* follows a rising tone the result is similar to a diphthong-final rising-toned root as far as the pitch pattern (there may be a fall at the very end but the rise in pitch extends well into the glide) but the lengthening and glottalization that would be present on an uncliticized word of this shape and tone are absent. The root-final vowel is not lengthened, although it would be if it did not have a following clitic, and the clitic glide itself is not lengthened, though it would be if it were final in the rising-toned root.

When *–ý* follows a low tone the result is the same as just described for a rising-toned root in terms of the lack of length and glottalization, although the root vowel may sometimes be lengthened. Pitch-wise there is a rise from the low tone of the root to the high tone of the clitic, which is very similar to the pitch pattern of a rising tone found on a monomorphemic root except for the lack of lengthening of word-final sonorants.

Following the glottal tone the plot thickens. When a diphthong-final root has glottal tone the word-final sonorant, in this case the glide, is post-glottalized. By this I mean that on the end portion of the glide there is creak and the segment ends in an abrupt glottal stop. However, if a vowel enclitic, e.g. the *–é* allomorph of the 3i pronoun, is added to such a word, then the result is that the glide is interrupted with glottalization and the non-glottalized portions of the segment are now split in two, with the first portion serving as

coda to the root syllable and the second portion serving as onset to the syllable containing the enclitic, as shown below.

(2.49)	*ga^{7}y*	*ga^{7}y-é*
	[ɣāɣ̍ʔ]	[ɣā$^{\acute{y}}$ʔyé]
	cinco	cinco-3i
	five	five-3i

If the glide clitic *–ý* is added to a vowel-final root with glottal tone the result is different than a diphthong-final glottal-toned word that does not contain a clitic. Instead, the vowel is glottalized rather than the glide, which itself follows the glottal stop. If looking at a wave form of such an encliticized word one sees two peaks of amplitude, what one might otherwise consider to be the sign of two syllables. I analyze this as one syllable phonologically, though phonetically it might be more appropriate to speak of two syllables. I imagine some other linguists would want to entertain an alternative analysis, one in which this type of encliticized word is phonologically disyllabic. It is an interesting issue which merits further exploration in the following paragraphs.

Just as the concept of 'glide' can have both a phonological reality (a type of phoneme, which may have both glide and non-glide allophones) and a phonetic reality (a short high vowel which occurs adjacent to a longer vowel in onset or coda position in a phonetic syllable, i.e. a peak of amplitude), so can the concept of syllable. The phonetic and phonological categories by the same name may be overlapping but not identical. Phonetically a syllable is a single peak of amplitude with a sonorous core, and also includes less sonorous material which is further away in time from the absolute peak of amplitude. Phonologically a syllable may include what are phonetically multiple peaks of

amplitude. I would propose that words consisting of a vowel-final glottal-toned root followed by the clitic *–ý* are phonetic disyllables (or polysyllables depending on the phonetic status of the segments in the phonological onset) but consist of a single syllable phonologically.

(2.50)	*ga^{7}y*	*wla^{7}-ý*
	[ɣāýʔ]	[wl̤āˊʔí]
	cinco	IMP-dejar=3i
	five	IMP-put.down=3i

Other Zapotec languages, but not CLZ, have a contrast between glottalized (checked) Vʔ and rearticulated Vʔ^{V} vowels. CLZ does have Vʔ^{V} phonetically as a variant of /Vʔ/ but does not have a phonemic contrast between the two types. In languages which do have such a contrast, e.g. SAMZ, the vowel on either side of the glottal stop in Vʔ^{V} is identical and counts as belonging to the same syllable. Most instances of words with *–ý* have a vowel other than /i/ (since it is only one of 6-7 vowels in the language). I can imagine that some would point to this difference in analyzing such words as disyllabic in CLZ. While it does not retract from such an argument, I should point out that in one instance other than *i*-final roots, the 3i clitic pronoun causes a sequence of identical vowels separated by a glottal stop. I argued above that if *–ý* was really regarded as a separate syllable following a glottal stop there would be no reason for it to occur rather than the *–é* allomorph. In one such instance the morpheme *is* realized this way. When the 3i enclitic follows a word, often a function word, ending in a glottal-toned vowel /a/, rather than the expected sequence *a^{7}-ý*, both the quality of the root vowel and the expected allomorph of the enclitic are changed to /e/.

(2.51) (a) *Ná ñâ ta^{7} nhó-ý.*
NEG H-ver ya 1i=3i
NEG H-see anymore 1i=3i
Ya no lo vemos.
We don't see it anymore.

(b) *Zé zîth ná ndlu^{7} te^{7}-é.*
lugar lejos NEG H-enseñarse ya=3i
place far NEG H-be.shown anymore=3i
De lejos ya no se ve.
From far away it isn't visible anymore.

(2.52) (a) *Nhwtza^{7} xa^{7} lâd.*
C-romper 3hd ropa
C-break 3hd clothing
Rompió la ropa.
S/he tore the clothing.

(b) *Nhwtza^{7} xe^{7}é.*
C-romper 3hd=3i
C-break 3hd=3i
Lo rompió.
S/he broke it.

This change in vowel quality in effect makes the root=clitic sequence sound more like a monosyllable. It makes the phonetic reality more closely resemble the phonological structure.

Both word-initial nasals and sonorant enclitics which follow a glottal stop show peaks of amplitude separate from the main syllable of the root and with less amplitude than that syllable. This is because less sonorant sounds, stops or fricatives (the *valleys* of amplitude), intervene between the root vowel and the sonorants in prefixes and enclitics that follow a glottal stop. One could argue that these are syllables but that they are unstressed. One reason for analyzing nasals in the onset as non-syllabic is that they do not bear tone. In §2.6 I say that tone is not contrastive on unstressed syllables, which predictably take high tone. One could propose, though I do not, that nasals in NC clusters in the onset do constitute separate but unstressed syllables. Since this is not the analysis I have pursued, I have never marked tone on nasals in the onset, nor have I ever perceived any contrastive pitch in that part of the word. On the other hand, I have marked, and do perceive, contrastive tone on enclitics like *–nˆ* and *-mí.* I have also marked high tone on the 3i pronoun clitic *–ý*, but someone wishing to pursue a syllabic analysis of this

segment in any or all environments could point out that the high tone of this clitic is the same tone found on unstressed syllables, and make a tandem argument for syllabic nasals in prefixes as well.

As I have defined the notion of syllable in CLZ, each syllable must have a vowel. If *–ý* is really a glide and not a vowel *–í*, then it cannot be a separate syllable from the root under this definition. An argument could be made that this clitic, in the environment where it follows a glottal stop, is phonetically a vowel. In fact, I agree with this statement on a phonetic basis. However, phonologically I would still consider the clitic to be composed of a glide because of the distribution of this allomorph. If it were the case that following a glottal stop a vowel could occur, then why not have the *–é* allomorph? Although we might consider the glottal stop to be a type of consonant phonetically (it is a stop after all), in Otomanguean languages it does not act like a consonant but rather like a suprasegmental feature of the vowel. The *–ý* (rather than *–é*) allomorph appears after vowel-final words with glottal tone just as it does after vowel-final words with any other tone, confirming that glottal-toned words are still regarded as vowel-final as long as there is no coda consonant. The difference between *–é* and *–ý* is that *–é* is a vowel and *–ý* is not a vowel, therefore preventing VV clusters in words marked with *–ý*. I conclude that *–ý* is phonologically a glide, although phonetically it may be realized as a vowel in certain instances, chiefly following a glottal-toned vowel.

Similar issues surround nasal and lateral enclitics as already described for the glide allomorph of the 3i pronoun *–ý*. While *–ý*'s vowel-like production in certain environments bolsters any argument for its really being a vowel, the enclitics which consist of a single nasal or lateral have another feature suggestive of syllablehood,

contrastive tone. The tone of *–ý* is high, the same tone found on unstressed syllables, but the first person singular and second person familiar pronomial enclitics have falling tone, a tone otherwise only associated with stressed syllables.

When the nasal or lateral enclitics follow roots, they sometimes do sound like distinct syllables. When such an enclitic follows a root with rising tone, the sequence sounds like one syllable because neither the root vowel nor the clitic coda are lengthened and the enclitic is absorbed into the domain of the rising pitch, as described in §2.5.4. When following words with high, low, or falling tone, the enclitic does sound more distinct from the root because of the change in pitch from the root tone to the enclitic tone, and the fact that such sequences of pitch patterns as found on encliticized words may never be found on words that are not encliticized. In this case the perception of enclitics as possibly being separate syllables may occur because of the fact that they are separate tone-bearing units. When a nasal or lateral enclitic follows the glottal tone however, the notion of the clitic being a separate syllable is phonetically more accurate and means that the enclitic sonorant constitutes a peak of amplitude separate from that of the root vowel which precedes the glottal stop, yet the enclitic does not count as a separate syllable phonologically. This is the exact same situation as described above for *–ý* following a glottalized vowel except that here we are talking about phonetically syllabic nasals and a lateral rather than a glide, which with a little lengthening is something we would call a ‘vowel.’ In sum, nasal and lateral enclitics are part of the same syllable as the root phonologically, though when following a word with glottal tone they might be considered a separate syllable phonetically as they have a separate peak of amplitude, and when following a word with high, low, or falling tone they may be perceived as phonetically

separate from the root syllable because they constitute a separate tone-bearing unit and thus the concatenation of root and enclitic produces pitch patterns that, outside of these encliticized words, never occur on monosyllabic words.

In conclusion, CLZ has a complex syllable structure in which sonorous peaks of amplitude may be spread throughout the onset, nucleus and coda, and separated from one another by intervening obstruents. In a phonetic sense each of these peaks of amplitude may comprise a separate syllable. Nevertheless, phonologically the language treats these sequential peaks of amplitude found in individual non-compounded native words as single syllables, even when encliticized, as long as the clitic is not a vowel phonemically. Complexity is added to the beginning of syllables through prefixation and to the end of syllables through encliticization.

2.4 Nasalization

Contrastive vowel nasalization, which I mark orthographically with the hook *Ɣ*, has only been found in the SMaC dialect of CLZ. All but one of the cases of vowel nasalization in this variety are the transparent result of the deletion of a nasal consonant following the vowel that gets nasalized. In native Zapotec words vowel nasalization only occurs in two cases of pronominal marking. In loanwords vowel nasalization is found when there was a post-vocalic /n/ or /ñ/. In the case of the palatal nasal, /y/ remains following the nasalized vowel. Some examples of loanwords with nasalization are shown in (2.42).

(2.53) *là brétą̨y* *sę́y* *Yą́*
bretaña seña, señal Reveriana
(kind of plant) sign (personal name)

The one case of nasalization that is not a case of recent nasal deletion is a possible loan, an interjection akin to Germanic ‘uh-huh’ *ą̌ją*[7].

(2.54) *“ą̌ją*[7]*” ndàb mbál mbi*[7]*zh.* Tlacuache: 24
uh-huh H-decir compadre león
uh-huh H-say compadre puma
“Sí,” dice Compadre León.
“Uh-huh,” says Compadre Puma.

In native words other than onomatopoeia, nasalization is found in two pronouns. The third person human respectful pronoun is a reduced form of the word for ‘gente; person’ *mĕn*. Elsewhere in the CLZ region the pronoun is *mĕ* but in SMaC it is *mę̌* [12]. Interestingly the third person animal pronoun, *má*, is also based on a full noun with a nasal, *măn*, but is not nasalized. I suspect that this is evidence of an earlier grammaticalization of *măn* to *má* for use as a classifier compared to the corresponding reduction of *mĕn*, which I imagine occurred later.

The most interesting and productive use of vowel nasalization in SMaC is on vowel-final roots marked for the first person singular. The full first person singular pronoun is *nâ* and this is the form of the pronoun found when following consonant-final roots or

2.1

[12] I am not totally confident about this pronoun having rising tone as opposed to high tone. These two tones sound more similar in SMaC than in other dialects and many times this word has sounded more high than rising to me. This 3hr pronoun has rising tone in the other dialects documented, while the 3a pronoun *má* has high tone in all dialects. While the fuller generic nouns on which these are based, *mĕn* and *măn*, are nearly identical segmentally and tonally, the reduced free pronouns have rising tone and high tone

when fronted, e.g. to preverbal position when in focus. SMaC does not typically have the short =C clitic pronouns found in SBL (see §8.2) but SMaC vowel nasalization occurs in the same environment that the SBL first person pronoun clitic *-nˆ* occurs in, i.e. following vowel-final roots. When the first person singular is the possessor of a vowel-final noun or the unfocused subject of a vowel-final verb, the only marking is the nasalization of the final vowel of the noun or verb root. The POS particle *tě* can be thought of as a noun meaning 'possession of' or perhaps an emergent preposition with a nominal history. This marker of alienable possession is also nasalized when the possessor is the first person singular. In (2.55-58) compare phrases with third person marking to those with first person singular marking (double marking of 1s in the gloss line indicates both tonal changes and nasalization).

(2.55)	*Xè mę̌.*	*Xę̌.*
	nariz 3hr	**nariz.1s.1s**
	nose 3hr	**nose.1s.1s**
	Su nariz.	Mi nariz.
	His nose.	My nose.
(2.56)	*Wǎ mę̌.*	*Wą́.*
	P-comer.P 3hr	**P-comer.1s.1s**
	P-eat.P 3hr	**P-eat.1s 1s**
	Va a comer.	Voy a comer.
	S/he is going to eat.	I'm going to eat.
(2.57)	*Mbèk tě mę̌.*	*Mbèk tę́.*
	perro POS 3hr	**perro POS.1s.1s**
	dog POS 3hr	**dog POS.1s 1s**
	Su perro.	Mi perro.
	Her dog.	My dog.

respectively. If the 3hr pronoun in SMaC is really high, this would make the two pronouns reduce equally, in terms of tone, from the fuller generic nouns.

(2.58)	*Mkë^{7} mę̌ tę́.*	*Wkę̬̌ tě lô.*
	C-pegar 3hr POS.1s.1s	**P-pegar.1s.1s POS 2f**
	C-hit 3hr POS.1s 1s	**P-hit.1s 1s POS 2f**
	Él me pegó.	Voy a pegarte.
	S/he hit me.	I'm going to hit you.

When the final vowel of a root with a first person singular possessor or subject, has the glottal tone, a nasalized /a/ follows the root rather than simple nasalization of the root vowel itself. The contrastive glottal stop (tone) blocks the spread of nasalization. In this case the nasalization acts in the opposite direction, affecting the following vowel (of the pronoun *nâ*) rather than the preceding vowel. It seems that the presence of a vowel-final root triggers the process whereby the nasal consonant turns into a feature of vowel nasalization. That is, a segment becomes suprasegmental. Once this feature spreads to the preceding vowel, the following vowel of the pronoun is deleted, but when this leftward spread is prevented by the aparrent barrier that is a glottal stop, the feature spreads progressively instead and there is no vowel deletion.

(2.59)	*Tzo^{7}-ą̂*	*Ndá xi^{7}-ą̂-yá*
	espalda=1s	**H-ir.1s M-comprarlo=1s=3i**
	back=1s	**H-go.1s M-buy.it=1s=3i**
	Mi espalda.	Lo voy a comprar.
	My back.	I'm going to buy it.

That the glottal stop acts here as a barrier is surprising given the fact that many languages allow assimilation across a glottal stop though not across other consonants, as described by Steriade (1987). Another surprising feature of this process has to do with the typology of clitics. I analyze the nasalization feature which marks the first person singular in SMaC as a clitic. It has the same distribution as the bound *–nˆ* 1s. pronoun in

SBL, which I also analyze as a clitic. It is phonologically dependent but syntactically independent. However, Zwicky & Pullum (1983) include the fact that morphophonological idiosyncracies are more common in affixed words rather than cliticized words as one of their six criteria that separate clitics from inflectional affixes. The failure of this nasalization to spread past a glottal stop seems an idiosyncracy which counters their generalization, but even in its normal form, following other tones, the nasalization feature that is an allomorph of the 1s. morpheme looks phonologically more like fusional morphology than familiar kinds of cliticization.

There are a few other cases of nasalized vowels which I regard as nonphonemic. *Sometimes* the vowel of a glottalized root is nasalized preceding the *-q̂* clitic. I view this as a case of non-phonemic anticipatory assimilation. Sometimes the vowel of the third person inanimate pronoun clitic *–yá* is nasalized following a nasalized vowel, i.e. following a first person singular subject. Also sometimes nasalized are the vowels of words with prevocalic nasals, e.g. *xnò* ‘anona; soursop.’ I view both of these last two cases as non-phonemic progressive assimilation.

2.5 Tones[13]

The main suprasegmental category of CLZ is tone. Phonetically tone is not a single phenomenon but rather each tone has a cluster of phonetic features or cues associated with it. In CLZ the main features of any given tone are pitch level and shape or contour (§2.5.1), glottalization (§2.5.2) and lengthening (§2.5.3). Tone interacts with coda consonants in interesting ways described here and in §2.1.2 and §2.1.4. Enclitic pronouns

in CLZ (see §8.2) are reduced forms of independent pronouns and retain some degree of tonal contrast when they consist of a single sonorant (rather than an obstruent), e.g. *nhó* has a clitic form *-n̓h*. Tone on these enclitics is realized somewhat differently than tone on independent words, and is described in §2.5.4. Tonal alternations within paradigms are exploited morphologically, as described in Chapters 4-6. Also mentioned there, but introduced here in §2.5.5, is the existence of different tonal registers. Related to tone are stress and intonation, covered in §2.6 and §2.7 respectively.

There are five contrastive tone categories in CLZ as evidenced by the minimal set in (2.60). In addition to pitch, tone in CLZ is indicated by such features as glottalization, length and amplitude on rime sonorants, including both vowels and sonorant consonants.

(2. 60)

high	**low**	**falling**	**rising**	**glottal**
mbé	*mbè*	*mbê*	*mbě*	*mbe*[7]
[mbé]	[mbèːˀ]	[mbê]	[mběːˀ]	[mbē̋ ʔ]
cangrejo crab	neblina mist	araña spider	tortuga turtle	luna; mariposa moon; butterfly

2.5.1 Pitch

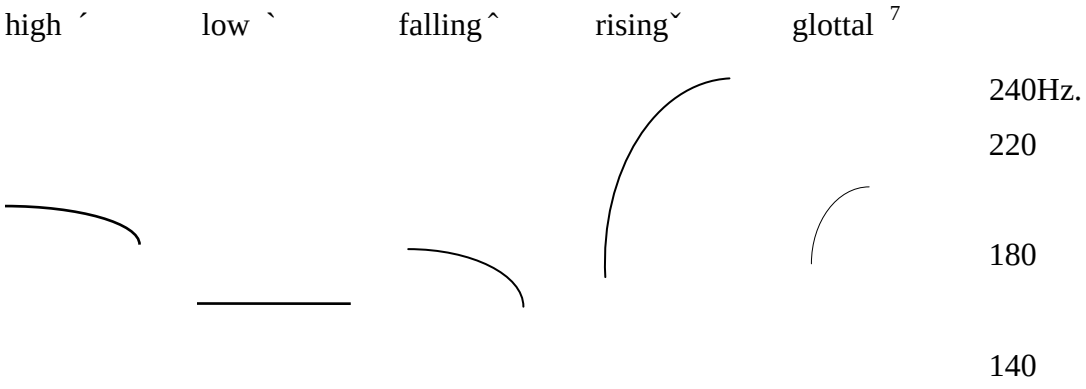
Pitch is what most people think of as the main phonetic component of tone. In CLZ pitch is indeed the primary, though not the only, phonetic feature of tone. Each tone has a distinctive pitch pattern, shown in Figure 10. The direction and degree of movement are as important as the range a certain tone falls in. In Figure 10 and in the description below I give the average fundamental frequency in Hz. for each tone. Numbers given are, unless

[13] Portions of this description of tone were published previously in Beam de Azcona (1998). However, errors have been corrected and new material added.

otherwise stated, for the primary SBL consultant, a man who was 48 when the measurements given here were taken.

It is important to understand that the context of these numbers is words spoken in isolation from single word elicitation. How these tones behave when in longer utterances and casual speech is addressed in §2.7. In Beam de Azcona (1998) I gave measurements for these pitch patterns based on recordings I made with my primary consultant from SBL in 1997, when he was aged 42. Six years later in the summer of 2003 I found different measurements for some of these pitch patterns. The same consultant was used in both years. I was originally doubtful that the consultant's voice had changed much in the time I have known him and considered other factors such as equipment used, and the basic fact that pitch varies significantly based on mood etc. However, after listening to recordings from 1997 it was apparent that the consultant's voice had a lower fundamental frequency then than now. Figure 10 reflects the 2003 numbers. I give both measurements in the exposition below.

Figure 10: Pitch patterns of San Baltazar Loxicha tones



The pitch patterns of the five CLZ tones play out over the entire sonorous portion of the rime. This may be just a vowel if root-final or if there is an obstruent coda. If there is a sonorous coda the pitch pattern plays out over the entirety of the VS sequence. This is most audible in cases with lengthened sonorants to be described in the next section. In the case of the rising tone it is almost as if the vowel has low tone and the sonorant consonant high tone, as the majority of the rise in pitch may take place on the sonorant consonant.

The high tone is the rarest tone in CLZ and mostly occurs on unstressed syllables in loanwords and compounds, although it does occur on some monosyllabic roots. Numbers given here for all tones come from monosyllabic (i.e. stressed) words spoken in isolation, unless otherwise noted. The high tone moves somewhat more than the low tone in the Loxicha variety of CLZ, but not as much as true contour tones. In closed syllables this tone typically starts around 210Hz. (in 1997) or 195Hz. (in 2003) and falls to around 200Hz. (in 1997) or 185Hz. (in 2003) or slightly lower. In open syllables the tone is more level and may even rise a little. When following another word in a phrase the high tone usually picks up near the ending pitch of the previous tone and continues with its characteristic pattern, usually falling, but sometimes level or with a very slight rise.

Pitch patterns for all tones may vary from the “typical” levels I am reporting here. They may vary according to the speaker’s mood, according to their syntactic environment and whether the words bearing particular tones are emphasized or not. The pitch patterns also change to mark morphological contrasts as described in Chapters 4-6. Even in 2003 I recorded examples of high tone that began at 230Hz. rather than the 195Hz. that I am reporting as typical for the 2003 recordings. In any language, tonal or otherwise, pitch is relative and varies for the reasons described here and others including sex and age. In

CLZ the pitch of the high tone varies according to many factors but can be distinguished from other tones. While it does have different pitch than the other tones, factors such as lack of length and glottalization (described below) and pitch pattern rather than the actual level of the pitch, are the most helpful cues. Pitch-wise it can be told apart from the rest by the fact that it is higher than a low tone in the same environment, and by the fact that it tends to fall rather than remain level but does not fall as much as the true falling tone.

In the Loxicha dialect of CLZ, the low tone is very level, and this lack of change in pitch is perhaps one of the main cues for this tone, as the actual fundamental frequency may vary greatly. For the primary consultant this tone is typically around 150Hz. (in 1997) or 165Hz. (in 2003) but even in 1997 I had recorded it as high as 170Hz. All CLZ tones except rising have upstepped variants which occur in a higher register. These are described more in §2.5.5. The upstepped low tone was typically measured at 195Hz. in 2003. In the Coatlán varieties of CLZ the low tone has much of a contour than in the Loxicha varieties. For a 65-year-old male consultant from Santa María Coatlán the low tone starts in the 175-190Hz. region and typically falls 25Hz. Although this is not as much movement as with the rising tone or the upstepped version of the falling tone, the Coatlán version of the low tone in CLZ shows more change in pitch than the high tone and about the same change in pitch as with the non-upstepped version of the falling tone, from which it differs in pitch height.

Phonetically the low tone is a low-falling contour tone in the Coatlanes, but even there there is phonologcial reason to call it low (level) rather than falling (contour). For example, if contour tones are thought to be composed of sequences of level tones, it would be problematic to have a tone inventory of only one level tone and 3-4 contour

tones (depending on how the glottal tone is characterized). Evidence that contour tones may be composed of level tones in CLZ comes from both synchronic morphological and historical evidence.

Isthmus Zapotec is a language generally considered to be in many ways conservative. Compared to SZ languages, IZ is different in part because it still maintains non-tonic vowels and has a smaller tone inventory. There are a number of disyllabic words, such as those shown in (2.61), in IZ with low tone on the initial syllable and high tone on the final syllable which correspond to monosyllabic words with rising tone in CLZ. This seems to indicate that at least some instances of rising tone were historically sequences of low and high tone, even though not all correspondences between IZ and CLZ are this neat.

(2.61)	IZ (Pickett et al. 1959)	CLZ	
	chònná	*chŏ̌n*	‘tres; three’
	mànía?	*mă̌n*	‘animal’
	ràlé	*ndă̌l*	‘H-nacer; H-be born’

As in most Zapotec languages, in CLZ there is tonal morphology associated with the potential mood as well as the first person singular. One common phenomenon of tonal morphology in CLZ is a root with underlying low tone being realized with rising tone when marked for one of these categories. Others (for example, Bickmore and Broadwell, 1998) have proposed that the cause for these same kinds of tonal alternations in other Zapotec languages is a floating high tone. Under such analyses, underlying low tone plus a floating high tone renders the surface rising tone. Thus what I propose as one historical source for rising tone, the loss of post-tonic vowels with high tone following tonic vowels with low tone, is virtually the same process as a common and productive morphological

source of rising tone. If both historically and synchronically low tone plus high tone renders rising tone, it would be more complicated to analyze the Coatlán low tone as falling because one would have to also posit some tonal contour simplification. This would not be impossible since I do propose such a solution for an alternation between falling and high tone in some paradigms, but analyzing the low falling contour of the Coatlán dialects as phonologically "low" rather than "falling" seems the less complicated of the two solutions.

In 1997 (before I knew about register differences) I noted that the falling tone typically started in the range of 200-180Hz, though sometimes lower, and fell 50Hz. or more. In 2003 I measured the normal register version of the falling tone as typically starting at 180Hz. and falling to around 160Hz. while I measured the upstepped, i.e. the higher register version of this tone, as typically starting around 235Hz. and falling to around 185Hz.

In 1997 I recorded that the rising tone usually started around 120 or 130Hz. and rose to anywhere from 170Hz. to over 200Hz. In 2003 I found that the rising tone most often had a pitch pattern resembling a rise from 170Hz. to 240Hz. though there were many variations on this in individual instances (e.g. there were individual tokens measuring 120Hz.→165Hz., 175Hz.→271Hz., 140Hz.→240Hz., and 158Hz.→306Hz.) With the rising tone there is an increase in amplitude concomitant with the increase in fundamental frequency. This tone moves less in SMaC than in the other varieties, making it easily mistaken for the high tone there.

Syllables with the glottal tone typically have a high-rising pitch pattern which in 1997 I recorded as beginning between 180 and 200Hz. and rising to 220Hz., 250Hz. or higher.

In 2003 I recorded the non-upstepped version of this tone as rising from 170 to 205 and the upstepped version of this tone as rising from 210 to 245. The pitch patterns on glottal syllables may vary more than the pitch patterns on syllables with other tones because differences in pitch do not contrast on glottalized syllables. This is important to note because in other Zapotec languages there are one to two types of glottalization which contrast with non-glottalized syllables independent of tone (see for example Bartholomew, 1983; and Pickett, 1959). In those languages a glottalized syllable can take different tones but in CLZ all words which are glottalized tend to have a high-rising pitch pattern but when they are made with another pitch pattern there is no semantic difference. The typical high-rising pitch pattern for glottal tone is different from the four other pitch patterns that define the high, low, falling and rising tones, though the glottalization itself is the most salient feature of the tone. That the one kind of contrastive glottalization that exists in CLZ contrasts with the other four tones and has its own pitch pattern is different from what is found in other Zapotec languages and appears to be innovatory.

2.5.2 Glottalization

Besides pitch, the next most important features of tone in CLZ are duration and glottalization. Glottalization has many functions in CLZ, so I examine it first. I use the term glottalization here to cover anything involving either creaky voice or occlusion of the glottis. In some other Zapotec languages there are two types of contrastive glottalization which yield what are called rearticulated or *quebrada* vowels vs. checked or *cortada* vowels. These contrast with plain non-glottalized vowels. Such languages include Sierra Juárez Zapotec (Bartholomew, 1983), Isthmus Zapotec (Pickett, 1959), San Agustín Mixtepec Zapotec (Beam de Azcona, 2004) and others. In some Zapotec

languages the *quebrada* type of vowel isn't rearticulated [VʔV] but rather is a creaky-voiced vowel, so that the contrast is plain vs. checked vs. creaky, as in San Lucas Quiaviní Zapotec (Munro, Lopez et al., 1999). In Valley Zapotec languages like SLQZ (same source) and Mitla (Stubblefield & Hollenbach, 1991) breathy vowels also occur making a plain:checked:creaky:breathy contrast. In CLZ there are six phonetically different kinds of glottalization but phonologically there is only one type of glottalization akin to the contrastive types found in other Zapotec languages. Four kinds of phonetic glottalization are conditioned variants of glottal tone. The other two kinds are involved in marking other tones but are not those tones' most salient feature, while glottalization *is* the most salient feature of the glottal tone.

In Zapotec languages with two kinds of contrastive glottalization, checked $V^{ʔ}$ syllables contrast with rearticulated $V^{ʔ}V$ syllables. CLZ has both $V^{ʔ}$ and $V^{ʔ}V$ phonetically but these do not contrast phonologically as they do in related languages. Instead, both types of vowels are conditioned variants of vowels with the glottal tone. Rearticulated $V^{ʔ}V$ vowels occur before voiceless fricatives (not devoiced allophones of voiced fricatives) and this holds whether the voiceless fricative is part of the root or an enclitic, as shown in (2.62). Checked V^{7} vowels occur before voiceless plosives, phonemically voiced (i.e. lenis) fricatives, in word-final position, and before enclitics that are sonorants (there are no voiceless plosive or voiced fricative enclitics). Examples of checked vowels in these positions are shown in (2.63).

When a root with glottal tone ends in a sonorous consonant, that sonorant is short and post-glottalized if word-final. This is to say that towards the end of the sonorant there is creak and a robust glottal stop follows the sonorant itself. The segment may also be

partially devoiced. Examples are given in (2.64). The same roots will have pre-glottalized sonorants if followed by a =V enclitic. In the case of pre-glottalization the first part of the sonorant consonant is creaky-voiced followed by full glottal closure and then continuation of the sonorant without creak. Thus, the glottal stop portion of this tone is realized during and/or following the last bit of sonority in a syllable, whether this means following a vowel before an obstruent or following a sonorous coda. In the case of sonorant consonant-final encliticized roots, a small portion of the sonorant is still in the coda, with the glottal stop following that last bit of sonority in the syllable and the remainder of the sonorant is the onset of the next syllable, as transcribed in (2.65).

(2.62) Rearticulated vowels	*yi*^{7}*x*	*xna*^{7}*-s*
	[ʝ̰ĭ̄́ʔ^{i}ṣ]	[ṣn̪ā́ʔ^{a}s]
	P-tostarse	POS-madre=1e
	P-toast	POS-mother=1e

(2.63) Checked vowels	*mbe*^{7}*k*	*bxi*^{7}*zh*	*ya*^{7}	*xna*^{7}*-nh´*
	[mbɪʔk^{h}]	[ɸṣī́ʔṣ̌^{ʔ}]	[yā́ʔ]	[ṣn̪ā́ʔŋ̥́]
	tufo feo	piña	mano	POS-madre=1i
	bad odor	pineapple	hand[14]	POS-mother=1i

(2.64) Post-glottalized sonorants	b*kwa*^{7}*n*	*bchë*^{7}*l*	*ga*^{7}*y*
	[ɸk^{w}ā́n̰ʔ]	[ɸčạǣ́l̰ʔ]	[ɣā́y̰ʔ]
	IMP-buscar	IMP-unir	cinco
	IMP-seek	IMP-unite	five

(2.65) Pre-glottalized sonorants	b*kwa*^{7}*n-e*	*bchë*^{7}*l-é*	*ga*^{7}*y-é*
	[ɸk^{w}ā́$^{n̰}$ʔ.n̪é]	[ɸçạǣ́$^{l̰}$ʔ.l̥é]	[ɣā́$^{y̰}$ʔ.yé]
	IMP-buscar=3i	IMP-unir=3i	cinco=3i
	IMP-seek=3i	IMP-unite=3i	five=3i

2.1

[14] When referring to a human this includes the forearm and the hand. This word can also refer to trees' branches and to branches of a river or stream.

The following minimal pairs nicely illustrate the difference between a root-sonorant with glottal tone and an enclitic sonorant following a root-final vowel with glottal tone.

(2.66) Glottalized root sonorants	*xi^{7}n*	*ya^{7}n*
	[s̻ɪ́n̻ʔ]	[yā́n̻ʔ]
	nalga	**olote**
	buttock	**corncob**
(2.67)	*xi^{7}-nˆ*	*ya^{7}-nˆ*
	[s̻ɪ́ʔn̥̂]	[yā́ʔn̥̂]
	M-comprar=1s	**mano=1s**
	M-buy=1s	**hand=1s**

In CLZ It is important to distinguish phonetic glottalization from contrastive glottalization. The four types of glottalization exemplified in (2.62-2.65) are variants of the one kind of contrastive glottalization which I analyze as a tone in CLZ. While pitch and duration are important cues for the glottal tone, the most salient feature of the glottal tone is the glottal stop itself, hence the name. Although there are four variations on the realization of the glottal tone, a glottal stop is always present somewhere in words bearing that tone and cannot be deleted through purely phonological processes. However, there are two other kinds of glottalization in CLZ which are not contrastive but instead are optional features of other tones. Contrastive glottalization is robust and only disappears when the rules of tonal morphology change the surface tone of the syllable to a non-glottal tone or when unstressed, in which case all other tones are neutralized as well. Non-contrastive glottalization is not as phonetically robust and one type of non-contrastive glottalization disappears when not in pre-pausal position.

One kind of non-contrastive glottalization occurs on vowels as a concomitant of the falling tone and occurs in the Coatlanes only. In addition to a falling pitch contour,

vowels with falling tone in in the Coatlanes are glottalized. The glottalization varies between creaky voice and an actual glottal stop, with or without an echo vowel.

The other type of non-contrastive glottalization is the pre-pausal glottal stop, so named because it disappears when not in pre-pausal position. The pre-pausal glottal stop is not as robust and has a shorter closure duration than the contrastive glottal stop. In CLZ the pre-pausal glottal stop has two functions, one is to mark low and rising tone, and the other is to mark lenis obstruents. The latter function was described above in §2.1.1 and §2.1.2. As mentioned there, in the SMaC dialect only the two functions of the pre-pausal glottal stop are combined in that only lenis obstruents in words with low, rising, or glottal tones take the pre-pausal glottal stop. In other dialects all lenis obstruents take the pre-pausal glottal stop, regardless of tone. In all dialects, words ending in sonorants, either vowels or sonorant consonants, and bearing low or rising tone, are followed by a pre-pausal glottal stop. In (2.68) I give examples of words ending in different kinds of sonorants with low and rising tone and pre-pausal glottal stop. In (2.69) I show the same words when not pre-pausal. In (2.70) I show examples of similarly shaped words with high and falling tone and either creaky voice (in the Coatlanes) or no glottalization (in the Loxichas).

(2.68) Pre-pausal [ˀ]	*mbzhìn*	*dà*	*mbǐl*	*yǐ*
	[mbz̯ìn̪ːˀ]	[ðàːˀ]	[mbĭl̪ːˀ]	[ɲ̟ìːˀ]
	miel	petate	lagartija	cal
	honey; syrup	mat	lizard	lime (mineral)
(2.69) No pre-pausal [ˀ]	*mbzhìn nîth*	*dà té-n̂*	*mbǐl to^{7}l*	*yǐ tě-m*
	[mbz̯ìn̪ː n̪îθ]	[ðàː t̪én̂]	[mbĭlː t̪ō̰l̰ʔ]	[ɲ̟ìːt̪ĕːm]
	miel de caña	petate POS=1s	lagartija resbal.	cal POS=3hr
	cane syrup	mat POS=1s	Coleonyx	lime POS=3hr

(2.70) High and falling tone	*mbzhîn*	*wlá*	*mbëˀl*	*yî*
	[mbʑ̌în̪]	[wlá]	[mbæ̂l̥]	[ɟ̬î]
	venado	amargo	pescado	piedra
	deer	bitter	fish	rock

One question that emerges is ‘what do low and rising tone have in common that causes them to both be marked with the pre-pausal glottal stop?’, or ‘what do high and falling tone have in common that leads to the lack of it?’. It would seem that the two members of each group are opposites. In each pair one tone is level and the other contour. In each pair one tone has higher pitch, the other lower. This lack of similarity of pitch suggests that the explanation is not completely phonetic, but at least partly phonological. Other than the presence or absence of certain concomitants of tone, high tone and falling tone are related in the same ways as rising and low tone in that roots with underlying falling and low tone often take high and rising tone respectively when marked for the potential mood. As mentioned previously, many monosyllabic rising-toned words in CLZ can be shown to have historically been disyllables with successive low and high tones. Thus there exists a phonological relationship between each pair that is not explained by phonetic similarity.

The pre-pausal glottal stop that is conditioned by low tone in CLZ has correlates in other languages. According to Maddieson (1978) a pre-pausal syllable-final glottal stop conditioned by low tone in long syllables in Kiowa (citing Silvertsen, 1956) may be due to “very low frequency at the end of a long low-pitched vowel” which develops into complete glottal closure. Words with final sonorants in CLZ have lengthening of the final sonorant concomitant with low (and rising) tone, so presumably the effect of producing low pitch over a lengthened sonorant could be the same in Zapotec as in Kiowa.

The CLZ pre-pausal glottal stop following rising tone is also not a lone example. Maddieson (1978) cites Ballard saying that in the Wu Chinese dialect of Wenchow the 34 and 45 rising tones end in a glottal stop. However, the same kind of phonetic explanation for the glottal stop concomitant with low tone in Kiowa cannot be offered for rising tone in Wu Chinese or CLZ since low pitch would not be present at the end of a rise in pitch.

It is unclear what phonetic process would have been responsible for the pre-pausal glottal stop concomitant with rising tone. It may have been some unknown process that happens with rising tones as in Wu Chinese, or perhaps the rising tone glottal stop in CLZ came about when most or all of these syllables still had low tone. In cases where the rising tone only occurs in the potential form of a verb paradigm and the other forms have low tone, the pre-pausal glottal stop could also be explained by paradigm levelling, the [ʔ] concomitant with low tone being extended to the rising toned form as well. The forms which historically had a low-toned syllable followed by a high-toned syllable are more difficult to explain since at the time that the tonic syllable had low tone it was not pre-pausal, the only environment where this kind of glottal stop occurs.

The dissimilarity of each set poses challenges to purely phonetic explanations for the development and distribution of the pre-pausal glottal stop. However, this dissimilarity provides clarity for listeners including children and linguists learning to recognize the language's tones. The tones with the most similar pitch levels (and the most likely to be mistaken for each other) are distinguished by the presence or absence of glottalization (and length, as described in §2.5.3) or even by the type of glottalization. Glottal tone and rising tone both have rising pitch patterns but the glottal stop of the glottal tone is robust with a shortening effect while the rising tone has only a slight glottal stop and a

lengthening effect. The falling and low tones both end in low pitch but are differentiated by glottalization and length. The falling tone may have creak in the Coatlanes or no glottalization in the Loxichas both differing from the pre-pausal glottal stop of the low tone. This system of pre-pausal glottalization thus maximally distinguishes the four non-glottal tones.

2.5.3 Length

Duration is also an important cue for tone in CLZ, as can be seen in the examples above. Vowels and sonorant consonants (especially /l̩/) with falling tone are slightly longer than vowels and sonorant consonants in words with high tone. As previously mentioned, sonorants in words with glottal tone are extremely short, typically around 100ms. in careful speech. Most salient though is the fact that vowels and sonorant consonants in syllables with low and rising tones are 100 ms. or more longer than their counterparts in syllables with high and falling tones. Root-final sonorant consonants are typically between 120 and 150ms. when in words with high or falling tone but are lengthened to between 200 and 260ms. when in roots with low or rising tone. Enclitic sonorants only take high and falling tone and so are not even eligible to be lengthened. However the fact that the rising toned pronoun *mě* has a high instead of rising tone in the enclitic form *–mˊ* demonstrates that sonorant lengthening with low and rising tone is restricted to roots (it cannot be that there is just a restriction on contour tones in enclitics since some have falling tone). Vowels with high or falling tone typically measure between 180 and 230ms., while vowels in roots with low or rising tone typically measure 300ms. and have even been measured at 400ms.

While words with both low and rising tone take the same characteristic lengthening, this process is more exaggerated in words with low tone than in words with rising tone. Low toned vowels or other sonorants are often longer then their already lengthened rising toned counterparts by a third or more. As described above, the pre-pausal glottal stop that accompanies this lengthening disappears when not pre-pausal. Lengthening of word-final sonorants is perhaps not as pronounced when not pre-pausal but some lengthening is still maintained phrase medially compared to words with other tones. The lengthening of word-final sonorants with low tone holds up more in this position than the lengthening of words with rising tone. Measurements given here are for words said in isolation by the main consultant from San Baltazar Loxicha. Words said in normal speech would of course have shorter durations, but still with the same relative difference in length according to tone.

Some other Zapotec languages are described as having a contrast between fortis and lenis sonorants, (for example, see Córdoba, 1886 [1578]; Pickett, 1959; Butler, 1980; Nellis and Nellis, 1983; Stubblefield and Stubblefield, 1991), with the primary phonetic difference being one of length. However, to my knowledge no other Zapotec language has been described as having increased sonorant consonant duration concomitant with certain tones and not others. In CLZ, whether a sonorant is short or long is completely determined by a word's tone. Furthermore, comparison with cognates from Zapotec languages with fortis and lenis sonorants reveals that the origin of CLZ short and long sonorants does not lie in the earlier fortis/lenis contrast since CLZ words with low and rising tone and lengthened sonorants often have lenis sonorants in other languages just as CLZ words with other tones often have cognates with fortis sonorants.

Although I know of no description of sonorant consonant length being linked to tone in other Zapotec languages, there is one intriguing reference to tone and vowel length. Pike (1948) quotes from an unpublished manuscript by Morris Swadesh. He wrote that there is phonetic but not phonemic vowel length in many varieties of Zapotec. He says that vowels are shorter when before a glottal stop or a fortis consonant and longer when before a lenis consonant or in word-final position. These generalizations ring true for CLZ as well. Most interesting though is Swadesh's" statement that "the accented syllable lengthens its vowel, especially if it has low or rising tone in a monosyllabic word" (my translation). It would be interesting to know what varieties of Zapotec Swadesh was writing about when he made this last statement. It is possible that he was talking about a Southern Zapotec language since he was referring to monosyllables, though there are certainly other possibilities.

Pike herself also notes that high-toned syllables tend to be shorter in Villa Alta Zapotec than mid or low-toned syllables. She writes that when a monosyllable follows a word with low tone, the difference in length on the monosyllable is more salient than the difference in pitch when comparing a monosyllable with mid tone to one with high tone. She give examples of *gèyï`ʔ yā* 'five steambaths' and *gèyï`ʔyá* 'five bamboo' saying that while the pitch difference between 'steambath' and 'bamboo' is hard to hear in this environment, the length difference is prominent.

2.5.4 Tone on enclitics

CLZ has enclitic forms of most pronouns, though not all dialects have the full inventory of enclitics. SBL, the main source dialect for this grammar, has the fullest

inventory. Most enclitics are of the form =C and are reductions of the fuller CV free forms of pronouns. Of these, there are four enclitics which consist of a sonorant: three nasals and one lateral. These four enclitics bear tone--- a tone identical to, or a reduced form of, the tone of the free pronoun. There are three other enclitics which differ phonologically from these in having a vowel or glide. The full description of how these enclitics are phonologically and syntactically selected is described in §8.2. In (2.71) I show all the SBL enclitics which are capable of bearing tone, along with the free pronouns on which the enclitics are based. The free 3i pronoun is *ta*^{7}, based on *ta*^{7}*n* ‘cosa; thing’ but is not included here since the enclitic forms are not based on it in any obvious way. In SBL the free 2r pronoun is *gó* but is not listed here because it is not the form related to the enclitic *–á*.

(2.71)	Free Pronoun	Enclitic	Phonological environment
1s	*nâ*	*-nˆ*	V__
1i	*nhó*	*-nh´*	V__
2f	*lô*	*-lˆ*	V__
3hr	*mě*	*-m´*	V__
2r	(*gá* variant occurs in SMaC)	*-á*	C__ and V__
3i	----------	-é	C__
		-ý	V__

The way high tone is realized on enclitics is similar to the way it is realized on roots with open syllables, with a fairly level realization (but not as level as the low tone) close to the pitch level the previous tone ended on, and sometimes rising or falling a bit, though not as much as the true contour tones. The high tone falls more in closed syllables, but does not fall significantly on enclitics. High tone on enclitics tends to rise more following

low and glottal tone and to be more level following falling tone. This last generalization lends itself to an analogy with gravity and speed and momentum, something like a go-cart race. Here, it seems it would take just as much energy (or at least is an equivalent gesture) to stop the tonal go-cart from a downward descent in progress, as it would to begin an upwards ascent from level ground or pitch or to continue an upwards ascent in progress.

The falling tone on enclitics also picks up where the root tone left off but falls from there. In Figures 11-14 I give spectrograms with pitch tracings of high and falling clitics following glottal-toned and falling-toned roots. Following the falling tone the high tone levels out while the falling tone continues falling. Following the glottal tone, high tone continues a gradual rise while the falling tone changes direction and falls. Parentheses indicate inaudibility in the recording.

Figure 11: Spectrogram with pitch tracing of *xna*^{7}-*n̂* ‘mi mamá; my mom’

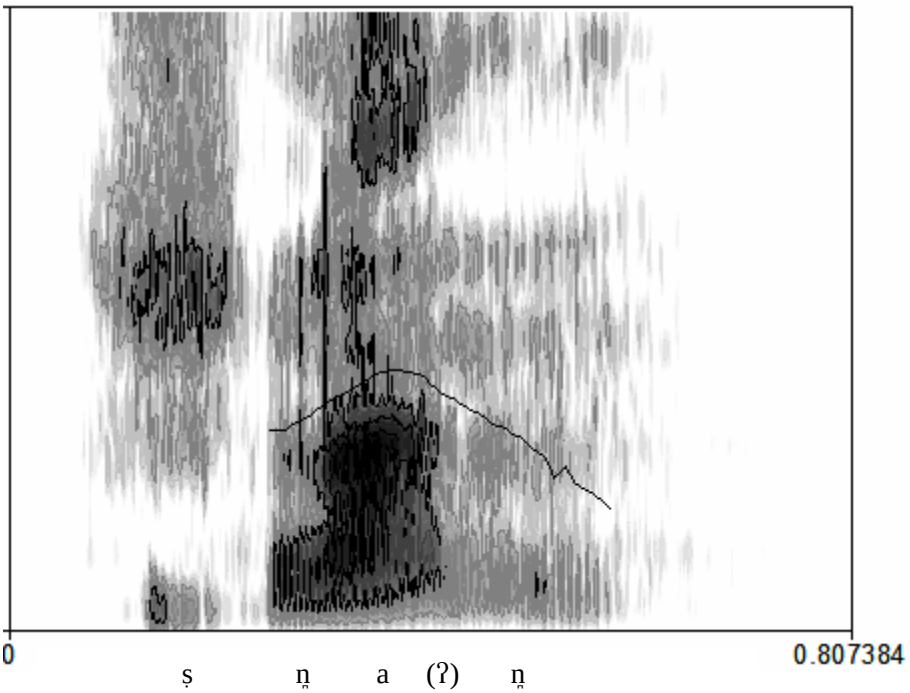


Figure 12: Spectrogram with pitch tracing of *xna*^{7}*-nh´* 'nuestra(s) mamá(s); our mom(s)'

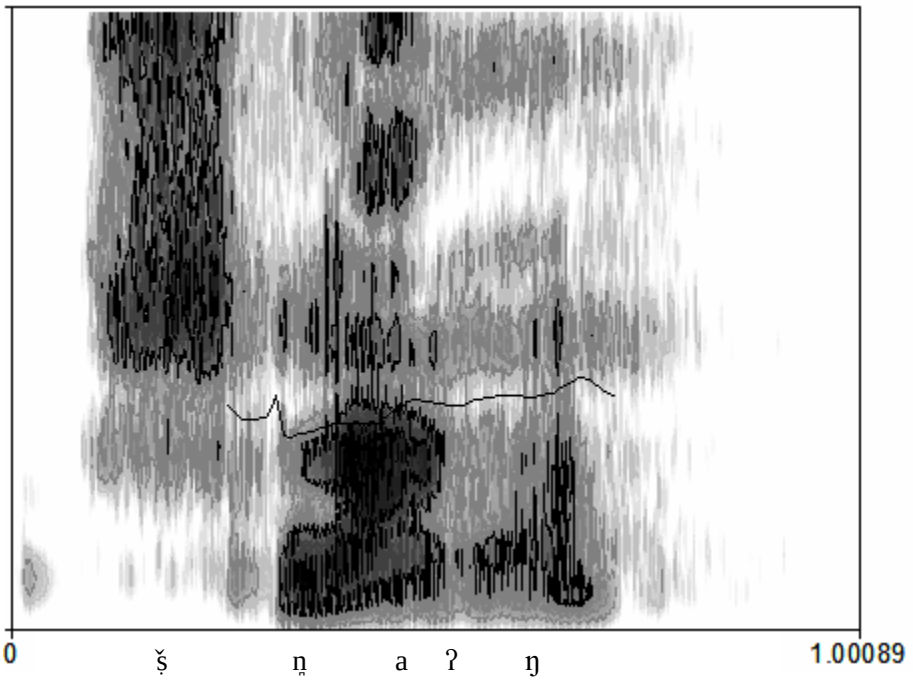


Figure 13: Spectrogram with pitch tracing of *tô-lˆ* 'tu boca; your mouth'

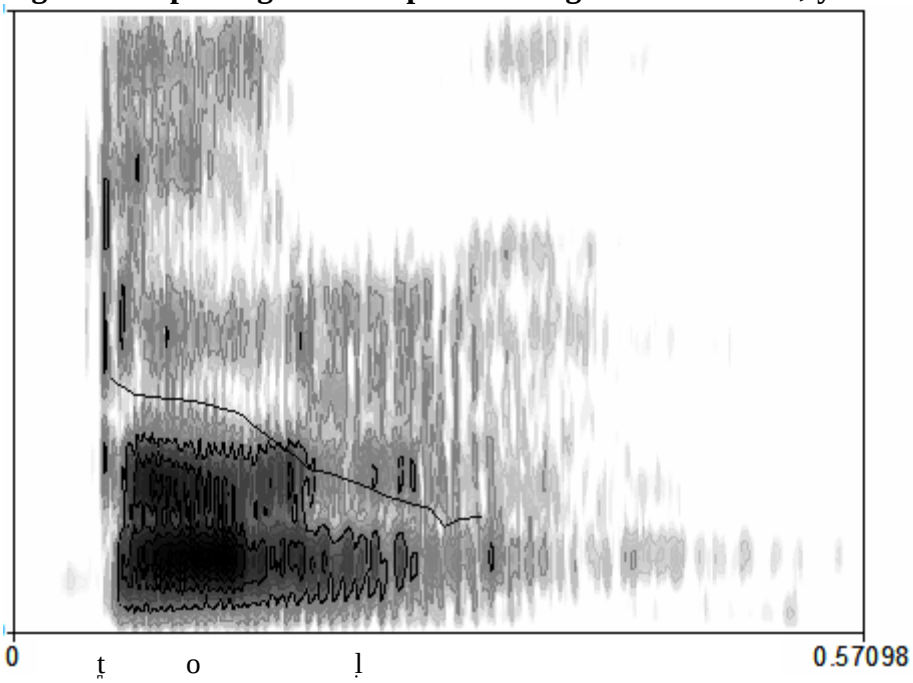
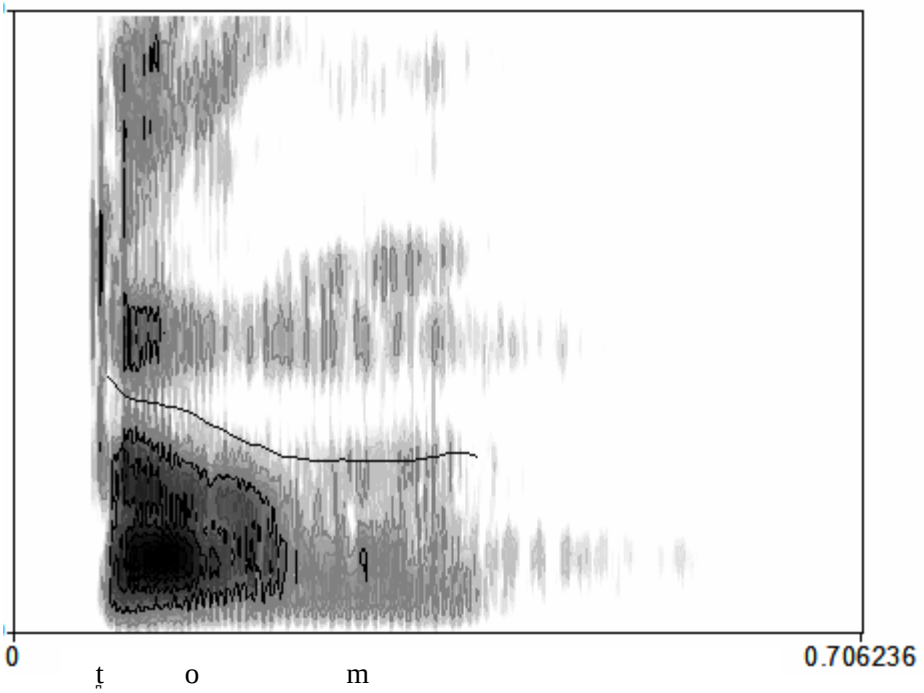


Figure 14: Spectrogram with pitch tracing of *tô-m´* ‘su boca de él/ella; his/her mouth’



When an enclitic follows a rising tone in a root the tonal contrast associated with the enclitic is neutralized and the sonorant of the enclitic becomes part of the domain of the rising tone, but only with respect to pitch. Both falling and high toned =S enclitics will simply continue the rise in pitch begun during the root vowel. The rise on the root itself may be slightly less dramatic or rapid than when uncliticized because there are as many extra milliseconds as the duration of the =S, for the pitch pattern to be realized. However, much or most of the rise does take place on the root vowel, since clitic sonorants are short and are not lengthened (or glottalized) with this tone the way that root sonorants are. I show this neutralization of the enclitic tone following rising tone with the rising-toned potential mood form of the verb ‘comer; eat’ with a falling-toned 2f subject in Figure 15 and a high-toned 3hr subject in Figure 16. Note that these pitch tracings do appear different at the end, but essentially after the sonorant has ended.

Figure 15: Spectrogram with pitch tracing of *wǎ-l* 'vas a comer; you're going to eat'

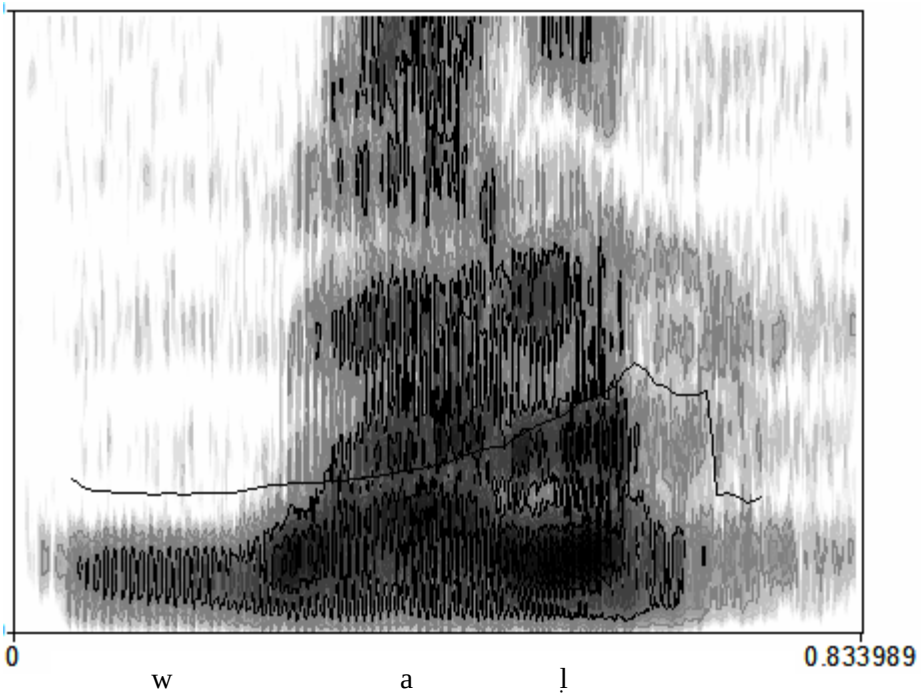
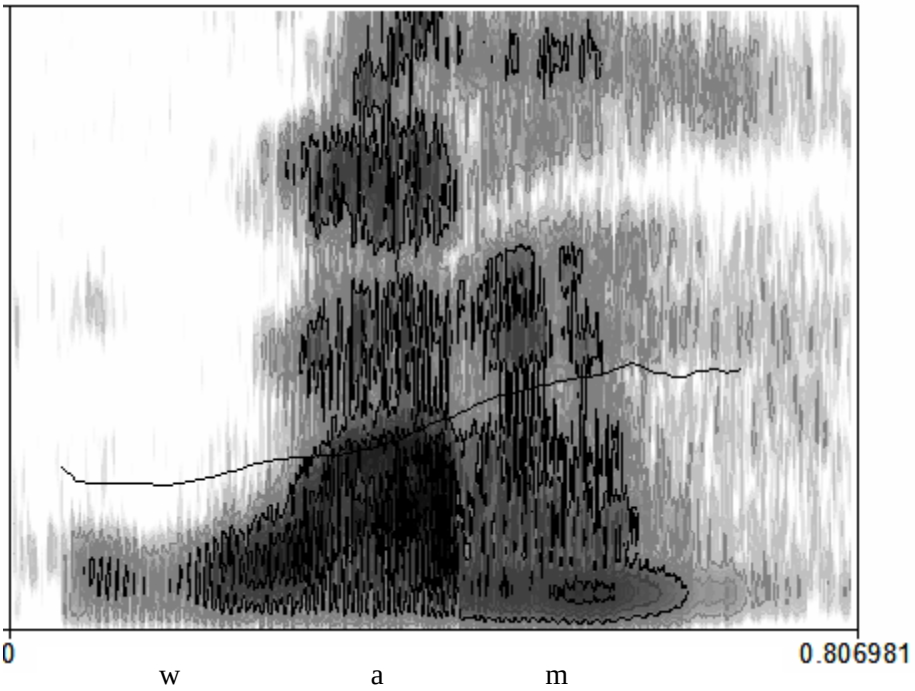


Figure 16: Spectrogram with pitch tracing of *wǎ-m* 'va a comer él o ella; s/he's going to eat'



The status of enclitics with respect to syllable structure is an interesting and problematic issue which is discussed further in §2.3.2. The fact that enclitics can bear tone is relevant to this issue, especially in light of the fact that nasals in NC clusters in the onset do not bear tone. That enclitics bear tone might be taken as evidence that they are syllabic, but this is an issue best left to §2.3.2. What does concern the present section is the way that tone is realized on enclitics. So far I have given a brief description of contrastive pitch on =S enclitics, saying that only high and falling tone occur on these enclitics, that rising tone on a full pronoun is reduced to high on an enclitic, and that following a rising-toned root the tonal distinction on an enclitic is neutralized. As already described in §2.5.2 and §2.5.3, pitch is not the only feature of tone in CLZ. Length and glottalization are also important parts of the realization of certain tones. The remaining issues concerning the realization of tone on enclitics concern the lack of length and glottalization on these enclitics and the difference between a root with rising tone and a LH sequence across a clitic boundary.

Elsewhere (Beam de A., forthcoming b) I analyze CLZ tones as being underlyingly specified for either one or two moras. Low and rising tones, the tones that cause lengthening of root-final sonorants, I regard as bimoraic tones, i.e. tones that as part of their realization cause lengthening, and are realized in two phonetic or phonological units. High and falling tones, which do not cause lengthening, I regard as monomoraic tones, tones which are realized over a short V or VS sequence, without any lengthening of the final sonorant in the string. I also analyze the glottal tone as bimoraic, but with the glottal closure filling the second mora slot rather than the lengthening that is seen with the low and rising tones, including the rising tone found on deglottalized roots. Taking

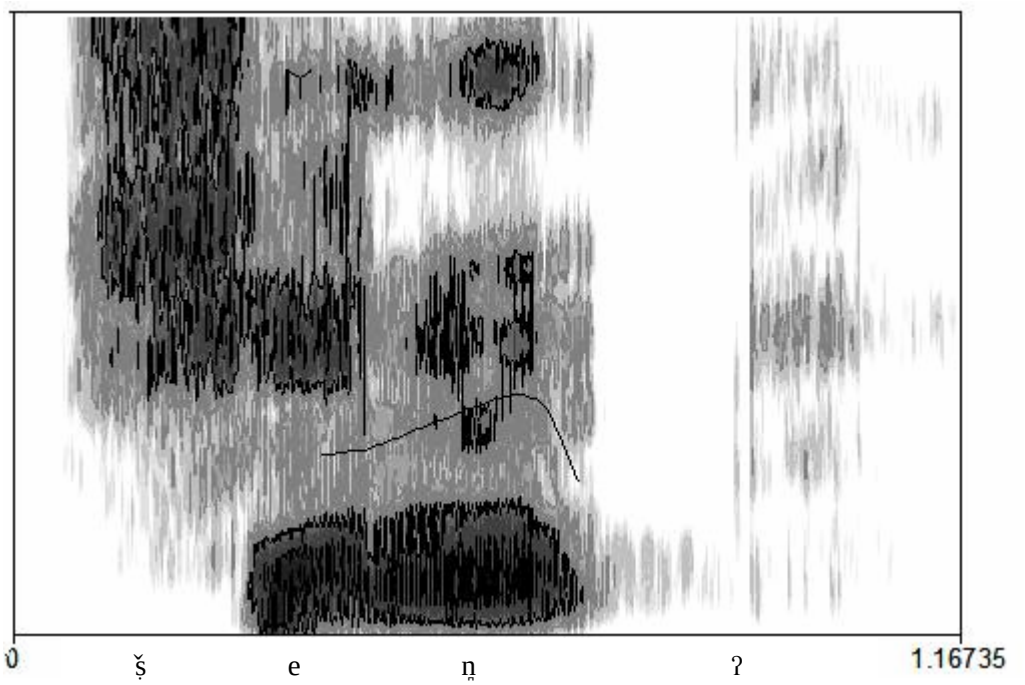
this analysis into account, it is notable that no enclitic bears a bimoraic tone. Even the pronoun *mě,* which does have a bimoraic tone in the independent form, is reduced to a high tone in the enclitic form. This suggests that CLZ enclitics can only consist of one mora and cannot bear bimoraic tones.

While we might regard the rising tone as an underlying sequence of LH, the same sequence across a clitic boundary produces different results than when in an uncliticized word. (2.72) shows a minimal pair that differ only by the existence of a clitic boundary, and a third word which forms a near minimal pair with each of these, differing from the other encliticized word by the tone on the root as well as on the enclitic.

(2.72)	*xěn*	*xě-n*	*xè-ńh*
	[s̩èn̩ː^{ʔ}]	[s̩ěn̩]	[s̩èːŋ̍]
	P-ancharse	**nariz.1s=1s**	**nariz=1i**
	P-widen	**nose.1s-1s**	**nose=1i**
	Se va a anchar.	Mi nariz.	Nuestras narices.
	It’s going to widen.	My nose.	Our noses.

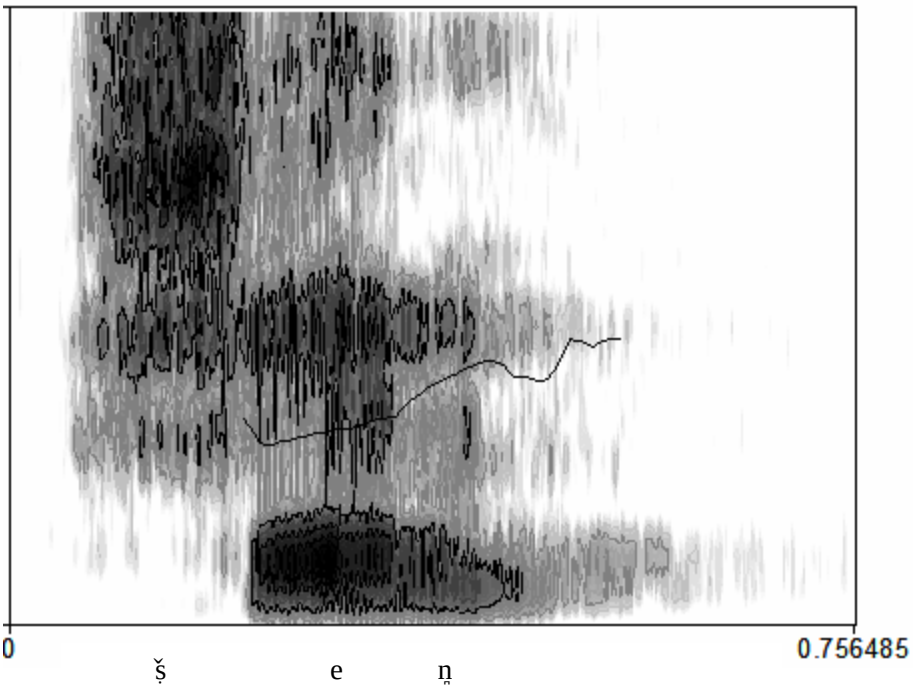
Xěn is the potential mood form of the verb *–xèn* and it has surface rising tone due to the floating high tone which marks potential mood. The rising tone on this word is realized the same as on any phonologically similar rising-toned word in which there is no apparent tonal morphology, e.g. *měn* ‘gente; person.’ This realization includes lengthening of the word-final nasal and the addition of the pre-pausal glottal stop, as shown in Figure 17.

Figure 17: Spectrogram with pitch tracing of *xěn* (/e/ 155 ms., /n̪/ 274 ms.)



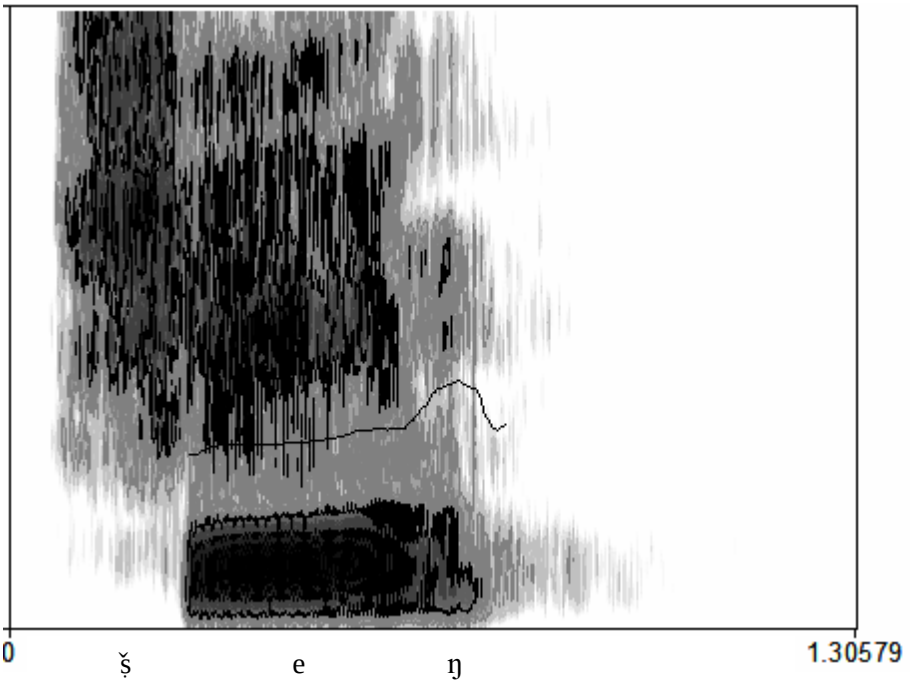
The word *xě-n* forms a minimal pair with *xěn* and differs by the clitic boundary between the /e/ and the /n̪/. Here the low-toned word *xè* ‘nariz; nose’ takes the floating high tone associated with first person singular marking and is realized with a surface rising tone on the root. Following the rising tone on the root the enclitic’s tone, which would otherwise be falling, is neutralized, as described above. The segmental material of the enclitic becomes part of the domain of the rising pitch pattern, however, the lengthening process normally associated with the rising tone, as well as the pre-pausal glottal stop, do not affect enclitic sonorants the way they would root-final sonorants. The result is a normal length vowel followed by a normal length nasal, contrasting with the lengthened nasal and prepausal glottal stop of *xěn*. In *xě-n* the rise in pitch begins on the vowel itself and continues onto the short nasal. This word is shown in Figure 18.

Figure 18: Spectrogram with pitch tracing of *xě-n* (/e/ 133 ms., /n̪/ 130 ms.)



The word *xè-nɦ́* is the same root as in *xě-n* but without the floating high tone associated with the first person singular. Since in this case the noun does not have rising tone the tonal contrast on the enclitic is not neutralized and there is again a rise in pitch since the 1i enclitic has high tone. In this case the vowel of the root is lengthened in order to accomodate the bimoraic low tone and the high tone remains confined to the nasal following the lengthened vowel, in effect making a trimoraic word. This word is shown in Figure 19.

Figure 19: Spectrogram & pitch tracing of *xè-nh´* (/e/ 317 ms., /ŋ/ 166 ms.)



These three words show three different variations of the same pitch pattern on different sides of clitic and word boundaries: root-final and pre-pausal LH, LH= preceding a tonally neutralized clitic, and L=H. The most interesting difference between the three is the length of the segments /e/ and /n̪/. In *xěn* the final nasal is lengthened to 274 milliseconds, as per the generalizations given in §2.5.3. That the nasal enclitics in *xè-ńh* and *xě-n* are not lengthened indicates that the lengthening of final sonorants concomitant with low and rising tone does not extend to enclitics.

There is one further intriguing difference between the two encliticized forms. The root-final vowel /e/ is lengthened to 317 ms. in *xè-ńh* but not in *xě-n*. If this word were not encliticized the /e/ would be lengthened with either low or rising tone, but when encliticized /e/ is apparently only lengthened when it has low tone, and not when it has

rising tone. As described above, tonal contrasts on enclitics are neutralized following rising tone. Either a high-toned or a falling-toned clitic will simply continue the rise in pitch of the rising tone begun on the previous vowel. In this sense, when a root has rising tone, the rising tone annexes the enclitic, making it part of its domain. The nasal enclitic in *xě-n* becomes part of the /en/ sequence over which the rise in pitch takes place. However, the lengthening that is concomitant with rising tone does not affect the clitic even in this circumstance where the root's pitch pattern is crossing the clitic boundary. This reveals two restrictions on the lengthening concomitant with rising (and low) tones: 1) no enclitic sonorants will be lengthened whether they bear a distinctive pitch pattern from the root or whether they share the root's pitch pattern, and 2) the root-final lengthening concomitant with low and rising tone will still affect a root-final vowel that precedes a clitic if and only if the pitch pattern associated with the root tone is not shared across the clitic boundary.

The special ability of the rising tone to affect the tone of the following syntactic unit is not confined to clitics but in fact affects independent words by raising their register, as described in the next section.

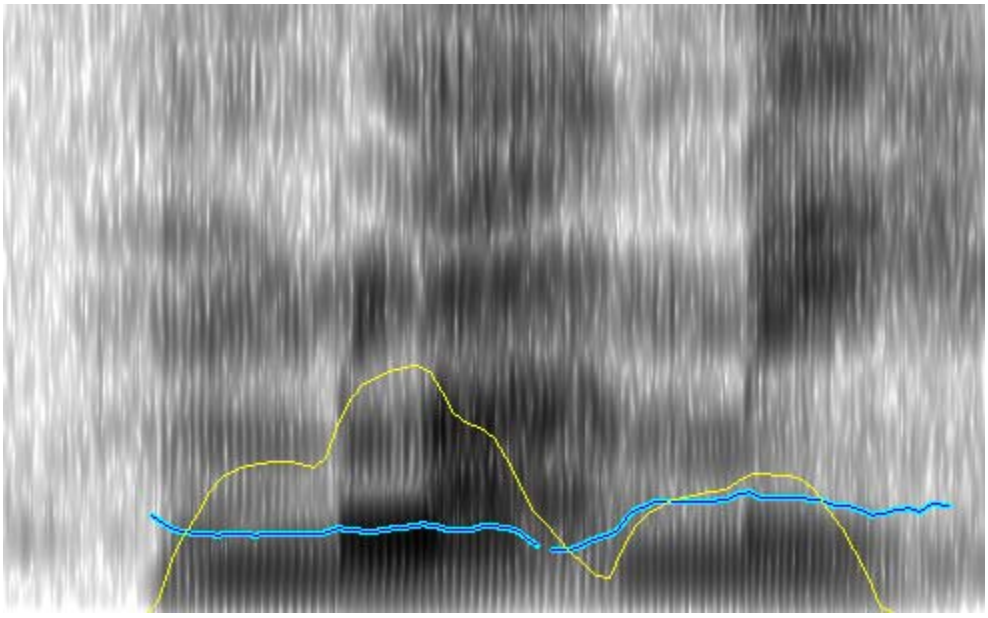
Though my analysis is more preliminary, it appears that tone on nasal and lateral enclitics is also contrastive when these are in onset position. The only clitic which may follow another clitic in CLZ is the third person inanimate pronoun which has allomorphs *–é* following a consonant and *–ý* following a vowel. Following a high tone the 3i enclitic continues the slow fall from high began on the high-toned root, not sounding tonally separate from the root at all. When following a root with low, falling, or glottal tone, the high-toned 3i enclitic rises in pitch. This is not very dramatic following the glottal tone

and simply sounds like a level tone that is realized a little higher than the previous tone. Following the low and falling tones, which end in low pitch, the tone on the 3i enclitic sounds similar to the rising tone but without as dramatic of a rise and without the lengthening or glottalization often found with that tone. When the 3i enclitic occurs as an object and follows a subject enclitic that consists of a sonorant, the tone of the subject enclitic affects the pitch of the 3i enclitic.

As just stated, if following a glottal-toned root the 3i enclitic would sound fairly level at a slightly higher pitch than the glottal tone ends on, and if following a low- or falling-toned root the 3i enclitic would rise, or at least not fall. Figures 20-23 show that the underlying tone of the subject enclitic affects the surface pitch of the object enclitic, even though segmentally the subject is in onset position and the object is the syllable nucleus.

In Figure 20 a glottal-toned root *-la*^{7} ‘dejar; put down’ is followed by a subject with underlying high tone *–mí* (although this is reduced from a fuller form with rising tone *mě*) which is then followed by an object with high tone *–é*. There is a rise in pitch during the transition but the subject *–mí* has a fairly level pitch, higher than the glottal-toned root, which is continued on the object *–é* until ending in a slight fall. In Figures 20-23 the thick line is pitch and the thin line is amplitude.

Figure 20 Spectrogram & pitch tracing of *mbla*^{7}*-m´-é*

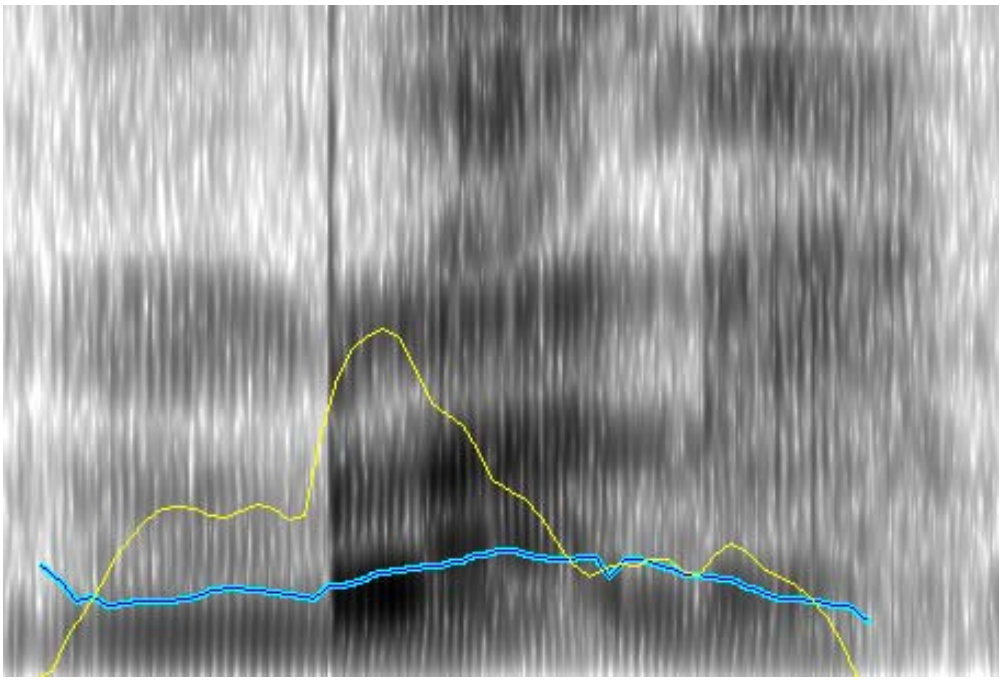


m b l̩ a ʔ m e

Compare this to Figure 21 which is exactly the same except for having a falling-toned subject *–lˆ*. In Figure 21 a fall in pitch from the high of the glottal-toned root, which incidently is higher in this example than in Figure 20 (perhaps arbitrarily, perhaps due to unknown factors associated with the encliticization), begins on the subject and continues on the object. The subject-object sequences *–m´-é* and *–lˆ-é* act much as if they were syllables with a single underlying tone *mé* and *lê*. In each case it is the tone of the onset subject which determines the tone of the subject-object syllable. Note also that the underlying falling-high sequence is realized as falling and not high. This is in contrast to a similar underlying falling-high sequence which is realized as surface high when a floating high tonal suffix is added to an underlyingly falling-toned root with potential mood or first person singular marking. This is a further detail which shows that tone

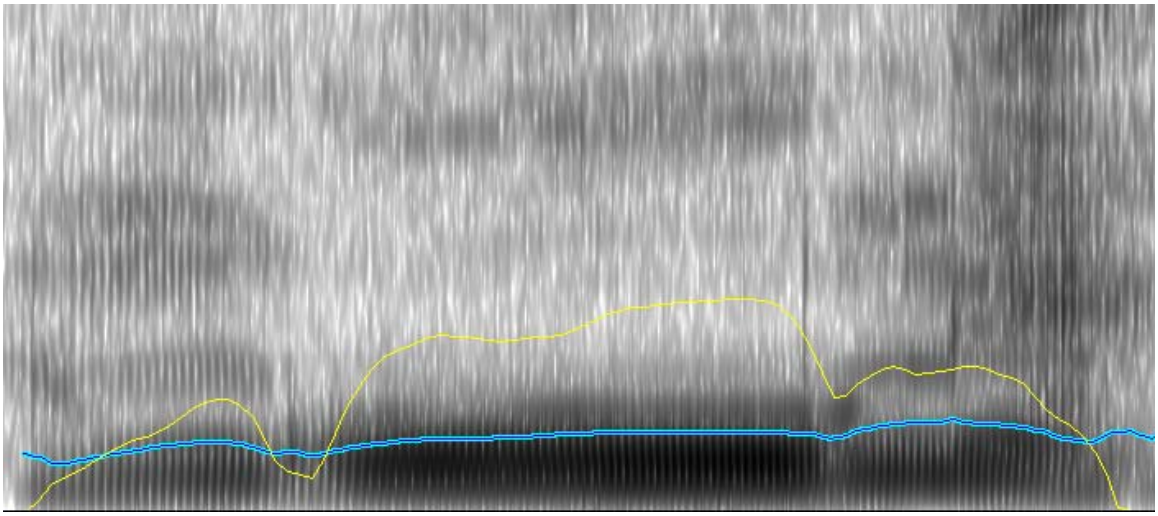
sequences on the root, even when tonal affixes are involved, are different than otherwise identical tone sequences which extend across clitic boundaries.

Figure 21 Spectrogram & pitch tracing of *mbla^{7}-lˆ-é*



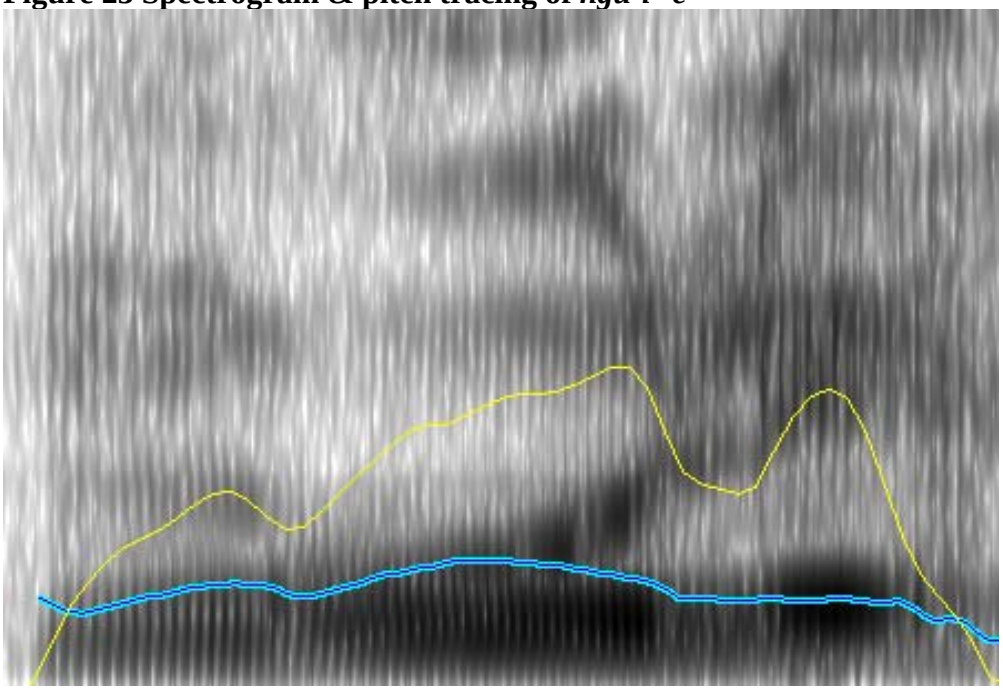
In Figure 22 there is a high-toned subject following a low-toned root. There is a slight rise and gradual fall (which is often typical of the high tone even on roots) extending onto the object *–é*.

Figure 22 Spectrogram & pitch tracing of *ngù-nh´-é*



In Figure 23 the same verb is followed by a falling toned subject *–lˆ*. Here the tone is lower than that of the root, and continuing fairly stably onto the object *–é* and falling at the end. Again the subject-object syllable acts as one tonally, though there is not as much fall in pitch as one might expect. Instead, the level-toned root has more of a fall than expected, in anticipation of the enclitic tone, and the enclitics have a more level realization than expected, the main fall in pitch already having taken place on the root.

Figure 23 Spectrogram & pitch tracing of *ngù-lˆ-é*



ŋ g u l̩ e

In Figures 22 and 23 we find again that subject-object enclitic sequences act as one tonally, which is appropriate since they are one syllable. There are differences between the syllable beginning in the underlying falling tone vs. the underlying high tone. While in this case both turn out fairly level, there is about 20 Hz. difference between the two, which were recorded within minutes of each other. However, the surprise here is that the main difference between the two is the pitch pattern of the root itself.

Phonologically, the tone of the root and of the object is the same in each example, the very same morphemes occur. In both examples the root tone is underlyingly low, *ngù*, and the object tone is underlyingly high, *-é*. Only the tone of the subject is different, *-ḿh* vs. *–lˆ*. Any difference in pitch seen at any place in the word must be caused by the different subjects, (unless arbitrary). The subject enclitics are here not part of the rime

and so their underlying tones are not saliently realized on the segments they are associated with syntactically. If they are to be realized at all they must be realized on either the preceding or the following vowel. In Figures 20 and 21 the subject's tone was realized on the syllable that began with the subject and reached its peak on the object. In Figure 21 it was also the case that the pitch was different on the root preceding the falling tone than on the root preceding the high tone in Figure 20. However, it was not the case that the underlying tone of the subject enclitic was realized on the root. If anything the normal pitch pattern of the glottal tone, high-rising, was emphasized in order to make a clear contrast with the following falling tone. In Figure 23 (but not 22) on the other hand the tone of the subject seems to be realized on the verb root. It is as if the tone of the root deleted in favor of the following subject's tone and the object kept its own underlying tone.

My analysis of these issues related to how tonal categories marked underlyingly on enclitics are expressed is, along with my understanding of intonation and perhaps derivational tonal morphology, among the least advanced of the many exciting phonological issues to be found in this language. The thoughts expressed here are preliminary but serve as an introduction to the tonal complexities which promise greater rewards in future work.

2.5.5 Register

All CLZ tones except rising have two main realizations that differ by pitch height. I analyze these variations as occuring in different registers. Most tones normally occur in the lower register in most instances but an upstepped (i.e. a higher register) version of a

tone can occur in at least two environments, one morphological and one phonological (or perhaps phono-syntactic).

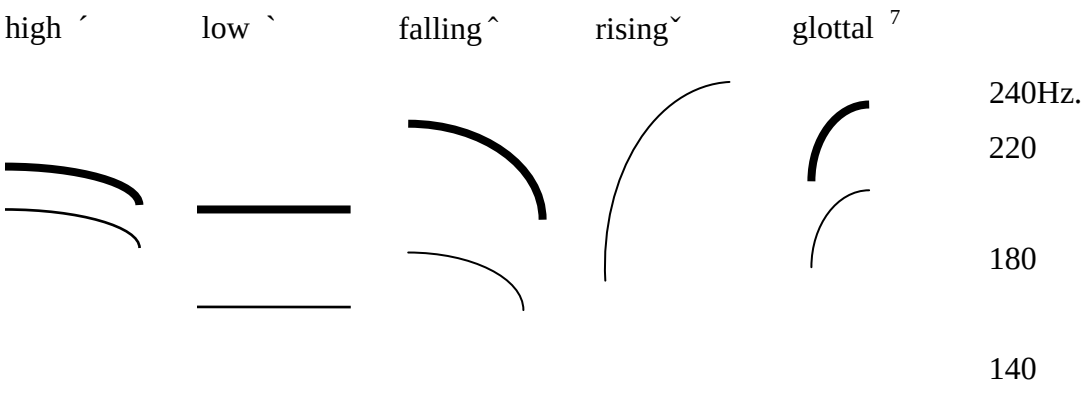
In verbs marked for the potential mood there are two different kinds of morphology involving changes in pitch which may come into play. Tonal morphology involves the combination of the underlying tone of a verb root with a floating high tone associated with the potential mood and produces a change in the surface tone such that low-toned verbs surface as rising and falling-toned verbs surface as high when marked for this aspect. Verbs that are not affected by this type of tonal morphology either because they do not have low or falling tones or because they do not meet certain morpho-syntactic requirements, instead are marked with the second kind of pitch-changing morphology which involves upstep. Verbs that take the second kind of tonal morphology, what is better called register morphology, have their surface tones in a higher than normal register when marked for potential mood.

A similar phonetic upstep or raising of register occurs on words that follow rising-toned words. The rising tone reaches a higher pitch than the other tones, especially compared to the non-upstepped versions of those tones. The rising tone normally goes so high that in an upstepping environment there is no change in the rising tone, presumably because it already reaches the upper limits of a speaker's comfortable pitch range. I take these facts to mean that the rising tone, (or at least the end of the rising tone), is in the upper register. It appears that this high register can spread onto the following word (i.e. the following syllable since most words are monosyllabic), causing upstep.

Figure 24 shows typical pitch patterns for CLZ tones in both low and high registers, for my primary consultant, a 48-year-old man in 2003. The bold line represents the

version of the tone that occurs in an upstepping environment and the thin line is the typical pitch pattern in other environments. Tokens measured were words and short phrases elicited in isolation, or taken from the beginning of a longer phrase.

Figure 24: Pitch patterns of San Baltazar Loxicha tones in two registers



As a disclaimer I must note that as always I found more variation than is apparent in Figure 24. While most tokens were close to these patterns, some were not. In most cases I asked the consultant to say the potential mood form of a verb and also some other form of that verb, usually the completive. I would elicit the two forms in both orders separately to make sure that differences were not due to listing intonation. In yet other instances I asked for one form at a time, though the consultant likely knew I was about to ask for a particular other form in a few seconds. In coming up with these typical numbers for the upstepped and non-upstepped pitch patterns I also looked at pitch measurements I made of words with these tones spoken in sentences. While utterance-medial and –final tones may be substantially different from these typical pitch patterns both because of syntactic stress and because of falling intonation, verbs are usually utterance-initial and stressed

and so potential and completive forms of verbs had pitch readings that were about the same whether spoken in isolation or in a sentence.

I have already stated that the rising tone reaches a high register regardless of environment and is never upstepped. It is debatable whether the high tone is really affected by upstep, although I contend that it is mildly affected. The high tone is the least common tone in native CLZ words. It was difficult to find verbs with high tone that met the morphosyntactic requirements for upstep. I recorded three such verbs. The high tone typically falls about 15Hz in closed syllables, and in open syllables it can be level or even rising. In the three tokens measured, one verb had pitch that was 20Hz. higher in the potential than in the completive, another verb had a potential that was 10Hz. higher, and the third verb had no difference between the two forms. The verb that showed the most difference had a pitch of 190Hz halfway through the syllable in the completive form and 210Hz. halfway through the potential form. I optimistically used this last verb as the representative in Figure 24. Two out of the three verbs indicate that the pitch may be raised somewhat when in the upstepping environment (here, potential mood). Comparisons of high- toned nouns in isolation with high-toned nouns preceded by rising-toned quantifiers were similarly mixed.

Of the four tones which are affected by upstep high tone is affected the least. It would make sense that the higher the pitch is to begin with, the less the difference would be when upstepped because a tone normally realized with a fairly high pitch is already closer to the upper limits of the speaker's pitch range than other tones. However, the glottal tone usually has higher pitch than the high tone and is upstepped to a greater degree. In recordings of nouns in isolation in 2003 I found that some nouns with high tone were

being said in the range of the upstepped high, or even higher than the upstepped high I used in making Figure 24. For example *mbé* ‘cangrejo; crab’ in one recording fell from 216Hz. to 210Hz., higher than the upstepped verb I mentioned above. When spoken in the context of reciting verb paradigms, two of three high-toned verbs elicited did show the expected difference of having high pitch concomitant with rising tone. However, it appears that high tone is already high enough that it normally borders on high register, and this is probably the reason that of the three verbs tested upstep was not apparent in one and only slight in the other two. While not as high as the rising tone, the high tone has a high enough realization in most instances that upstep will not be obvious.

In 2003 I found that low-toned verbs typically have a 30Hz higher pitch in the potential, e.g. 195 vs. 165Hz, but the effects of upstep are the most obvious on words with falling tone. An upstepped falling tone, I found, starts about 50Hz. higher (though there were examples with larger and smaller differences) than a non-upstepped falling tone, and falls farther, about 50Hz. total, ending where a non-upstepped falling tone starts or lower. Non-upstepped falling tones typically fall only about 20Hz. Typical 2003 readings were a fall in fundamental frequency from 235Hz. to 185Hz. on upstepped tokens and from 180Hz. to 160Hz. on non-upstepped tokens.

Glottal-toned words tend to have high-rising pitch patterns, although this is less consistent than the pitch patterns of other tones. The syllable peaks of words with this tone are much shorter than words with the rising tone both because the glottal tone shortens sonorants and because the rising tone lengthens sonorants. The change in fundamental frequency during a glottal-toned syllable peak is about half as much as the change seen in the long rising-toned syllable peak. The normal glottal tone has a pitch

pattern that is close to the first half of the rising tone pattern, though starting a bit higher, rising from about 170Hz. to 205Hz. When upstepped the glottal tone is more typical of the second half of a rising tone, with pitch rising from about 210Hz. to 245Hz.

The effects of upstep appear to be gradient. Excluding the glottal tone for the moment, the two tones which end in low pitch and in fact have lower pitch than the other tones at their lowest point, have the most significant change in pitch when occurring in an upstepping environment (potential mood or following a rising tone). The tone that at its highest point (which is also its endpoint) has the highest pitch of any of the five tones, i.e. the rising tone, is not affected by upstep at all. The high tone itself is perhaps slightly affected by upstep but the effects are not that obvious. Thus it appears that the lower the pitch, the greater the upstep.

The glottal tone is the obvious exception to this last statement. It has a pitch pattern which at its lowest point is higher than the typical pitch of the low tone, yet the difference between upstepped and normal glottal tone is 10Hz. more than the difference between upstepped and normal low tone. Comparative evidence (Beam de A., 2004) indicates that CLZ syllables that have the glottal tone historically had some other tone plus a glottalization feature. One might wonder whether these words still have tone plus glottalization underlyingly and if so, which tone(s)? There is some evidence to indicate that the glottal tone has a relationship to the rising tone and/or the low tone. For example, roots marked for the first person singular may be subject to deglottalization and such roots will then surface with a rising tone. However, the first person singular also has a floating high tone associated with it and so the result would be the same if the glottal tone were always or sometimes low tone plus glottalization. It is certainly phonetically

plausible that low tone could be realized with higher than normal pitch and with a bit of a rise preceding a glottal stop. The very fact that the glottal tone is subject to upstep while the rising tone is not might itself be taken as evidence that the glottal tone cannot be analyzed as a glottalized allophone of the rising tone. From a surface synchronic point of view, I would simply highlight the fact that some key differences between the glottal tone and the rising tone have to do with length.

Both environments where upstep occurs in CLZ seem to be natural environments for assimilatory pitch-raising if one looks at the historical and synchronic facts. Since the rising tone lengthens the sonorous portion of the rime, the pitch on the rising-toned syllable continues to rise for a long time. Since the rising tone ends so high, it is probably near or at the upper limits of the speaker's normal pitch range to begin with. If this rise were to begin at a higher pitch it might not be able to continue the rise for the entire length of the tone-bearing unit, which is why the rising tone itself is not upstepped. Since the rising tone ends so high, the tone on the next word is naturally made with higher pitch than if made in isolation or following a low-pitched word. The potential mood today is not marked segmentally at all in some cases, or in others has only a single consonant as a prefix *g-* or *w-*. However, the prefixes marked on consonant-initial verb stems were CV- historically. Comparative evidence (Beam de A., forthcoming b) suggests that this now-deleted prefix vowel bore a high tone. Since verbs occur at the beginning of sentences in Zapotec this prefix would also not have had its high pitch lowered in the way that syllables near the end of an utterance have lowered pitch. It is likely that when the high-toned prefix vowel existed the stem vowel in the following syllable had a slightly higher pitch pattern than when following a low-toned prefix. With the deletion of the high-toned

prefix vowel, the very conditioning environment for the upstep, the upstep itself came to be part of potential mood marking. While it is true that the high tone in CLZ today does not precipitate upstep on following words the way the rising tone does, this tone may have functioned this way historically in a prefix. The phenomenon of potential mood upstep itself is the only evidence we have that a prefix tone may have had this effect, since there are no remaining pre-tonic prefix vowels.

2.6 Stress

In this section I describe the phonetic and phonological features which lend prominence to a syllable. However, what I describe here is not always what is traditionally thought of as stress. To a large extent, syllable prominence in CLZ has to do with tonal categories. A syllable may be prominent in two ways: lexically and syntactically. In a polysyllabic word one syllable will have more prominence, the subject of this section. Similar phonetic properties lend prominence to particular words in an utterance. I consider these words to have syntactic stress, which I also discuss in §2.7.

Due to historical non-tonic vowel deletion, most CLZ words are monosyllabic. When considering lexical stress, the lone syllable of a monosyllabic root must be the stressed syllable, although certainly a given word may lack stress syntactically, a topic I touch on in §2.7. Lexical stress is only an issue in CLZ when there are polysyllabic words. There are only three types of words with more than one syllable in CLZ: onomatopoeia, compounds and loanwords. I will not be considering stress in onomatopoetic words here as these words are already frequently beyond the boundaries of the normal CLZ phonology seen in all other lexical items. As for the few unanalyzable disyllables, I

regard them as old compounds that have become opaque. I will now describe the phonological properties of stress in CLZ, discussing compounds and loanwords in turn.

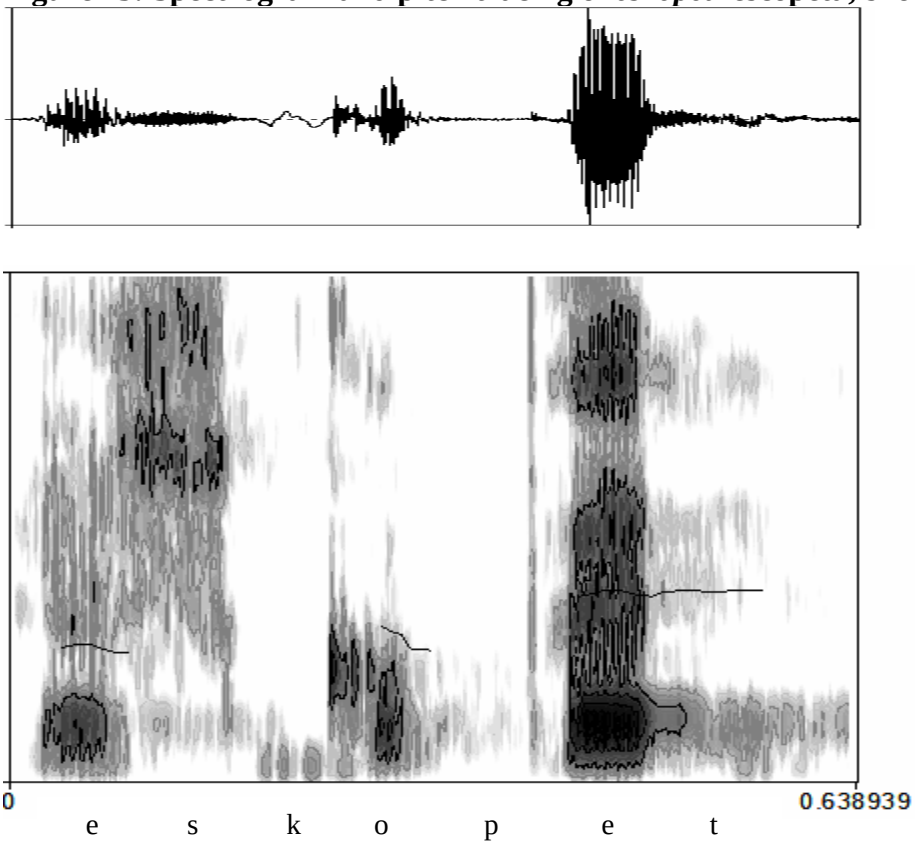
Polysyllabic words in CLZ have final stress. Final syllables tend to be heavy CVC syllables although they may be light CV syllables. Pre-tonic syllables tend to be light (C)V syllables although they may be heavy (C)VC syllables. Unstressed syllables can only take high tone while stressed syllables can take any tone, although high tone is the least common of the five tones in stressed syllables. Stressed syllables are louder than unstressed syllables. Stressed syllables are sometimes, but not always, longer than unstressed syllables. This may be at least partly due to the fact that unstressed syllables can only take high tone, one of the shorter or "monomoraic" tones in the language, while stressed syllables often have rising tone, a "bimoraic" or lengthening tone. Thus, there are four phonological features which can give prominence to a final syllable, in order of increasing importance: length, loudness, syllable weight, and contrastive tone.

The change from a high to a non-high tone is enough to give prominence to the final syllable. This could be considered the one defining feature of stress if not for the fact that some polysyllabic loanwords have high tone on all syllables. Syllable weight may be the next most important factor which adds prominence to a syllable. Although some pre-tonic syllables may have codas in Spanish, such as the first syllable in 'shotgun' *escopeta*, open syllables are more common in Spanish and so even in the loanword *éskópét* the immediate pre-tonic syllable is light and provides a contrast with the final heavy syllable regardless of the heavy pre-tonic syllable earlier in the word. Since open syllables are the norm in Spanish but not in CLZ, the coda of the final syllable in Zapotec is taken from the onset of the post-tonic Spanish syllable as the post-tonic vowel is deleted. This

creates a contrast with the preceding syllable, which is typically light. In the absence of a tone contrast the light/heavy contrast alone can provide prominence for the final syllable.

Besides syllable weight, other factors lend prominence to a stressed syllable with high tone. In polysyllabic loanwords with all high tone like *éskópét* from *escopeta* 'shotgun,' the pitch on the final syllable is higher than on the pretonic syllables and there is also increased amplitude. This is shown in the wave form and spectrogram with pitch tracing.

Figure 25: Spectrogram and pitch tracing of *éskópét* 'escopeta; shotgun'



In sum, an unstressed syllable is any non-final syllable with high tone. All final syllables are stressed and the prominence which is stress can be attained either by a non-high tone or by syllable weight or both, in addition to increased amplitude, and possibly

increased length (though this may likely be due to the fact that non-high tones are longer than the high tone).

One could make an argument that unstressed syllables in this language are toneless. Tone is not contrastive on unstressed syllables. I have become accustomed to marking high tone on these syllables because when transcribing texts in earlier years if I asked the consultants to repeat a polysyllabic word slowly the unstressed syllables clearly had high pitch, something like on the word *mbé* ‘cangrejo; crab.’ Thus, my view of CLZ unstressedness being marked with high tone is somewhat of a phonetic point of view rather than a phonological one, and is also simply an artifact of earlier stages of my work on this language. Nevertheless these syllables do have high pitch when said carefully (though the pitch varies more in casual speech, as with all tones). High tone is in CLZ a “normal” tone, which may be the consultants’ way of saying “toneless.” When fluent CLZ speakers imitate people who have not mastered the language, they mimick the toneless speech of these speakers by simply putting high tone on every syllable.

From a practical point of view, the issue of whether or not these syllables are toneless comes down to an issue of whether or not tone should be written orthographically. I deem that high tone can be marked on these syllables, in part to excuse myself from retranscribing hundreds of words, but also to make it clear that a syllable is unstressed rather than leaving an ambiguity (e.g. a non-native speaker or linguist might not write tone because they’re not sure what tone a word has and a native speaker may find diacritics cumbersome and use them inconsistently). However, as the co-developer (along with Terrence Kaufman and Lázaro Díaz Pacheco) of the orthography used here, I consider it acceptable to optionally not write tone on unstressed syllables.

While I think it would be reasonable to analyze modern CLZ unstressed syllables as toneless, I do not think that this was the case historically. Evidence that the ancestor of CLZ had contrastive tone on pretonic syllables includes the existence of upstep (described in the previous section) with potential mood but not with other verb forms, and the fact that in SAMZ, a related SZ language which maintains pretonic vowels in a few prefixes, there is contrastive tone on such syllables.

Other than onomatopoeia, the only native words which are polysyllabic are compounds. There are three types of complex lexical items in CLZ (see §7.2): 1) fixed lexical phrases such as idioms and metaphors, which show no phonological reduction but may show syntactic peculiarities, 2) compounds in which at least one root is altered (reduced), and 3) compounds with no reduction. Reduction includes segmental changes such as coda consonant loss and the change from falling, low, rising, or glottal to high tone. I generally regard unreduced compounds as having stress on both roots and reduced compounds as having final stress. Here I will only consider reduced compounds since there is a stress difference between the two syllables.

As stated, reduced compounds have predictable final stress. If the first root has a coda when in isolation it typically loses it in the compound. If the second root has a prefix which renders a consonant cluster in isolation, that prefix or part of it may be lost. This also prevents the pre-tonic syllable from acquiring weight since the first members of the consonant cluster from the onset of the second root could act as the coda of the first root when concatenated (an exception is ‘church’ below). Sometimes an onset in the second root that is not a prefix deletes in favor of the coda from the first root. In (2.73) I give examples of easily analyzable nominal compounds. When comparing the compounds

with their component nouns, notice the loss or change of segments, and the change from various tones on the first noun to high tone on the first syllable of the compound.

(2.73) Reduced nominal compounds (all with final stress) and their components

yìch	+	*yèk*	=	*yíchèk*
‘pelo; hair’		‘cabeza; head’		‘cabello; head hair’
mbèd	+	*zàn*	=	*mbézàn*
‘guajolote; turkey’		‘hembra; child-bearing’		‘guajolota hembra; female turkey’
ngǐd	+	*mbzìn*	=	*ngízìn*
‘gallina; chicken’[15]		‘ratón; mouse’		‘murciélago; bat’
ngǐd	+	*wze*^{7}	=	*ngíze*^{7}
‘gallina; chicken’		‘macho; male’		‘gallo; rooster’
lìd	+	*mbdo*^{7}	=	*líbto*^{7}
‘casa; house’		‘santo; saint ’		‘iglesia; church’[16]
lìd	+	*yi*^{7}*b*	=	*lítyi*^{7}*b*
‘casa; house’		‘fierro; metal’		‘cárcel; jail’[17]
yîd	+	*tô*	=	*yítô*
‘piel; skin’		‘boca; mouth’		‘boca; mouth’

2.1

[15] This root used to mean ‘butterfly’ and so the original metaphor for ‘bat’ was not the now-folk-etymologized ‘chicken mouse’ but in fact ‘butterfly mouse’. This metaphor goes back to at least Proto-Zapotec (Kaufman, 2003).

[16] In SMaC this word is *lípdo*^{7}. In both dialects one of the two medial consonants is voiceless and the other voiced, but which one is each varies between the two. The word for ‘house’ is *lìd* in SBL, *lìt* in SMigC, and *lìt*^{7} in SMaC, the final consonant coming from earlier **ty*. In CLZ *to*^{7} is a bound morpheme meaning ‘big’ or ‘holy’ such as in the word for ‘ocean’ *nîtz do*^{7}, literally ‘big or holy water.’ This is related to the word *mbdo*^{7} cited above as ‘santo; saint.’ This most closely resembles the form in the word for ‘church’ though the nasal portion of the prefix has been lost. Interestingly, the *b* or *p* is the earlier animacy prefix, before the SZ languages acquired prenasalization. The lack of *m* could be predicted with the synchronic phonological generalization that there are no medial CCC consonant clusters. In other words such as *mbzìn* ‘mouse’ → *ngízìn* ‘bat’ the whole *mb* prefix is lost. Perhaps these compounds were formed at different times or perhaps the word for ‘church’ was originally a different type of compound and has only more recently undergone the slight reduction of destressing the first syllable.

[17] The retention of a voiceless *t* in this compound in the SBL dialect resembles the free form as it still is in the Coatlán dialects, attesting to the compound’s formation at a time before the sound change that turned word-final **ty* into *d* in SBL.

There are a number of other words in CLZ which are phonologically like the compounds above in that they typically have a light, high-toned first syllable and a stressed, optionally heavy final syllable. In many cases the stressed final syllable is a known morpheme and the unstressed syllable an unanalyzable remnant. For example, *kwëˆ* means ‘(estar) enfermo; (to be) sick’ as in *kwëˆ mĕ̌ wê* ‘aquella persona está enfermo; that person is sick’ but *–ákwëˆ* means ‘doler; to hurt’ as in *ndákwëˆ ndëˇy nâ* ‘duele mi diente; my tooth hurts.’ There are many verbs that begin in unstressed *–á* and this example makes it seem like a grammatical marker of some kind, yet it is not regular and while sometimes it precedes a known root, many times it precedes what looks like a root phonologically but is not known to mean anything independently.

Interestingly, in Villa Alta Zapotec (see Pike, 1948) if the second member of a compound has high tone, it will perturb to mid or low tone depending on the tone of the first member of the compound. In CLZ I have not noticed native compounds with high tone on the second member either, here because that would be the stressed syllable. It is unclear whether both languages disallow high tone in the second members of compounds for the same reasons or not. Also, since non-compounds which necessarily have stress may have high tone, there may be compounds with stressed ultimas with high tone that I simply am not aware of.

Loanwords are the other group of words which have unstressed syllables in CLZ. It is impossible to come up with one set of predictions for all loanwords because depending on the time of the borrowing and perhaps other factors, loanwords have been phonologized to different degrees. Some early loanwords from Spanish and possibly Nahua underwent complete nontonic vowel deletion the same as most native words and

so resemble native Zapotec words with a (C)CVC shape and even various of the available CLZ tones. However, more recent Spanish loanwords undergo only post-tonic vowel deletion while pre-tonic vowels remain[18]. Furthermore, except for the oldest loanwords, only high and rising tone are found on the syllables of Spanish loans and rising tone is never found on an unstressed syllable. Rising tone marks stressed syllables of Spanish loanwords that are marked in some way, either phonologically (e.g. having final stress in Spanish) or semantically (e.g. a female name that differs from the corresponding male name by having rising rather than high tone). The different patterns of stress, vowel loss, and tone placement on Spanish loanwords are described thoroughly in §2.8.

2.7 Intonation

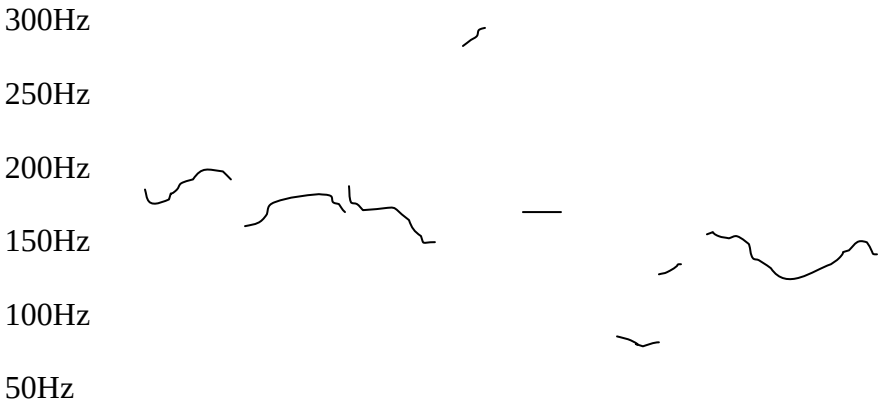
In §2.5.1 I described the pitch patterns found on words spoken in isolation in the careful context of elicitation. When spoken in normal speech intonation plays a role in the actual fundamental frequency of sonorous segments.

Like most languages, CLZ has falling intonation. Over the course of an utterance, lexical items with the same tone will have higher pitch when occurring earlier in the utterance and lower pitch when occurring later in the utterance. For example, the opening line in a folktale is *kwěnt tě mbál mbi^{7}zh nà kónh mbál nděz.* The consultant was a 65-year-old man from Santa María Coatlán. The words *kwěnt, tě,* and *nděz* all have rising tone, but each had successively lower pitch. *Kwěnt* started at approximately 150Hz. and ended at approximately 180Hz. *Tě* started at approximately 135Hz. and ended at

[18] Some of the most recent loanwords often undergo no vowel deletion at all and may have little change in pronunciation. This is essentially code-switching, though classifiers may be added, e.g. Spanish *sávila*

approximately 160Hz. *Nděz* at the very end of the utterance had pitch beginning at approximately 110Hz. and ending at approximately 135Hz, as illustrated in Figure 26.

Figure 26: Intonation in an utterance from Santa María Coatlán



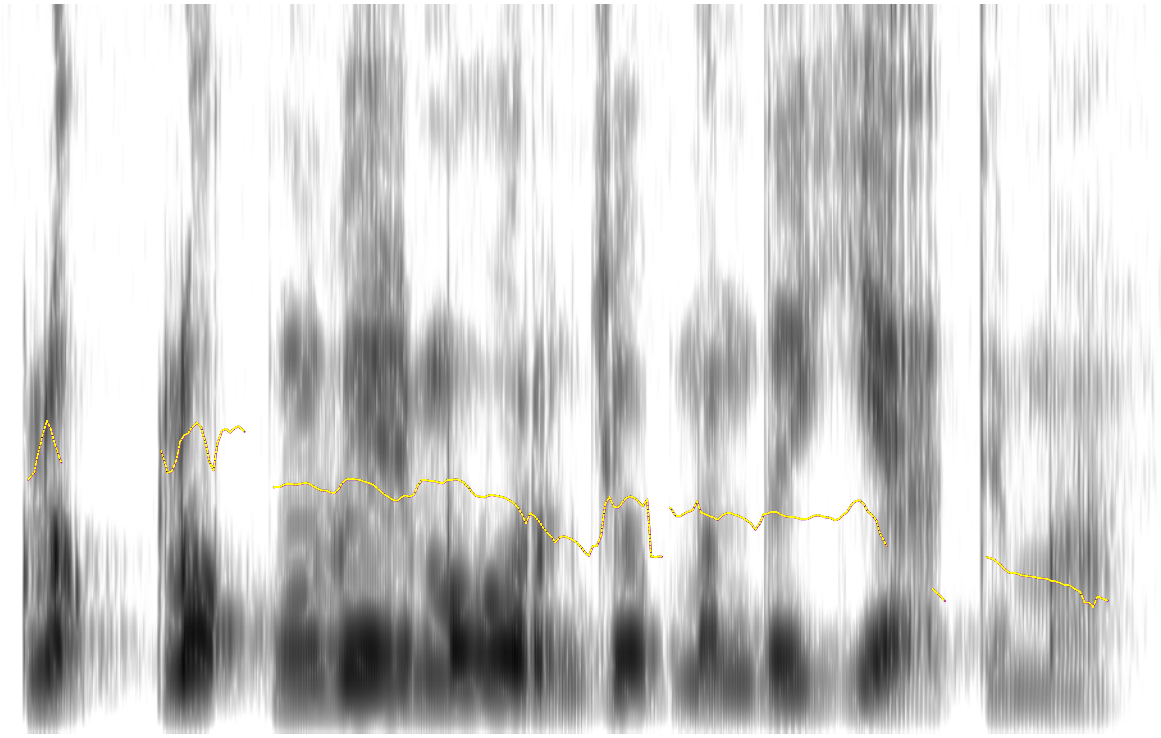
kwěnt tě mbál mbi^{7}zh nà kónh mbál **nděz** [Tlacuache: 1]

Similar effects are found in sentences I recorded and acoustically measured from a 48-year-old man from San Baltazar Loxicha in 2003. In the sentence *mbìth xa^{7} má* the final high tone had about the same pitch (185Hz.) as the initial low tone (187Hz.). Towards the end of a long utterance the loss of air pressure lowers the pitch so much that tones which normally rise or remain level are not just realized at a lower fundamental frequency but have a change in pitch pattern such that pitch actually falls during high and rising toned words, such as the words *tě* and *má* in Figure 27. This may also be due to a lack of syntactic stress, i.e. an effort to maintain the pitch pattern (if not pitch height) is not made because a word or words is deemed repetitive or less important information. A full gloss of this sentence is given in (2.89).

2.2 _____

'aloe vera' > *ya^{7} sábila.*

Figure 27: Falling intonation in SBL



“Klo^{7}k klo^{7}k” nbèzh má gór nzho^{7}b má ndô yëˆ tě má.

Rising intonation with questions exists but is not obligatory since even yes/no questions are usually indicated syntactically with a question word. I discovered this early on in a lunchtime conversation in 1997 when I tried to turn a declarative sentence into a yes/no question. That sentence ended in a low-toned word. Even though there was no rising-toned word in the lexicon to form a minimal pair with that low-toned word, my conversation partner immediately corrected me, repeating the sentence with normal intonation but with the addition of the sentence-initial question particle *xâl*. Because of this incident, for years I believed that there was no question intonation in CLZ, but more recently I have found that question intonation does exist, by paying closer attention to conversations between CLZ speakers. Sometimes the words in questions, while each

maintaining their distinctive tones, will resist the normal tendency to have successively lower pitch during the course of the utterance. Such question intonation may be slightly rising or may remain flat over the course of the utterance, being marked by resisting the fall. But to reiterate, the use of a marked question intonation is optional.

In both questions and declarative utterances, emphasis may be placed on particular words. Some minimal emphasis is placed on a word just by making the normal tone contrast. A word that is de-emphasized or syntactically unstressed will lose its distinctive tone. In some instances such syntactically destressed words sound to me like the "high" toned unstressed syllables of compounds and loanwords. In other cases, as at the end of Figure 27, a destressed word at the end of the utterance may simply fall, showing the pitch pattern of falling intonation rather than the pitch pattern associated with the lexical item. When excited, extra emphasis can be placed on words by lengthening them and articulating them with increased amplitude and sometimes a slow rise in pitch. This rise in pitch is most notable on words that already have high or rising tone, but is more subdued on words with other tones. Rather, even if the pitch is raised, it seems that the natural pitch pattern may be exaggerated on this loud and lengthened, emphasized word. Intonation is a topic that merits further investigation in CLZ, as in most languages.

2.8 Loanword phonology

CLZ possibly contains loanwords from Mixtec (*nzho^{7}zh* 'chuparrosa; hummingbird'), Chatino (*nì* alienably possessed 'casa; house') and other types of Zapotec (some are described in Beam de A., forthcoming a). It is certainly conceivable that there may also be loans from both the nearby Pochutec and the Classical Nahuatl from the Valley of

Mexico. Though I am not aware of any examples of loanwords borrowed from these last two languages there certainly has been contact and some bilingualism in the past, Nahuatl. Many loans from other indigenous Mexican languages would likely have been in the language long enough to be fully phonologized and appear to be native words. The loanwords that are newer and easier to identify are of course from Spanish. In this section I describe the phonological features of Spanish loanwords in CLZ, focussing on segments in §2.8.1 and on tone in §2.8.2 and syllable structure in §2.8.3.

2.8.1 Segments in loanwords

The phonemes /ɸ, s, x, ñ, ɾ, r̰/ are more common in Spanish loanwords than in native words. [ɸ] is found in native words as a conditioned allophone of /β/ but an unconditioned /ɸ/ occurs in loanwords that have /f/ in Spanish. The other phonemes shown here are found in a few Zapotec morphemes, mostly in function words, but are more common in loanwords. Recent loanwords with /f, s, x, ñ, ɾ, r̃/ in Spanish are borrowed with /ɸ, s, x, ñ, ɾ, r̃/ in CLZ, but earlier loanwords show that some of these were not present in colonial[19] CLZ and there were segmental replacements.

Spanish /f/ was borrowed with /xw/ in the name *Rafael* which was borrowed as *Jwăy* /xwăy/. Just as native Zapotec /kw/ delabialized before a round vowel, we find /x/ rather than /xw/ in in the name *Refugia* borrowed as *Júj* /xux/. I presume these to be earlier loans than ones containing /ɸ/ such as the Spanish name *Ranulfo*, borrowed as *Núf* /núɸ/.

The Spanish word *silla* ‘chair’ is an example of an early loan borrowed with Zapotec /ṣ/ rather than /s/, which in native words is only found in the future prefix and the 1e pronoun. This word is *xíl* /ṣíḷ/ in CLZ. The fact that this word has /ḷ/ rather than /y/ helps to date the loan is early because modern Mexican Spanish has /y/ in this word rather than the palatal lateral found in the sixteenth century and in Iberian dialects of modern Spanish.

Other words also indicate that Spanish /s/ was borrowed as /ṣ/ early on. This may either indicate the scarcity of /s/ as a native phoneme during the colonial period, as now, or alternatively this may reflect a more apical realization of /s/ in the variety of Spanish that CLZ speakers came into contact with in the early colonial period, compared to the Spanish spoken in the SZ region today. The fact that Spanish words with /s/ are today borrowed into CLZ with /s/ may reflect increasing familiarity with Spanish and/or the fact that the type of Spanish being borrowed from now is not a peninsular dialect. The Spanish name *Agustín* and word *maestro* ‘teacher’ were borrowed earlier as *Gŭxt* and *mĕxt* while the Spanish word *fiesta* ‘party, festival’ was borrowed more recently, replacing a native word *lni* that is found in SJMZ (Nelson, 2004), SAMZ, and other languages.

Possible evidence of the lack of early CLZ /ñ/ is the Spanish word *pañuelo* ‘handkerchief.’ This word is pronounced [payˈnwelo] in the local variety of Spanish even today and is borrowed as *báy* /βáy/ in CLZ. Since the syllable borrowed is not the tonic syllable of the Spanish word, I assume that the form borrowed was actually the related

[19] Roughly the seventeenth century CE, though perhaps including parts of the sixteenth and eighteenth centuries as well.

word *paño* ‘cloth, rag.’ This is similar to how the same word was borrowed into some varieties of Mixtec, e.g. Mixtepec Mixtec /pą̃ì ̀/ ‘rebozo; shawl’ (Paster & Beam de A., 2004), and SAMZ *bǎy*.

/ɾ/ and /r̃/ exist today in a handful of seemingly native words including a third person pronoun, and in many recent Spanish loanwords. However, it is apparent that most or all Zapotec languages lacked these phonemes in the early contact period. For example, the /ɾ/ of Spanish *compadre* is borrowed with CLZ /ḷ/ in *mbál* (other Zapotec examples are given in Beam de A., forthcoming a).

At the time of the earliest wave of Spanish borrowings Zapotec languages had not yet developed the voicing distinction of the modern fortis:lenis contrast. Instead, they had voiceless obstruents which contrasted in some other way, probably geminate:single. Spanish obstruents, both voiced and voiceless were borrowed as lenis consonants in Zapotec and went through the voicing changes that native words also went through subsequent to contact. Examples include *gŭch* (SMaC dialect) ‘cuche; pig’ and the aforementioned *báy*, probably from Spanish *paño*.

Above I mentioned the change in American Spanish from an earlier palatal lateral to a palatal glide, and the fact that early loanwords into CLZ like ‘chair’ have a lateral corresponding to this phoneme. A more global change that took place in World Spanish since the sixteenth century is the loss of /s̃/. This sound has become /x/ in most words in Spanish but some early loanwords into CLZ retain /ṣ/, helping to date themselves as early loans. These include names like *Juana* > *Xwán* (in the Coatlán dialects). The vegetable

jícama, CLZ *xgàm*, originally comes from Nahuatl *xicama* (Santamaría, 1992) and may have either entered CLZ through Nahuatl or through Spanish.

2.8.2 Tone and stress in loanwords

The low tone on *xgàm* 'jicama' is unexpected and is either a sign of the earliness of the loan and/or of its origins, if it was borrowed from Nahuatl rather than Spanish. Most Spanish loanwords only take high or rising tone on their stressed syllables, with rising tone sometimes marking semantic differences and others phonological differences such as final stress in Spanish.

There are a few different patterns that can be found when examining how Spanish loanwords are phonologized to Zapotec, particularly where tone and stress are concerned. For words being borrowed from Spanish into CLZ today typically the post-tonic syllable is deleted and high tone is placed on all remaining syllables, as in (2.61). In all the Spanish words given as examples in this section stress is penultimate when unmarked, final if the word ends in /l/, and is marked with an acute accent on the appropriate syllable if deviating from this pattern.

(2.74)	*Ábélín*	*yi^{7}b yà áméríkán*	*éskópét*	*púlmónh*
	Avelino	hacha americana	escopeta	pulmón
		American hachet	shotgun	lung

Earlier loanwords underwent more vowel deletion and even some segmental deletion and change. They still were usually borrowed with high tone, although there are exceptions like the first two low-toned words in (2.75).

(2.75)	*xgàm*	*áùj*	*báy*	*wáy*	*xtíl*
	jícama	aguja	pañuelo	caballo	Castilla
	jicama	needle	handkerchief	horse	Hispanic
	mbál	*mál*	*yáxíl*[20]	*sę́y* (SMaC only)	
	compadre	comadre	silla	seña	
	compadre	comadre	chair	sign	

Some Spanish loanwords take rising tone on the stressed syllable if there is final stress in the Spanish word and high tone if the stressed syllable in Spanish is non-final. This group of loanwords includes what must be earlier loans with total non-tonic vowel deletion, but also some later loans which have maintained pre-tonic vowels. Loanwords following this pattern are shown in (2.76). Compare especially the forms *Láx* 'Lázaro' and *Lăx* 'Nicolás.'

(2.76)	*Láx*	*Béd*	*Bét*	*páyás*	*pápáy*
	Lázaro	Pedro	Beto	payaso	papaya
				clown	papaya
	Lăx		*Bĕl*	*Măx*	*pérŏl*
	Nicolás[21]		Isabel	Tomás	perol
					aluminum pot

Another group of loanwords, all with pretonic syllables, have high tone on the unstressed syllable and rising tone on the now-final stressed syllable even though it was not final in Spanish.

2.1

[20] Only *xíl* is borrowed from Spanish. This is a compound formed with the root for 'tree' (or 'wood') *yà*). Note the tonal reduction on that first root.

[21] In an apparent exception to the generalization being highlighted here, the name *Gelacio*, which has normal unmarked penultimate stress in Spanish, is also *Lăx*, the same as the name *Nicolás*, which does have marked final stress.

(2.77)	*Bártŏl*	*Báléř*	*bórrĕg*	*pálŏm*	*pérĭk*
	Bartolo	Valeria/o	borrego sheep	paloma dove	perico perikeet

Other words take a rising tone on the stressed syllable when the stressed vowel preceded a Spanish consonant cluster but high tone otherwise.

(2.78)	*Gănhj*	*pŭlk*	*Bénĭg*	vs.	*Bénít*
	Ángel	pulque agave wine	Benigno		Benito

There are other cases where tone is exploited to make a semantic difference in loanwords. In (2.79) gender differences in proper names are maked by different tones. This is not very productive in the language but the generalization is apparent for pairs like those shown here.

(2.79)	*Áwrĕl*	*Chĕnch*	vs.	*Áwrél*	*Chénch*
	Aurelia	Cresencia		Aurelio	Cresencio

Although these different patterns make it impossible to regularly predict what tone the stressed syllable of a loanword will take, it seems that the norm is for all syllables of loanwords to be assigned high tone and for rising tone to be used on the stressed syllables of loanwords that are marked in some way. This includes semantic markedness like feminine gender, or phonological markedness such as the original word having final stress or a coda, both of which would be marked in Spanish which typically has penultimate stress and open syllables. Anecdotally, a common complaint of older Zapotec speakers is that some younger speakers who are viewed as incompetent put high

tone on all the syllables of Zapotec words which “makes Zapotec sound like Spanish.” It seems that Spanish syllables (which are toneless) are typically perceived as high by CLZ speakers, which fits with the use of high tone on loanwords.

2.8.3 Syllable structure of loanwords

The segmental structure of syllables in Spanish loanwords is also different than that of native words described in §2.3. Some segments have a different distribution. For example, in native words /x/ is only found syllable-finally and rarely at that. All word-initial instances of /x/ are Spanish loans.

With rare exceptions other than loanwords, CLZ consonant clusters occur only in the onset and never in the coda. When a word does have a complex coda, e.g. *mbíchánt* ‘chapulín; grasshopper’ in SMaC, it should be regarded with suspicion and is probably a loanword, though not necessarily from Spanish. The following complex codas have been found in borrowed words, some resulting from post-tonic vowel deletion and others coming from original clusters in Spanish: *nhj, nhjl, nhk, nhkl, nch, nt, ntr, ntz, mpl, mp, ltz, lk, rrk, st, xt, bs.* Examples are given below.

(2.80)	*jwébs*	*Gŭxt*	*Jwĕltz*	*símpl*	*Lănch*	*Gănhk*	*kúlántr*
	jueves	Agustín	Félix	sin sal; a tiempo	Esperanza	Ángela	cilandro[22]
	Thursday			plain (of food)			cilantro

2.1

[22] This is the gloss given by the consultant. The voiceless consonants *k* and *t* indicate that this is a recent loan, since earlier Spanish consonants were borrowed as lenis and underwent voicing along with native words. The form of the word used for glossing differs from standard varieties of Spanish which have *cilantro* with a *t*, however the form of the loanword indicates that it was taken from another non-standard form I have heard among Zapotec-Spanish bilinguals, *culantro*.

While CLZ and other SZ languages are notable for their complex onsets, Spanish loans are contributing new onset clusters to the language that do not occur in native words. The following onset clusters occur only in Spanish loans: *fl, fw, fy, jw, jy, tm, sp, sy, str, tr, tw*. The cluster *jw* occurs both when the cluster was original in Spanish, e.g. *Juan,* and as a substitution for Spanish *f* in earlier loans. The cluster *pl* is rare, occuring in only two native words and three Spanish loans. Examples are given below.

(2.81)	*Flóréntz*	fwérs	*Jwĭl*	*tmî*	*spéj*	*strópăj*	*twáy*
	Florencia	fuerza	Filemón	dinero (earlier *tomín)*	espejo	estropajo	toalla
		strength		money	mirror	loofa	towel

I have mainly made a study of word-initial onset clusters in Spanish loans. Some of these are also onset clusters in Spanish but some have only become clusters in Zapotec with the deletion of Spanish pre-tonic vowels. Clusters other than those listed here do occur in the onset of Spanish loanword syllables in CLZ when word-medial, where the inventory of clusters is the same as in Spanish. For example, the Spanish onset cluster [ky] (sometimes analyzed as underlying /ki/ where /i/ is realized as a glide when unstressed and prevocalic) is relatively rare in initial position[23]. No Spanish word with initial [ky] has been borrowed into CLZ but two words with medial [ky] have including the name *Mélkyăd* from Spanish *Melquiades*.

2.1

[23] Consulting the large Collins Spanish dictionary, 6th edition, I found one now-obsolete word beginning in <quia>, and only twelve other words based on only five roots, one of them a loan: conjugated and derived forms of *quebrar* ‘break’ and *querer* ‘want’ such as *quiero* ‘I want,’ the pronoun *quien* ‘who,’ *quieto* ‘quiet, well-mannered, calm,’ and *quiosco* ‘kiosk.’

2.9 Onomatopoeia

In this section I examine onomatopoetic words in CLZ and divide these into three groups according to the extent to which the words violate the phonological generalizations that hold true for non-onomatopoetic words. Less than 20% of the onomatopoetic words I have documented conform to both the segmental inventory and the phonotactics of CLZ. Another nearly 20% of these words employ sounds which are not phonemes of CLZ. The remainder of onomatopoetic words use CLZ segments but violate the phonotactics of native CLZ words either by having some segments in unusual environments or by employing suprasegmental processes like devoicing and lengthening in inappropriate environments. A full list of onomatopoeia is provided in Appendix B.

Unlike English, Spanish, and certain other Mesoamerican languages, CLZ does not mark onomotopoetic words morphologically for use as verbs or other parts of speech. These words are used almost exclusively as quotations. Like locatives and temporals they can be placed before the verb phrase (i.e. before the verb) or after the verb phrase following the verbal arguments. Perhaps these onomatopoetic words could be considered objects although the optional preposing of onomatopoeia relative to the verb phrase seems more common than the preposing of objects. Also the verbs they occur with do not seem particularly transitive in general. Exceptions to the mostly-quotation generalization are examples (2.91) and (2.92) below in which one *extracts* a named onomatopoetic sound from one's body.

When a human or animal or supernatural being/meteorological force, i.e. a subject with volition, causes the noise then the verb *–b-èzh* 'gritar; scream' (seen in examples 2.86-90) is used and when an inanimate object causes the sound the verb *–zìd* 'sonar;

sound' (seen in examples 2.82-85) is used. Body part subjects tend to take the verb *–b-èzh* that is used with animate subjects, as in (2.87) and (2.88) where *–zìd* would be ungrammatical. However, in (2.82) *-zìd* is used with *ndâtz* 'pie; foot' as subject, because although the foot is the overt subject, it is actually understood that it is the shoe that is making the noise and not the foot. In (2.82) the subject is inanimate and the equivalent sentence with *–b-êzh* would be ungrammatical. However, in (2.84) *–b-êzh* could be substituted for *–zìd* because there may be an animate force behind the action (a person, spirit or wind). Likewise in (2.85) a landslide is the subject and the example given is with *–zìd* but reportedly some speakers could use *–b-èzh* here instead. I presume this would ascribe animate qualities to the landslide. (2.90) could be used with either verb, though *–b-êzh* is preferred because a human must operate the saw. The use of these verbs with onomatopoeia is illustrated in the following example sentences.

(2.82) *"To^{7}k to^{7}k" nzyìd ndâtz xa^{7}.*
sonido.de.caminar.con.tacón H-sonar pie 3hd
sound.of.walking.with.high.heels H-sound foot 3hd
"*To^{7}k to^{7}k"* suena su pie de la gente cuando traen tacón.
"*To^{7}k to^{7}k"* sounds her/his foot when wearing a hard- or high-heeled shoe.

(2.83) *"Mbras" ngwzìd bóté ngwlëˇ.*
sonido.de.botella.quebrando C-sonar botella C-quebrar
sound.of.bottle.breaking C-sound bottle C-break
"*Mbras*" sonó la botella que se quebró.
"*Mbras*" went the bottle that broke.

(2.84) *"Mbrôj" ngwzìd yálâ. Mbyǎ yálâ.*
sonido.de.puerta.grande.cerrando C-sonar puerta C-cerrarse
sound.of.solid.door.closing C-sound door C-close
"*Mbrôj*" sonó la puerta. Se cerró la puerta.
"*Mbrôj*" went the door. The door closed.

(2.85) “*Mbrônh*”, *ngwzìd yû wë`*.
sonido.de.derrumbe C-sonar tierra derrumbe
sound.of.landslide C-sound earth landslide
“*Mbrônh*”, sonó el derrumbe.
“*Mbrônh*,” the landslike sounded.

(2.86) *“Wë^{7} wë^{7} wë^{7}” nbèzh chǐb.* (Example from SMigC, not SBL)
grito.del.chivo H-R1-gritar chivo
sound.of.the.goat H-R1-scream goat
“*Wë^{7} wë^{7} wë^{7}*” grita el chivo.
“*Wë^{7} wë^{7} wë^{7}*” screams the goat.

(2.87) *Xè-ḿ ngwtêzh “akwisa”*.
nariz=3hr C-R2-gritar sonido.del.destornudo
nose=3hr C-R2-scream sound.of.sneezing
Su nariz gritó, “*akwisa*”.
Her/his nose screamed, “*akwisa*.”

(2.88) *“Mbe̋w”, ngwtêzh yèn mě.*
sonido.de.eructarse C-R2-gritar pescuezo 3hr
sound.of.burping C-R2-scream neck 3hr
“*Mbe̋w*”, gritó su pescuezo.
“*Mbe̋w*,” screamed his throat.

(2.89) *“Klo^{7}k klo^{7}k” nbèzh má gór nâ nzho^{7}b má ndô yëˆ tě má.*
grito.de.gallina H-R1-gritar 3a hora REL H-estar 3a cara nido POS 3a
call.of.laying.hen H-R1-scream 3a hour REL H-AUX 3a face nest POS 3a
Dice “*klo^{7}k klo^{7}k*” la gallina culeca cuando está calentando (o abrazando) sus huevitos.
“Cluck Cluck” says the hen when she is on her nest.

(2.90) *“Xŭr xŭr” nbèzh sérrúch.*
sonido.de.serrote.cortando.madera H-gritar serrucho
sound.of.saw.cutting.wood H-scream saw
“*Xŭr xŭr*” suena el serrucho cuando está uno cortando la madera.
“*Xŭr xŭr*” goes the saw (when cutting wood).

(2.91) *“Aj”, ngwdòb mě látyo^{7}-ḿ*.
sonido.de.sorpresa C-R2-jalar corazón=3hr
sound.of.surprise C-R2-pull heart=3hr
“Aj”, jaló su corazón (o estómago).
“Aj,” came a sound from the pit of his stomach.

(2.92) *Nâ nbo^{7} kwri^{7}s ngŭtz ya^{7}-n^.*
1s H-R1-sacar sonido.de.chasquido dedo mano=1s
1s H-R1-take.out snap finger hand=1s
Yo trueno mis dedos.[24]
I snap my fingers "*kwri^{7}s.*"

A comprehensive list of the onomatopoeia I have found in CLZ can be found in Beam de Azcona (2004b), and also in my forthcoming dictionary of CLZ. In the remainder of the discussion I will mention only illustrative examples of the three types of onomatopoeia.

2.9.1 Words that conform to CLZ phonology

One common type of onomatopoeia in this group is the representation of animal sounds, specifically, animal vocalizations. When considering only animal vocalizations and not other sounds animals make such as walking or eating, there are twice as many onomatopoeia of this type that conform to CLZ phonology and phonotactics than not, even though overall onomatopoeia that conform to CLZ phonology make up less than 20% of the corpus. Perhaps since animal vocalizations are the closest kinds of natural sound to human speech, they are adapted more to the rules of human speech. The sound of paper tearing doesn't sound anything like human speech and so that type of sound may be less likely to be formed into the mold of normal phonology. Besides the fact that animal, particularly mammal and bird, vocalizations sound like human speech, there is also the fact that in cultures the world over there are folktales where animals are personified. We humans are animals and whatever our acceptance or denial of that fact,

we clearly identify with animals in a way that we do not with a piece of paper or a fire cracker. This is one reason that animals' "speech" may be treated phonologically similarly to human speech. Since the rooster is an imported animal it speaks with the Spanish onomatopoeia borrowed into Zapotec *kíkíríkí.*

Certain sounds or strings of sounds occur frequently in this group of onomatopoeia which conform to CLZ phonology. Five items have /x/ (<j>) as a coda consonant. It seems that most or all of these involve what we might call a *thud* in English, a single or repeated but not continuous blow or strike. Chopping wood *châj,* shutting a door *mbrôj,* or knocking on a door *po^{7}j* are all clearly like this. When horse excrement drops to the ground *tâj tâj* or high heels hit the floor *to^{7}j to^{7}j* the sounds produced are sudden, like English thuds, plops, or tick-tocks. Although we might expect a fricative to indicate continuous sound, none of the coda /x/'s are lengthened here even though that is common in other types of onomatopoeia in CLZ. I expect the use of the fricative here may just represent the brief, low frequency (indicated by the back fricative) resonance of the sound after the blow or strike of the action. The backness of the fricative may indicate the dull quality of a *thud*-like sound. This same symbolism may be found in some words in other groups that conform less well to CLZ phonology, e.g. *poj* is the sound of a balloon exploding---another sudden non-continuous sound.

There are four examples of onomatopoeia in this group which seem to share a consonantal template, with different meanings being indicated by different vowel quality and different tones. These four forms begin in a voiceless retroflex fricative <x> and end

2.2

[24] The translation given doesn't use an onomatopoeia, and for this reason in 2004 LDP said that although one could say this with this meaning, it would sound better to just use a real noun, *mbîtz* which means a sudden involuntary movement such as a seizure, a hiccup, a Charlie horse, or a pulse.

in a trill <r>. This *x_r* template indicates a continuous sound caused by the actions of ripping *xar*, sawing *xŭr xŭr*, scratching *xâr xâr* and dragging *xar xar xar*.

2.9.2 Words that violate CLZ phonotactics

The majority of onomatopoeia in CLZ violate the language's phonotactics by having sounds which are phonemic, but in unexpected places. Phonemes which are marginal in other types of words occur with higher frequency in onomatopoeia. For example, only in onomatopoeia do we frequently find *j* in syllable-initial position and *s, m, nh* in syllable-final position. These are environments where these marginal phonemes do not normally occur.

(2.93)	*anhjaja*	*brônh brônh*	*brum brum brum brum*	*chas*
	grito del burro	sonido de agua creciente en el río	sonido del huracán Paulina	sonido de reventar un mecate
	donkey's call	sound of the river when it rains a lot	sound of hurricane Paulina	sound of rope tearing

Many phonotactic violations have to do with vowels. Some onomatopoetic words lack vowels altogether which is a clear phonotactic violation. There are unusual suprasegmental phenomena involving the vowels of onomatopoetic words including devoicing and lengthening when not marked for low or rising tone. Vowel-initial words are as rare as p-initial words and so even though they exist I still consider vowel-initial words to violate the proscribed syllable structure of this language. Polysyllabic words (not repetitions of the same syllable) are also the exeption and not the norm. Some uses of glottalization found in onomatopoeia don't fit CLZ phonology. Examples of this are

when there are no sonorants present to bear tone, or when the type of tone or consonants present don't call for any of the types of glottalization described in §2.5.2.

(2.94)	*ch^{7}ch^{7}ch^{7}ch^{7}*	*ính* [íŋːːː]	*akwisa*	*mánhâ mánhâ*
	sonido de víbora de cascabél	sonido de sancudo	sonido de un destornudo	sonido de un nene llorando
	sound of the rattlesnake	sound of a mosquito	sound of a sneeze	sound of a baby crying

A consonantal template *prs* occurring in several onomatopoeia violates the language's phonotactics in several ways. *P* is extremely rare in initial position in native words. *R* occurs mostly in loanwords but is very rare in native words. *S* is also rare in native words, occuring in one prefix and one pronoun only, and never word-finally in native words. Most of the words with this template have the vowel /a/ though one word lacks a vowel. Those that do have a vowel differ as to the length and tone of the vowel as well as by whether or not (or how many times) the syllable is repeated. Again there is a fairly consistent meaning associated with the template, this time it is the theme of moving (or motion in) liquid: fish moving or things falling in the water or of people spashing in or throwing water *prás prás*, slipping (as with wet surfaces) or waves crashing both make a *prâs* sound, and diarrhea sounds like *prrss* where the *rr* is a voiceless trill. My consultant once used this same template for the sound of walking in soggy clothes (e.g. shoes full of water), but later changed it to a slightly more natively phonological form *gwras gwras.*

A few onomatopoeia are recognizeably Spanish loanwords. For example, I have heard Spanish monolinguals in Nayarit and elsewhere use *tras* to describe sounds like blows, effortfull, air-moving, sudden impact-type sounds. A Zapotec speaker used *tràs tràs tràs tràs tràs* for the sound of walking in mud, a successive stream of such sounds. Many

onomatopoeia are so universal that there is almost no point in suggesting that they are borrowed. It is quite predictable that CLZ would end up with something like *më*$^{\sim 7}$[mæ̰ːʔ] (SBL) or *ë`j ë`j ë`j ë`j* (SMigC) for a goat's sound and *mự* for a cow's. A number of CLZ onomatopoeia appear cognate with some Isthmus Zapotec forms collected by Terrence Kaufman from a consultant from Juchitán. Some of these may be due to the universal nature of some aspects of sound symbolism, but others are probably Zapotec-specific and are genuine cognates. For example, in CLZ the sound of a chair squeaking when moved on the floor is *nzhi*^{7}*r nzhi*^{7}*r*, which is quite similar to the Juchitán onomatopoeia *dxi:*^{7} *dxi:*^{7}. The sound of crushing dry leaves *ch*^{7}*kch*^{7}*kch*^{7}*k* is similar to Juchitán *cha*^{7}*a cha*^{7}*a.* The sound of a landslide or lightning strike *mbrúnh* shares a *br* cluster with Juchitán *braa*. The sound of a bottle breaking or a coin falling on the floor *nzérính* shares a high front vowel and final nasal with Juchitán *brin.*

2.9.3 Words that have sounds not phonemic in CLZ

This group of words contains several kinds of sounds that do not exist elsewhere in the CLZ lexicon, including loanwords. Clicks, ingressive sounds, and sounds with unusual places of articulation abound in this group.

When I asked LDP to provide examples using the onomatopoeia in each of the three groups discussed here, he offered extemporaneous example sentences for the onomatopoeia that conform to CLZ phonology or that have CLZ phonemes but violate CLZ phonotactics, but for the words in this final group he more often than not just made

the sound by itself. This suggests that these are in some way extra-linguistic. They probably also show more variation from speaker to speaker.

Some onomatopoeia in this group express sounds that are universal to the human condition, e.g. shivering (ingressive [sːʔ]), hiccuping (a high-pitched [i] followed by an ingressive uvular or pharyngeal fricative), snoring (successive ingressive-egressive uvular trill), and farting (voiceless linguo-labial trill, made longest for a fat person, shorter for a thin person, and very short and cut off by a glottal stop for a child). Others are more culture-specific, e.g. the sound a man makes when laughing at a woman with contempt [hɥʔ], or the sound of a sigh (a universal which is nevertheless expressed differently in different languages) *háyhậ*.

This chapter has described to the best of my current knowledge the sounds which occur in CLZ, both the way they are articulated and they way they pattern phonologically. Further phonological information is found in the following chapters, especially concerning phonological patterns that are exploited morphologically.