# Clause-typing and evidentiality in Ecuadorian Siona

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# Chapter 3: A phonological sketch of Ecuadorian Siona

## *3.1 Introduction*

In this chapter I will discuss some of the main features of the Ecuadorian Siona phonological system. There are two reasons why this system is relevant for the analysis of clause typing and evidentiality in Ecuadorian Siona in this dissertation. The first, minor, reason is that this will make it easier to understand the phonological background of the system that expresses clause typing and evidentiality. The second and major reason is that the reconstruction of the verbal system requires insight into the phonological system of Ecuadorian Siona; the reconstruction has both a phonological and a semantic side.

In order to describe the phonological system of Ecuadorian Siona, I first present the prosodic structure of a word in subsection 3.2. I provide an overview of the phonemic inventory of the language in subsection 3.3. I discuss the consonantal phonemes and their allophonic realization in subsection 3.4 and the vocalic phonemes and their allophonic realization in subsection 3.5. I address the topic of nasal harmony in subsection 3.6. Finally, I explain the practical orthographies used in the rest of this dissertation in subsection 3.7.

## *3.2 Prosodic structure*

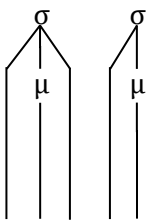
The prosodic structure of words in Ecuadorian Siona is important for the understanding of other phonological features of the language. I follow the theory of Prosodic Morphology which was developed by various authors (Hayes, 1995; McCarthy, 1982; McCarthy & Prince, 1995; Nespor & Vogel, 1986 among others), in order to describe the prosodic structure of words in Ecuadorian Siona. This theory applies the notion of templates, which "are defined in terms of the authentic units of prosody: mora (μ), syllable (σ), foot (F), prosodic word (PrWd)" (McCarthy & Prince, 1995, p. 318). Every template consists of constraints that need to be satisfied. These constraints are determined by prosodic principles that can be either universal or specific to a language.

### 3.2.1 Syllable structure

The basic syllable structure in Ecuadorian Siona is (C)V(V)(H). There are some restrictions on this syllable structure. For instance, the occurrence

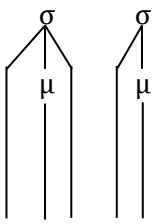
of a long vowel or a diphthong in a syllable is as a rule restricted to open syllables; syllables with a consonant in their coda generally contain one short vowel. Syllables that contain two vowels or a long vowel are analysed as bimoraic here. There are further restrictions on the type of sound that can occur in the coda position of a syllable: codas can only contain a non-moraic glottal stop /ʔ/ or fricative /h/. These glottal sounds are represented in the syllable structure template by the capital H. The use of the non-moraic glottal sounds is illustrated in example (1):

(1) a.




w a h t i
'bad spirit'

b.




w a ʔ t i
'machete'

The use of the non-moraic /h/ in a coda position is illustrated in (1a) and of the /ʔ/ in (1b). Another restriction with regard to codas in the language is that words always end in a vowel,[58] as illustrated in (1).

There are additional restrictions with respect to the syllable structure depending on the type of morpheme. Ecuadorian Siona stems have the following structures: CVV, CVCV or CVHCV. Suffixes can be formed in the following ways: -V, -CV, -CVCV, -CVH,[59] and -HCV. The glottal sounds in the suffixes of the shape -HCV occur in the coda position of the previous syllable. A suffix of this shape is the verbal suffix [-ʔ.ne] that can be used to mark an information question. The syllabification of a word containing this suffix is illustrated below:

(2) [kaa.kɨʔ.nẽ]
ka-kɨ-'ne?
say-2/3S.M.PRS.N.ASS-INT
'Do(es) you (m)/he say?'

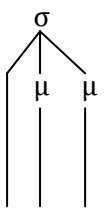
[58] Except for borrowings, such as [moh.tor].
[59] The glottal in the coda position is not realized in word final position. Only when the suffix is followed by another suffix it is realized.

In example (2), it is shown that the glottal stop /ʔ/ that is part of the suffix [-ʔ.ne] is pronounced as the coda of the previous syllable [kɨʔ]. This shows that a syllable cannot start with a glottal sound followed by a consonant.

### 3.2.2 Bimoraic structure

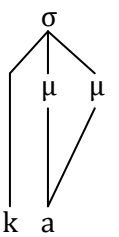
One prosodic constraint in Ecuadorian Siona is that a word stem is minimally formed by two morae. This means that lexical monosyllabic stems contain either two distinct short vowels or one long vowel that carries two morae. A stem consists of a root, which can be followed by at most one derivational suffix. For instance, the stem [sao] 'to let go' consists of the monomoraic root [sa] 'to go' and the derivational suffix *-o* 'causative', which together form a bimoraic stem. Other roots, such as [soe] 'to pluck', [ka:] 'to say' and [t̪uh.ta] 'to pull out', are bimoraic by themselves. The prosodic structures of these bimoraic roots are illustrated in example (3):

(3) a.



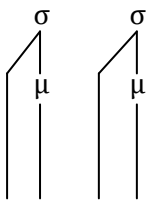

'to pluck'

b.




'to say'

c.




'to pull out'

Another prosodic constraint seems to be that stems are maximally bimoraic.[60] Stems are predominantly monosyllabic or disyllabic. There is a small number of trisyllabic words, but it is likely that these contain fossilized morphology. The bimoraic constraint was also observed for other Tukanoan languages, such as Barasana (Gomez-Imbert, 1997), Tatuyo (Gomez-Imbert, 2004) and Wanano (Stenzel, 2007).

### 3.2.3 Stress and tone

It is difficult to draw conclusions about the existence of any stress or tone system in Ecuadorian Siona. The main reason for this is that I am not aware of any minimal tone or stress pairs at this stage of the study of the language.[61] The regular prosodic pattern in the language is that the pitch goes up in the last syllable of the word. Since there is no conclusive evidence for a contrastive tone or stress system and it is not relevant for the main topic of this dissertation I will leave this issue for future analysis.[62]

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[60] Roots on the other hand can be monomoraic, as mentioned above. One verb class contains only verbs with monomoraic roots. These verbs need additional morphology in order to form bimoraic stems. This verb class is discussed in chapter 5, subsection 5.4.2.

[61] According to some speakers, there is a prosodic difference between [toa] 'fire' and [toa] 'Pouteria caimito, fruit species' However, there is no substantial difference in the realization of these words in a sentence when analyzed in PRAAT. Therefore, I treat these as homophones. Further data collection is necessary in order to provide an analysis of the stress / tone system.

[62] In future analysis it is important to take the prosodic systems of the other Tukanoan languages into account. The Western Tukanoan language Máíjɨ̱kì (Orejón) (Michael, 2012b; Velie, 1975; Velie, Brend, & Gordon, 1976) and Eastern Tukanoan languages such as Barasana (Gomez-Imbert, 1997, 2004; Gomez-Imbert & Kenstowicz, 2000; Jones & Jones, 1991), Tatuyo (Gomez-Imbert, 2004) and Wanano (Stenzel, 2007) are described as tone languages. Other Tukanoan languages are described as stress languages, such as the Western Tukanoan languages Ecuadorian Sekoya (Johnson & Levinsohn, 1990; Johnson & Peeke, 1975) and Colombian Siona (Wheeler, 1970, pp. 20-21; 1987b, pp. 89-92; Wheeler & Wheeler, 1975), and the Eastern Tukanoan language Tuyuka (Barnes, 1996). Some Tukanoan languages, such as the Eastern Tukanoan language Kubeo (Chacón, 2012, pp. 108-172; Wetzels & Meira, 2010) and the Western Tukanoan language Koreguaje (Gralow, 1985) are described as having a combined system in which tone and stress co-occur. Ecuadorian Siona shows similar features as Ecuadorian Sekoya and Colombian Siona, however, it is not evident to me that they are generated by a stress system.

*3.3 Phonemic inventory*

Ecuadorian Siona has a large phonemic inventory compared to other Tukanoan languages; it comprises 17 consonantal and 12 vocalic phonemes. Barnes (1999) proposes 9 consonants and 12 vowels for proto-Tukanoan, following Malone (1987). One of the reasons that the phoneme inventory is rather large in Ecuadorian Siona is that the nasal consonants and vowels have the status of independent phonemes, while they are not in many Eastern Tukanoan languages (Chacón, 2012; Gomez-Imbert, 2004; Stenzel, 2013). Table 3.1 presents the consonantal phonemes of the language and table 3.2 the vocalic phonemes.

Table 3.1: The consonantal phonemes

| | | La-bial | Coro-nal | Pala-tal | Dorsal | | Laryn-geal |
|---|---|---|---|---|---|---|---|
| | | | | | Plain | Labial | |
| Stops | Plain | p | t | | k | $k^w$ | |
| | Laryngealized | p̰ | t̰ (d) | | k̰ | $k̰^w$ | ʔ |
| Affricates | | | tʃ | | | | |
| Tap | | | (ɾ) | | | | |
| Frica-tives | Plain | | s | | | | h |
| | Laryngealized | | s̰ | | | | |
| Nasal | | m | n | | | | |
| Approximants | | (w) | | (j) | | | |

Table 3.2: The vocalic phonemes

| | Coronal | | Dorsal | | | |
|---|---|---|---|---|---|---|
| | | | -round | | +round | |
| | -nasal | +nasal | -nasal | +nasal | -nasal | +nasal |
| High | i | ĩ | ɨ | ɨ̃ | u | ũ |
| Mid | e | ẽ | | | o | õ |
| Low | | | a | ã | | |

*3.4 Consonants*

The Ecuadorian Siona consonants are susceptible to phonotactic restrictions. The realization of the consonants depends on their position in the word: some phonemes are realized differently at the beginning of a word, stem-internally, or at a morpheme boundary; and some

consonant phonemes do not occur in certain positions. Consonants cannot occur in coda position except for the glottal consonants. All these properties will be discussed in this subsection for the different classes of consonants: for the stops in 3.4.1, for the fricatives and affricates in 3.4.2, for the nasals in 3.4.3, and for the approximants in 3.4.4.

### 3.4.1 Stops

Ecuadorian Siona stops manifest two types of phonemic contrasts. The stops contrast in place of articulation and in a plain /p, t, k, $k^w$/[63] or a laryngealized realization /p̰, t̰, k̰, $k̰^w$, ʔ/. The contrast between plain and laryngealized consonants can be considered phonemic, because they are contrastive in word-initial position. In the examples below, (near) minimal pairs are presented for the labial, coronal, dorsal and labial dorsal series:

(4) a. [paɨ]
paɨ-ɨʔ[64]
scare.off-2/3S.M.PST.N.ASS
'Did he scare (it) off?'

b. [p̰aɨ]
ba-ɨʔ
have-2/3S.M.PST.N.ASS
'Did he have (it)?'

(5) a. [te.ʔo]
teʔ-o.
one-CLS:F
'one woman'

b. [t̰e.ʔo]
de'o-o
be.good-3S.F.PST.ASS
'She was good.'

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[63] The plain stops are often slightly aspirated: [$p^h$, $t^h$, $k^h$, $k^{wh}$]. However, since the plain stops are not always aspirated, this feature seems to be optional in the language.

[64] The segmented examples are given in the practical adapted orthography that is used throughout the rest of this dissertation. This adapted orthography is explained in section 3.7 of this chapter.

(6) a. [ko.ʔe.hi]
ko'e-hi.
search-3S.M.PRS.ASS
'He is searching.'
b. [k̰o.ʔi.hi]
go'i-hi.
return-3S.M.PRS.ASS
'He is returning.'

(7) a. [kʷɨɨ.hi]
kʷɨ-hi.
swim-3S.M.PRS.ASS
'He is swimming.'
b. [k̰ʷii.hi]
g̰ʷi-hi.
scream-3S.M.PRS.ASS
'He is screaming.'

The properties of the plain stops will be discussed in 3.4.1.1 and those of the laryngealized stops in 3.4.1.2. The glottal stop will be discussed in a separate subsection (3.4.1.3), because it behaves differently than the other stops.

### 3.4.1.1 Plain stops

Almost all plain stops occur in every onset position of the word, that is, word-initially, stem-internally, and suffix-initially. However, there are some restrictions on their use. For instance, stops only occur under specific conditions stem-internally: they always follow a laryngeal / ʔ, h/. There exist even more restrictions in the case of the labial plain stop /p/: it does not occur in suffix-initial position.[65] The occurrence of plain stops is illustrated in the table below:

[65] This is probably due to a sound change, as discussed in this subsection.

Table 3.3: Examples of words with the plain stops /p, t, k, kʷ/ in word-initial position (#_), stem-internal (VH_V) and suffix-initial position (V-_V).

| | #_ | VH_V | V-_V |
|---|---|---|---|
| /p/ | [pɨ.βɨ] 'pile'<br>[pee.ɾi] 'cockroach'<br>[paɨ.je] 'to scare off' | CVʔ.pV<br>[pũʔ.pu.je] 'to smoke'<br>[paʔ.pa] 'palm leaf'<br><br>CVh.pV<br>[ah.pa.si] 'sapote (fruit sp.)' | - |
| /t/ | [tiʔ.wi] 'side'<br>[to.ja] 'pattern'<br>[ta.ɾi] 'turtle' | CVʔ.tV<br>[waʔ.ti] 'matchet'<br>[toʔ.te.je] 'to sting'<br><br>CVh.tV<br>[wah.ti] 'bad spirit'<br>[tuh.tu] 'wind' | -tV<br>[kʷaʔ.ko.-to] 'when someone cooks'<br><br>h-tV<br>[sah.-te.-ɲã] 'they went, they say' |
| /k/ | [kɨa.je] 'tell'<br>[kɨ.wi.ɾa] 'whirlpool'<br>[ka.ja.je] 'two' | CVʔ.kV<br>[kʷaʔ.ko.je] 'to cook'<br>[waʔ.ke.je] 'to tear off'<br><br>CVh.kV<br>[koh.ka] 'word'<br>[pɲ̰ah.ku] 'pomfret, fish sp.' | -kV<br>[kʷaʔ.ko.-ko] 'she is cooking.'<br><br>h-kV<br>[sah.ko.-ɲã] 'she left, they say.' |
| /kʷ/ | [kʷɨ:.je] 'to swim'<br>[kʷaʔ.ko.je] 'to cook'<br>[kʷẽ.nẽ.ɲẽ] 'to dry oneself' | CVʔkʷV<br>[k̲ʷeʔ.kʷe.je] 'to make fun of something'<br><br>CVhkV<br>[mah.kʷe] 'sand fly' | -kʷV<br>[ɲã:.-kʷa.ʔi] 'the ones who see' |

3.4.1.1.1 The rarity of /p/

The labial stop /p/ is not only more restricted in its use, but it is also less frequent than the other stops. There seems to be a historical reason

for this low frequency: the labial plain stop *p of Proto-Tukanoan became debuccalized in Ecuadorian Siona, as well as in various other Tukanoan languages,[66] and is now reflected in the language as /h/ (Chacón, to appear; N. E. Waltz & Wheeler, 1972). Despite this diachronic process that has occurred in the language, there are some words that still contain a plain stop [p]. The most likely explanation for the origin of this sound in Ecuadorian Siona is that these words containing [p] are loanwords. One example of a loanword with [p] is [pai.ɾi] 'priest' from the Spanish word *padre*. In other cases, it is more difficult to find a Spanish counterpart for the word containing [p]. Spanish, however, does not need to be the only source language for loanwords in Ecuadorian Siona. It is likely that Ecuadorian Siona also borrowed words from other languages in the region. This means the language may have acquired words containing the stop [p] from different languages as well.[67]

#### 3.4.1.1.2 /kʷ/ as a phoneme

There are various indications that /kʷ/ is a phoneme and not a combination of the phonemes /k/ and /w/ or of /k/ and a rounded dorsal vowel in Ecuadorian Siona. The first combination is ruled out, because the language does not have consonant clusters. The first indication that it is not a combination of /k/ and a rounded dorsal vowel is that monosyllabic stems starting with /kʷ/ all contain a long vowel, such as the vowels /ɨ/ and /ẽ/ in the stems [kʷɨɨ] 'swim' and [kʷẽẽ] 'take down'. If /kʷ/ were to be analyzed as a combination of /k/ and a rounded dorsal vowel /u/ or /o/, these monosyllabic stems would violate the bimoraic stem constraint. The stems would consist of three morae, as illustrated in (8a). In the representation in (8b), /kʷ/ is interpreted as one phoneme and the stem does no longer violate the bimoraic stem constraint.

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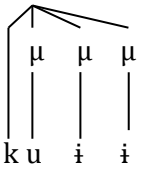
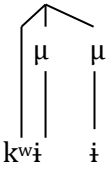
[66] Other Tukanoan languages that have undergone this process of debuccalization are all the other Western Tukanoan languages: Koreguaje, Sekoya and Orejón and some Eastern Tukanoan languages: Kueretu, Makuna and Barasana (Chacón, to appear; N. E. Waltz & Wheeler, 1972, pp. 129-131).

[67] Another possibility is that the plain stop [p] in Ecuadorian Siona reflects a different phoneme of Proto-Tukanoan. In order to confirm this hypothesis, one should find cognates in other Tukanoan languages. This task remains for further research.

(14) a. *σ




b. σ

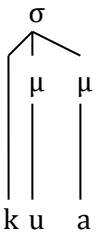



'swim'

A second indication for the phonemic status of /kʷ/ is the occurrence of the phoneme in disyllabic stems. Examples of such stems are [kʷaʔ.ko] 'to cook' and [kʷẽnẽ] 'to dry oneself.' If /kʷ/ were a combination of /k/ and /u/ or /o/, these disyllabic stems would also violate the bimoraic stem constraint, because the stem would consist of three morae. The labial vowel /u/ or /o/ and the other two vowels in the stem, [a] and [o] in the case of [kʷaʔ.ko], would all carry a mora.

A final indication is that stems with a combination of /k/ and /u/ are realized differently in the language. The verb stem [kua] 'to take (someone) around' contains this combination, and in this stem the vowel /u/ is realized as a full vowel while the vowel /a/ is short. In other words, this vowel only carries one mora. The moraic structure of this stem is presented in the example below:

(15)




'to take (someone) around'

3.2.1.2 Laryngealized stops

The realization of the laryngealized stops /p̰, t̰, k̰, k̰ʷ/ depends on the position in the word. In word-initial position these stops are realized as creaky stops [p̰, t̰, k̰, k̰ʷ]. This laryngealization generally spreads to the beginning of the following vowel. The word-initial laryngealized stops [p̰,

t̰] occur in complementary distribution respectively with intervocalic [β, ɾ]. There are no stem-internal or suffix-initial counterparts of the word-initial /k̰, k̰ʷ/ in the language. The only intervocalic position in which these two stops can occur is in compounds. The table below shows examples of words containing laryngealized stops and their allophones in different positions in the word:

Table 3.4: Examples of words with the laryngealized stops /p̰, t̰, k̰, k̰ʷ/ and their allophones in word-initial position (#_), stem-internal (V(ʔ)_V) and suffix-initial position (V-_V).

| | #_ | V(ʔ)_V | V-_V |
|---|---|---|---|
| /p̰/ | [p̰ja] 'pepper'<br>[p̰e̞o.je] 'to not be/have'<br>[p̰ãh.ku] 'pomfret, fish Sp. *Palometa*' | [p̰ã̞.βi.je] 'to touch'<br>[ho.βo] 'the middle'<br>[k̰ʷe.βe.je] 'to be drunk' | [teo.-βë] 'traditional dish Sp. *maito*'<br>[wɨo.-βi] 'he began'<br>[toa.-βo] 'fire' |
| /t̰/ | [t̰uh.ta.je] 'to pull out'<br>[t̰oʔ.ɾo.wɨ] 'basket'<br>[t̰ai.je] 'to come' | [aʔ.ɾi] 'small'<br>[we.ɾo.je] 'to buy'<br>[ka.ɾa.je] 'to lack' | [ho.-ɾo] 'flower'<br>[wẽh.kɨ.-ɾe] 'the sea cow' |
| /k̰/ | [k̰o.he] 'hole'<br>[k̰a.he.je] 'to go down'<br>[k̰u.ja.je] 'to wash oneself' | | |
| /k̰ʷ/ | [k̰ʷe.βe.je] 'to be drunk'<br>[k̰ʷi:.je] 'to scream'<br>[k̰ʷah.tʃa.je] 'to think' | | |

3.4.1.2.1 The laryngealized stops /p̰/ and /t̰/

As we have seen, the laryngealized stops [p̰, t̰] in word-initial position alternate with [β, ɾ] in stem-internal and in suffix position. This distribution is probably due to a lenition process of the stops in intervocalic position. The allophonic relation between the laryngealized stops and their lenited counterparts can also be observed in compounds and in fast speech. When a word, starting with [p̰] or [t̰], forms the second part of a compound or when it is pronounced rapidly in regular

speech, these sounds tend to be realized as [β] and [ɾ], as illustrated in the example below:

(16) a. [i̵.ha.βãĩ̃]
ɨha-bãĩ̃[68]
foreign-people
'non-Sionas'
b. [p̰eo.ɾoʔ.ɾo.wɨ̵]
beo-do'do-wɨ̵
NEG.EXIS-basket-CLS:CONTAIN
'containing nothing'

It is not the case, however, that there are no intervocalic [p̰, t̰] in Ecuadorian Siona at all, because the lenition of these sounds is not generalized for compounds.

There is an additional complication in the case of the laryngealized dental stop /t̰/. There are additional allophonic realizations of this phoneme in bound morphemes. Specifically, in a set of bound morphemes /t̰/ is realized either as [t̰], [d̰] or [d]. Examples are the counterfactual suffix [-t̰aʔ] shown in example (17), the plural that is mostly used for family members [-t̰owɨ̵] shown in example (18) and the nominal classifier for water [-t̰aʔka] shown in example (19):

(17) [sah.ti.t̰aʔ.wɨ̵]
sah-ti-daʔ-wɨ̵.
go-EP-CTF-OTH.PST.ASS
'I almost went.'

(18) [wao.t̰o.wɨ̵]
wa-o-dowɨ̵.
child.in.law-CLS:F-PL.FAM
'daughters in law.'

(19) [kɨ̵o.hai.t̰aʔ.ka]
kɨ̵o-hai-da'ka.
warm-VLZ-CLS:WATER
'warm water.'

[68] The laryngealized stops [p̰, t̰, k̰] are written as <b, d, g> in the Siona orthography and in the adapted orthography. See section 3.7 for further conventions in the practical orthographies.

A comparable phenomenon occurs in the eastern Tukanoan language Wanano (Stenzel, 2013, pp. 30-32). The tap [ɾ] is an allophonic variant of the voiced stop /d/ that occurs in intervocalic position. The phonetic voiced stop [d], however, does occur intervocalically in serialized verbs and nominal classifiers. Stenzel (2013, p. 32) argues that these morphemes have a different status in the phonology, because they are roots or reduced roots in Wanano.

A similar argument can probably be made for the occurrence of intervocalic [t̰] that occurs in specific bound morphemes in Ecuadorian Siona. The suffixes that start with this laryngealized stop are likely to be recently grammaticalized roots. These bound roots, therefore, have a different status in the phonological system of the language.

#### 3.4.1.3 The glottal stop

The glottal stop has a different distribution from that of the other consonants in the language.[69] However, the phonemic glottal stop neither occurs in word-initial nor in word-final position. Furthermore, it occurs in coda position in contrast to most other consonants. Some examples of stems containing a glottal stop in different positions are presented in the table below:

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[69] The glottal stop occurs in a similar way in many other languages of the Tukanoan family, such as most Western Tukanoan languages: Colombian Siona (Wheeler, 1987b), Koreguaje (Cook & Criswell, 1993) and Secoya (Johnson & Levinsohn, 1990) and in some Eastern Tukanoan languages: Desano, Piratapuyo, Siriano, Tukano and Wanano (Stenzel, 2007, p. 332). In the Western Tukanoan languages the glottal stop has been analyzed as a phonological segment, probably because it behaves in some aspects as other phonological segments.

However, because of the different distribution of the glottal stop, some authors (Ramirez, 1997, pp. 66-68; Stenzel, 2007) have proposed that its occurrence is a suprasegmental feature in Eastern Tukanoan languages. Ramirez (1997, pp. 66-68) analyses the glottal stop in Tukano as a 'laryngealized or glottalized tone' that interferes with the other tones in the language. Stenzel (2007) gives a similar analysis for the glottal stop in Wanano. Although this author does not analyze the glottal stop as a tone, she does analyze it as a suprasegmental feature. In Stenzel's analysis, glottal stops are found when vowels possess the feature 'constricted glottis.' It would be interesting to explore the question whether a suprasegmental analysis also applies to the glottal stop in Ecuadorian Siona.

Table 3.5: Examples of stems with a glottal stop/ʔ/ in stem-internal position in coda position (V_C) or in intervocalic position (V_V).

| | V_C | V_V |
|---|---|---|
| /ʔ/ | [t̪oʔ.ɾo.wɨ] 'basket'<br>[kʷaʔ.ko.je] 'to cook'<br>[jaʔ.hi.je] 'to ripen' | [ma.ʔa] 'path'<br>[jɨ.ʔɨ] 'I'<br>[t̪e.ʔo.je] 'to be good' |

There is some variation in the realization of the glottal stop. The glottal stop in Ecuadorian Siona often lacks complete closure as in many languages of the world (Ladefoged & Maddieson, 1996, p. 75). Especially, in intervocalic position it tends to be realized as a creaky voice on the vocalic stream. Before a consonant, glottal stops are more often articulated as a full closure.

The glottal stop is contrastive in the positions described above. In table 3.6 below, there are examples of minimal pairs that differ in meaning with respect to the presence of a glottal stop:

Table 3.6: Examples of pairs that differ with respect to the presence of a glottal stop in coda position (V_C) or an intervocalic position (V_V).

| | /ʔ/ | /h/ or Ø |
|---|---|---|
| V_C | [waʔ.ti] 'machete'<br>[kaʔ.ra-je] 'to be afraid' | [wah.ti] 'evil spirit'<br>[ka.ra-je] 'to lack' |
| V_V | [ma.ʔa] 'path'<br>[wa.ʔi] 'fish, animal' | [ma:] 'parrot'<br>[wai] 'kill' |

As shown in table 3.6, the glottal stop contrasts with /h/ before a voiceless stop and with Ø before a lenited stop or a vowel.

The occurrence of the glottal stop in Ecuadorian Siona, as described up until here in this subsection, is very similar to the occurrence of the glottal stop in other Tukanoan languages, such as Wanano (cf. Stenzel, 2007). However, there is a major difference between the use of the glottal stop in Ecuadorian Siona and Wanano. Whereas the glottal stop does not occur in suffixes in Wanano, it does in Ecuadorian Siona. The glottal stop in the latter language has a quite similar distribution as the glottal stop in the stem: it can occur in intervocalic position as the onset of a suffix (-ʔV) or suffix-internally (-CVʔV), and as the coda of a suffix (-CVʔ). However, in the case of the suffixes there is a fourth option: a glottal stop that is part of the suffix can also be added to the previous syllable as a coda (-ʔ.(CV)). Examples of these four types of glottal stop involving suffixes are given in the table below:

Table 3.7: Examples of suffixes with a glottal stop /ʔ/ in an onset position (-#_), (-V_V) or in a coda position (V_C), (-_.(CV)).

| Position | Template | Examples |
|---|---|---|
| Onset | -ʔV | -'ɨ 'OTH'<br>[kʷaʔ.ko.kʷa.ʔɨ]<br>'I am a cook' / 'I cook.' |
| | -VʔV | -jũ'ũ 'HORT'<br>[ã.ɲũ.ʔũ]<br>'Let's eat' |
| | | -hɨ̃'ɨ̃ 'IMP'<br>[kah.ka.hɨ̃.ʔɨ̃]<br>'Enter!' |
| | | -hã'ã 'LIM'<br>[s̪ia.ja.hã.ʔã]<br>'until the river' |
| Coda | -CVʔ | -t̪a' 'CTF'<br>[to.me.t̪aʔ.wɨ]<br>'I would have fallen.' |
| | | -hã' 'PRP'<br>[kɨa.hãʔ.kɨa.ʔɨ]<br>'I am going to tell' |
| | | -sa' 'CNJ'<br>[he.ɾo.saʔ.ɾe]<br>'where?' |
| | -ʔ.(CV) | -Ṽ' 'REM.PST'[70]<br>[bãʔ.kɨ.ɲã]<br>'He was, reportedly.' |
| | | -'ne 'INT'<br>[dah.teʔ.nẽ]<br>'Did you (pl.) come?' |

Table 3.7 shows that the use of the glottal stop in Ecuadorian Siona is not restricted to stems, as in some Tukanoan languages. This sound in Ecuadorian Siona is frequently used in various positions of the suffixes.

There is one final remark that needs to be made about glottal stops in Ecuadorian Siona. This concerns the use of the sound in word-initial position. The glottal stop does occur in this position, but this use

[70] The remote past suffix consists of the nominalization of the final vowel of the root and the insertion of a glottal stop before the next syllable.

is not contrastive. It often disappears in fast speech, as illustrated in the example below:

(20) [ʔɨha] ~ [ɨha]
'Foreign'

The fact that the glottal stop disappears in fast speech in word-initial position is one indication that it is not contrastive. Another, more important, indication is that there are no minimal pairs in Ecuadorian Siona that show a contrast between /ʔ/ in word-initial position and an empty onset in the same position. Because of its non-contrastive nature, the word-initial glottal stop can probably be analyzed as a prosodic device that is used for the demarcation of a word boundary. This is a very common use of the glottal stop in the world's languages (Ladefoged & Maddieson, 1996, p. 74). Due to the fact that the glottal stop is not contrastive in word-initial position, this use is not analyzed as a realization of the phoneme /ʔ/.

### 3.4.2 Fricatives & Affricates

The Ecuadorian Siona phoneme inventory contains three fricatives /s, s̱, h/ and one affricate /tʃ/. These four phonemes are contrastive in word-initial position:

(21) a. [sua.hi]
sua-hi.
light-3S.M.PRS.ASS
'He is lighting (a fire).'

b. [s̱oa.hi]
zoa-hi.
wash-3S.M.PRS.ASS
'He is washing.'

c. [tʃoo.hi]
cho-hi.
laugh-3S.M.PRS.ASS
'He is laughing.'

d. [hoa.hi]
hoa-hi.
cleave-3S.M.PRES.ASS
'He is cleaving.'

The sibilants will be discussed in the first part of this subsection, in 3.4.2.1. Secondly, I will show the properties of the affricate /tʃ/ in 3.4.2.2. The distribution of the glottal fricative /h/ will be discussed in 3.4.2.3.

### 3.4.2.1 The sibilants

Ecuadorian Siona contains a plain-laryngealized distinction in the domain of the sibilants,[71] akin to the opposition that exists in that of the stops. The two phonemes in question have the same distribution as some of the stops: the plain sibilant occurs in any onset position in the word, whereas the laryngealized sibilant only occurs in word-initial position. The lack of laryngealized sibilants in word-internal position is not the only similarity the sibilants share with stops. The word-internal plain sibilant /s/ behaves like the word-internal plain stops. In stem-internal position, it mostly follows a glottal occlusion, as in [ãʔ.so] 'cassava', or it is preceded by the sound /h/ that occurs in the coda of the preceding syllable as in [nãh̃.so] 'wooly monkey'.[72] The table below presents examples of words containing sibilants:

[71] Laryngealized sibilants, such as /s̰/ in Ecuadorian Siona, are even rarer in the world's languages than laryngealized stops (Ladefoged & Maddieson, 1996, p. 178). The contrast between the plain sibilant /s/ and the laryngealized sibilant/s̰/ is currently not very strong in Ecuadorian Siona. It is possible that the contrast between the plain sibilant /s/ and the laryngealized sibilant /s̰/ will eventually disappear from the language. In the corpus that was gathered for this dissertation, it is often difficult to distinguish the two. In the case of the laryngealized sibilant, the creakiness on the following vowel is often minimal.

[72] There seem to be some words, such as [bõsɨ] 'young person,' in which [s] seems to occur without being preceded by a glottal. A possible analysis of these cases is that the sibilant [s] reflects an exceptional intervocalic realization of the laryngealized sibilant /s̰/. Possible evidence for this analysis is that, as shown below, /s̰/ is realized as [s] when they occur as the second part of a compound.

Table 3.8: Examples of words with the sibilants /s, s̱/ in word-initial position (#_), stem-internal (V(ʔ)_V) and suffix-initial position (V-_V).

| | #_ | VH_V | V-_V |
|---|---|---|---|
| /s/ | [si.wa.je]<br>'to be happy'<br>[soh.to]<br>'clay'<br>[sai.je]<br>'to go' | CVʔsV<br>[ãʔ.so] 'cassava'<br>[weʔ.se] 'outside'<br>[mõʔ.se] 'day'<br><br>CVhsV<br>[nãh.so] 'wooly monkey'<br>[seh.so.je] 'to spear'<br>[sih.so.je] 'to vomit' | -sV<br>[ṯaa.si.ʔi]<br>'I will bring.'<br>[saa.sio]<br>'She will take.'<br><br>H-sV<br>[ṯah.si.ʔi] 'I will come.'<br>[sah.sio] 'She will go.' |
| /s̱ / | [s̱i.wa.ʔo] 'girl'<br>[s̱oa.je] 'to wash'<br>[s̱aʔ.ku] 'step' | | |

When a laryngealized /s̱/ is used in word-internal position in a compound, it is realized as [s]. In this position, the contrast is lost, as illustrated below:

(22) [soh.to.sia.ja]
sohto-zia-ja
clay-river-CLS:RIVER
'Clay River'

The merging of /s/ and /s̱/ in compounds can also explain why there are no stem-internal and suffix-initial laryngealized sibilants: they only occur in word-initial position. In any other position of the word, they would be expected to be pronounced as a plain sibilant.

Both the plain and the laryngealized sibilant are frequently articulated as an affricate [ts] in word-initial position, as shown in the example below:

(23) a. [sai.je] ~ [tsai.je] 'To go'
b. [s̱ia.ja] ~ [ts̱ia.ja] 'River'

There is inter-speaker variation with respect to the use of affricate allophones. Some speakers only use affricates sporadically, while other speakers seem to pronounce every sibilant as an affricate.

3.4.2.2 The affricate /tʃ/

Disregarding the allophonic variants of /s/ and /s̪/, [ts] and [ts̪], Ecuadorian Siona only has one phonemic affricate: /tʃ/. This phoneme does not occur very frequently, but it occurs both word-initially and word-internally. Nevertheless, there are no suffixes that start with this affricate. Although this phoneme does not have a laryngealized counterpart, it does share one feature with the stops, namely, in word-internal position it can be preceded by /h/. In fact, the affricate is preceded by /h/ in all its word-internal occurrences in the corpus. Table 9 shows examples of occurrence of /tʃ/ in the language:

Table 3.9: Examples of words with the affricate /tʃ/ in word-initial position (#_), stem-internal (VH_V) and suffix-initial position (V-_V).

| | #_ | VH_V | V-_V |
|---|---|---|---|
| /tʃ/ | [tʃao.je] 'to finish'<br>[tʃo:.je] 'to laugh' | [ah.tʃa.je] 'to hear / to listen'<br>[k̪ʷah.tʃa.je] 'to think'<br>[k̪oh.tʃo.je] 'to lie' | |

3.4.2.3 The glottal fricative /h/

In addition to the sibilants /s, s̪/ Ecuadorian Siona has a third fricative, namely /h/. I will discuss the occurrence of /h/ in onset position in subsection 3.4.2.3.1. I will address the occurrence of [h] in coda position in subsection 3.4.2.3.2.

3.4.2.3.1 The glottal fricative /h/ in onset position

The phoneme /h/ occurs frequently in any onset position of the word. It is found in word-initial, stem-internal and suffix-initial position. This is illustrated in table 3.10 below:

Table 3.10: Examples of words with the fricative /h/ in word-initial position (#_), stem-internal (V(H)_V) and suffix-initial position (V-_V).

| | #_ | V(H)_V | V-_V |
|---|---|---|---|
| /h/ | [hɨo.je] 'to slash'<br>[hoa.je] 'to cleave'<br>[hai.ɾa] 'lake' | [k̰a.he-je] 'to descend'<br>[nã.hõ] 'catfish'<br>[ɨ.ha] 'foreign'<br><br>[jaʔ.hi.je] 'to ripen'<br>[joʔheo] 'younger sister' | [joʔ.hɨ] 'while they are making'<br>[ka:.hi] 'he says'<br>[mã.ʔã.hã.ʔã] 'over the road' |

The phoneme /h/ in onset position developed most likely due to the debuccalization of the plain stop /p/ (Chacón, to appear; N. E. Waltz & Wheeler, 1972, pp. 129-131) as mentioned above. Gomez-Imbert (2004, p. 58) reports that this same process also occurred in Barasana. According to this author, *p has lost its place of articulation and is now pronounced as a glottal fricative /h/.

#### 3.4.2.3.2 The glottal fricative [h] in coda position

Both the glottal [h] and /ʔ/ can occur in coda positions in Ecuadorian Siona. One of the restrictions for both glottal sounds is that that they cannot occur in word-final position, as mentioned above for /ʔ/. A further restriction is that [h] can only occur in the coda position before a specific set of mostly voiceless consonants [p, t, tʃ, s, k, ɲ]:

(24) a. [ah.pa.si] 'sapote (fruit sp.)'
b. [soh.to] 'clay'
c. [ah.tʃa.je] 'to listen'
d. [nãh.so] 'wooly monkey (monkey sp.)'
e. [p̰ah.ku] 'pomfret, fish sp.'
f. [t̃oh.ɲa] 'boards'

One major question in the analysis of the occurrence of [h] in coda position is whether it is a realization of the phoneme /h/ or whether it is produced by a phonological process. Interestingly, there are indications for both analyses in the language. I will present the indications for [h] being a reflex of a phonological process in 3.4.2.3.2.1 and the indications for it being a realization of the phoneme /h/ in 3.4.2.3.2.2.

3.4.2.3.2.1 Coda [h] as preaspiration

One reason to analyze the coda [h] in Ecuadorian Siona as the reflex of a phonological process is that it mostly occurs under very specific phonological conditions. It generally occurs before a voiceless consonant, as shown in examples (24a-e).[73] This restricted occurence of a glottal fricative in coda position is not uncommon in Tukanoan languages. It has also been observed in Colombian Siona (Wheeler, 1987b) and Ecuadorian Sekoya (Johnson & Levinsohn, 1990) from the Western Tukanoan branch, and in Piratapuyo, Tukano, Desano, Tuyuka, Siriano and Wanano (Stenzel, 2007, p. 355) from the Eastern branch.

The appearance of [h] in coda positions shows similar restrictions in these languages. For instance, the coda [h] only appears in root-internal position before voiceless consonants in Wanano. This suggests that there is a relation between the voiceless consonants and the emergence of the coda [h]. This emergence is a predictable phonological process in the language: all root-internal voiceless consonants are preaspirated in Wanano (Stenzel, 2007, pp. 355-356).

A difference between Wanano and Ecuadorian Siona is that the coda [h] does not only occur root-internally in Ecuadorian Siona, as shown in (24a-e), but also in other word-internal positions. The occurrence of [h] in the coda position in non-root-internal position is phonologically predictable as well. Coda [h] generally occurs on morpheme boundaries when the phonological structure of the word meets the following three requirements. First of all, the second morpheme needs to start with a voiceless stop in order for it to be preceded by a coda [h]. Secondly, [h] only appears in the coda of a monomoraic morpheme when it is used on a morpheme boundary. Thirdly, the second morpheme fills the second mora of a bimoraic prosodic foot. This is shown in the example below:

(25) a. [sah.ko]
sah-ko
go-2/3S.M.PST.N.ASS
'Did you (F) / she go?'

b. [ah.kɨ]
ah-kɨ
COP-CLS:ANIM.M
'The one (M) from'

[73] The examples are presented above in 3.4.2.3.2. The reason why /h/ in example (24f) does not precede a voiceless stop is explained in 3.4.2.3.2.2.

c. [sai.sih.kɨ.bi]
sa-i-sih-kɨ-bi
go-IMPF-CMPL-CLS:ANIM.M-SBJ
'The one (M) who had gone'

The inflected verb *sahko* in (25a), the nominalized verbs *ahkɨ* in (25b) and *saisihkɨbi* in (25c) all show [h] in coda position at a morpheme boundary. In all three cases, the sound appears before a voiceless stop, after a monomoraic syllable and it appears before the syllable that forms the second mora of a bimoraic foot.[74] Because the occurrence of coda [h] can be predicted from the phonological structure of the word, it is possible to analyze the occurrence as a phonological process, namely as preaspiration.[75]

There is a further evidence in the language that coda [h] can be analyzed as preaspiration. This evidence comes from a loanword, which is illustrated in (26):

(26) [moh.toɾ]
'motor'

The source of the loanword [moh.tor] shown in (26) is the Spanish word [mo.'toɾ] 'motor.' The Spanish word does not have a glottal fricative in the coda position. This means that the glottal fricative [h] was inserted when it was borrowed in Ecuadorian Siona. This indicates as well that the occurrence of the glottal fricative [h] in coda positions before a voiceless consonant is the result of a regular phonological process in Ecuadorian Siona as well, just as in other Tukanoan languages.

[74] The verbs *sah* 'to go' in (25a) and *ah* 'to be' (25b) are monomoraic forms, that seem to violate the bimoraic stem constraint. Nevertheless, these verbs form a bimoraic foot in combination with additional morphology: the past tense suffix *-ko* in (25a) and the nominalizer *-kɨ* in (25b). The suffix *-sih* 'completive' in (25c) is a monomoraic bound root. This bound root needs the nominalizer *–kɨ* in order to form a bimoraic foot as well.

[75] The pronominal form [ĩõh.te] 'her' seems to be counterevidence to the claim that the coda /h/ is found before a consonant in the second half of a prosodic foot. It is possible that this form emerged due to the deletion of a velar /g/. However, the reconstruction of this form falls outside of the scope of this dissertation.

3.4.2.3.2.2 Coda [h] as a realization of /h/

However, not all glottal fricatives in coda positions can be attributed to the predictable phonological process of preaspiration of voiceless consonants in Ecuadorian Siona. This can be understood from the occurrence of [h] before [ɲ]. This occurrence is illustrated in examples (27b) and (28b):

| | | | | | |
|---|---|---|---|---|---|
| (27) | a. | [toh.to] | | b. | [toh.ɲã] |
| | | tohto | | | toh-jã |
| | | board | | | board-PL |
| | | ‘board’ | | | ‘boards’ |
| (28) | a. | [hɨ̃h.tɨ] | | b. | [hɨ̃h.ɲã] |
| | | hɨ̃htɨ | | | hɨ̃h-jã |
| | | hand | | | hand-PL |
| | | ‘hand’ | | | ‘hands’ |

The plural forms [toh.ɲã] in (27b) and [hɨ̃h.ɲã] in (28b) show that the coda [h] can occur before the palatal nasal [ɲ]. This does not mean that this palatal nasal can be added to the list of consonants that trigger preaspiration. The consonant does not trigger preaspiration in other contexts, such as root-internally:

| | | |
|---|---|---|
| (29) | a. | [wã.ɲũ.mĩ] ‘anaconda’ |
| | b. | [ɲã.ɲɨ̃] ‘moon’ |

The example in (29) shows that the palatal nasal [ɲ] does not trigger preaspiration in root-internal position. In this sense, the palatal nasal [ɲ] behaves different from the voiceless consonants, because they do show regular preaspiration in root-internal position.

Because the palatal nasal [ɲ] does not trigger preaspiration, it is problematic to analyze the appearance of [h] in examples (27b) and (28b) as the result of a predictable process of preaspiration. This use of the glottal fricative seems to be best analyzed as the use of the phoneme [h] in coda position. This coda [h] is maintained when the disyllabic roots [toh.to] ‘board’ and [hɨ̃h.tɨ] ‘hand’ are reduced to one syllable during the process of pluralization. When these nouns are pluralized, their roots are reduced to [toh] and [hɨ̃h] and the plural suffix [ɲã] is attached to this reduced root. Therefore, the coda [h] precedes the nasal consonant [ɳ], which does not trigger preaspiration in any other

occasion. This is an indication that the coda [h] is best analyzed in these cases as an occurrence of the phoneme /h/.

In summary, there are indications that the [h] in coda position is produced by a phonological process, similarly as in other Tukanoan languages. Its occurrence can be predicted in most cases and it is also inserted in the loanword [moh.tor]. Nevertheless, there is counterevidence against this analysis as well. Before the palatal nasal [ɲ] it is more difficult to predict the occurrence of [h] phonologically. Therefore, it is difficult to decide whether the coda [h] can be analyzed as a case of preaspiration in Ecuadorian Siona. I leave this as an open question in this dissertation.[76]

### 3.4.3 Nasals

Ecuadorian Siona seems to have two phonemic nasal consonants, namely a bilabial nasal /m/ and a dental nasal /n/. The nasals occur in specific contexts: they are followed by nasal vowels.[77] In many Tukanoan languages, the nasals /m, n/ are not considered to be phonemes. For instance, in Eastern Tukanoan languages such as Barasana (Gomez-Imbert, 2004), Kubeo (Chacón, 2012), Tuyuka (Barnes, 1996) and Wanano (Stenzel, 2007, 2013), [m] and [n] are

[76] A third analysis has been proposed for the occurrence of [h] in coda position in Tukanoan languages. Many scholars (Barnes & Malone, 2000; Criswell & Brandrup, 2000; Johnson & Levinsohn, 1990; Ramirez, 1997; N. E. Waltz, 2002; Wheeler, 1987b) have analyzed this phenomenon as the appearance of a voiceless vowel. I do not analyze the consonant [h] as a voiceless vowel, because, as Gomez-Imbert (2011) and Stenzel (2013) have pointed out, this would mean that the roots that show this phenomenon have a trimoraic root. This would violate the bimoraic root structure that exists in many Tukanoan languages. The bimoraic root structure suggests that the [h] does not hold a vowel position, but rather a consonantal position. This consonantal analysis of the occurrence of [h] in coda positions provides a more unified analysis of the Tukanoan languages in general. Tukanoan languages that do not have preaspiration often show a phonetic gemination of the root-internal consonants (Gomez-Imbert, 2011). Gomez-Imbert (2004, 2011) analyses the preaspirated consonants as a reflex of these geminated consonants in which the first part of the geminate has debuccalized. As Stenzel (2013) points out, the advantage of this analysis is that it unifies the explanation for various related phenomena in the Tukanoan languages and the bimoraic root structure that is found throughout the languages is maintained.

[77] The nasal quality of the vowels that follow the nasal consonants is probably due to nasal spread.

nasal allophones of /b/ and /d/. When the voiced labial and coronal stops are part of a nasal syllable, they are realized as nasal stops. There is a complementary distribution between [b] and [m] and [d] and [n] in these languages.

In Ecuadorian Siona, the labial and coronal nasals are not allophonic variants of labial and coronal stops. There is no complementary distribution involved. The plain stops /p, t/ and the laryngealized stops /p̰, t̰/ can occur under the same conditions as the nasals /m, n/; these consonants can all precede nasal vowels, just as the nasals /m, n/. This is shown in table 3.11 below:

Table 3.11: Examples of different types of labial and coronal stops (plain: C, laryngealized: C̰ and nasal: C̃) in nasal syllables

| | CṼ | C̰Ṽ | C̃Ṽ |
|---|---|---|---|
| Labial stops | [põʔ.ka] 'rotten'<br>[pũʔ.pu.je] 'to smoke' | [p̰ãĩ] 'people'<br>[p̰õ.nɨ̃.ɲẽ] 'to turn around' | [mãi] 'we incl.'<br>[mõː.ɲẽ] 'to fish' |
| Coronal stops | [tãĩ.ɲẽ] 'to plant'<br>[tũ.mã.ɲẽ] 'to ascend' | [t̰ãɨ̃.ɲẽ] 'to pull'<br>[t̰ɨ̃ĩ.ɲẽ] 'to stay' | [nã.hõ] 'fish, Sp. paiche'<br>[nɨ̃h.ka.je] 'to stand' |

Table 3.11 shows that the labial and coronal stops and nasals all occur in syllables that contain nasal vowels in Ecuadorian Siona. This suggests that the nasal consonants cannot be analyzed as stops that are nasalized under influence of the nasal vowel that follows them. As shown in the table above, stops are not affected by the following nasal vowels. Therefore, I analyze the nasals /m, n/ as phonemes in Ecuadorian Siona.

The language has another nasal consonant, namely the palatal nasal [ɲ]. This nasal, however, cannot be analyzed as a phoneme. The palatal nasal is an allophonic realization of the palatal approximant /j/. These two consonants are in complementary distribution: [j] is found in oral contexts and [ɲ] in nasal contexts as shown in the examples below:

(30) a. [jaɨ]
ja-ɨ
puma-CLS:M
'male tiger'

b. [p̪aa.je]
ba-je
have-INF
'to have'

c. [ui.jo]
ui-jo
spear-CLS:LONG.THIN.RIGID
'spear'

(31) a. [ɲãɨ̃]
jã-ɨ?
[see-2/3S.M.PST.N.ASS]
'Did he see?'

b. [p̪ãã.ɲẽ]
bã-je
NEG.COP-INF
'to not do'

c. [uiɲõã]
ui-jo-ã
spear-CLS:LONG.THIN.RIGID-PL
'spears'

The examples in (30) show that /j/ is realized as [j] in oral contexts, and the examples in (31) show that it is realized as [ɲ] in nasal contexts. This complementary distribution shows that [j] and [ɲ] are allophones.

### 3.4.4 Approximants

Phonetically, Ecuadorian Siona has two approximants: a labio-dorsal and a palatal glide [w, j]. These approximants occur frequently and can occur in any onset position of the word: word-initially, stem-internally and suffix-initially. This is shown in table 3.12:

Table 3.12: Examples of words with the approximants [w, j] in word-initial position (#_), stem-internal (V(ʔ)_V) and suffix-initial position (V-_V).

| | #_ | V(ʔ)_V | V-_V |
|---|---|---|---|
| [w] | [wa.ʔi] ‘fish/ animal’<br>[wɨ.ʔe] ‘house’<br>[wɨo.je] ‘to begin’ | [si.wa.je] ‘to be happy’<br>[tiʔ.wi] ‘side’<br>[se.wo.je] ‘to answer’ | [si.ʔa.-wa.ʔi] ‘everyone’<br>[hɨo.-wɨ] ‘I / you / we / they slashed’ |
| [j] | [ji.ha] ‘earth’<br>[joʔ.je] ‘to make’<br>[jɨi.ɲɨ̃] ‘kapok, tree sp.’ | [to.ja] ‘pattern’<br>[kãʔ.jo.je] ‘to play’<br>[ho.je.je] ‘to unfold’ | [hɨo.-je] ‘to slash’<br>[hɨo.-jɨ] ‘I / you / we / they slash’ |

The palatal approximant [j] is not only realized as an approximant, but it is also frequently realized as an affricate [dʒ], as shown in the example below:

(32) [jɨi.ɲɨ̃] ~ [dʒɨi.ɲɨ̃]
jɨi-jɨ̃
kapok-CLS:TREE
‘kapok tree’

The realization of the approximant /j/ as an affricate [dʒ] occurs in all positions of the word, except in nasal contexts. The allophones[j] and [dʒ] are generally in free distribution. The palatal approximant [j] has another allophone, as mentioned above. It is realized as [ɲ] in nasal contexts, as shown in example (32).

Phonologically, the analysis of the approximants [w, j] is more challenging. It is not clear whether the approximants [w, j] must be analyzed as phonemes. There are some indications that [w] and [j] are consonantal realizations of the vowels /o/ and /i/. One indication is that the vowels /o/ and /i/ can be reduced to [w] and [j]. The addition of the derivational suffixes *-a* ‘transitive’ and *-o* ‘causative’ causes reduction of the preceding vowel. When the preceding vowels are /o/ and /i/, they become, respectively, the approximants [w] and [j], as illustrated in the examples below:

| | | | | |
|---|---|---|---|---|
| (33) | a. | [t̪e.ʔo.je] | b. | [t̪eʔ.wa.je] |
| | | de'o-je | | de'o-a-je |
| | | be.good-INF | | be.good-TRS-INF |
| | | 'to be good' | | 'to fix (something).' |
| (34) | a. | [k̪o.ʔi.je] | b. | [k̪oʔ.jo.je] |
| | | go'i-je | | go'i-o-je |
| | | return-INF | | return-CAUS-INF |
| | | 'to return' | | 'to make someone return' |

Both the underived roots in (33a) and (34a) and the derived complex stems in (33b) and (34b) have a bimoraic structure. It seems that during the process of derivation the vowel /o/ in (33) and /i/ in (34) were reduced to, [w] and [j] respectively, in order to maintain a bimoraic stem structure.[78] The vowels lose their syllabic position and are then realized as onsets of the second syllable. The vowels no longer carry moraic weight due to this change. This process suggests that the approximants [w, j] can be analyzed as the allophonic realizations of /o, i/ in a non-syllabic position.

There is, however, a possible counterargument for this analysis of the approximants at least in the case of the palatal approximant [j]. This counterargument concerns the allophonic realization [dʒ]. When the vowel /i/ comes to fill the onset position of a syllable, it behaves in some cases just as a regular [j], namely, the [j] is mostly pronounced as [dʒ]. This is illustrated in the example below for [k̪oʔ.jo.je] 'to make someone or something return':

(35) [k̪oʔ.jo.je] ~ [k̪oʔ.dʒo.dʒe]
go'i-o-je
return-CAUS-INF
'to make someone or something return.'

The onset /i/ phonetically represented as [j] in [k̪oʔ.jo.je] can be realized as [dʒ], as shown in (35). This is not possible for all occurrences of /i/ that fill an onset position due to a morphological process. An example is provided below:

[78] It seems that /u/ can undergo a similar process, where it can also reduce in order to maintain a bimoraic structure as will be explained in section 3.5.1. There are no cases that /e/ reduces to [j]. This may be accidental.

(36) [sa.jo.nã] ~ *[sa.dʒo.nã]
sa-i-o-na
go-IMPF-S.F.PRS-DS
'While she went…'

The dependent verb form [sa.jo.nã] in example (36) illustrates that not every /i/ that is realized in an onset position due to a morphological process can be pronounced as [dʒ].

Therefore, there seems to be a difference between /i/ pronounced in onset position and the approximant /j/. This could be an argument to analyze /j/ as a phoneme in Ecuadorian Siona. The behavior of /i/ as an approximant in [k̟oʔ.jo.je] does not need to be a counterargument against this analysis.[79] It seems that the form has lexicalized and that this causative derivation is no longer a productive process.[80] The formation of dependent verbs is very productive in the language and the glide [j] is recognized as an underlying /i/. There are no indications that the labio-velar approximant [w] has to be analyzed as a phoneme in the language, as there are for the palatal approximant.

### *3.5 Vowels*

The Ecuadorian Siona vocalic phoneme inventory consists of twelve vowels: six oral vowels /i, ɨ, u, e, o, a/ and six nasal counterparts /ĩ, ɨ̃, ũ, ẽ, õ, ã/. The examples below present (near) minimal pairs for the oral vowels:

[79] It is possible that the /j/ developed out of various sources: an /i/ in onset position in some cases and a consonant in other cases. One indication for the latter source is that some cognates of the Ecuadorian Siona word with a palatal approximants /j/ have a different consonant in other Tukanoan languages. For instance, intervocalic /j/ in Siona is /s/ or /h/ in various Eastern Tukanoan languages (Chacón, to appear).

[80] Another indication that this derivation is no longer productive is that the suffix cannot be applied to every verb root. It seems to be restricted to a lexicalized set of verbs. Furthermore, some of these derivations have unpredictable meanings. For instance, *sa-o-je* 'go-CAUS-INF' does not mean 'to make someone go,' but 'to send away.'

/a/ vs. /e/

| | | | | |
|---|---|---|---|---|
| (37) | a. | [jeʔ.ja.hi] | b. | [jeʔ.je.hi] |
| | | je'je-a-hi | | je'je-hi |
| | | teach-TRS-3S.M.PRS.ASS | | learn-3S.M.PRS.ASS |
| | | 'He is teaching.' | | 'He is learning.' |

/a/ vs. /i/

| | | | | |
|---|---|---|---|---|
| (38) | a. | [ku.ɾi][81] | b. | [ku.ɾa] |
| | | kudi | | kuda |
| | | 'money' | | 'chicken' |

/a/ vs. /ɨ/

| | | | | |
|---|---|---|---|---|
| (39) | a. | [wao.nĩ] | b. | [wɨo.nĩ] |
| | | wa-o-ni | | wɨ-o-ni |
| | | child.in.law-CLS:F-OBJ | | get.up-CAUS-SS |
| | | 'the daughter in law' | | 'after beginning' |

/a/ vs. /u/

| | | | | |
|---|---|---|---|---|
| (40) | a. | [t̪uh.ta.jɨ] | b. | [t̪uh.tu.jɨ] |
| | | duhta-jɨ | | duhtu-jɨ |
| | | pull.out-OTH.PRS.ASS | | fall.in.water.PL-OTH.PRS.ASS |
| | | 'They are pulling (it) out.' | | 'They are falling into the water.' |

/a/ vs. /o/

| | | | | |
|---|---|---|---|---|
| (41) | a. | [eh.ta.hi] | b. | [eh.to.hi] |
| | | ehta-hi | | ehto-hi |
| | | go.out-3S.M.PRS.ASS | | take.out-3S.M.PRS.ASS |
| | | 'He is going out.' | | 'He is taking (it) out.' |

/e/ vs. /i/

| | | | | |
|---|---|---|---|---|
| (42) | a. | [nẽẽ.se.ʔe] | b. | [nẽẽ.si.ʔi] |
| | | ne-seʔe | | ne-si-ʔi |
| | | do-NLZ.PST | | do-FUT-OTH.ASS |
| | | 'The thing that happened.' | | 'I will do (it).' |

[81] This is probably a Quechua loanword from the word for gold, which is *kuri* in Ecuadorian Kichwa and *qori* in Peruvian varieties of the language.

/e/ vs. /ɨ/

| | | | | |
|---|---|---|---|---|
| (43) | a. | [sai.je] | b. | [sai.jɨ] |
| | | sa-i-je | | sa-i-jɨ |
| | | go-IMPF-INF | | go-IMPF-OTH.PRS.ASS |
| | | ‘To go.’ | | ‘I am going.’ |

/e/ vs. /u/

| | | | | |
|---|---|---|---|---|
| (44) | a. | [ʈuʔ.te.wɨ] | b. | [ʈuh.tu.wɨ] |
| | | du’te-wɨ | | duhtu-wɨ |
| | | pull.out.PL.ACT-OTH.PST.ASS | | fall.in.water.PL-OTH.PST.ASS |
| | | ‘They pulled (them) out.’ | | ‘They fell into the water.’ |

/e/ vs. /o/

| | | | | |
|---|---|---|---|---|
| (45) | a. | [jeh.ke] | b. | [jeh.ko] |
| | | jehk-e | | jehk-o |
| | | other-CLS:GEN | | other-CLS:F |
| | | ‘Other things’ | | ‘Another woman’ |

/i/ vs. /ɨ/

| | | | | |
|---|---|---|---|---|
| (46) | a. | [sai.hi] | b. | [sai.hɨ] |
| | | sa-i-hi | | sa-i-hɨ |
| | | go-IMPF-3S.M.PRS.ASS | | go-IMPF-PL.PRS.DEP |
| | | ‘He is going.’ | | ‘While they are going.’ |

/i/ vs. /u/

| | | | | |
|---|---|---|---|---|
| (47) | a. | [siʔ.si.ɾe] | b. | [suh.si.ɾe] |
| | | si’si-de | | suhsi-de |
| | | gather-OTH.PST.N.ASS | | nettle-OBJ |
| | | ‘Did they gather?’ | | ‘The nettle’ |

/i/ vs. /o/

| | | | | |
|---|---|---|---|---|
| (48) | a. | [sai.hi] | b. | [sao.hi] |
| | | sa-i-hi | | sa-o-hi |
| | | go-IMPF-3S.M.PRS.ASS | | go-CAUS-3S.M.PRS.ASS |
| | | ‘He is going.’ | | ‘He is sending (it) off.’ |

/ɨ/ vs. /u/

| | | | | |
|---|---|---|---|---|
| (49) | a. | [hɨa.je] | b. | [hua.je] |
| | | hɨa-je | | hua-je |
| | | be.hard-INF | | put.inside-INF |
| | | ‘Hard’ | | ‘To put (it) inside’ |

/ɨ/ vs. /o/

| | | | | |
|---|---|---|---|---|
| (50) | a. | [hɨa.je] | b. | [hoa.je] |
| | | hɨa-je | | hoa-je |
| | | be.hard-INF | | cleave-INF |
| | | ‘Hard’ | | ‘To cleave’ |

/u/ vs. /o/

| | | | | |
|---|---|---|---|---|
| (51) | a. | [hua.hi] | b. | [hoa.hi] |
| | | hua-hi | | hoa-hi |
| | | put.inside-3S.M.PRS.ASS | | cleave-3S.M.PRS.ASS |
| | | ‘He is putting (it) inside.’ | | ‘He is cleaving (it).’ |

The Ecuadorian Siona vocalic phoneme inventory is twice the size of the inventories of many Eastern Tukanoan languages (see Barnes, 1996, p. for Tuyuka; see Chacón, 2012, p. for Kubeo; see Gomez-Imbert, 2004, p. for Barasana and Tatuyo; see Stenzel, 2007, p. for Wanano). This difference is due to the lack of nasal vowels in the Eastern Tukanoan inventories. Although these languages do employ nasal vowels, they are not considered to be phonemes. Nasality is a feature that can spread to the following syllables and is often viewed as a feature that is assigned to the entire word (Barnes, 1996; Gomez-Imbert, 2004; Stenzel, 2007). Although Ecuadorian Siona displays this type of nasal harmony, there are syllables that consist of an oral consonant and a nasal vowel. Accordingly, the nasality cannot be considered a quality of the entire syllable, but only of the vowel in these cases.

There are some phonotactic restrictions concerning the occurrence of vowels. These restrictions do not depend on the position of the vowel in the word, as in the case of the consonants. Phonotactic restrictions of vowels depend on their occurrence with other vowels. Most of the vowels can be used in combination with other vowels; they can form diphthongs. However, the vowels can undergo various phonological processes when they come in contact with other vowels. In order to understand the morphological verb forms that are under discussion in this dissertation, it is useful to briefly discuss these processes. Subsection 3.5.1 is devoted to coalescence, subsection 3.5.2 to vowel assimilation and vowel harmony, subsection 3.5.3 to the reduction of vowels and subsection 3.5.4 to the dissimilation of vowels.

3.5.1 Coalescence

The first phonological processes that some Ecuadorian Siona vowels undergo is coalescence. There are various types of coalescence in the language with restrictions specific to each type.

The first type of coalescence is not restricted to any type of vowel. This process consists of merging two equal vowels into a single short vowel. This process occurs when a suffix that consists of a single vowel is attached to a morpheme that ends in the same vowel. The process is represented schematically in the example below:

(52) $CVCV_i + -V_i \rightarrow CVCV_i$

The schema in (52) represents the merging of two identical vowels. There are various suffixes that consist of a single vowel, such as the suffix /-a/ that is part of a negation construction, and the suffixes /-ɨ/ and [-o] which have various functions in nominal and verbal morphology marking amongst other features, masculine and feminine gender, respectively.

(53) a. [ɲãã p̪ah.ko]
jãã-a bah-ko?
see-NEG be-2/3S.F.PST.N.ASS
'Didn't you (F)/ she see?'

b. [p̪õ.nɨ̃]
bõnɨ-ɨ?
turn.around-2/3S.M.PST.N.ASS
'Did you / he turn around?'

c. [kʷaʔ.ko]
kʷa'ko-o?
cook-2/3S.F.PST.N.ASS
'Did you (F)/ she cook?'

When the suffixes that consist of a vowel are attached to morphemes that end in an identical vowel, there is no lengthening of the final vowel. These suffixes only emerge in the surface structure when the preceding morpheme ends in a different vowel:

(54) a. [wɨʔ.wɨa p̪ah.ko]
wɨ'wɨ-a bah-ko?
run-NEG be-2/3S.F.PST.N.ASS
'Didn't you (F)/ she run?"

b. [kah.kaɨ]
kahka-ɨ?
enter-2/3S.M.PST.N.ASS
'Did you (M)/ he enter?'

c. [kah.kao]
kahka-o?
enter-2/3S.F.PST.N.ASS
'Did you (F )/ she enter?'

The examples in (54) show that the suffix *-a* 'negation' and the suffixes *-ɨ* and *-o* with various functions appear in the surface structure on the condition that the vowel in the stem and in the suffix are not identical. This is in contrast with the examples in (53) in which the one vowel suffixes are attached to stems that end in the same vowel. In the case of identical vowels, as shown above, the vowels merge into one short vowel.

The second type of coalescence is restricted to the vowel /i/. The vowel coalesces with preceding vowels that are [+front, -low, -high], that is, with /e/. Coalescence of /e/ and /i/ occurs when the imperfective suffix *-i* is added to a monomoraic root that ends in the vowel /e, ẽ/. The two vowels are realized as a long vowel [e:]. This is illustrated in the example (55) below:

(55) a. [wee.ko]
we-i-ko.
lie.in.hammock-IMPF-3S.F.ASS
'She is lying in a hammock.'

b. [hẽẽ.ko]
hẽ-i-ko.
cross-IMPF-3S.F.ASS
'She is crossing (it).'

Example (55) shows that /i/ coalesces with the vowels /e, ẽ/. When /i/ follows other vowels this process does not occur, as illustrated in (56):

(56) a. [ʈai.ko]
da-i-ko.
come-IMPF-3S.F.ASS
'She is coming.'

b. [wɨi.ko]
wɨ-i-ko.
get.up-IMPF-3S.F.ASS
'She is getting up.'

c. [tʃoi.ko]
cho-i-ko.
call-IMPF-3S.F.ASS
'She is calling.'

d. [tui.ko]
tu-i-ko
be.on.top-IMPF-3S.F.ASS
'She is (sitting) on top of something.'

The monomoraic verbs in (55) and (56) form bimoraic stems in combination with the imperfective suffix *-i*. This suffix is not visible in the surface structure when it follows the vowels /e, ẽ/. The suffix *-i* is visible when it follows any other vowel. It follows from the morphosyntactic behaviour of the verbs [wee.je] 'to lie in a hammock' and [hẽẽ.ɲẽ] 'to cross,' that the suffix is present in these cases. They behave identically to the other monomoraic verbs.

The third type of coalescence concerns the vowel /ɨ/.This vowel is more susceptible to changes than the vowel /i/. The vowel/ɨ/ coalesces with the other high vowels /i, u/. This is illustrated in the examples below:

(57) a. [k̰o.ʔi]
go'i-ɨ?
return-2/3S.M.PST.N.ASS
'Did you (M)/he return?'

b. [pũʔ.pu]
pũ'pu-ɨ?
smoke-2/3S.M.PST.N.ASS
'Did you (M)/he smoke?'

Example (57a) shows that /ɨ/ coalesces with /i/ when it is attached to this vowel. The fused vowel is realized as /i/. Example (57b) shows that /ɨ/ coalesces with /u/ when it is attached to this vowel. The fused vowel is realized as /u/.

### 3.5.2 Partial vowel assimilation & vowel harmony

The vowel /ɨ/ can undergo further phonological changes. It assimilates to the preceding vowel under specific circumstances. First of all, /ɨ/ assimilates when it follows the mid vowels /e, o/. This is illustrated in the examples below:

(58) a. [oh.tei]
ohte-ɨ?
sow-2/3S.M.PST.N.ASS
'Did you (M)/he sow?'

b. [hɨou]
hɨo-ɨ?
slash-2/3S.M.PST.N.ASS
'Did you (M)/he slash?'

Example (58a) shows that the vowel /ɨ/ is realized as a high front vowel [i] when it follows the mid front vowel /e/. When it follows the mid rounded vowel /o/, as shown in (58b), it is realized as the high rounded [u].[82]

The vowel /ɨ/ can also assimilate to the mid front vowel /e/ when it is not directly preceded by this vowel. The two vowels can be separated by a glottal stop. This process of vowel harmony is illustrated below:

(59) [te.ʔi]
te'-ɨ
one-CLS:ANIM.M
'one man'

Example (59) illustrates that despite the presence of the glottal stop the dorsal vowel /ɨ/ is assimilated to the front vowel /e/ and realized as [i].

This process of vowel harmony does not only occur when /ɨ/ follows the mid vowel /e/, but also when it follows the high vowel /i/:

(60) [kɨa.si.ʔi]
kɨa-si-ʔɨ
tell-FUT-OTH.ASS
'I am going to tell.'

[82] These final vowel [i] and [u] are often reduced to glides: [j] and [w], respectively. The language does not seem to tolerate triphtongs.

It is illustrated in example (60) that the high dorsal vowel /ɨ/ is assimilated to the high front vowel /i/ and realized as a high front vowel [i] as well. This process of vowel harmony has not yet been observed for the rounded dorsal vowels.

### 3.5.3 Vowel reduction

A third process that affects the vowels in Ecuadorian Siona is vowel reduction. The language displays two types of reduction:

1. The deletion or reduction of a vowel in a disyllabic root when a derivational suffix is added.
2. The deletion of a vowel after a glottal stop

The first type of reduction takes place during the derivation of transitive or causative disyllabic verb stems. When the derivational suffixes *-a* 'transitive' or *-o* 'causative' are applied to a disyllabic root that has a bimoraic structure and that ends in /ɨ, ɨ̃, e, ẽ, a, ã/, the final vowel is deleted and the derivational suffix takes its place. As a result of this process the bimoraic structure of the stem is maintained. This process is illustrated by the examples presented below:

| | | | | |
|---|---|---|---|---|
| (61) | a. | [jeʔ.je.je]<br>je'je-je<br>learn-INF<br>'to learn' | b. | [jeʔ.ja.je]<br>je'je-a-je<br>learn-TRS-INF<br>'to teach' |
| (62) | a. | [kʷẽ.nẽ.ɲẽ]<br>kʷẽne-je<br>dry.oneself-INF<br>'to dry oneself' | b. | [kʷẽ.nã.ɲẽ]<br>kʷẽne-a-je<br>dry.oneself-TRS-INF<br>'to dry (something).' |
| (63) | a. | [eh.ta.je]<br>ehta-je<br>go.out-INF<br>'to go out' | b. | [eh.to.je]<br>ehta-o-je<br>go.out-CAUS-INF<br>'to take (someone/thing) out.' |

| | | | | |
|---|---|---|---|---|
| (64) | a. | [hɨ.jɨ.je] | b. | [hɨ.jo.je] |
| | | hɨjɨ-je | | hɨjɨ-o-je |
| | | break-INF | | break-CAUS-INF |
| | | 'to break' | | 'to break (something)' |

Some vowels undergo a different process in order to maintain the bimoraic structure when a transitive or causative stem is derived from a disyllabic root. When a $C_1VC_2V$ root holds the consonant /k/ in $C_2$ position and the root ends in one of the vowels /u, o/, the final vowel loses its syllabic value. When the dorsal stop /k/ is followed by the vowels /u/ and probably /o/, the vowel is realized as a secondary articulation of the stop. This is realized as a labial dorsal consonant /k$^w$/, as illustrated as (65):

| | | | | |
|---|---|---|---|---|
| (65) | a. | [ũh.ku.je] | b. | [õh.k$^w$a.je][83] |
| | | ũhku-je | | ũhku-a-je |
| | | drink-INF | | drink-TRS-INF |
| | | 'to drink' | | 'to give someone something to drink' |

In example (65b), the combination of /kua/ is realized as [k$^w$a] in the (di)transitivized verb [õh.k$^w$a.je] 'to give someone something to drink.' The stem [õh.k$^w$a] maintains its bimoraic structure this way, similarly to the examples of vowel deletion shown in the example (61-64).

This type of vowel reduction does not only occur within the stem. It also occurs when the bound copula *-a* is attached to the suffix *-ko* that has various functions. This is illustrated in the examples below:

(66) [saak$^w$ao]
sa-a-ko-a-o
go-TRS-NLZ.F-COP-3S.F.ASS
'She is the one who takes.'

The sequence /koao/ is reduced to [k$^w$ao] in example (66). This reduction process is highly regular in the language.

Another example of vowel reduction was already presented in section 3.4.4 and it occurs after a glottal stop. In $C_1V.C_2V$ stems with a

[83] There are no clear indications that the lowering of the vowel /ũ/ to /õ/ in this example is a productive process in Ecuadorian Siona. This process occurs on some occasions and needs to be further studied in order to determine a possible phonological rule.

glottal stop /ʔ/ in $C_2$ position followed by the vowels /i/ or /o/.[84] The examples are repeated below:

| | | | | |
|---|---|---|---|---|
| (67) | a. | [t̪e.ʔo.je] | b. | [t̪eʔ.wa.je] |
| | | de.'o-je | | de.'o-a-je |
| | | be.good-INF | | be.good-TRS-INF |
| | | 'to be good' | | 'to fix (something).' |
| (68) | a. | [k̪o.ʔi.je] | b. | [k̪oʔ.jo.je] |
| | | go'i-je | | go'i-o-je |
| | | return-INF | | return-CAUS-INF |
| | | 'to return' | | 'to make someone return' |

Examples (67b) and (68b) show that the vowels /u, i/ are realized as approximants as a consequence of the derivation process. The vowel /o/ is pronounced as a labio-velar approximant /w/ and the vowel /i/ as a coronal approximant /j/. Due to this change, the syllable structure of the new formed stem is different from the syllable structure of the root. The structure $C_1V.ʔV$ is changed into CVʔ.CV. The suffixation of the transitive and causative jeopardizes the bimoraic stem structure. However, thanks to the processes of vowel reduction described above, the bimoraic stem constraint is also satisfied in these contexts.

A second process of vowel reduction occurs in stems and suffixes that have a vowel that follows a glottal stop. This vowel is deleted under specific conditions. The deletion is shown in (69):

(69) $CV_i.ʔV_i$ + -CV → CVʔ.CV

In (69) it is shown that a vowel that follows a glottal stop is deleted when it is identical to the previous vowel and followed by a suffix. When both these constraints are satisfied, the vowel is deleted and the syllable structure is different from the underlying structure. The glottal stop is no longer in the onset position, but it appears in the coda position. Examples of this rule are illustrated in (70):

[84] It is not clear whether this choice of vowels is structural or accidental. It is possible that the process includes all vowels with the feature [-low], but there are no examples with the vowels /ɨ, u, e/ to back up this analysis. More data is needed in order to shed light on this phonological rule.

(70) a. [mãʔ.ɲã]
ma'a-jã
path-PL
'paths'
b. [pa̰.ʔi.seʔ.-ɾe]
ba'i-se'e-de
be-NLZ.PST-OBJ
'the history'
c. [jɨʔ.βi]
jɨ'ɨ-bi
1S-SBJ
'I'

Three examples are provided in (70) that show the deletion of a vowel that follows a glottal stop. The vowel that is deleted in (70a) is the second vowel /a/ in *maʔa* 'path,' in (70b) the vowel /e/ in the suffix *-seʔe* 'past nominalizer' and in (70c) the vowel /ɨ/ in the pronoun *jɨʔɨ* 'I.'

The different types of vowel reduction presented in this subsection are probably caused by prosodic constraints in Ecuadorian Siona. A constraint that instigates one of these processes is bimoraic constraint of the stem. The first type of reduction, the deletion or reduction of second vowel of the root when the causative suffix *-o* or the transitive suffix *-a* are attached to it, is motivated by this constraint. The second type of deletion, which occurs after a glottal stop, may be caused by prosodic constraints as well.

### 3.5.4 Dissimilation

A final phonological process that affects Ecuadorian Siona vowels is dissimilation. This process occurs when a monosyllabic root that ends in the vowel /u/ obtains the causative derivational suffix *–o*. In this context, the vowel /u/ loses its rounding and is pronounced as [ɨ]. It is possible to recognize the dissimilation of /u/ in contact with /o/, because in other contexts it is pronounced as [u].

(71) a. [tui.je]
tu-i-je
sit.on.top-IMPF-INF
'To sit on top (of something).'

b. [tua.je]
tu-a-je
sit.on.top-TRS-INF
'To sit down on top (of something).'

c. [tɨo.je]
tu-o-je
sit.on.top-CAUS-INF
'To put down on top (of something).'

(72) a. [uu.je]
u-je
burn-INF
'To burn.'

b. [ɨo.je]
u-o-je
burn-CAUS-INF
'to burn something.'

(73) a. [ʈui.je]
du-i-je
fall.in.water-IMPF-INF
'To fall in the water.'

b. [ʈɨo.je]
du-o-je
fall.in.water-CAUS-INF
'To make someone/something fall into the water.'

Examples (71a-b), (72a) and (73a) are illustrations of the roots *tu* 'to sit on top of something,' *uu* 'to be hot' and *ʈu* 'to fall into the water,' respectively, when they are not followed by the causative suffix *-o*. In (71c), (72b) and (73b) the causative morpheme is suffixed to the roots ending in /u/. In these examples, the vowel /u/ dissimilates: the cluster /uo/ is pronounced as [ɨo].

However, this dissimilation process is not generalized to all /uo/ sequences. It only occurs with the derivational suffix *-o* that marks the stem as a causative verb. The process does not occur with the inflectional suffix *-o* that has the function of marking various types of feminine subjects:[85]

[85] For further information on functions of the inflectional suffix *-o* see chapter 5.

(74) [pũʔ.puo]
pũ’pu-o
smoke-3S.F.PST.ASS
‘She smoked.’

In example (74), the /uo/ cluster is realized as such. The main difference between the causative suffix illustrated in (71c), (72b) and (73b) and the subject agreement suffix illustrated in (74) is that the causative is part of the stem and the subject agreement suffix is not. The dissimilation process only seems to take place stem-internally.

*3.6 Nasal harmony*

The nasal consonants and vowels in Ecuadorian Siona are analyzed as phonemes here. Minimal pairs of oral and nasal consonants were presented in table 3.11 above. An example of a minimal pair of oral and nasal vowels is:

| | | | | | |
|---|---|---|---|---|---|
| (75) | a. | [p̪aa.βi] | vs. | b. | [p̪ãã.βi] |
| | | ba-a-bi. | | | bã-bi. |
| | | be-TRS-3S.M.PST.ASS | | | NEG.COP-3S.M.PST.ASS |
| | | ‘He had.’ | | | ‘He did not do. |

Example (75a) contains the item with the oral vowel and (75b) with the nasal vowel.

The nasal phonemes can trigger nasal harmony. Nasal harmony is a typologically common process, but languages differ as to its application, with respect to three factors. The first variable is the direction in which the process applies; nasal harmony can be regressive (towards the beginning of a word) or progressive (towards the end of a word). The second variable is the domain in which the process applies. It can apply within a syllable, within a word, within a phrase etc. The third variable concerns the behavior of the segments. The different segments can either trigger, block nasal harmony, they can be a target or be transparent to this process (Jurgec, 2011; Walker, 2000).

Ecuadorian Siona, similarly to other Tukanoan languages (Chacón, 2012; Gomez-Imbert, 2004; Kaye, 1971; Stenzel, 2007, pp. 340-345), exhibits nasal harmony.[86] This process is bidirectional in the

[86] However the variables with respect to this process are different for the other Tukanoan languages.

language: it shows both regressive and progressive harmony. The occurrence of regressive nasal harmony is illustrated in the examples below:

| | | | | |
|---|---|---|---|---|
| (76) | a. | [toa.βo]<br>toa-bo<br>fire-CLS:ENCLOSED.AREA<br>'fireplace' | b. | [toa.βõã]<br>toa-bo-ã<br>fire-CLS:ENCLOSED.AREA-PL<br>'fireplaces' |
| (77) | a. | [t̪oʔ.ɾo.wɨ]<br>do'do-wɨ<br>basket-CLS:CONTAIN<br>'basket' | b. | [t̪oʔ.ɾo.w̃ɨ̃ã]<br>do'do-wɨ-ã<br>basket-CLS:CONTAIN-PL<br>'baskets' |
| (78) | a. | [ui.jo]<br>ui-jo<br>spear-CLS:LONG.THIN<br>'spear' | b. | [ui.ɲõã]<br>ui-jo-ã<br>spear-CLS:LONG.THIN-PL<br>'spears' |

It is shown in examples (76-78) that the plural suffix *-ã̃* causes the other preceding segments in the syllable to nasalize. Regressive vowel harmony only applies within a syllable. It can be observed in the examples above that only the preceding segments within the syllable to with the plural suffix *-ã̃* are nasalized. For instance, only the segments /j/ and /o/ are nasalized in example (78b), because these segments form one syllable with the suffixed /ã/. The segments /u/ and /i/ from the preceding syllable in (78b) do not become nasal. The examples above show that the domain of regressive nasal harmony in Ecuadorian Siona is restricted to the segments within the syllable to which the nasal segment is attached.

Progressive nasal harmony applies within a less restricted domain, namely, nasality can spread to the rest of the prosodic word. This is illustrated in the examples below:

| | | |
|---|---|---|
| (79) | a. | [kaa.jɨ]<br>ka-jɨ<br>say-OTH.PRS.ASS<br>'I, you, we, you (PL), they say.' |

b. [ɲãã.ɲɨ̃]
jã-jɨ
see-OTH.PRS.ASS
'I, you, we, you (PL), they see.'

c. [p̪ãã.ɲɨ̃]
bã-jɨ.
NEG.AUX-OTH.PRS.ASS
'I, you, we, you (PL), they don't.'

d. [ĩõ.w̃ã.ʔĩ]
ĩ-o-wa'i
DEM.PRX-CLS:ANIM.F-PL
'they'

Example (79a) shows that when the verbal suffix *-jɨ* follows an oral vowel, the segments in the suffix are oral. Example (79b-c) show that the sequence /jɨ/ is realized as the nasal sequence [ɲɨ̃] when it follows a nasal vowel. It is shown in example (79d) that the nasality can spread even further than the following syllable. In this example, nasality spreads within the same syllable to the vowel /o/, to the next syllable to the sequence /wa/ and to the last syllable to the final syllable /ʔi/. This suggests that the domain within which progressive nasal harmony applies is broader than in the case of regressive nasal harmony; the former process applies to the entire prosodic word.[87]

Regressive and progressive nasal harmony do not seem to differ with respect to the behavior of the segments. The segments that seem to trigger nasal harmony are the nasals /n, m, ĩ, ɨ̃, ũ, ẽ, õ, ã/. The segments that clearly block nasal harmony are most of the stops and the fricatives /t, k, kʷ, p̪, t̪, s/. These consonants do not become nasal when they occur in a nasal environment and they block the spreading of nasality to adjacent segments. This is illustrated in the examples below:

(80) a. [ɲãã.to]
jã-to
see-CLS:PLACE
'when (someone) sees'

b. [ɲãã.ko]
jã-ko
see-3S.F.PRS.ASS
'she sees'

[87] It may even apply to the whole word, but more research on nasal harmony in Ecuadorian Siona is needed to determine this.

c. [ɲãã.kʷa.ʔi]
jã-ko-wa'i
see-CLS:ANIM.F-PL
'the ones that see'

d. [ɲãã.βi]
jã-bi
see-3S.M.PST.ASS
'he saw'

e. [ɲãã.ɾe]
jã-de
see-OTH.PST.N.ASS
'did I / we / you (PL) / they see?'

f. [ɲãã.si.ʔi]
jã-si-'ɨ
see-FUT-OTH.ASS
'I / you / we / you (PL) / they will see'

The examples in (80a-f) show that nasality does not spread to segments that follow the consonants /t, k, p̰, t̰, s/. Therefore, these consonants are analyzed as blockers of nasal harmony. In the case of the other stops /p, k̰, k̰ʷ/, the affricate /tʃ/ and the laryngealized sibilant /s̰/, it is unclear whether they are blockers. They do not become nasal in nasal environments, but since they do not occur in suffixes, it is impossible to determine whether they block nasal harmony.

The third type of segments are the targets. The segments that are targeted by nasal harmony are the vowels /i, ɨ, u e, o, a/, the approximants /w, j/ and the glottal /h, ʔ/. The vowels are always nasal when they occur in a nasal environment. The approximants show a similar behavior, as shown in the examples below:

(81) a. [nẽẽ.w̃ɨ̃]
ne-wɨ
do-OTH.PST.ASS
'I / you / we / you (PL) / they did.'

b. [nẽẽ.ɲẽ]
ne-je
do-OTH.PRS.N.ASS
'Do I / we / you (PL) / they do?'

Examples (81a-b) show that both /w/ and / j/ become nasal when they follow a nasal vowel. Therefore, the approximants can be considered targets of nasal harmony.

It is more difficult to perceive whether the glottal sounds /h, ʔ/ are targets of nasal harmony. The fricative /h/ seems to become nasal however only in nasal environments. This is illustrated in the examples below:

(82) a. [kaa.hi]
ka-hi
say-3S.M.PRS.ASS
'he says'

b. [nẽẽ.hĩ]
ne-hi
do-3S.M.PRS.ASS
'he does'

(83) a. [p̪ah.kɨ]
bah-kɨ?
be-2/3S.M.PST.N.ASS
'were you (M) / was he?'

b. [ãh̃.kɨ]
ãh-kɨ?
eat-2/3S.M.PST.N.ASS
'did you (M) / he eat?'

Example (82b) illustrates that /h/ is realized as [h̃] in an onset position when it occurs after a nasal vowel. Example (83b) shows that /h/ becomes nasal as well when it occurs after a nasal vowel. Since /h/ seems to become nasal in both onset and in coda position, I consider this sound a target of nasal harmony.[88]

It is almost impossible to perceive whether the glottal /ʔ/ becomes nasal in a nasal environment. One can, however, perceive that the following segments become nasal, as illustrated in the example below:

[88] I perceive /h/ as nasal in examples (82b) and (83b), however, this needs to be studied in more detail.

(84) [sai.hãʔ.ɲẽ]
sa-i-hã'-je
go-IMPF-PRP-INF
'for the purpose of going'

Example (84) shows that /ʔ/ does not block nasal harmony. Since the sequence /je/ is realized as [ɲẽ], it is clear that /ʔ/ does not prevent nasality from spreading to the next syllable.[89] Since the glottal sounds /h, ʔ/ do not block nasal harmony and /h/ seems to become nasal in a nasal environment, these two sounds are considered to be targets of nasal harmony.[90] The table below summarizes the behavior of the consonants with respect to nasal harmony.

Table 3.13: The behavior of the segments with respect to nasal harmony

| Behavior of segment | Segment |
|---|---|
| Triggers | n, m, ĩ, ɨ̃, ũ, ẽ, õ, ã |
| Blockers | (p), t, k, kʷ, p̰, t̰, (k̰, k̰ʷ, tʃ,) s, (s̰) |
| Targets | (h, ʔ,) w, j, i, ɨ, u e, o, a |
| Transparent segments | - |

*3.7 Practical orthographies*

So far I have provided an overview of the main properties of the Ecuadorian Siona phonological system. Now I will clarify the practical orthographies that I use in the other chapters of this dissertation. Regarding the fact that there exists an orthography for Ecuadorian Siona, I will use this orthography in the examples. This orthography was developed by the missionaries Orville and Maria Johnson of the Summer Institute of Linguistics. The missionary couple taught this orthography to the Ecuadorian Siona people, who still use it today.

In addition, I use an adapted orthography that is closer to the International Phonetic Alphabet and that shows some features that are

[89] There is one case in which /ʔ/ seems to block the spread of nasality. The phoneme /j/ in the verb [k̰ãʔ.jo] 'play' is not nasalized, although it follows a nasal vowel and a glottal stop. The difference between the glottal stop in [k̰ãʔ.jo] and the one in [saihãʔɲẽ] is that it occurs root-internally in the former and on a morpheme boundary in the latter. It is possible that this difference is related to the difference in behavior of a morpheme-internal glottal stop and a glottal stp at morpheme boundaries.

[90] /ʔ/ does not become nasal, because, as Piggott (1992, p. 39) argues, a nasalized glottal stop is "an impossible phonetic entity."

relevant in this dissertation, such as /h/ in coda position. The Siona orthography is adopted in the first line of the example and the adapted orthography in the second line. The layout of an example is illustrated in (85):

(85) sani ñu'iona wẹquë gajereña.
sa-ni jũ-'i-o-na wẽhkɨ
go-SS sit-IMP-S.F.PRS-DS tapir
gahe-de-jã.
go.down-OTH.PST.N.ASS-REP
'She went away and sat down and then the tapirs came down.' (20110328slicr001.007).

The Ecuadorian Siona orthography is based on the Spanish orthography. The Ecuadorian Siona phonemes are as far as possible represented as their (nearest) match in Spanish. This means that the phoneme /k/ is represented as <c> before the vowels /a, o, u/ and as <qu> before the vowels /i, ɨ, e/. The affricate /tʃ/ is represented as <ch>, the fricative /h/ as <j> and the approximate /w/ as <hu>. The approximant /j/ is represented as <y> in oral environments and as <ñ> in nasal environments.

There are some Ecuadorian Siona phonemes that do not exist in Spanish. The first phoneme that does not exist in Spanish is /kʷ/. This phoneme is represented as <cu>. A second group of phonemes that do not exist in Spanish are the laryngealized consonants. Because Ecuadorian Siona lacks voiced obstruents, the symbols for voiced stops are used to represent the laryngealized stops: <b> corresponds to the labial laryngealized stop /p̰/. The coronal laryngealized stop /t̰/ is represented as <d> in stem- and bound-root-initial position and as <r> in stem-internal and suffix-initial position. The symbol <g> corresponds to a dorsal laryngealized stop /k̰/ in front of the vowel /a, o, u/ and <gu> in front of /i, ɨ, e/. The symbol <gü> stands for the dorsal labial laryngealized stop /k̰ʷ/. The laryngealized coronal fricative /s̰/ is written as /ts/. The last consonant that does not exist in Spanish is the glottal stop /ʔ/. This phoneme is represented as <'>. The vowel /ɨ/ is another phoneme that exists in Ecuadorian Siona but not in Spanish. The symbol <ë> is used to express this vowel. The final symbol that is used in the Ecuadorian Siona orthography is <V̰> to mark that a vowel is nasal. An example of a representation of a nasal vowel is <a̰>. Nasal vowels are not marked when they follow a nasal consonant, as in <naso>

[nãh̃.so] '*Lagothrix lagotricha*, monkey species.' The glottal /h/ in coda position is not represented in the Ecuadorian Siona orthography.

In the adapted orthography, I adopt some symbols from the Ecuadorian Siona orthography. The phonemes /p̰, ʔ, tʃ/ are represented as <b, ', ch> in the adapted orthography. Furthermore, the laryngealized /t̰/ is represented as <d> independently of its position in the word. The dorsal stops /k, k̰, kʷ, k̰ʷ/ are represented as <k, g, kʷ, gʷ>. This is a simplified system in comparison with the Ecuadorian Siona orthography. Since all other laryngealized consonants are represented by symbols that normally represent voiced stops, the symbol <z> is used to represent the laryngealized sibilant /s̰/. The phonemes /h, w, ɨ/ are represented in the same manner as in the International Phonetic Alphabet: <h, w, ɨ> in the adapted orthography. The coronal approximant /j/ is expressed as <j> in both oral and nasal contexts. It is predictable when /j/ is realized as [j] or as [ɲ]. When <j> is followed by an oral vowel, it is realized as [j] and when it is followed by a nasal vowel, it is realized as [ɲ]. Nasal vowels are only marked as nasal, as in <ĩ, ɨ̃, ũ, ẽ, õ, ã>, when they are inherently nasal. The nasal quality can be derived from the context when vowels are not inherently nasal. A final difference between the Ecuadorian Siona orthography and the adapted orthography is that the coda [h] is expressed in the latter; it is represented as <h>. An overview of both orthographies is provided below in table 3.14.

Table 3.14: An overview of the practical orthographies used in this dissertation

| Phoneme | Siona orthography | Adapted orthography |
|---|---|---|
| p | p | p |
| p̃ | b | b |
| t | t | t |
| t̃ | d / r | d |
| k | c / qu | k |
| k̃ | g / gu | g |
| kʷ | cu | kʷ |
| k̃ʷ | gu / gü | gʷ |
| ʔ | ’ | ’ |
| s | s | s |
| s̃ | ts | z |
| tʃ | ch | ch |
| h | j | h |
| hC | C | hC |
| m | m | m |
| n | n | n |
| w | hu | w |
| j | y / ñ | j |
| i | i | i |
| ĩ | i̱ | ĩ |
| ɨ | ë | ɨ |
| ɨ̃ | ë̱ | ɨ̃ |
| u | u | u |
| ũ | u̱ | ũ |
| e | e | e |
| ẽ | e̱ | ẽ |
| o | o | o |
| õ | o̱ | õ |
| a | a | a |
| ã | a̱ | ã |