GHOST CONSONANTS AND LENITION IN LEGGBO*

Imelda Icheji Udoh
University of Uyo, Akwa Ibom State, Nigeria
ichejiudoh@yahoo.com

Leggbo has two classes of consonants – fortis and lenis consonants. The fortis consonants, are articulated with more force and they occur in stronger contexts than the lenis consonants which are articulated with relatively less force and are therefore found in weak environments. Following the Phonological Strength Hierarchy (Katamba 1989), *stops* are the strongest sounds and *approximants* the weakest. In Leggbo, the process of change from stop articulation through frication to deletion has left *ghost* consonants in the language. Such consonants which were originally stops are today fricatives, with an option of a complete drop. The traces of their original forms are evident in the progressive aspect which is marked by fortition and suffixation.

Le leggbo a deux classes de consonnes - les consonnes fortes et les consonnes douces. Les consonnes fortes sont articulées avec un peu plus d'énergie que les consonnes faibles. Selon le classement phonologique (Katamba 1989), les occlusives sont les sons les plus forts et les glides les plus faibles. En Leggbo, le processus de changement de l'occlusive par friction jusqu'à l'effacement a provoqué des consonnes fantômes dans cette langue. Des consonnes qui étaient à l'origine des occlusives sont aujourd'hui des fricatives qui peuvent disparaître complètement. Les traces de leur forme originale se voient dans l'aspect progressif qui est marqué soit par la puissance ou par l'affaiblissement de l'articulation.

0. INTRODUCTION[1]

The Leggbo[2] language is a minority language of the *Upper Cross* subgroup (Faraclas1989, Grimes 2000), spoken in the Cross River State of Nigeria by about 60,000 people living in Abi and Yakurr Local Government Areas of the state. The speakers are called 'Aggbo', and they live in about six villages, each of which has a variety of its own. The six varieties are Letatama (spoken in Adadama), Lebamma (spoken in Itigidi), Lekuleku (spoken in Ekureku), Lemmabana (spoken in Immabana), Leyigha (spoken in Assigha) and Lenyima (spoken in Inyima). The variety described in this paper is the Letatama variety.

Very little work has been done on the language. Apart from classifications such as Faraclas (1989), Crozier and Blench (1992) and Grimes (2000), they are just a few other works on the language. Spreda and Spreda (1966) is a phonological description of the

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[1] A shorter version of this article is published in Udoh 2003.

[2] Until now, it was written as 'Legbo', but following work in progress by Larry Hyman and others, on the language and the realization that *fortition* is a distinctive feature with a high lexical and grammatical functional load, we represent it as 'Leggbo'.

language. It has a proposed orthography and presents a comparative wordlists in four dialects spoken in Ekureku, Immabana, Adadama and Itigidi only. It is an interim work with a lot of loose ends. Bendor-Samuel and Spreda (1969) treats the fortis and lenis prosody of the present continuous verb in the language. This is the first report of the fortis/lenis contrast in Leggbo. Dimmendaal (1978), reconstructs Leggbo consonants, in his investigations towards the classification of the Upper Cross languages.

The paper is discussed in five sections. In section 1, an overview of the Leggbo phonology, and a description of the Leggbo verb structure, are presented as background to the paper. Section 2 discusses the lenition and fortition prosodies as they operate in the language. Section 3 presents the ghost context and how they work as 'place holders' for the ghost consonants. In section 4, the support for the ghost consonants is given, and concluding remarks are given in section 5.

We provide an overview of the Leggbo phonology, as background to the phonological processes underlying our discussion in this paper.

The language has the consonant phonemes[3] given in 1. I have included the voiced velar fricative, as an allophone of the voiced velar stop because its occurrence is widespread as a noun prefix; and it has important synchronic role as a kind of 'place holder' for 'ghost' consonants in the language (I return to this in section 2).

(1) a. Consonants found in fortis contexts

Stops	-	**pp bb tt dd kk gg kkp ggb kkw bbj**
Nasals	-	**mm nn ɲɲ ŋŋ ŋŋw**
Fricatives	-	**vv ss zz**
Affricates	-	**ddz ttʃ ddʒ**
Approximants	-	**ww jj**
Laterals	-	**ll**

b. Consonants found in lenis contexts

Stops	-	**p b t d k kp gb kw bj**
Nasals	-	**m n ɲ ŋ ŋw mj**
Fricatives	-	**v s z ɣ**[4] **vj**
Affricates	-	**tʃ**
Approximants	-	**w j**
Laterals	-	**l**

c. Consonant phonemes

Stops	-	**p b t d k g kp gb kw bj**
Nasals	-	**m n ɲ ŋ ŋw mj**
Fricatives	-	**v s z vj**
Affricates	-	**dz tʃ dʒ**
Approximants	-	**w j**
Laterals	-	**l**

[3] This is a result of current work on Leggbo by the members of the Field Methods course coordinated by Larry Hyman at UC Berkeley in the 2002/2003 session. The phonetic/phonological analyses were done in conjunction with Ian Maddieson and Julie Larson.

[4] This is an allophone of /**g**/, and it is occurs in this form only in lenis environments.

Fortition of the consonants is widespread, and it has a heavy functional load both lexically and grammatically (more details are given in section 1). All consonants have a fortis form except /**vj**/, which occurs only in lenis form. A few consonants do not have lenis forms, but occur only in fortis forms like **ff ppj ddz ggw**. There is a restriction of coda consonants, and only laterals and nasals can occur in coda positions.

There are seven vowels in the language, with a distinctive length feature.

(2) a. Vowels found in fortis contexts
i e ɛ a ɔ o u

b. Vowels found in lenis contexts
ii ee ɛɛ aa ɔɔ oo uu

c. Vowel phonemes
i e ɛ a ɔ o u

There are three level tones – (H)igh, (M)id and (L)ow tones. All tones combine to form contours. In the data in this work, we have marked only the H and L tones.

In addition to the phonological overview, and since the evidence for the 'ghost' consonants are drawn from the verb in this work, an overview of the Leggbo verb structure is also in order here. 'Ghost' consonant is here used loosely to refer to segments that are phonologically present, but only realised phonetically (I return to this in section 2).

Leggbo verbs are basically either monosyllabic (as in 3a-f) or bi-syllabic (as in 3g-i). Structurally they are made up of many syllabic constituents. The basic verb pattern is an obligatory stem which in turn has an obligatory root. A third verb shape involves either reduplication of part of the stem or the addition of the suffix **–azi**, (which is a pluractional suffix) leading to thri-syllabic shapes as seen in 3j. The verbs have the syllable shapes given in 3.

(3)	a. CV	e.g.	**du**	beat
	b. CVV	e.g.	**baa**	marry
	c. CCV	e.g.	**ddu**	whisper
	d. CVC	e.g.	**dum**	bite
	e. CVVC	e.g.	**kwɔ̀ɔl**	groan
	f. CCVC	e.g.	**mmèŋ**	swallow
	g. CV.V	e.g.	**bù.a**	follow
	h. CVVɣV	e.g.	**vîiɣá**	wedge
	i. CVCCV	e.g.	**dakka**	dream
	j. CVCVCV	e.g.	**juŋazi**	scare
			kakaŋa	be hard

These verbs may take on the pluractional suffix **–azi**, sometimes with potential assimilation to the vowels (see section 3.2.1 for more details). In the data in 4c-e, the first vowel of the suffix assimilates with the last vowel of the root. All verbs that have plural subject or object take this suffix. Verbs that require multiple acts also take this suffix.

(4) a. **si** do
siazî do many things/times

b. **du** beat
duazî beat many things/times

c. **bo** be enough
boozî be enough many times

d. **ba** ask
baazî ask many times/people

e. **zeè** see
zeezi see many times/people

f. **num** take
nùmazî take many things/times

Furthermore, some verbs are intrinsically pluractional and hence the **–azi** suffix forms part of their roots. Such verbs refer to actions that require either one continuous act or a series of acts. Again note the assimilation of the /a/ in 5.

(5) **yɔ̀ghɔzî** bluff
mjɛ̀lɛzî be slippery
juŋazî scare, frighten a child as in play
gwàɣazi walk fast

Basically, majority of Leggbo verbs as has been mentioned are either monosyllabic or bi-syllabic. However, there are tri-syllabic verbs like the two examples in 3j. Such verbs have either the **–azi** suffix, or a reduplicated root.

The CVV verb has a single long vowel. The CV.V can be analysed as a sequence of vowels. Sometimes there is a consonant between the vowels (as in 3h above), even though the articulation of the consonant is rather soft. In 3g, there is no consonant between the vowels, and I have used a /./ to separate the syllables. The assumption here is that there was a consonant in that position historically and there is still a slight trace or glimmer of it in that position now.

This paper argues that there are ghost consonants in such Leggbo verbs as in 3g, and that the consonants disappeared through two operations : *lenition* and *deletion*. The *lenition* and *fortition* processes (see section 1) provide evidence for what is represented in the /./ position. These arguments are supported with data showing the behaviour of the voiced velar stop in weak and strong syllabic environments (I return to this point in section 3).

1. LENITION AND FORTITION PROSODIES IN LEGGBO

Lenition is a phonological process related to consonantal strength, and it manifests as an opening of consonantal stricture. This strength is measured on a scale and it can pass through a series of stages which can lead to ultimate deletion of the segment. It involves three processes : vocalization, i.e. weakening to glide or liquid (as in **p → w**); spirantization, i.e. the development of a plosive into a fricative (as in **t → s**); debuccalization, i.e. loss of supra laryngeal gesture (as in **s → h**). The strongest consonants are those at the extreme end of the stricture, while the weakest have the widest opening and may be the last stage before deletion (Harris 1994:120). Thus, the degree of strength manifesting in the level of opening of the consonantal stricture leads to the articulation of consonants with certain peculiar qualities. Voiceless stops have the strongest obstruction and approximants have the weakest. Other kinds of sounds (using *Manner of Articulation* as parameter) fall in between. Using *Sonority* as a parameter, voiceless sounds are stronger than voiced sounds. Then following a combination of these parameters the Phonological Strength Hierarchy as projected in Katamba (1989:107) is used as a guide in 6.

(6) stop > affricate > continuant > nasal > approximant

Although weakening does not always lead to deletion, the ultimate form of weakening is the absence of any obstruction at all, a situation which leads to a deletion of the sound. I use the terms *lenition* and *fortition* very loosely here to cover the processes associated with consonantal weakness versus strength along the lines of Harris (1994).

Lenition in Leggbo affects all consonants. Articulatorily, it involves an opening in the stricture of the consonantal articulation which leads to a reduction of the consonants and a kind of compensatory lengthening of the following vowel which also has a kind of breathy quality.

The lenition process in Leggbo contrasts with the fortition process, where fortition in the strength hierarchy involves strong, tense movements associated with the consonants. Articulatorily, it involves extra compression of the articulators in the consonants characterised by obvious consonantal lengthening followed by a shortened vowel. In addition to these features, perceptually, there is also an unusual outburst for Obstruents. These processes lead to two sets of consonants in Leggbo – lenis and fortis consonants. Tentatively, I represent the lenis consonants as a single consonant, while the fortis sounds I have represented as double. The double representation is supported by the double peaks of the fortis sounds as shown in the intra-oral air pressure measurement of the bilabial stop consonant shown in 9.

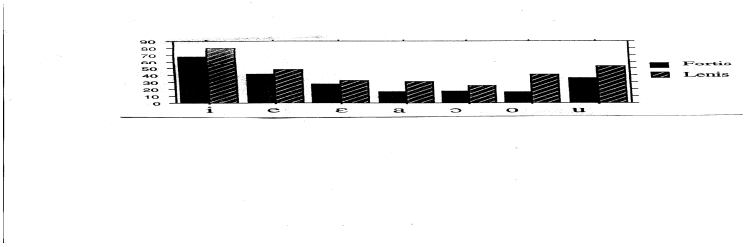
The lenis and fortis articulations in Leggbo are prosodies operating within the domain of the syllable. The lenis consonants appear short while the vowels following them are long. On the other hand, the fortis consonants are lengthened and the vowels following them are short. Both processes occur only in initial and coda positions. In 7, we have some examples of the fortis/lenis contrast.

(7) a. **baa** marry
bbai marrying

b. **maan** deliver a baby
mmanni delivering a baby

c. **yaal** paddle
yyalli paddling

To illustrate this point further, we present in 8, a chart showing the averages across vowel contexts[5]. A comparison of the fortis/lenis pairs shows that the VOT of the vowels after the lenis consonants are longer than those after the fortis consonants.



(8) VOT averages across vowel contexts

All consonants in Leggbo have fortis forms except /**vj**/. A few consonants however, do not have lenis forms. /**ff**/, /**ppj**/, /**ddz**/, /**ggw**/ occur only in fortis forms. A tentative explanation for this is that these sounds by their nature of articulation are produced forcefully, and as such it is difficult to articulate them weakly.

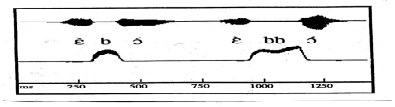
So far, however, it has been ascertained that closure durations for the fortis consonants are twice those of their lenis counterparts. For instance, the mean duration values for /**p**/ and /**b**/ are 108.8ms and 88.2ms, while the values for the fortis /**pp**/ and /**bb**/ are 212.5ms and 203.8ms respectively[6].

The fortis consonants are articulated with greater strength than the lenis ones. One can conclude at this point given these points that the difference between these classes of consonants is that of gemination, but there are indications of more going on than mere duration.

The oral pressure pattern for the fortis consonants have two clear peaks while the lenis consonants have single peaks[7]. In 9, the air pressure pattern of the voiced bilabial

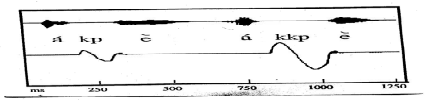
[5] I am grateful to Ian Maddieson and Julie Larson of UC Berkeley for this preliminary information on the acoustic investigations on the fortis/lenis contrasts in Leggbo.
[6] These figures were provided by Ian Madieson.
[7] The intra-oral air pressure measurement was also done by Ian Maddieson. More details of these investigations will be published at a later date.

stop shows a clear distinction of the peak patterns of both classes of bilabial stops. While the lenis /**b**/ has one peak, the fortis /**bb**/ has two clear peaks[8].



(9) Intra-oral air pressure of lenis/fortis bilabial Stops[9]

The strength of articulation of the fortis Stops is further confirmed with the air pressure pattern of the voiceless labial velar stop, /**kp**/ and /**kkp**/, in which the pressure changes show the movements of the articulators themselves, rather than pulmonic activity as shown in 10.



(10) Intra-oral air pressure of lenis/fortis labial-velar Stops[10]

Tentatively, we can claim that although the fortis consonants are so clearly allied to gemination, the use of fortis/lenis labels is quite appropriate here given that :

[8] This distinction was consistent in all the repetitions of the different lenis/fortis pairs that Ian measured of my speech.

[9] **èbɔ** = hand, **èbbɔ** = branch

[10] **ákpe** = you will teach, **ákkpe** = you will pick things.

(11) a. there is widespread occurrence of the contrast in the language
b. that the prosody extends beyond the segment, and it is a feature of the whole word, particularly as it affects the vowels following the fortis/lenis consonant
c. apart from duration, the strength of articulation differs in both classes of sounds as reflected in the movements of the articulators

The distinction between lenis and fortis consonants has both lexical and grammatical functions in Leggbo. Lexically, its distinctive function is widespread as the following verbs in 12 show :

(12)	a.	i.	**tuù**	dance
		ii.	**ttu**	stampede
	b.	i.	**duù**	beat
		ii.	**ddu**	whisper
	c.	i.	**kpaà**	be strict
		ii.	**kkpa**	pay
	d.	i.	**nàa**	take
		ii.	**nnà**	shine
	e.	i.	**ńnàà**	I will take
		ii.	**ńnnà**	I will shine

Grammatically, the progressive aspect is marked through fortition and suffixation as shown in 13.

(13)	a.	i.	**e nîi**	he gave
		ii.	**e nnîi**	he is giving
	b.	i.	**ɛ káámi**	he helped
		ii.	**ɛ kkámmii**	he is helping
	c.	i.	**ɛ yááli**	he paddled
		ii.	**ɛ yyállíi**	he is paddling

It is also observed again that the lenis words in 13.a.i, b.i, c.i, have long following vowels, while the fortis words in 13.a.ii, b.ii, c.ii, also has long following vowels. This is because although there is a constraint against *CCVV sequences in lexical entries (compare with 12), long vowels after fortis consonants like those in 13.a.ii, b.ii, c.ii, can only be derived by concatenation after a geminate in the progressive where CV verbs take **–i** suffix in addition to the fortition of the consonants. This explains the lengthened vowels in this set of words after the fortis consonants.

The grammatical function of fortition also produces other interesting changes. For instance, it can devoice fricative stops in initial positions as shown in 14a-c. In medial positions, it strengthens laterals, fricatives and glides to fortis stops as shown in 14d-f.

(14) a. **vɛɛ̀** pick up
ffɛ̀ì picking up

b. **zo.ò** look for
ssokki looking for

c. **vàa** butcher
ffài butchering

d. **bila** climb
biddi[11] climbing

e. **ppjà.a** arrest
ppjàkki arresting

f. **kkuwa** kneel
kkukki kneeling

2. THE GHOST SYLLABIC ENVIRONMENT AND THE 'PLACE HOLDERS'

The ghost environment is defined as a weak context, which has only a trace of a consonant, by way of some kind of syllable break. The vowel in such contexts appear unusually long. This class of CV.V forms as in verbs contrasts with CVV verb forms as the examples in 15-17 show.

		Stem		Progressive	
(15)	a.	**dɔɔ̀**	be heavy	**ddɔ̀ì**	being heavy
	b.	**dɔ.ɔ~dɔɣɔ**	sleep	**dɔŋŋi**	sleeping
(16)	a.	**dzaà**	urinate	**dzaì**	urinating
	b.	**dza.a~dzaɣa**	suck breast	**dzakki~dzabbi**	sucking
(17)	a.	**bba**	block	**bbaì**	blocking
	b.	**bba.à~bbaɣà**	slap	**bbakki~bbabbi**	slapping

The V.V context constitutes the 'ghost' syllabic environment. Such contexts have a constant variation with the velar fricative [ɣ] (which is an allophone of the voiced velar

[11] This is one of the CVCV verbs that form their progressive by fortition of the second C (see also the data in 28a).

stop /**g**/ in the language). The presence of a consonant in this position can be confirmed easily through a fortis articulation in which the consonants are strengthened back to Stops in the progressive aspect. The minimal pairs in 15-17 show a distinction between verbs with the ghost consonants and verbs with long vowels. Note that while the long vowels merely have fortition and suffixation, the ghost consonants actually surface as stop consonants in the progressive. Note also that the verbs with the ghost consonants alternate between **ø** and **ɣ**.

The 'ghost' environment therefore is that which harbours a 'ghost' consonant, where a 'ghost' consonant is a consonant that has a phonological representation, that surfaces either as a null element or as a velar fricative [**ɣ**]. In 18b, 19b, the empty segmental slot represents the 'ghost' environment. It can be filled up by [**ɣ**], which is an alternative. Notice that in 15b, 16b, 17b, all such environments have a stop in the progressive, while their minimal pair counterparts in 5a, 16a, 17a, merely have the fortition of the initial consonant and the suffixation as indicated earlier.

(18)	a.	x x x	b.	x x x x	c.	x x x x
		| | |		| | |		| | | |
		d ɔ ɔ		**d ɔ ɔ**		**d ɔ ɣ ɔ**
		be heavy		sleep		sleep

(19)	a.	x x x	b.	x x x x	c.	x x x x
		/\ | |		/\ | |		/\ | | |
		d z a a		**d z a a**		**d z a ɣ a**
		urinate		suck breast		suck breast

The weak contexts in which the velar fricative is produced has an option of a complete drop. It serves synchronically as a kind of place holder'[12] for the voiced stops which surface fully only in progressive forms marked by a stronger context of fortition.

3. EVIDENCE FOR THE GHOST CONSONANTS

The evidence and support for the ghost consonants are here provided using the behaviour of the voiced velar stop /**g**/ in both weak and strong environments. Lenition in the noun prefix and fortition in the progressive aspect of verbs are used to illustrate the points being made here.

The articulation of some consonants in weak contexts helps to reduce the strength of such consonants, such that stops are gradually reduced to fricatives and finally deleted completely. This development is illustrated using the instability of the voiced velar stop in Leggbo, caused by a wide range of variation.

[12] I owe this idea to Larry Hyman.

3 .1 g-LENITION AND TRUNCATION

The voiced velar stop has a fortis form which occurs initially and medially /**gg**/. In these positions, it is stable and does not allow the kind of variation that its lenis counterpart allows. It occurs in such words as those given in 10.

(20) **ggama** perch
ggu.a uproot
ɛggɔ̀ cloth
aggà needle, nail

The lenis voiced velar stop /**g**/ has three allophones [**g**], [**ɣ**], [**h**] none of which occurs in word final position. [**g**] occurs in both initial and medial positions. In these positions, it is also stable, and does not alternate with any of its allophones. Some examples are given in 11.

(21) **ègidȉ** beans
ǹgɔ̀m foolishness
gàdda step over
gábbí perch on
gɛèm be big
gɔ̀mɔzí be foolish

Like the fortis form, in initial position of root forms, it is stable and does not alternate with any variant. However, as a noun prefix, and in medial positions, it is quite unstable. It occurs mostly as a noun prefix with the front vowels /**e ɛ i**/ in initial position as **ge gɛ gi**. Although Leggbo has some prefixless nouns, majority of the nouns have the shape CV-, V-, **ŋ-**. The CV- prefixes are **li-**, **le-**, **lɛ-**, **gi-**, **gɛ-**. The V-prefixes are **i-**, **ɛ-**, **e-**, **a-**. The **ŋ-** prefixes are **ŋ-**, **m-** and **ɲ-**. The /**l**/ of the CV prefix is more stable, but the /**g**/ is not so stable as it has a number of options as shown in the data in 32. In this initial prefix position, it can be weakened to a velar fricative with an option of a complete drop.

The coda is traditionally identified as the classic site for consonantal weakening, in terms of syllable structure in most languages (Harris 1992:394). The Leggbo case as shown in the data in 22, presents the case of lenition in onset position.

(22) **ɣîttù ~ îttù** life
ɣèdȉ ~ èdȉ speech, trouble
ɣètɔ̀ ~ ètɔ̀ work

In medial position, it alternates with [**h**], with a further option of a complete drop as shown in 23.

(23) **dzáɣá ~ dzáhá ~ dzá.á** suck
bbáɣá ~ bbáhá ~ bbá.á slap, tie wrapper, hide
bàɣa ~ bàha ~ bà.a boil something on the fire

The velar stop in these two positions is reduced to a fricative as the examples in 22 and 23 show. In initial position as a prefix and in medial position, the voiced velar stop is therefore highly unstable. Its alternation between a Stop, a Fricative and a complete drop makes it so unstable. The synchronic relevance of this instability of the sound caused by such alternations in both initial and medial positions are indications of its movement on the Strength Hierarchy (see 14) involving spirantization shown n 24.

(24) Stop > Fricative > **ø**

3.2 FORTITION AND THE PROGRESSIVE ASPECT[13]

The strength of articulation involved in the fortition process appears to have preserved the consonants in the positions where there is doubt as to the nature of the segments in the ghost environments. The grammatical function of this process provides the evidence for this problem. The progressive aspect discussed below illustrates the point.

The progressive aspect is formed in two ways, one of which is the addition of **–azi** suffix which is also a pluractional suffix (see also section 0). The data in 4 and 25 show the pluractional suffix on verbs. There is some kind of semantic overlap between the two grammatical functions in the verbs whose progressives are formed with the addition of the pluractional suffix. The **–azi** suffix does not condition any fortition of the consonants.

(25) a. **ttálì** untie
ttálázî untying

b. **bînì** carry
bînázî carrying

c. **vìli** cut
vìlazî cutting

However, a majority of the verbs form their progressive by the fortition of the consonant and suffixation of **–i**. The wide range of verb patterns presented in 3a-i mark their progressive by fortition and **–i** suffixation, but in slightly different manners as shown in 26-32, where the behaviour of the different verb patterns are presented.

[13] The –ing morpheme in Leggbo can be identified as **-i**, with two manifestations : (1) it combines with **-az-** and this combination is ambiguous with a pluractional meaning in which the verb indicates multiple action and states as well as a progressive meaning, (2) it is accompanied by fortition of some syllable in the verb.

(26) C(C)V verbs become CCV-**i**

a. **du** beat
ddui beating

b. **ba** tie
bbai tying

c. **bba** seal
bbai sealing

d. **tto** cry
ttoi crying

(27) CVV verbs become CCV.

a. **baà** marry
bbaì marrying

b. **weè** swim
wweì swimming

c. **dɔɔ̀** be heavy
ddɔ̀ì being heavy

d. **bɔɔ̀** heal
bbɔ̀ì healing

e. **làa** rub off
llài rubbing off

In line with the constraint of long vowels after fortis consonants, the long vowels in these verbs (27), become shortened.

(28) C(C)VCV verbs become C(C)VCCV.

a. **sînî** leak
sînnî leaking

b. **ddɔ̀mɔ** wet
ddɔ̀mmi wetting

c. **dzàŋa** quarrel
dzàŋŋi quarrelling

d. **kkana** imitate
kkanni imitating

These verbs form their progressive by the fortition of the second C.

(29) C(C)V**ɣ**V verbs become C(C)VCCV.

a. **vîiɣá~vîihá~vî.á** wedge
vîkkî wedging

b. **kpááɣá~kpááhá~kpá.á** lock
kpákkî locking

c. **kpééɣé~kpééhé~kpé.é** announce
kpékkî announcing

d. **dɔ́ɔɣɔ́~dɔ́ɔhɔ́ ~dɔ́.ɔ́** sleep
ddɔŋŋî sleeping

e. **bbáɣá~bbáha ́~bbá.á** slap
bbákkî slapping

f. **kkóɣó~kkóhó ~kkó.ó** cuddle
kkókkî cuddling

g. **kkɔ̀ɣɔ~kkɔ̀hɔ~kkɔ̀.ɔ** eye someone
kkɔ̀kki eying one

It can also be observed that all the verbs in 29 with /**ɣ**/ have a variation with /**h**/. They can also be a further variation without the consonant at all.

(30) C(C)V**l**V become C(C)VCCV.

a. **ddɔ̀lɔ** draw
ddɔ̀ddi drawing

b. **bàli** step on
bàddi stepping on

c. **bbɔ̀li** peal
bbɔ̀ddi pealing

d. **fɛ̀lɛ** germinate
fɛ̀ddi germinating

e. **bbàla** remember
bbàddi remembering

f. **bbɔ̀li** peal
bbɔ̀ddi pealing

(31) C(C)V**w**V become C(C)VCCV.

a. **kùwa** open
kùkki opening

b. **duwa** hide
dubbi hiding

c. **kkuwa** kneel
kkukki kneeling

Note that **–i** suffix can replace the final vowel of the verb root if the verb ends in a vowel other than /**i**/. Laterals can be strengthened to stops as seen earlier in 14d-f and in the examples in 30. Like the laterals, semi vowels can also be strengthened by fortition to fortis stops. An important point to note here is that both the C(C)V**ɣ**V, C(C)V**I**V and C(C)V**w**V behave like the C(C)VCV verbs (compare the data in 28, 29, 30 and 31).

(32) C(C)V.V become CVCCV.

a. **zɛ.ɛ** walk
zɛŋŋi walking

b. **ze.e** see
zemmi seeing

c. **bù.a** follow
bùkki following

d. **du.a** hide
dubbi~dukki hiding

e. **mmi.a** squeeze
mmikki squeezing

f. **dda.i** lick
ddakki licking

g. **nnu.i** push
nnukki pushing

h. **kkwɔ.i** pack
kkwɔŋŋi packing

The CV.V verbs in 32 do not behave like the C(C)V and CVV verbs by mere fortition of the initial consonant and addition of **–i** suffix as seen in the examples in 27. Rather, fortis stops surface in these contexts with the strength of the fortition. The C(C)V.V verbs behave rather like C(C)VCV verbs pointing to the fact that they originally had the same shape (compare 32 and 28).

Some generalisations can be made at this stage concerning the progressive formation of the verbs presented in 3. The verbs can be grouped into four broad categories.

(33) a. CV, CVV, CCV → CCV-**i**.
Open syllables which form their progressive with fortition of the consonant and suffixation of **–i**.

b. CVC, CVVC, CCVC → CCVCC-**i**.
Closed syllables which form their progressive with fortition on both consonants and suffixation of **–i**.

c. CCV.V, CCVVCV → CCVCC-**i**.
Bi-syllabic verbs which form their progressive with fortition of the second consonant and suffixation of **–i**.

d. CVC-**azi**, RED → CVCV-**azi**.
This last group is made up of either a verb (closed syllable) that has pluractional qualities, or verb with a reduplicated stem. In both cases, the pluractional suffix is merely added.

In summary it is important to note that as shown in 33c, C(C)VCV, C(C)V**l**V, C(C)V**w**V, C(C)V**ɣ**V, C(C)V.V verbs become C(C)VCCV in the progressive. That the C(C)V.V verbs behave like all others with a C in that context is a strong indication that an intervocalic consonant which surfaces in this process of fortition associated with the progressive aspect is part of the underlying form of the verb root with these shapes.

4. CONCLUSION

The behaviour of the voiced velar stop in weak environments, where it is reduced to a fricative and in strong environment, where it surfaces as a stop provides us with evidence that there are consonants in the 'ghost' environments. The wide variety of stops in the fortis environment can be explained as some kind of assimilation. From the discussion so far, we can propose the Stop consonants /**b d k ŋ m**/ as the underlying phonemes in such environments. The relationship between these geminate consonant stops, their reduction and/or disappearance in weakened environments is obvious.

The consonants [**ɣ h**] are 'place holders' which synchronically provide some kind of trace for consonants that once occurred in these positions in the language. That the consonants found in ghost environments (V.V) surface as geminate stops in progressive formation in the same way as other consonants in CCVCV verbs is evidence that there is a

connection between the lost consonants, these 'place holders' and other consonants in the system synchronically.

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