Chapter 6

Labial-velar to labial sound changes in Luto

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Proto-Sara-Bongo-Bagirmi labial plosives became labial fricatives (*P > F) in both the Nduga and Luto dialects of the Luto language. Subsequently, labial-velar plosives became labial plosives (*KP > P) in the Luto dialect, but were retained in the Nduga dialect.

This study adds to the growing literature on the labial-velar to labial change *KP > P (Cahill 2024 [this volume]). In addition, the occurrence of *P > F and the nonoccurrence of *KP > P in the Nduga dialect provides evidence that the chain shift was a pull chain rather than a push chain.

1 Introduction

In this paper I describe sound changes in Luto (ISO 639–3 code [ndy]), a language spoken in northern Central African Republic and southern Chad by approximately 19,000 speakers. *Ethnologue* (Eberhard et al. 2022) lists the language name and one dialect name as "Lutos." This spelling may have been the result of a misreading of Nougayrol (1990: 76). The standard autoglossonym is "Luto."

The Luto language is classified as part of the Sara-Bongo-Bagirmi (SBB) subgroup of Central Sudanic. *Ethnologue* lists five dialects: Luto (which is called Rito or Ruto in Chad), Nduga, Nduka, Wada, and Konga. In this paper, I'll examine the first two dialects: Luto and Nduga.

My research was conducted in Bangui, Central African Republic, during three visits from 2012 to 2017, for a total of about four weeks. I worked with a team of three speakers, who are fluent in both the Luto and Nduga dialects. Part of

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the research was done in collaboration with SIL members Paul Murrell and Brad Festen. Unless otherwise noted, the data in the paper are from our consulting sessions.

There is a modest amount of previous research on the Luto language. This includes *mémoires* by Moundo (1975) and Ndoko (1991), demographic information found in Nougayrol (1990), and a phonology sketch and wordlist by Olson (2013) and Olson & Ndocko-N'Doukoua (2013), respectively. A large amount of data on Luto is found in the comparative lexicon of the SBB languages by Boyeldieu et al. (2006) (and its accompanying article Boyeldieu (2006)). The lexicon provides extensive wordlist data for "Luto", "Nduga", "Ndoka", and "Wad". "Ndoka" and "Wad" are likely the same as what *Ethnologue* calls the Nduka and Wada dialects, respectively.

In § 2, I review the consonant systems of the Nduga and Luto dialects. In § 3, I discuss the recent set of labial-velar to labial sound changes in the Luto dialect. In § 4, I discuss an earlier process that changed Proto-SBB labial plosives to fricatives in both Nduga and Luto. In § 5, I discuss the two sets of sound changes and show that the interplay between them is likely a chain shift – specifically a pull chain – in which fricativization created a gap in the consonant system, which was consequently filled by the labial-velar to labial change, in order to maintain symmetry.

2 Consonants

The Nduga and Luto consonant systems are shown in Tables 1 and 2.[1] For the purposes of this paper, there are three key things to note. First, a set of three labial-velar plosives exists in Nduga, but they are absent in Luto. Second, the set of labial plosives is robust in Luto, but they are rare in Nduga. (Rarity is represented by parentheses.) Third, there is a robust set of labial fricatives in both dialects.

3 *KP > P (labial-velar to labial change)

The first set of sound changes examined here is the recent change of labial-velar plosives to corresponding labial plosives in the Luto dialect, as shown in Table 3. That is, *kp became /p/, *gb became /b/, and *ŋgb became /mb/. I call

[1] I use IPA transcriptions in this paper. Whether a narrow phonetic transcription of /ŋgb/ should be [ŋg͡b] or [n̪͡mg͡b] is left for further research.

Table 1: Nduga consonant system

ɓ		ɗ				
(p)		t		k	kp	
(b)		d		g	gb	
(mb)		nd		ŋg	ŋgb	
	f	s				(h)
	v	z				
	mv	nz				
m		n	ɲ			
		r		ɽ		
		l				
w			j			

Table 2: Luto consonant system

ɓ		ɗ			
p		t		k	
b		d		g	
mb		nd		ŋg	
	f	s			(h)
	v	z			
	mv	nz			
m		n	ɲ		
		r		ɽ	
		l			
w			j		

these changes "recent," because the language consultants recognize that they have occurred within their lifetimes. The changes occurred with the entire series of labial-velar plosives: voiceless, voiced, and prenasalized. I capture this set by employing capital letters as an abbreviation. Hence, *KP > P includes the three changes.

The sound change set *KP > P is not found in general surveys of sound changes, such as Campbell (2004: 33–46). However, Cahill (2024 [this volume]) shows that these changes are common in Sub-Saharan Africa. These changes could perhaps be construed as lenitions, a category which includes among other things the change of two consonants to one (Campbell 2004: 44). However, the labial-velar plosives in Luto – as well as throughout Africa – are considered unitary

Table 3: Labial-velar to labial changes in the Luto dialect (*KP > P)

voicing	sound change
voiceless	*kp > p
voiced	*gb > b
prenasalized	*ŋgb > mb

phonemes. As a result, we are not dealing with the change of two consonants into one, but rather the change of a single consonant with two primary places of articulation (labial and velar) into another consonant with a single place of articulation (labial). As a result, the label "lenition" is not ideal in this case.

Labial-velar plosives still exist in Nduga. These labial-velars correspond to labial plosives in the Luto dialect. So, Nduga /kp/ corresponds with Luto /p/, Nduga /gb/ corresponds with Luto /b/, and Nduga /ŋgb/ corresponds with Luto /mb/, as shown in Table 4.

Table 4: Labial-velar : labial correspondences

Nduga		Luto
kp	:	p
gb	:	b
ŋgb	:	mb

Sample cognates that exemplify these three correspondences are given in Table 5.

The first row in Table 5 shows the correspondence kp : p in word-initial position. The word for 'poison' is [kpā.rù] (with a kp) in Nduga and [pā.rù] (with a p) in Luto. The fourth row shows the same correspondence in word-medial position: Nduga [tì.kpì] corresponds to Luto [tì.pì] 'intestines'.[2]

The second row shows the correspondence gb : b in word-initial position. Nduga [gbā.gū] corresponds with Luto [bā.gā] 'wing'. Note that there is also an unexplained difference of vowel quality in word-final position for this particular word. The fifth row shows the same correspondence word-medially: Nduga [nzì.gbò] corresponds with Luto [nzì.bò] 'to wash'.

[2]Word medial labial-velar plosives in monomorphemic words are common in SBB (Boyeldieu et al. 2006).

Table 5: Sample cognates that exemplify labial-velar : labial correspondences

posn.	corresp.	Nduga	Luto	gloss	< Proto SBB	
init.						
	kp : p	[kpā.ɾù]	[pā.ɾù]	'poison'	—	
	gb : b	[gbā.gū]	[bā.gā]	'wing'	*gb-G-, *a-ɔ	N/303
	ŋgb : mb	[ŋgbā.ɽā]	[mbā.ɽā]	'assegai'	*ngb-l̩-, *a-a	N/300
med.						
	kp : p	[tì.kpì]	[tì.pì]	'intestines'	*t-kp-, *i-i	N/058
	gb : b	[nzì.gbò]	[nzì.bò]	'to wash'	*?-gb-, *i-o	V/068
	ŋgb : mb	—	—	—	—	

Finally, the third row shows the correspondence ŋgb : mb word-initially: Nduga [ŋgbā.ɽā] corresponds with Luto [mbā.ɽā] 'assegai'. I did not find this correspondence in word-medial position.

The SBB crosslinguistic lexicon (Boyeldieu et al. 2006) provides additional support for *KP > P. That resource posits Proto-SBB forms for four of the glosses in Table 5, as shown in the rightmost column. Of particular interest is the fact that all of the reconstructed forms include the labial-velar plosives instead of the labial plosives.

Boyeldieu et al. (2006) separate out the consonants and vowels in their reconstructed forms, and I've followed this practice for the forms I provide from their source. Sometimes they posit more than one set of reconstructed consonants or vowels for a given gloss. In those cases, I include the proto forms that most likely correspond to the data in Table 5. I also provide the reference number for each gloss.

Since we're looking at labial-velar plosives, it would be appropriate to examine more closely both labial and velar plosives in the language.

As far as velar plosives are concerned, there is a robust number of them in both dialects. As a result, the correspondence sets k : k, g : g, and ŋg : ŋg are well-established. These are exemplified in Table 6.

The cognates in Table 6 are identical except for the tone in the first row: A high-low [ˊ ˋ] tonal pattern in Nduga corresponds to a high-superhigh [ˊ ˝] pattern in Luto. The correspondence between these two tonal patterns is regular.

As seen in the rightmost column, Boyeldieu et al. (2006) posit Proto-SBB forms for all of these words. This provides support that we are dealing with true cognates here, and that the velar plosives can be traced back to Proto-SBB.

Table 6: Velar plosive correspondences and sample cognates

posn.	corresp.	Nduga	Luto	gloss	< Proto SBB	
init.						
	k : k	[kú.lù]	[kú.lű]	'charcoal'	*K-l-, *u-u	N/115
	g : g	[gā.zù]	[gā.zù]	'horn'	*g-j-, *a-u	N/052
	ŋg : ŋg	[ŋgā.lā]	[ŋgā.lā]	'heart'	*ng-l-, *a-ɔ ?	N/245
med.						
	k : k	[nzà.kà]	[nzà.kà]	'cultivate'	*nd̰-k-, *a-a	V/354
	g : g	[kā.gā]	[kā.gā]	'tree'	*k-g-, *a-a	N/199
	ŋg : ŋg	[kó.ŋgō]	[kó.ŋgō]	'hill'	*k-Rng-, *O-O ?	N/166

In Table 7, we look at correspondences between labial plosives in the two dialects. It turns out that these sounds are quite rare in Nduga. As a result, I found only a very few cases of the correspondence sets p : p, b : b, and mb : mb in our data.

Table 7: Labial plosive correspondences

posn.	corresp.	Nduga	Luto	gloss	< Proto SBB	
init.						
	p : p	[pì.píī]	[pì.píī]	'hot pepper'	—	
	b : b	[bá.ndà]	[bá.ndă]	'net'	*gb-nd-, *a-a	N/318
	mb : mb	[mbà.mbò]	[mbà.mbò]	'hundred'	—	
med.						
	p : p	[pì.píī]	[pì.píī]	'hot pepper'	—	
	b : b	—	—	—		
	mb : mb	[mbà.mbò]	[mbà.mbò]	'hundred'	—	

Once again, the corresponding forms in Nduga and Luto are identical except for the same tone difference that we saw in Table 6 ([ˊ ˋ] vs. [ˊ ˝]), which we see in the second row of Table 7.

Contrary to what we saw for velar plosives, however, only one of the words in Table 7 has a reconstructed form in Boyeldieu et al. (2006), and its form is unexpected: The reconstructed form of the word for 'net' has a labial-velar *gb instead of the expected labial *b. This suggests that the Nduga form of the word

(which contains /b/) could be construed as an exception to the general gb : b correspondence seen in Tables 4 and 5 above.

The other words in Table 7 have not been traced back to Proto-SBB. This leads me to consider these to be likely the result of recent borrowing or innovation rather than being cognates.

4 *P > F (fricativization)

If labial-velar plosives have become labial in the Luto dialect, while labial plosives are rare in Nduga, what explains this state of affairs?

The SBB crosslinguistic lexicon (Boyeldieu et al. 2006) provides some clues to this. Looking at the data in that source, I was able to identify the set of sound changes shown in Table 8. Specifically, the three labial plosives found in Proto-SBB have become the corresponding labial fricatives in both Nduga and Luto. That is, Proto-SBB *p became /f/, *b became /v/, and *mb became /mv/.

Table 8: Proto-SBB to Nduga/Luto fricativization (*P > F)

voicing	sound change
voiceless	*p > f
voiced	*b > v
prenasalized	*mb > mv

Here we are dealing with fricativization (also called spirantization), which among other things can involve the change of a plosive to a fricative. This is a common change crosslinguistically (Campbell 2004: 45), although a prenasalized version is perhaps less well-known. Also, Proto-SBB lacked labial fricatives (Boyeldieu 2006), so the sound system was well-situated to accept this change.

Table 9 provides some sample data, taken from Boyeldieu et al. (2006). The transcriptions are from the original source, including y = IPA [j]. We see that fricativization has occurred in both Nduga and Luto. In addition, the changes are attested in both word-initial position and word-medial position.

The examples in Table 9 that concern the prenasalized stops provide perhaps the clearest cases. There, the cognates between Nduga and Luto are identical (except for one tone difference), and the sound change is regular.

Table 9: Sample forms that exemplify *P > F (Boyeldieu et al. 2006)

posn.	sd. chg.	Nduga	Luto	gloss	< Proto SBB	
init.						
	*p > f	fítī	fítī, fītī	'flower'	*p-t-, *i-i	N/767
	*b > v	vèlé	vèlɛ̄	'feather'	*b-l-, *E-E	N/148
	*mb > mv	mvīyá	mvíyà	'beard'	*mb-y-, *i-a	N/144
med.						
	*p > f	ūfà	—	'cut up'	*-p-, *u-a	V/131
	*b > v	ɗóvò	ɗóvò	'path, road'	*ɗ-b-, *O-O	N/255
	*mb > mv	kámvà	kámvà	'foliage'	*k-mb-, *a-a	N/129

5 Discussion

So, to review, we've seen that Proto-SBB labial plosives became labial fricatives (*P > F) in both the Nduga and Luto dialects. In addition, labial-velar plosives became labial plosives (*KP > P) in the Luto dialect, but labial-velar plosives were retained in the Nduga dialect.

These two sets of sound changes can account for the fact that labial plosives are rare in Nduga, as well as the fact that labial-velar plosives are absent in the Luto dialect.

Fricativization (*P > F) is well-established as a sound change crosslinguistically, and the labial-velar to labial change (*KP > P) is common in Sub-Saharan Africa, as mentioned in § 3. One question that arises then is this: What motivates the interplay of these processes in this particular case?

One common view would be to consider that these two changes make up a *chain shift* (Campbell 2004: 47–52). I suggest that we are dealing with a *pull chain*: *P > F created a gap in the consonant system that paved the way for *KP > P to fill in the gap.

In this view, the absence of labial plosives in the consonant inventory after the application of *P > F resulted in a somewhat asymmetric sound system, containing coronal and velar plosives but no labial ones. Pike (1947: 59) has noted that sound systems tend toward phonetic symmetry, so one could argue that the system began to look for a way to repair this asymmetry.

The second sound change, *KP > P, served to repair this gap, at the expense of the labial-velar plosives – three sounds that are less common crosslinguistically than the labial plosives. Hence, this produced a more symmetric and typologically common sound system – at least for the Luto dialect.

One of the implications of this analysis is that the extant Nduga consonant system is perhaps unstable, suggesting that it may be subject to readjustment in the future. We already see that a handful of words containing labial plosives has emerged in the language, probably from borrowing or innovation.

Instead of a pull chain, one could entertain the idea that the chain shift consisted of a *push chain*. In this view, *KP > P came first, encroaching on the labial plosives. In order to maintain semantic distinctions, the labial plosives then became fricatives, i.e. *P > F.

However, this interpretation does not account for the Nduga data. In that dialect the labial-velar plosives have been retained, and *P > F has occurred without pressure from a *KP > P change.

Table 10 exemplifies the ordering of the two sound changes in the Luto dialect for the words for 'feather' and 'intestine' (tones omitted). The ordering relationship between the two sound changes is one of *counterfeeding*. In the actual order, *P > F does not apply to Proto-SBB **tikpi* 'intestine'. However, if the two changes had occurred in the opposite order, *KP > P would have applied to **tikpi* resulting in *tipi*. This form meets the structural description of *P > F, which would have resulted in *tifi*. That is, *KP > P would have fed *P > F. But given the actual ordering of the sound changes, feeding does not occur.

Table 10: Counterfeeding ordering in the Luto dialect

	sound changes	'feather'	'intestine'
Proto-SBB		*bElE	*tikpi
*P > F	fricativization	vele	—
*KP > P	LV-to-L change	—	tipi
Extant forms		vele	tipi

Cahill (2024 [this volume]) notes that there are some languages that have a velar reflex of *KP, i.e. *KP > K. These are rare in comparison to *KP > P. Cahill presents an argument from speech perception for explaining the preponderance of *KP > P. As pointed out by Ladefoged & Maddieson (1996: 334–339, and references therein), in the production of labial-velar consonants, the labial articulation slightly lags the velar one. At the moment when the velar articulation is released, the labial articulation still holds, damping the acoustic energy of the velar release. Then, at the moment when the labial articulation is released, the rest of the oral cavity is already open, allowing for undamped acoustic energy. As a result, the labial release is the more prominent of the two. The moment of

release is the most perceptually prominent part of the articulation of a plosive, so KP is more likely to be perceived as P than K. This could perhaps provide an additional motivation for why the change *KP > P occurred in Luto instead of *KP > K.

6 Conclusion

To conclude, we have seen that Proto-SBB labial plosives became labial fricatives (*P > F) in both the Nduga and Luto dialects of the Luto language. Subsequently, labial-velar plosives became labial plosives (*KP > P) exclusively in the Luto dialect of the language.

This study adds to the emerging evidence for the sound change set *KP > P (Cahill 2024 [this volume]). In addition, the presence of *P > F and the absence of *KP > P in the Nduga dialect provides evidence that the chain shift involved is a pull chain rather than a push chain.

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