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The Development of Nasalized Vowels in the Teke Language Group (Bantu)

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1. Introduction*

This current research on nasalized vowels is motivated by two main considerations. First, although surveys of phonological systems are becoming increasingly available (see, for instance, Greenberg 1978, Maddieson 1984), the data necessary for the examination of universal diachronic processes is sparse (for a notable exception, see Hagège and Haudricourt 1978). Second, there has been a growing interest among Africanists recently concerning the reconstruction of nasalized vowels for various stages of Niger-Congo (Bolé-Richard 1985, Stewart 1983, 1985, and Williamson 1985). A study of the evolution of nasalized vowels in Bantu - a subgroup of Niger Congo - where such vowels are rarely found, would then, make a valuable contribution to both the issue of universals of nasalization as well as to the particular case of nasalization in Niger-Congo.

The paper is divided into three parts: 1) a summary of universal tendencies of vowel nasalization; 2) a presentation of data on vowel nasalization in the Teke language group; and 3) a discussion of the correlations found between the behaviour of nasalized vowels in the Teke group and the universals posited for the development of nasalized vowels. Finally, I indicate directions for further research on nasalized vowels in Bantu.

2. Universal Tendencies of Vowel Nasalization

Recent surveys of vowel systems based upon different language samples indicate that slightly less than one-fourth of the world's languages (24% in Crothers (1978), 22.4% in Maddieson (1984), 21% in Ruhlen (1978)) have nasalized vowels. Geographically, most of these languages are located on the American continent (North, Central and South), in Northern India and in the western part of Sub-Saharan Africa. Among languages with nasalized vowels, none have more nasalized than oral vowels. In addition, contrary to what was commonly believed, those with an equal number of nasalized and oral vowels are not a rarity since

they constitute approximately half of the sample (Crothers 1978). When languages have fewer $\underset{\sim}{V}$[1] than V, it is often a mid vowel that is missing from the nasal system (Crothers 1978:124). For these mid vowels, there seems to be an assymetry between front and back with the $\underset{\sim}{o}/\underset{\sim}{ɔ}$ distinction being preserved more than the $\underset{\sim}{e}/\underset{\sim}{ɛ}$ distinction[2] (Maddieson 1984:130).

Diachronically, the most general process from which nasalized vowels evolve is through *regressive* assimilation, shown in (1)[3]: an oral vowel becomes phonetically nasalized when it precedes a nasal consonant; after the loss of the nasal consonant, nasalization on the vowel becomes distinctive.

(1) VN > $\underset{\sim}{VN}$ > $\underset{\sim}{V}$

There are also cases of progressive assimilation as is shown in (2), but they do not seem to be as common as cases of regressive assimilation (Hyman 1972, Chen 1975).

(2) NV > $\underset{\sim}{NV}$ > $\underset{\sim}{V}$

It has been suggested that the quality of V and the place of articulation of N play a role in this diachronic process.

a. Nasalization affects low vowels first, mid vowels second and high vowels last.

b. Nasalization affects front vowels before back vowels.

If these two suggestions are combined we obtain the following path of vowel nasalization (Ruhlen 1978:224).

c. Nasalization occurs first before labial nasal consonants, second before dental nasal consonants and finally before velar nasal consonants.

The two processes given in b and c are based primarily on restricted data from

French and Chinese (Chen 1975). In order to arrive at more general diachronic statements, additional examples of attested nasalization of vowels are needed. Of particular interest are examples of change in progress. It is such a case, attested in the Teke group of languages, that I describe below.

3. The Teke Group

3.1. Geographical Location and Linguistic Classification

These languages are found on the southeastern plateau of Gabon and on both sides of the Congo (or Zaire) river in the Republic of Congo and in Zaire. Their nucleus belongs to the B.70 subgroup of Bantu languages (Guthrie 1953, 1971) and is located in the Republic of Congo. Neighbouring languages of the B.60 group in Gabon or of the B.80 group in Zaire are included in the Teke group by some authors (Adam 1951, Bryan 1959, Guthrie 1960). The languages to be discussed below belong to B.70 only.[4]

3.2. Nasalized Vowels in the Teke Group

a. Guthrie's descriptions and reconstructions

As early as 1953, Guthrie indicates in *The Bantu Languages of Western Equatorial Africa* (p. 78) that nasalized vowels occur frequently in the languages of the Teke group. In 1957 he visited the Teke area and published the results of his fieldwork in a 1960 article entitled "Teke radical structure and common Bantu". In this paper he indicates some correspondences between Proto-Bantu forms and nasalized vowels in Teke. A more complete account of these developments is given in his *Comparative Bantu* (Guthrie 1971) where three of the Teke languages presented show nasalized vowels: Ibali, Ndzindziu and Ngungwel. The nasalized vowel reflexes in these three languages correspond to the Proto-Bantu forms containing *mb or *m in intervocalic position[5] and are presented in Tables 1[6] and 2. Guthrie also mentions that in Ndzindziu *ambi > ao and *embi > iu.

Table 1. Reflexes of Proto-Bantu *-V_1mba in Ibali, Ndzindziu and Ngungwel (adapted from Guthrie 1971).

Proto-Bantu	Ibali	Ndindziu	Ngungwel
*-ɨmba	iima		
*-imba	iima		ii(m)
*-emba	io	iɔ	iɛ(m)
*-amba	ao	iɔ	aa(m)
*-omba	uo	wɔ	ɥo(m)
*-umba	uuma	wu	uu(m)
*-ʉmba	uuma	wu	

Table 2. Reflexes of Proto-Bantu *-V_1ma in Ndindziu and Ngungwel (adapted from Guthrie 1971).

Proto-Bantu	Ndzindziu	Ngungwel
*ɨma	yu	a(m)
*ima	yu	a(m)
*ema	ɔ	a(m)
*ama	ɔ	a(m)
*oma	ɔ	a(m)
*uma	u	a(m)
*ʉma	u	a(m)

In addition, Ngungwel has developed nasalized vowels before dental nasals, *n (Table 3) and also before *nd (Table 4).

Table 3. Reflexes of Proto-Bantu *V_1nV_2 in Ngungwel (adapted form Guthrie 1971).

Proto-Bantu	Ngungwel
*ɨnV_2	
*inV_2	e(n)
*enV_2	e(n)
*anV_2	
*onV_2	we(n)
*unV_2	we(n)
*ʉnV_2	

Table 4. Reflexes of Proto-Bantu *-V_1nda in Ngungwel (adapted from Guthrie 1971).

Proto-Bantu	Ngungwel
*i̱nda	
*inda	ɛɛ̰(n)
*enda	i̱ɛ̰(n)
*anda	aa̰(n)
*onda	oo̰(n)
*unda	uṵ(n)
*u̱nda	

These tables show that Ibali presents the most restricted case of nasalization (it occurs only when *C_2 = mb and *V_1 = e, a, o). In Ndzindziu nasalization seems to have affected all *V_1 when *C_2 was m or mb. The process has gone even further in Ngungwel where *n and *nd have also become an appropriate context for developing nasalization. Except for the data given on Table 3 and the two forms *ambi and *embi mentioned above, all forms presented by Guthrie have a in *V_2 position. This limitation makes it difficult to evaluate the role played by the final vowel in the development of nasalization.

b. Additional data

To permit a better understanding of the diachronic process of nasalization, I shall now present additional data from two of the languages discussed above, Ibali and Ndzindziu[7], and I will add two other languages, Fumu and Kukua[8], in order to illustrate earlier stages of the vowel nasalization process. The languages are presented in the order which I believe recapitulates the diachronic evolution.

Tables 5 to 12 summarize the relevant data from these four languages.[9] The data for Fumu are taken from Calloc'h (1911) and Mboukou (1976). These two sources were combined because Calloc'h's data are more extensive but do not indicate vowel length or tone. The Kukua data are from Paulian (1975, unpublished).[10] The data on the last two languages, Ibali and Ndzindziu, are my own.[11]

Fumu

The reflexes of Proto-Bantu *-V_1mV_2 (Table 5) and of *-V_1mbV_2 (Table 6) show that in Fumu *m is preserved, *mb > m with lengthening of preceding V_1 and that generally the quality of *V_1 is preserved, except for *i̱ and *u̱ which

become i and u respectively. There is also palatalization before *e and labialization before *o when *C_2 was mb. The reflexes of Proto-Bantu forms in Fumu for *V_2, and in fact in the entire Teke group, are quite complex, as will be seen in the following paragraphs. Of particular interest are cases of *i̱ and *i > u and also cases of *u̱ and *u > i. For further discussion on this topic, see Hombert (forthcoming).

Table 5. Reflexes of Proto-Bantu *-V_1mV_2 in Fumu (adapted from Calloc'h 1911 and Mboukou 1976).

V_1 \ V_2	i̱	i	e	a	o	u	u̱
i̱				ima			
i		imu		ima			
e			(eme)		emo		
a				ama			
o				omo			
u			umi	uma			
u̱							umu

Table 6. Reflexes of Proto-Bantu *-V_1mbV_2 in Fumu (adapted from Calloc'h 1911 and Mboukou 1976).

V_1 \ V_2	i̱	i	e	a	o	u	u̱
i̱				iima			
i							
e				ye(e)me		ye(e)mo	
a		a(a)mi	aami	aama		a(a)mo	
o				wo(o)mo	wo(o)mo		
u				uuma		u(u)mi	
u̱				uuma			

Kukua

In general, the reflexes in Kukua (Tables 7 and 8) are similar to the Fumu reflexes, i.e., *mb > m with compensatory lengthening of preceding V_1. However, an important fact mentioned by Paulian (personal communication) should be pointed out: the forms noted VVmV in Table 8 can *also* be pronounced VṼ (i.e., eeme or eḛ, aama or aa̰ and oomo or oo̰). Notice also that *all* reflexes are

palatalized if $*V_1$ was a front vowel and labialized when $*V_1$ was a back vowel.

Table 7. Reflexes of Proto-Bantu $*\text{-}V_1mV_2$ in Kukua (adapted from Paulian 1975 and unpublished).

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				ima			
i				ima			
e					eme		
a				ama			
o				omo			
u			umi	uma			
ụ							umu

Table 8. Reflexes of Proto-Bantu $*\text{-}V_1mbV_2$ in Kukua (adapted from Paulian 1975 and unpublished).

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				yiima			
i							
e				yeeme	yeeme	yeeme	
a		aami	aami	aama		aami	
o				woomo	woomi		
u				wuuma			wuumi
ụ				wuuma			

Ibali

Data concerning nasalization in Ibali were presented in a recent paper (Fontaney and Hombert, to appear) where it was indicated that nasalized vowels in nominal forms could be divided into three groups:

- vowels ụ̃, ị̃ and ạ̃, found in noun prefix position;
- nasalized vowels preceded by a nasal consonant such as mị̃ 'urine' and ŋẹ̃ 'acidity';
- long (or double) nasalized vowels which are nasalized throughout their whole duration (e.g. ạạ̃) or only during their second half (e.g. ị̃ɔ̃ and ụ̃ɔ̃), such as nʈsáǽ̃ 'palm wine', ɭúɔ̃ 'request', ŋgʈɔ̃ 'bat'.

The origin of nasalized vowels for the first two groups is clear. In the first case, Proto-Bantu prefixes *mu-, *mi- and *ma- have become ụ̃-, ị̃- and ạ̃- (nasalization of V by *preceding* nasal consonant with subsequent loss of the consonant). Similarly, in the second case, a vowel is nasalized by a preceding nasal consonant, but the nasal consonant is preserved. In Fontaney and Hombert, we argued that the position of an accent accounted for the loss of the nasal consonant in one case but not in the other. The nasalized vowels of the third group are those which are of particular interest here.

Table 10 confirms the reflexes we established in our earlier paper, where we discussed a smaller corpus consisting of nouns only. Nasalization developed in Ibali from $*V_1mbV_2$ only when $*V_1$ was *e, *a, or *o[12], the reflexes of which are ị̃ɔ̃, ạạ̃ and ụ̃ɔ̃ respectively. Thus, the quality of the resulting nasalized vowel seems to be independent of the quality of $*V_2$. Nasalization did not occur with closed vowels *ị, *i, *ụ and *u, or when $*C_2$ was m as shown in Table 9. These data seem to indicate that nasalization is triggered by V_1, but that V_1 is nasalized only after V_2 has been nasalized and C_2 lost. Furthermore, the nasalization of V_1 seems to depend also on its height, low vowel a being nasalized before i or u.

Table 9. Reflexes of Proto-Bantu $*\text{-}V_1mV_2$ in Ibali.

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				ima			
i		imu		ima			
e			(eme)		emu		
a				ama			
o				omo			
u			umi	uma			
ụ							umu

Table 10. Reflexes of Proto-Bantu *-V_1mbV_2 in Ibali.

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				iima			
i							
e			iɔ̃		iɔ̃	iɔ̃	
a		aã		aã		aã	
o				uɔ̃	uɔ̃		
u				uuma		uumi	
ụ				uuma			

Ndzindziu

In this language, all reflexes of Proto-Bantu *-V_1mV_2 (Table 11) and of *-V_1mbV_2 are nasalized. In constrast to Ibali, nasalization in Ndzindziu occurs even with closed vowels in *V_1 and with *m in C_2 position.

Several facts are quite surprising in Table 11. First of all, the vocalic length of the Ndzindziu reflexes is not consistent. Some reflexes show short nasalized vowels (e.g., o̰, ɔ̰), some are also short but preceded by a glide (e.g., ^{j}o̰, ^{j}ɔ̰) and finally some are double vowels, partly oral and partly nasal (e.g. uo̰ and oo̰). Secondly, some of the reflexes of *-ima and all reflexes of *ịma are unexpected since *V_1 is front but the reflexes show the back vowel u in this position. It seems that the i/u change that was mentioned earlier for V_2 position (see Fumu paragraph) may have occurred in some rare cases also in V_1 position.

Table 11. Reflexes of Proto-Bantu *-V_1mV_2 in Ndzindziu.

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				uo̰			
i		^{j}o̰		$\left\{\begin{matrix} ^{j}$ɔ̰ \\ oo̰ \end{matrix}\right.$			
e					^{j}ɔ̰		
a				ɔ̰			
o				ɔ̰			
u			o̰	oo̰			
ụ							o̰

Table 12 is more homogeneous. All reflexes are of the same type: VV̰. It seems that when *V_1 was front, the reflexes are iɔ̰ independently of the quality of V_2; when *V_1 was a: *ambv$_2$ > aɔ̰; when *V_1 was back, the reflexes are uo̰ (with one exception *umbu > uo̰ and not uɔ̰; this is the only case in Table 12 where a reflex depends on the quality of *V_2).

Table 12. Reflexes of Proto-Bantu *V_1mbV_2 in Ndzindziu.

V_1 \ V_2	ị	i	e	a	o	u	ụ
ị				iɔ̰			
i							
e			iɔ̰	(iɔ)	iɔ̰	iɔ̰	
a		aɔ̰	aɔ̰	aɔ̰		aɔ̰	
o				uo̰	uo̰		
u				uo̰		uo̰	
ụ				uo̰			

The last four tables (Tables 9, 10, 11 and 12) concerning Ndzindziu and Ibali, the two languages where the nasalization process is the most advanced, can be completed and the correspondences confirmed by looking at verb conjugation. Bantu verbal roots generally have a -$C_1V_1C_2$- structure. In the infinitive form -a is added in final position while in the past tense -i takes this V_2 position, e.g., in Ndzindziu, u-kúnà 'to plant', but m^{j}é kúnì 'I planted'.

Examining the appropriate contexts for nasalization, i.e., with *C_2 = *mb in Ibali and *m or *mb in Ndzindziu, we obtain the correspondences presented in Tables 13, 14 and 15.

Table 13 shows that nasalization occurs in Ibali when *C_2 = *mb and *V_1 = *e, *a, or *o and that the quality of the resulting vowel is independent of V_2. In contrast, as shown on Tables 14 and 15, *V_2 may influence, in some cases, the quality of the resulting nasalized vowel in Ndzindziu.

Table 13. Reflexes of Proto-Bantu *-V_1mb-a and *V_1mb-i in Ibali.

V_1 \ V_2	-a (infinitive)	-i (past tense)
ị	iima	iimi
i		
e	iɔ̰	iɔ̰
a	a̰a̰	a̰a̰
o	uɔ̰	uɔ̰
u	uuma	uumi
ụ	uuma	uumi

Table 14. Reflexes of Proto-Bantu *-V_1m-a and *-V_1m-i in Ndzindziu.

V_1 \ V_2	-a (infinitive)	-i (past tense)
ị	ʊ̰ʊ̰	ʊ̰ʊ̰
i	ʊ̰ʊ̰	ʊ̰ʊ̰
e		
a	ɔ̰	ɔ̰
o		
u	o̰o̰	o̰o̰
ụ		

Table 15. Reflexes of Proto-Bantu *-V_1mb-a and *-V_1mb-i in Ndzindziu.

V_1 \ V_2	-a (infinitive)	-i (past tense)
ị	iɔ̰	iɔ̰
i		
e	iɔ̰	iɔ̰
a	aʊ̰	aʊ̰
o	ʊ̰ʊ̰	ʊ̰ʊ̰
u	ʊ̰ʊ̰	ʊ̰ʊ̰
ụ	ʊ̰ʊ̰	ʊ̰ʊ̰

Nasalization found in Ibali when *C_2 = *mb and in Ndzindziu when *C_2 = *mb and *m, does not occur with other prenasalized stops or nasal consonants. Tables 16 and 17 present reflexes of Proto-Bantu *n and *nd.

Table 16. Correspondences between Proto-Bantu *n in C_2 position (from Guthrie 1971) and Ibali and Ndzindziu reflexes.

	Proto-Bantu	Ibali	Ndzindziu
to finish	1283 màn-à	-mànà	-mànà
to plant	1217 kún-à	-kúnà	-kúnà
to deny	1838 tún-à	-túnà	-túnà
to become aged	1382 nu̱n-à	-nùnà	-nùnà

Table 17. Correspondences between Proto-Bantu *nd in C_2 position (from Guthrie 1971) and Ibali and Ndzindziu reflexes.

	Proto-Bantu	Ibali	Ndzindziu
to become black	1555 pi̱nd-à	pìlnà	pìlnà
shin	1526 píndí	u-wíínɪ́	
thorn	320 céndé	n-tš^{j}éénɛ́	n-tš^{j}éénɛ́
to begin	49 bánd-à	báánà	báánà
to follow	493 dànd-à	làànà	làànà
to spread	1663 tànd-à	tàànà	tàànà
to desire	1788 tónd-à	t^{w}óónɔ̀	tóónɔ̀

It can be seen on Tables 16 and 17 that *n > n and that *nd > n with lengthening of the preceding vowel. In both cases the nasal has been preserved.

This is quite different from the result obtained when the prenasalized stop is a velar[13], as shown in Table 18. In this case the consonant is dropped without the development of nasalization on adjacent vowels.[14]

Table 18. Correspondences between Proto-Bantu *ŋg in C_2 position (from Guthrie 1971) and Ibali and Ndzindziu reflexes.

	Proto-Bantu	Ibali	Ndzindziu
to surround, to bind	624 di̱ŋg-à	dzíà	
neck	1086 ki̱ŋgò	ŋ-kíú	ŋ-kíí
to become red	92 bèŋg-à	bìè	bìè
news	292 càŋgò	n-tsàà	n-tsàà
knee	170 bóŋgó	búó	búó
to teach	660 dòŋg-à	ìùò	ìùò
moon	420 cúŋgí	n-tš^{ɥ}íí	n-tš^{ɥ}íí
pepper	718 dúŋgú	n-dúú	a̰n-zúú

4. Correlations between the development of nasalized vowels in Teke and universal tendencies

In the preceding section various stages of vowel nasalization have been examined in the Teke group of languages. In Fumu, nasalization has not yet started. In Kukua, nasalization is *optional* in certain phonetic contexts, those corresponding to Proto-Bantu forms in which $*V_1$ was non-high and $*C_2$ was a prenasalized *labial* stop. These are exactly the contexts where we find *obligatory* nasalization in Ibali. In Ndzindziu, the development of nasalization has gone further: it occurs *also* with high vowels (front and back) and with forms which had *m in C_2 position and not only *mb as in Ibali.

The real issue here is not why a prenasalized stop (e.g., mb) is more likely to trigger vowel nasalization than a plain nasal (e.g., m). I propose that what is crucial is that when prenasalized stops become plain nasals (e.g., mb > m), there is compensatory lengthening of the preceding vowel. Subsequently, nasalization affects *long* vowels before short ones. That nasalization occurred after vowel lengthening is illustrated by the fact that Proto-Bantu forms with long $*V_1$ ($*\text{-}V_1V_1mV_2$) (e.g., 'to rest', Proto-Bantu *púúm-à > Ibali wúúmà, and > Ndzindziu wúũ̀) evolved in the same fashion as $*\text{-}V_1mbV_2$ forms presented earlier in Tables 10 and 12.

Notice also that independently of the $*V_2$ quality, the nasalized reflexes in Ibali and Ndzindziu are always back vowels (o̰, ɔ̰, ʊ̰). This is probably due to the labialization effect of *m before it drops out. Based upon Guthrie's Ngungwel data it would appear that after the development of nasalization from labial nasal consonants, the process spreads to dental nasal contexts. In this case the resulting nasalized vowels are not necessarily back or rounded (see Tables 3 and 4). Finally, one puzzling fact should be emphasized. Velar nasals have disappeared without leaving any traces of nasalization on neighboring vowels (see Table 18).

Some of the phonetic factors associated with the development of nasalized vowels in Teke are quite parallel to the universal tendencies presented in Section 2: 1) nasalization occurs first when the vowel *preceding* the nasal consonant is low and affects high vowels at a later stage; and 2) labial nasals seem to trigger vowel nasalization before dentals.[15]

However, three facts brought to light during the study of this change in progress in Teke, merit closer investigation in future studies of the development of nasalization.

- long vowels are affected before short vowels (i.e., $*V_1mbV_2 > V_1V_1mV_2$ is nasalized before $*V_1mV_2$)

The connection between long vowels and nasalization has been mentioned in the literature (see, for instance, Bloch 1965:48, Bloch 1970:86 for Northern Indian languages)[16] but has not been, to my knowledge, considered in the short list of universal tendencies of vowel nasalization.

- labialization of the quality of nasalized vowel reflexes

This association has been pointed out by Ruhlen (1978:230) and is due, I believe, to the effect of the place of articulation of the original nasal consonant. If this is true, labialization should not occur when nasalized vowels originate from dental or velar nasal consonants.

- the respective role played by $*V_1$ versus $*V_2$ in the development of nasalization

Whether the process of vowel nasalization was regressive or progressive in Teke is not completely clear at the moment. In most cases the process was conditioned by the quality of V_1, with V_2 playing a very minor role. This suggests that nasalization in Teke was primarily a regressive process. It should be mentioned, though, that the nasalized vowel reflexes are generally nasalized toward their offset but not their onset, thus suggesting a progressive process (i.e. VNV > V̰V̰).

Some of the discrepancies between the process of nasalization observed in Teke and the universal tendencies may be accounted for by the fact that in Teke the triggering nasal consonant was in intervocalic position, whereas in most of the studies of vowel nasalization, the nasal consonants were in word final position (see, for instance Chen 1975).

5. Directions for future research

Most of the suggestions concerning the development of vowel nasalization in Teke would be strengthened if Proto-Teke reconstructions were available. To allow this reconstruction, additional data from other languages of the area are needed. Because I did not have such data I had to compare *Proto-Bantu* forms with modern Teke forms and consequently, took the risk of overlooking

crucial intermediate diachronic stages necessary for understanding the process of nasalization in Teke.

When studying a change in progress, it is particularly important to collect accurate phonetic data in order to hypothesize the direction of change. Ideally, these data should cover the articulatory, acoustic and perceptual domains. It would be extremely interesting, for instance, to measure the degree of produced and perceived nasality (if any) in the environment of n as a function of the quality of V_1 in Ibali and Ndzindziu. This may, then, enable prediction about how nasalization is progressing.

Finally, contrary to recent suggestions concerning various stages of the Niger-Congo family (Bolé-Richard 1985, Stewart 1985, Williamson 1985), I have assumed in this paper that Proto-Bantu (and Proto-Teke) had only oral vowels and that nasalized vowels are a recent evolution. Future research should examine all Bantu languages in which nasalization has been described (e.g., Zone B: Nson (Meeussen 1964); Zone C: Leke (Vanhoudt 1979-80) and Sakata (De Witte 1955); Zone R (Schadeberg 1982 and Crabb 1962) to ascertain whether the diachronic process of nasalization in other languages has followed the same pattern as I have presented for Teke or whether different diachronic paths can be proposed.

Notes

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1. $\tilde{V}$ stands for nasalized vowel and V for oral vowel.
2. Ruhlen (1978:222) does not believe there is a difference between front and back.
3. Hagège and Haudricourt (1978:203) suggest another explanation for the development: the change from postnasalized consonant to plain consonant, attested in Hienghène (New Caledonia):

   pmV > fṼ

   This type of development is not unrelated to progressive assimilation examined below.
4. For a more precise localisation of these languages, see Jacquot (1965), Mboukou (1976), Soret (1955) and Vansina (1973). See Annex A for a list of languages belonging to the B.70 group.
5. I use interchangibly "invervocalic" or "C_2 position" for the position of the nasal consonants since the forms considered here have a C_1 V_1 C_2 V_2 structure.
6. Proto-Bantu is reconstructed with seven vowels: ɨ, i, e, a, o, u, ʉ. ɨ and ʉ refer to the so-called "super-closed" vowels.
   In Tables 1, 2, 3 and 4, I have included only reflexes for which Guthrie provided examples. This does not necessarily mean, though, that nasalization did not occur with other $*V_1$ and $*V_2$ combinations.
7. I was unable to have access to native speakers of Ngungwel.
8. For Fumu and Kukua, Guthrie indicates that $V_1mb > V_1V_1^m$ and $V_1nd > V_1V_1^n$.
9. Specific examples are presented in Annex B.
   Empty slots in Tables 5 through 12 occur when I was unable to find reflexes for the corresponding $*V_1/*V_2$ combinations.
10. I would like to thank C. Paulian for her most helpful discussion of Kukua and for allowing me to use her, as yet, unpublished data.
11. My informants are Mr. Jean-Jonas Ununu and Mr. Jean-Thomas Ununu for Ibali and Mr. Eric Opu and Mr. Luc Okio for Ndzindziu.
12. Notice that these are the same cases where we had optional nasalization in Kukua.
13. Plain velar nasals are rare in Proto-Bantu and have not been considered here.
14. Here again, the reflexes of $*V_2$ are unexpected and require further study.
15. Although, velar nasals may have been dropped first (i.e., before labials) they did not nasalize adjacent vowels.
16. I thank B. Michailovsky for pointing out these data to me.

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Annex A

List of Teke languages spoken in Congo (adapted from Jacquot 1965 and Mboukou 1976)

	Geographical Location	Other Names
1. Fumu	around Brazzaville	Fummo, Ifumu
2. Ibali	in and around Brazzaville	Bale, Bali
3. Wumu	45 kms north of Brazzaville	Wuumo, Mpuo, Wuu
4. Buma	between Lefini and Nkeni Rivers	Boo, Boo
5. Ndzindziu	around Djambala	Nzinzu, Djambala
6. Kukua	around Lekana	Kukuya, Koukouya
7. Ngungwel	around Gamboma	Ngangulu
8. Itege	Alima	Itee, Tege
9. Yaka	around Sibiti	Yaa
10. Kwee	around Pangala and Mayama	Kwɛɛ, Kwe, Tie
11. Tsaayi	around Zanaga	Tsayi
12. Laali	around Sibiti	Laale, Lali
13. ŋeŋe	east of Djambala	Nene, ŋee
14. Ngwongwoni	2 villages south of Zanaga	

Annex B

Correspondences between Proto Bantu $*V_1mV_2$ and $*V_1mbV_2$ (Proto-Bantu reconstructed forms and identification numbers from Guthrie 1971) and Fumu (Fumu 1 (Mboukou 1976), Fumu 2 (Calloc'h 1911), Kukua (Paulian 1975, unpublished) Ibali and Ndzindziu reflexes

	Proto-Bantu		Fumu 1	Fumu 2	Kukua	Ibali	Ndzindziu
to swell	144	bʃmb-à	bʃʃmà	bima	byʃìmà	bʃʃmà	bɪ̀
corpse	145	bʃmbà		i-bima	ki-byìmà	i-bìmù	i-bɪ̀
to catch				sima	syìmà	sìmà	šɪ̀
horn	317	cémbò			n-tsyéèmè	n-tsfɔ̀	n-tšfɔ̀
finger	538	démbó			o-lyéèmè	u-lfɔ̀	u-lfɔ̀
bat	804	gèmbú		ŋ-gyemo	ŋ-gyèèmé	ŋ-gɪ̀ɔ	ŋ-gɪ̀ɔ
white clay	1477	pémbé			m-pyéémé	m-pfɔ́	m-pfɔ́
grave				m-pyeme	m-pyéémé	m-pfɔ́	m-pfɔ́
to touch		-à		byeme	byèèmè	bɪ̀ɔ̀	bɪ̀ɔ̀
to play	ps428	támb-à		tama	táàmà	táà	táɲ
to patch	39	bàmb-à		bama	bààmà	bàà	bàɲ
to cook	486	dámb-à			ɪáàmà	ɪáà	ɪáɲ
to blame					yáàmà	yáà	yáɲ
to beat				sama	sààmà	sàà	sàɲ
to implore					sáàmà	sáà	sáɲ
liana			m-báámá	li-bama	li-báámá	m-báá	li-báŋ
sole (of foot)	1659	támbʃ		i-tamɪ	ki-táámʃ	i-táá	i-táŋ
monitor lizard	43	bámbì		m-bami	m-báámì	li-báá	li-báɲ
bell					m-páámì	m-páá	
god	925	jàmbé	n-záámʃ	n-zami	n-zààmʃ	n-zaa	n-zãɲ
seven	269	càmbù		n-samo	n-tsààmì	n-sàà	n-tsàɲ
hemp				dyamu	dž^{w}ààmì	dzàà	dz^{w}àɲ
fine			yààmù		yààmì	yàà	yáɲ
half			ndààmù			ndàà	
ant				ŋ-kamu	ŋ-kààmì		ŋ-kàɲ
to borrow	376	còmb-à		cwomo	fwòòmò	fùɔ̀	fùɲ
to ask for	653	dómb-à			lwóòmò	lúɔ̀	lúɲ
to sweep	1137	kómb-à		kwomo	kwóòmò	kúɔ̀	kúɲ
broom	1141	kómbó		kwomo	kwóòmì	i-kúɔ̀	i-kúɲ
eight				m-pwomo	m-pwóómó	m-púɔ́	m-púŋ

	Proto-Bantu	Fumu 1	Fumu 2	Kukua	Ibali	Ndzindziu
to buy	414 cúmb-à	súúmà	suma, fuma	fwúùmà	fúúmà	fúɔ̰
to hide	198 búmb-à				búúmà	
name	1214 kúmbú		ŋ-kumi	ŋ-kwúúmí	ŋ-kúúmì	ŋ-kúó̰
navel			mu-ŋkumi		ṵ-ŋkúúmí	ṵ-ŋkúó̰
to bake in ashes	ps56 bɣ̀mb-à	bvúúmà		bvwùùmà	bvùùmà	bvùɔ̰
to dig	1752 tʃm-à	tsímà	tsima	tsímà	tsímà	tšúɔ̰
to think				tsìmà	tsìmà	tšùɔ̰
become surprised	337 cím-à		sima	símà		šúɔ̰
recollection			n-simu	n-sìmí	n-tsìmú	n-tšʉ̃ʉ̃
other			kima	kìmà	-kìmà	-kʲɔ̃
lack of space					m-pìmá	m-pʲʉ̃
tongue	572 dímì		li-limu		li-límò	li-lʲô̰
monkey	1058 kímà		ŋ-kima	ŋ-kímà	ŋ-kímà	ŋ-kʲô̰
hoe	1705 témò	témù	temo	témè	témù	tʲɔ̃
rotating credit association				ki-témè	i-témù	i-tʲɔ̃
doubt				ḭ-kémè	ḭ-kémù	ḭ-ŋkʲɔ̃
slowness, heaviness			leme	ki-lèmè	u-lèmè	u-lʲɔ̃
to shout	1907 yám-à	yámà	yama		yámà	yɔ̃
to dry				yámà	yámà	yɔ̃
to be strong		wámà	wama	wámà	wámà	wɔ̃
hundred	997 kámá		mu-ŋkama	ŋ-kámá	ŋ-kámá	ŋ-kɔ́
python	159 bòmà	mbòmò		m-bòmò	m-bòmò	m-bɔ̀
drum	1401 ŋòmà	ŋgòmò		ŋòmò	ŋòmò	ŋɔ̀
bridge					i-tòmò	i-tɔ̀
to send	1831 túm-à	túmà	tuma	túmà	túmà	tóɔ̰
to climb	-à	kúmà		kúmà	kúmà	kóɔ̰
to squat	-à		pfuma		pfúmà	pfóɔ̰
leech				n-tùmá	n-tʉ̀má	n-tòɔ́
tale, story			ŋ-kuma	ŋ-kúmá	ŋ-kúmá	ŋ-kóɔ́
husband	697 dúmè	mu-lúmì		ṵ-lúmì	ṵ-lúmì	ṵ-lô̰
chief	1265 kɣ́mɣ̀		m -fumu	mfúmú	mfúmú	mpfɔ́