TYPICAL VOWEL SYSTEMS AND PROCESSES IN WEST AFRICAN NIGER-CONGO LANGUAGES

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West African Niger-Congo languages are well-known for vowel harmony based on the feature [expanded] or [ATR]. This paper first notes some typical vowel systems for the area and then examines a number of vowel processes, including but not restricted to those which involve vowel harmony. They will be described with a set of features which partly differ from the standard set.

On constate que très souvent les langues niger-congo de l'Afrique de l'Ouest possèdent des systèmes d'harmonie vocalique basés sur le trait [pharynx élargi] ou [ATR]. Cet article note d'abord quelques systèmes qui sont typiques dans la région, et examine ensuite quelques processus phonologiques qui affectent les voyelles, y compris ceux de l'harmonie vocalique, ainsi que d'autres qui sont moins connus. On les décrira avec l'aide d'une gamme de traits distinctifs qui diffèrent en partie des traits traditionnels.

0. INTRODUCTION

West African Niger-Congo languages are well known for vowel harmony based on the feature [ATR] (better named [expanded]: Lindau 1975). Casali (1997) has shown that many interesting generalisations can be made about such systems. In addition to processes based on [expanded] vowel harmony, there are other processes which can be regarded as typical for West African languages. This paper will first note some typical vowel systems for the area and then examine a number of vowel processes, including but not restricted to those which involve vowel harmony.[1] They will be described with a set of features which partly differ from the standard set. Nasalised vowels are not treated here.

1. BALANCED VOWEL SYSTEMS

Guthrie (1948:12) cites as one of the subsidiary criteria for Bantu the presence of "a balanced vowel system in the radicals, consisting of one open vowel 'a' with an equal number of back and front vowels". Balanced vowel systems of this type, which I will call triangular systems, are typical but certainly not diagnostic for Bantu, since they occur widely throughout West African Niger-Congo languages as well as being the most widespread type in general. They are subclassified according to the number of vowels, as in (1).[2]

[1] I am grateful to Peter Kpolovie for checking Epie data, to Emmanuel Efere, Ozo-mekuri Ndimele, and other colleagues for comments during an earlier presentation, and to Akinbiyi Akinlabi, Bruce Connell, and Ian Maddieson for further comments.

[2] Transcription is IPA, except that for convenience the tilde is placed below the vowel, and **y** replaces IPA [**j**].

(1) Triangular systems

	Nine vowels		*Seven vowels*		*Five vowels*	
	[+pal]	[+lab]	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]	**i**	**u**	**i**	**u**	**i**	**u**
[+hi, +mid]	**ɪ**	**ʊ**				
[+mid]	**e**	**o**	**e**	**o**	**e**	**o**
[+mid, +low]	**ɛ**	**ɔ**	**ɛ**	**ɔ**		
[+low]	**a**		**a**		**a**	
	Ịjọ cluster *Ijoid*		Idoma *Idomoid*		Gwari[3] *Nupoid*	

In the notation of the tables in this paper, I use a feature [mid] in addition to the conventional [high], [low]. These three features form a *scalar* set in which the [+] values of the extremes ([high], [low]) are incompatible, whereas the [+] value of [mid] can combine with either [+high] or [+low], as well as standing alone. The advantages of this are:

1. That five degrees of height can be specified.
2. That the intermediate levels are shown as more marked by having two [+] values.
3. That the loss of [**ɪ ʊ**] (as in seven-vowel systems) can be specified as a simplification of [+high, +mid] to either [+high] (implying [–mid]), or to [+mid] (implying [–high]), a natural merger reflected in a simple formal process; similarly, the loss of [**ɛ ɔ**] (as in five-vowel systems) can be specified as a simplification of [+mid, +low] to either [+low] (implying [–mid]), or to [+mid] (implying [–low]). These are all natural and commonly attested processes.

The place features of vowels in the tables in this paper are specified with [+palatal] for front unrounded vowels and [+labial] for back rounded vowels; as with height, unspecified features are implied to be [–]. This allows central vowels to be left unspecified, i.e. [–palatal, –labial], as shown in table (1). These two features are not universally adequate without elucidating their relationships with [back] and [round], but they serve for this paper.

Nine-vowel triangular systems in West African Niger-Congo languages, in my experience, always have [expanded] vowel harmony; seven-vowel systems often have a reduced form of it; five-vowel systems do not.

There are also incomplete triangular balanced systems, with /**ɛ**/ missing, subclassified into eight and six-vowel systems, as in (2).

[3] Hyman and Magaji 1970.

(2) Incomplete triangular systems

	Eight vowels		*Six vowels*	
	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]	**i**	**u**	**i**	**u**
[+hi, +mid]	**ɪ**	**ʊ**		
[+mid]	**e**	**o**	**e**	**o**
[+mid, +low]		**ɔ**		**ɔ**
[+low]	**a**		**a**	
	Igbo *Igboid*		Tiv *Bantoid*	

In these systems /**e**/ shows considerable allophonic variation within a single language; e.g. between [**e**] and [**ɛ**] in Igbo, and between [**e**], [**ɛ**], and [**ə**] in Tiv, suggesting that these systems derive historically from nine and seven-vowel triangular systems respectively.

Casali (1997) treats as variants of the nine and seven-vowel systems those which have one or more additional central vowels. The most common pattern here, in my experience, is an additional open-mid vowel. In a ten or eight-vowel language it functions as the [+expanded] counterpart of /**a**/, where I treat it as open-mid and transcribe it as /**ɜ**/; in a six-vowel system I treat it as close-mid and transcribe it as /**ə**/. I call systems of this type triangular low central systems.

(3) Triangular low central systems

a.

	Ten vowels			*Eight vowels*		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	**i**		**u**	**i**		**u**
[+hi, +mid]	**ɪ**		**ʊ**			
[+mid]	**e**		**o**	**e**		**o**
[+mid, +low]	**ɛ**	**ɜ**	**ɔ**	**ɛ**	**ɜ**	**ɔ**
[+low]		**a**			**a**	
	KoHumono[4] *Upper Cross*			Lokaa (Yakurr)[5] *Upper Cross*		

[4] Cook 1969.
[5] Iwara 1982.

b.

	Seven vowels			*Six vowels*		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	**i**		**u**	**i**		**u**
[+hi, +mid]						
[+mid]	**e**		**o**	**e**	**ə**	**o**
[+mid, +low]		**ʌ**	**ɔ**			
[+low]		**a**			**a**	
	Ibibio[6] *Lower Cross*			Jju (Kaje)[7] *Platoid*		

Another type of system completes the central column of the system with a full set of central vowels. I call this a triangular full central system. Note that in (4) I use /**ʌ**/ as a [–expanded] open-mid vowel (following Marchese 1983:131), whereas I use /**ɜ**/ for the [+expanded] one.

(4) Triangular full central systems

	Thirteen vowels			*Seven vowels*		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	**i**	**ɨ**	**u**	**i**	**ɨ**	**u**
[+hi, +mid]	**ɪ**	**ʉ**	**ʊ**			
[+mid]	**e**	**ə**	**o**	**e**	**ə**	**o**
[+mid, +low]	**ɛ**	**ʌ**	**ɔ**			
[+low]		**a**			**a**	
	Bété (Soubré dialect)[8] *Eastern Kru*			Tarok[9] *Plateau: Tarokoid*		

Systems with one or more gaps in the central series also occur; I call these triangular partial central systems.

[6] B. Connell p.c.
[7] McKinney 1972.
[8] Marchese 1983.
[9] Longtau 1993.

(5) Triangular partial central systems

	Twelve vowels			*Eleven vowels*		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	**i**	**ɨ**	**u**	**i**		**u**
[+hi, +mid]	**ɪ**	**ʉ**	**ʊ**	**ɪ**		**ʊ**
[+mid]	**e**	**ə**	**o**	**e**	**ə**	**o**
[+mid, +low]	**ɛ**		**ɔ**	**ɛ**	**ʌ**	**ɔ**
[+low]		**a**			**a**	
	Bété (Issia dialect)[10] *Eastern Kru*			Bété (Gagnoa dialect)[11] *Eastern Kru*		

2. HARMONY SYSTEMS BASED ON [EXPANDED] ([ATR])

I adopt the feature [expanded] from Lindau 1975, where it refers to the expansion of the pharynx by either advancing the root of the tongue, or by lowering the larynx, or both, and contrast it with a feature [contracted], meaning that the pharynx is contracted by either retracting the root of the tongue, or by raising the larynx, or both. These are *paired* features, of which the [+] values are incompatible. The advantage of these features is that they allow the vowels which combine with those of both sets, as well as all the vowels of languages which do not have this type of harmony, to be specified as [–expanded], [–contracted].

The maximal attested system of [expanded] (or [ATR]) harmony involves thirteen vowels as in (6), where the middle column represents vowels which are [–expanded, –contracted]. Systems of this type are attested only in Kru. In tables in this section I use the IPA diacritics [̟] for [+expanded] vowels and [̠] for [+contracted] vowels.

[10] Marchese 1983.
[11] Marchese 1983.

(6) Thirteen-vowel [expanded] harmony systems

	[+expanded]			[+contracted]		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	i̱	ɨ̱	u̱			
[+hi, +mid]				ɪ̱	ʉ̱	ʊ̱
[+mid]	e̱	ə̱	o̱			
[+mid, +low]				ɛ̱	ʌ̱	ɔ̱
[+low]			a			

Godié (Marchese 1983)
Eastern Kru

The Godié system has /**a**/ co-occurring with both sets, but behaving like the [+contracted] vowels in phonological processes.

Ten-vowel systems, shown in (7), are found more widely.

(7) Ten-vowel [expanded] harmony system

	[+expanded]			[+contracted]		
	[+pal]		[+lab]	[+pal]		[+lab]
[+hi]	i̱		u̱			
[+hi, +mid]				ɪ̱		ʊ̱
[+mid]	e̱		o̱			
[+mid, +low]		ɜ̱		ɛ̱		ɔ̱
[+low]					a̱	

Ogbronuagum (Kari 2000)
Central Delta

This could be regarded as a 'perfect' harmony system; two complete sets of five vowels with no opaque vowel. It suggests that corresponding to the Godié thirteen-vowel system there could be a 'perfect' fourteen-vowel system of two complete sets of seven vowels; this is not attested, perhaps because it would require a contrast of /**ə**/ with /**ɜ**/, which might be difficult to sustain.

Ten-vowel systems of this type easily reduce to nine-vowel [expanded] harmony systems by merging /**ɜ**/ with /**e**/ or /**a**/, as in Delta Edoid languages (Thomas and Williamson 1967). (8) shows words where /**ɜ**/ in Degema and Engenni corresponds to /**e**/ in Epie-Atịsa, in 'stay', 'river', and 'today'; such words contrast with others in which /**e**/ occurs throughout (e.g. 'tomorrow'). The Ediro dialect of Engenni, on the other hand, merges /**ɜ**/ with /**a**/, as in 'stay' and 'river'; words where this is the case contrast

with others showing /a/ throughout (e.g. 'debt'). The monosyllable 'stay' shows that /**ɜ**/ must be an original vowel, not the result of /**a**/ harmonising with another [+expanded] vowel in the root; in Epie-Atịsa 'stay' (with /**e**/ < ***ɜ**) contrasts with 'escape' (with /**a**/); unfortunately I have not been able to find cognates of 'escape' in other lects. Thus the ten-vowel system must be original in Delta Edoid, and the nine-vowel reduced systems later.

(8) Correspondences of /**ɜ**/, /**e**/, and /**a**/ in Delta Edoid

	'stay'	'river'	'today'	'tomorrow'	'debt'	'escape'
Degema	**zɜ̀, dʒɜ̀**	**éˡdɜ́**	**ínínɜ̀**	**úˡɗé**	**ùsá**	
Engenni	**zɜ̀**	**édɜ̀**	**íɲɜ̂**	**úɗè**	**ɔ̀sà**	
Ediro	**zà**	**édà**		**úɗè**	**ɔ̀sà**	
Epie	**zè**	**édè**	**ìjíˡné**	**ùɗê**	**ùsà**	**zà**

Nine-vowel [expanded] harmony systems occur widely in West African Niger-Congo languages: marginally in Mande (Gouro, Yaouré), widely in Atlantic, Ijoid, Kru, Gur, Kwa, Benue-Congo. They are the most common type of [expanded] harmony system. As in Godié, /**a**/ co-occurs with both sets, but behaves like the [+contracted] vowels in phonological processes.

(9) Nine-vowel [expanded] harmony system

	[+expanded]			[+contracted]	
	[+pal]	[+lab]		[+pal]	[+lab]
[+hi]	i̱	u̱			
[+hi, +mid]				ɪ̱	ʊ̱
[+mid]	e̱	o̱			
[+mid, +low]				ɛ̱	ɔ̱
[+low]			a		

Nyabwa (Marchese 1983)
Eastern Kru

Marchese (1983) reports another type of nine-vowel harmony system in Kru (Tépo, Cedepo, Grebo, and Krahn), where the vowels form three sets.

(10) Three sets in an [expanded] vowel harmony system

Set 1	Set 2	Set 3
[+expanded]	[–expanded]	[–expanded]
[–contracted]	[–contracted]	[+contracted]

Vowels within each set co-occur: then Set 1 vowels co-occur with Set 2 vowels, i.e. all [–contracted] vowels co-occur; finally, Set 3 vowels co-occur with Set 2 vowels, i.e. all [–expanded] vowels co-occur. Obviously this is a similar system to (9), but with three vowels in the neutral set instead of one.

(11) Three-set [expanded] vowel harmony system

	[+expanded]				[+contracted]	
	[+pal]	[+lab]	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]	i̱	u̱				
[+hi, +mid]					ɪ̱	ʊ̱
[+mid]	e̱	o̱				
[+mid, +low]			ɛ	ɔ		
[+low]			a			

Grebo (Marchese 1983, from Innes)
Western Kru

An alternative form of reduction from a ten-vowel [expanded] harmony system is to merge /**ɪ ʊ**/ with /**i u**/ or /**e o**/. This is attested in Lokaa (eight vowels) as opposed to KoHumono (ten vowels) (both Upper Cross).

(12) Eight-vowel [expanded] harmony system, Lokaa type.

	[+expanded]		[+contracted]	
	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]	i̱	u̱		
[+hi, +mid]				
[+mid]	e̱	o̱		
[+mid, +low]	ɜ̱		ɛ̱	ɔ̱
[+low]			a̱	

Lokaa
Upper Cross

A better-known eight-vowel [expanded] harmony system is Igbo, which lacks /**ɜ**/ and /**ɛ**/.

(13) Eight-vowel [expanded] harmony system, Igbo type.

	[+expanded]		[+contracted]	
	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]	i̱	u̱		
[+hi, +mid]			ɪ̱	ʊ̱
[+mid]	e̱	o̱		
[+mid, +low]				ɔ̱
[+low]			a̱	

Igbo
Igboid

Some irregularities in the harmony system, and forms surviving in various dialects, suggest that first /**ɜ**/ merged with /**a**/, and later /**ɛ**/ merged with /**a**/ in initial positions and with /**e**/ in non-initial positions.

In some seven-vowel languages /**e**, **o**/ do not co-occur with /**ɛ**, **ɔ**/. This is treated as a system in which there are three sets of vowels, as in (9)–(11) above. It thus appears that we can talk of 'two-set' and 'three-set' harmony languages.

(14) Seven-vowel [expanded] harmony system

	[+expanded]				[+contracted]	
	[+pal]	[+lab]	[+pal]	[+lab]	[+pal]	[+lab]
[+hi]			**i**	**u**		
[+hi, +mid]						
[+mid]	**e̱**	**o̱**				
[+mid, +low]					**ɛ̱**	**ɔ̱**
[+low]			**a**			

Grebo (Marchese 1983, from Innes)
Western Kru

No harmony has been observed in six- or five-vowel systems.

3. BIDIRECTIONAL [EXPANDED] HARMONY AGREEMENT

In West African languages with [+expanded] harmony, the root is either [+expanded] or [–expanded]. Akinlabi (1995), using data from Jenewari (1973, 1980, 1983, 1985, and 1989), argues that in Kalaḅarị (a nine-vowel system) the active (or marked) value of the feature is [+expanded], that there is a constraint preventing

[+low] and [+expanded] occurring in the same segment, and that /a/ is opaque, that is, it prevents [+expanded] from spreading past it. Thus in

(15) [**ì ɗàwóˡó**] my kolanut

the /**a**/ prevents the [+expanded] value of the root from spreading to the preceding pronoun, which takes the value of the immediately following vowel. This is indeed what happens.

He also argues, however, that the harmony associates to the vowels of the root from right to left, and that this explains why only prefixes and preceding (phonological) clitics harmonise with the root, but not suffixes and following (phonological) clitics. The more usual view, which I accept, is that West African languages are root-dominant; that is, in a language where clitics and affixes harmonise with the [expanded] value of the root, the value of [expanded] in the first vowel of the root spreads to prefixes and (phonological) preclitics, while the value of [expanded] in the last vowel of the root spreads to suffixes and (phonological) postclitics. This is also true in Kalaḅarị. Akinlabi cites four suffixes: the factative marker **-m**, which obviously cannot harmonise, two markers in which the first vowel is /**a**/ (**-árì** 'present continuous' and **-ɓà** 'future'), and **-téˡé** 'perfect'. It is true these do not harmonise. But note that one suffix does so: [**ni**], [**nɪ**] 'human collective suffix', as in:

(16) [**túɓó-ní**] traders
[**ìdɔ̀-nì**] Ịdọ people

Jenewari (1977:76, footnote 21) analyses the second form as /**ìdɔ̀-nì**/, and has the suffix harmonising with the root, as expected with a root-dominant language. I agree that the suffix harmonises with the root, but suggest that the underlying form contains an underspecified vowel **I** (i.e. **ɨ/ɪ**, summarised as **I**) rather than /**i**/. In Okrika, which is mutually intelligible with Kalaḅarị, the neuter singular definite article is /**mÍ**/ (i.e. [**mí**/**mɨ́**]), rather than /**mɛ́**/ as in Kalaḅarị. It therefore appears that suffixes do harmonise with the root in Kalaḅarị if they are [+high]. It is not only [+high] affixes that harmonise with the root, however, because the pronouns /**Ò**/ [**ò/ɔ̀**] 'he/him/his' and **Ó** [**ó**/**ɔ́**] 'you/your (plural)' also harmonise in Kalaḅarị.

I suggest that roots must be specified as either [+expanded] or [+contracted]; in a language with a third set of neutral vowels, there is a third option [–expanded, –contracted]. Affixes and phonological clitics have the same three options, but in addition some languages, idiosyncratically, have underspecified vowels which must agree with the nearest vowel in the root. In Kalaḅarị /**-téˡɛ́**/ 'perfect' is [+contracted], while /**nÍ**/ 'human collective suffix', /**Ò**/ 'he/him/his', and /**Ó**/ 'you/your (plural)' are underspecified. On the other hand, in Yoruba neither preclitics nor postclitics harmonise with the root:

(17) [**ó bɔ́ ɛ**] he fed you
[**ó lé ɛ**] he chased you

and are therefore fully specified. Part of the process of bleaching as lexical words become grammaticalised into affixes or phonological clitics is that they may lose their specification for [expanded] or [contracted]. It appears that morphemes with [+high] vowels more readily lose their specification. For example, in Ịzọn (Kolokuma) only

pronouns and suffixes with [+high] vowels harmonise with the root, while the pronoun [**ɔ́**] 'you (plural)' does not, although it is cognate with Kalaḅarị [**ó**/**ɔ́**] which does.

I suggest that the process whereby the [expanded] or [contracted] specification of the root spreads to affixes and phonological clitics on both sides of the root which are unspecified for harmony be referred to as *agreement* or *harmonisation*, a bidirectional process, while the interaction of roots in harmony be described as *regressive assimilation*. To this process we now turn.

4. REGRESSIVE ASSIMILATION IN [EXPANDED] HARMONY

When two or more roots combine as a compound, they tend to assimilate. Two examples are cited in Kalaḅarị (Jenewari 1977:76, footnote 21).

(18) Harmony assimilation in Kalaḅarị compounds

a.	**ɔ́kí**	+	**ɓó**	>	**ókúɓó**	
	take		come		bring	
b.	**éré**	+	**ɓɔ́**	>	**ɛ́réɓɔ́**	
	female		person		woman	

Two observations may be made here. First, the process is not fully productive; newer compounds do not undergo it. Secondly, the process is regressive; the last morpheme influences the earlier one. Even though /**ɓɔ́**/ may be called a grammatical clitic, because it never occurs without a preceding morpheme, it behaves phonologically like a root. Thus assimilation in harmony is regressive, quite unlike the agreement in harmony of dependent elements which, as shown in §3, spreads bidirectionally from the root.

Further evidence that assimilation in harmony is regressive is found in Ịzọn (Kolokuma dialect, Williamson and Timitimi 1983).

(19) Assimilation in Ịzọn (Kolokuma) to final [+expanded] element

a.	**àtálá**	+	**yé**	>	**àtáláyé**	>	**àtáléí** > **àtéléí**	
	fish with lift-screen		thing				lift-screen	
b.	**bárá** + **pɛ́lɛ́**	+	**yé**	>	***bárápɛ́lɛ̀yɛ̀**	>	**bárápɛ́lɛ̀ì**	
	hand + cut						sleeveless singlet	
c.	**dáá**	+	**yé**	>	**dááyé**	>	**déí**	
	fish with line						rod, hook and line	
d.	**dísɛ́**	+	**yé**	>	**dísɛ́yé**	>	**dísɛ́í**	
	be pleasing to						one's choice	
e.	**dó**	+	**yé**	>	**dóyé**	>	**dúí**	
	chew						chewing-stick	
f.	**fárí**	+	**yé**	>	***fáríyé**	>	**fáríí**	
	sharpen; whet						whetstone	
g.	**ɔ̀rɔ̀**	+	**yé**	>	**ɔ̀rɔ̀ yé**	>	**ɔ̀rèí**	
	their						theirs	

* indicates a stage which is assumed to have led to the later one, although it is not currently attested in the data.

(20) Assimilation in Ịzọn (Kolokuma) to final [+contracted] element

a.	**béí**	+	**yɔ́**	>	**béí yɔ̀**	>	**bíyɔ̀**
	this		place				this place
b.	**fɛ́**	+	**yɔ́**	>	***féyɔ́**	>	**fɔ́ó**
	buy		place				market
c.	**ìnè** + **bìná**	+	**araU**	>	**ìnè bìná-àràò**	>	**ìmbòràó**
	my + sibling		female				my 'sister'
d.	**béí**	+	**àngá**	>	**béí ángà**	>	**bíángà**
	this		side				this way; this side

From (19) and (20) it is clear that in compounding or contraction the harmony assimilation is always regressive; the harmony set of the last element gradually works its way towards the beginning of the word.

5. LABIAL HARMONY AND LABIAL ASSIMILATION

A second type of harmony has sometimes been observed in West African Niger-Congo languages, based on the feature which distinguishes back rounded vowels from front unrounded ones. Mensah (1983:323–324) observes it in the Kwa languages Abbey, Abron, Abouré, and mentions it in the Fanti dialect of Akan. I refer to this as [labial] harmony.

(21) [labial] harmony in Kwa

	[–labial]		[+labial]	
Abbey	**édʒì**	back	**òpú**	pebble
Abron	**bìdíé**	charcoal	**bòwúó**	bone
	sìrɛ̀	forgive	**hóhòɔ̀**	stranger
Abouré	**è sɔ̀ɔ̀lɔ̀**	you lie (ACC.)	**ò wùlè**	you die (ACC.)

In the Abouré example, the second person pronoun shows labial harmony with the root, although the suffix translated 'ACC.' does not. There thus appears to be limited [labial] spreading comparable to the [expanded] spreading noted in §3.

Akinlabi (1997) has proposed that Kalaḅarị has harmony in the feature [labial] ([back] in his system) as well as [expanded]. He observes that mid vowels of the same height must agree in the feature [back], which does the work of [labial] in my system.

(22) Labial harmony in Kalaḅarị mid vowels

Possible words		*Impossible words*	
bélè	light	***belo**	***bole**
pɛ́lɛ́	cut	***pɛlɔ**	***pɔlɛ**
póló	quarter (of town)	***pole**	***pelo**
kɔ́rɔ́	wine-palm	***kɔrɛ**	***kɛrɔ**

Comparing different Ịjọ lects, words of CVCV structure are [+labial] throughout in some lects, [–labial] throughout in others, but never have one vowel [+labial] and the other [–labial] if they are [+mid, –high]. The effect of this, combined with [expanded]

harmony, is that in words of this type all the vowels must be identical. I describe as harmony any system where the root vowels must all agree in a particular feature.

(23) Labial harmony in mid vowels in Ịjọ lects

	'quarter (of town)'	'touch'
Okrika	**póló**	**gbó'ló**
Nembe	**pòlò**	**gbòló**
Bụmọ	**póló**	**gbóló**
Ikibịri	**pélé**	**gbóló**
Kolokuma	**pélé** 'compound'	**gbélé/gbóló**

It is less common to find [labial] harmony spreading from the root as [expanded] harmony does. Maddieson (1999) reports that the Kwa language Bowiri has six variants [**ti**-] [**te**-] [**tɛ**-] [**tu**-] [**to**-] [**tɔ**-] of one prefix, where the rounded variants precede [+labial] vowels in the root.

I am not aware of any cases in Ịjọ of [labial] harmony spreading from the root. There is, however, regressive assimilation just as there is in the case of [expanded].

(24) Regressive labial assimilation in Ịzọn (Kolokuma)

ènì	+	**dóó**	>	**ɔ̀ndʊ̀ʊ́**
that		side		that other side

6. PALATAL ASSIMILATION

Palatal harmony is based on [palatal] and patterns in the same way as labial harmony; examples have already been given in (21). No cases have been reported of three-set labial/palatal harmony parallel to the three-set expanded harmony systems. Indeed, labial/palatal harmony systems are much more limited in scope than expanded ones.

There are, however, cases of palatal assimilation which, as might be expected, are regressive. In (25) the first vowel of the Mein forms has been assimilated to the [+palatal] feature of the later vowels.

(25) Palatal assimilation in Ịzọn: Mein contrasted with Kolokuma

Kolokuma	Mein	
àbìèsénì	**èbìésènì**	lungfish
kɔ̀rí	**kèrì**	hold

7. STRICTURE ASSIMILATION

These various harmony and assimilatory processes make the vowels in a word become more similar. Other processes, however, have the effect of making them less alike. One of these is stricture assimilation, a process whereby a vowel between two consonants partially assimilates to the stricture of the consonants by becoming close. Attested independently in a number of Ịjọ lects, it gives the effect of dissimilation in that the vowels become less alike, but is actually caused by an assimilatory rather than a dissimilatory process.

(26) Stricture assimilation in Ịjọ: Kumbo contrasted with other lects

Nembe	Ogulagha	Kolokuma	Mein	Kumbo	
èpèlá	**èpélé**	**ìpélè**	**èpèlé**	**èpìlé**	draughts
pɛ̀lɛ̀	**pélɛ́**	**pélɛ́**	**pèlɛ́**	**pílɛ́**	
kàrà	**kárá**	**kárá**	**kàrá**	**kírá**	carve
nàmà	**námá**	**námá**	**nàmá**	**nímá**	animal, meat
kòrò	**kóró**	**kóró**	**kòró**	**kúró**	fall
kɔ̀rɔ̀	**kórɔ́**	**kórɔ́**	**kɔ̀rɔ́**	**kùrɔ́**	wine-palm
kn̰ŋgɔ́	**kn̰ŋn̰ú**	**kn̰n̰**	**kn̰**	**kùn̰**	neck
ɓɔ̀gɔ̀	**bɔ́ɣɔ́**	**bɔ́ɔ́**	**bɔ̀ɔ́**	**bɔ́ɔ́**	pass

These words contrast with others where a close/non-close sequence of vowels is general.

(27) Ịjọ lects with original close/non-close sequences of vowels

Nembe	Ogulagha	Kolokuma	Mein	Kumbo	
pìná	**píná**	**píná**	**pìná**	**píná**	be white
tùɓò	**túbó**	**túbó**	**tùbó**	**túbó**	bargain
kùrɔ́	**kúrɔ́**	**kùrɔ́**	**kùrɔ̀**	**kùrɔ̀**	be hard
ɔ̀ɓùgɔ́	**ɔ̀búkɔ́**	**bùgɔ́**	**àbùkɔ̀**	**àbùgɔ̀**	monkey

Stricture assimilation appears to be a common process in West African Niger-Congo languages, although it has not been much discussed.

8. INITIAL VOWEL LOWERING

Another process which sometimes makes the vowels in a word dissimilar is initial vowel lowering. This is observed in Delta Edoid, where [+contracted] vowels in Engenni are regularly lower than in their cognates in Epie. It appears that the process begins with the lowering of /**ɛ**/ to /**a**/, since this has already happened in Degema. The other initial vowels in Degema agree with Epie. Presumably the next step is for /**ɔ**/ to lower to /**a**/. This now leaves the way open for the close vowels to lower to become the new /**ɔ**/ and /**ɛ**/ without merging with the original ones.

(28) Initial vowel lowering in Delta Edoid

Epie	Degema	Engenni	
ɛ̀fɛ̀ɛ̀	**àfɛ́n̰**	**àfɛ̀ì**	urine
ɔ̀mɔ́	**ɔ́ˈmɔ́**	**ámɔ̀**	child
ìfʊ́ʊ́	**ìfán̰**	**ɛ̀fàì**	belly
ùɓɔ̀	**ùɓɔ́**	**ɔ̀ɓɔ̀**	arm, hand

In the Mein dialect of Ịzọn initial vowel lowering also affects the close expanded vowels. It appears that first the open-mid vowels lower to /**a**/, as already suggested in Delta Edoid. Thus:

(29) [+low, +mid] > [+low, –mid]

Then the close vowels all lower:

(30) [+high] > [–high, +mid].

(31) Initial vowel lowering in Ịzọn: Mein compared with Kolokuma

	Kolokuma	Mein	
[+low, +mid] > [+low, –mid]	**èrí**	**àrí**	see, find
	ɔ̀wɔ̀ú	**àwɔ̀ù**	children
[+high] > [–high, +mid]	**ìndìí**	**èndì**	fish
	ùwóú	**òwóú**	climb, ascend
	ìyɔ́rɔ́	**èyɔ́rɔ́**	female
	ɔ̀gólá	**ɔ̀gólá**	judgement, case

I do not know how widespread this process is in West African Niger-Congo languages.

9. THE PLACE OF /**a**/

This section argues that /**a**/ in West African Niger-Congo languages is never a back vowel. The evidence for this is as follows. First, systems of six vowels (like Tiv) or eight vowels (Igbo type), which were described in §1 as incomplete triangular systems, can be presented in a more symmetrical form as rectangular systems with equal numbers of front and back vowels (cf. (2)). In such cases, /**a**/ invariably patterns as a front vowel. Similarly, the seven-vowel Ibibio triangular low central system, which like Igbo and Tiv lacks /**ɛ**/, can equally be presented more symmetrically with /**a**/ treated as front.

(32) Incomplete triangular systems presented as rectangular systems

	Eight vowels		*Seven vowels*			*Six vowels*	
		[+lab]	[+pal]		[+lab]		[+lab]
[+hi]	**i**	**u**	**i**		**u**	**i**	**u**
[+hi, +mid]	**ɪ**	**ʊ**					
[+mid]	**e**	**o**	**e**		**o**	**e**	**o**
[+low]	**a**	**ɔ**	**a**	**ʌ**	**ɔ**	**a**	**ɔ**
	Igbo		Ibibio			Tiv	

In rectangular systems [**a**] always patterns as a front vowel pairing with [**ɔ**] and never, as would be expected by the Chomsky and Halle (1968) system of features, as a back vowel.

In Jukun (5-vowel triangular), Shimizu (1980:4, 89) explicitly states that /**a**/ is front, because in a situation where front vowels become closer /**a**/ becomes /**e**/, and in a situation where front vowels become back /**a**/ becomes /**o**/.

In the examples of stricture assimilation in Ịzọn (25), it is observed that /**a**/ raises to /**ɪ**/ and not to /**ʊ**/. This again shows that /**a**/ patterns as front and not back.

The only evidence I am aware of for /**a**/ as back in West African Niger-Congo languages is offered by Akinlabi (1997) in his discussion of Kalaḅarị. He observes

that sequences /**o-a**/ are possible, as in /**gbóˡlá**/ 'ask', but not /**e-a**/ (*/**gbéˡlá**/), and that sequences /**a-ɔ**/ are also possible, as in /**àwɔ̀**/ 'children', but not /**a-ɛ**/ (*/**àwɛ̀**/). He uses these facts as part of his argument for [labial] harmony in Kalaḅarị. There are, however, words like /**ètèláˡá**/ 'road' in Kalaḅarị, and the cognate in Okrika (mutually intelligible with Kalaḅarị) for 'ask' is /**gbéˡlá**/. This suggests that at least the /**e-a**/ gap is accidental rather than systematic. All the other evidence cited suggests that /**a**/ in West African Niger-Congo languages is non-back and more specifically central: thus to be specified as [–palatal, –labial]. This feature system has the further advantage that /**a**/ becomes the least marked vowel (as in (6)), which appears intuitively correct, and is supported by the fact that it is the most common vowel cross-linguistically.

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