Studies in African Linguistics
Volume 33, Number 2, 2004

JUMJUM PHONOLOGY*

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This article describes the basic aspects of the phonology of Jumjum, a little-known Western Nilotic language. The treatment includes syllable structure and word shapes, vowels and vowel harmony, consonants and consonant assimilation, and tones and tonal processes.

1. Introduction

Jumjum is a little-described Western Nilotic language spoken in the southern part of Blue Nile Province in Sudan. It belongs to the group of languages which Evans-Pritchard (1932) called Southern Burun, and which also includes Mabaan and Ulu. In Köhler's (1955) internal subgrouping of the Western Nilotic languages, Southern Burun and the neighbouring Northern Burun languages constitute one of three branches of Western Nilotic, the two other branches being Dinka-Nuer and the Luo languages. There are no previously published studies of Jumjum, except for two short word lists in Evans-Pritchard (1932: 28-31) and Bender (1971: 268).[1]

* The data on which this article is based were collected during two trips to Khartoum in 2002 and 2004. I wish to thank the Carlsberg Foundation for grants for the fieldwork and my Jumjum informants Juzuli Fadol Lago, Ramadan Makin Bashir and Yusif Juzuli for their assistence. I also wish to thank an anonymous referee and the editor for helpful comments on an earlier version of the article.

[1] However, at the 9th Nilo-Saharan Linguistics Colloquium, Institute of African and Asian Studies, University of Khartoum, 16-19 February 2004, Abeer Mohamed Ali Beshir presented a paper on Jumjum, "Morphophonemic alternations in Jumjum number formation", based on her recent master's thesis.

The present article describes the basic aspects of the phonology of Jumjum.[2] Section 2 deals with syllable structure and segmental word shapes. Section 3 describes the vowel system and accounts for the distribution of the vowels in terms of three types of harmony: [ATR] harmony, rounding harmony, and total harmony. Section 4 describes the inventory and distribution of consonants and accounts for certain constraints in terms of assimilation. Finally, section 5 describes the tonal system, accounts for the variability in the manifestation of the underlying tones in terms of three general tonal processes, and illustrates the functions of tones.

Morphophonological alternations abound in Jumjum as in many other Western Nilotic languages, but because of space limitations they are not dealt with in this article.

2. Syllable Structure and Segmental Word Shapes

As illustrated by means of monosyllabic words in (1), there are four syllable types in Jumjum.[3] All syllables begin with a consonant, they are open or closed, their vowels are short or long, and there are no intrasyllabic consonant clusters.

(1)	a.	CV	bí	(future tense particle)
	b.	CVC	ɲáŋ	'crocodile'
	c.	CVV	wɔ̂ɔ	'away, out'
	d.	CVVC	jâan	'tree'

The length of a word is from one to at least four syllables, and all four syllable types also occur as the first and last syllables of disyllabic and trisyllabic words, as seen in (2)-(3), in which, respectively, the attested disyllabic and trisyllabic word shapes are listed and exemplified.[4] Here points indicate syllable

[2] There seem to be two dialects of Jumjum. The dialect described here is said to be spoken by people of Watkey.

[3] Tone marks indicate underlying tones, except that the tone marking of forms enclosed in brackets indicates surface tones, as in section 5 below. Lack of tone marks indicates that the underlying tones have not been identified.

[4] Here and in similar displays, morphologically complex words are normally followed by a morphemic translation in parentheses after the English translation. The following abbreviations are used in morphemic translations: **1DUIN** first person dual inclusive; **1PL** first person plural; **1PLEX** first person plural exclusive; **1PLIN** first person plural inclusive; **1SG** first person singular; **2PL** second person plural; **2SG** second person singular; **3** third person; **3PL**

boundaries, while hyphens indicate morpheme boundaries. The middle syllable of trisyllabic words has been attested as *CV* or *CVC*, but not as *CVV* or *CVVC*.

(2)	a.	CV.CV	wàŋ-ì	'my eye' (eye-1SG)
	b.	CV.CVC	kàbál	'sheep' (sg.)
	c.	CV.CVV	ʔìkɛ̂ɛ	'you' (2PL)
	d.	CV.CVVC	ʔìkɔ̂ɔn	'we' (1PLEX)
	e.	CVC.CV	kùm-mú	'egg' (egg-SG)
	f.	CVC.CVC	kɔ́ttàŋ	'tortoise'
	g.	CVC.CVV	ʔɔ̀l-l-âa	'you pushed me' (push-PST-2SG>1SG)
	h.	CVV.CV	wìil-è	'its tail' (tail-3SG)
	i.	CVV.CVC	tàatáŋ	'ash'
	j.	CVVC.CV	ʔáat-tʌ̀	'chicken' (chicken-SG)
	k.	CVVC.CVC	ʔíɪ̱ŋ-ɲàn	'intestine' (intestine-SG)
	l.	CVVC.CVV	nùuṯ-k-âa	'you tell me' (tell-BEN-2SG>1SG)
	m.	CVVC.CVVC	nùuṯ-k-ɔ̂ɔn	'you tell us' (tell-BEN-2SG>1PLEX)
(3)	a.	CV.CV.CVC	pʌ́t-ʌ̀káy	'bark' (bark-SG)
	b.	CV.CVC.CV	pʌ́t-ʌ̀ŋgʌ́	'barks' (bark-PL)
	c.	CVC.CV.CV	mín-nɛ̀ní	'child' (child-SG)
	d.	CVC.CVC.CV	yʌ̀ɲṯʌ́ŋ-gʌ́	'names' (name-PL)
	e.	CVV.CV.CV	ʔʌʌ́ṯ-ʌ́n-ʌ̀	'I came' (go:CP-PST-1SG)
	f.	CVV.CV.CVC	ʔʌʌ́ṯ-ɔ́n-ɔ̀n	'we came' (go:CP-PST-1PLEX)
	g.	CVV.CVC.CV	pɛ́ɛtàɲ-ɲí	'garbages' (garbage-PL)
	h.	CVVC.CV.CV	mɛ́ɛŋká-ní	'spiders' (spider-PL)
	i.	CVVC.CV.CVC	cʌʌ́y-g-ɔ̀n-ɔ́n	'we have it' (be.present-BEN-PST-3PL>1PLEX)
	j.	CVVC.CV.CVV	nɪ̀ɪ̱j-g-áḍ-âa	'you cook for me' (cook-BEN-PRS-2SG>1SG)
	k.	CVVC.CV.CVVC	nɪ̀ɪ̱j-g-ɔ́ḍ-ɔ̂ɔn	'you cook for us' (cook-BEN-PRS-2SG>1PLEX)
	l.	CVVC.CVC.CV	ɲʌʌ́l-ḍàŋŋí	'pythons' (python-PL)

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third person plural; **3SG** third person singular; **AG** antigenitive; **ANTIP** antipassive; **ATT** attributive; **BEN** benefactive; **CF** centrifugal; **COM** comitative; **CP** centripetal; **FUT** future tense; **M** multiplicative; **NMLZ** nominalizer; **PL** plural; **PREP** preposition; **PRO** pronoun; **PRS** present tense; **PST** past tense; **PTCP** participle; **SG** singular or, sometimes, singulative; **X>Y** X as subject and Y as object in a cross-reference suffix.

A few examples of words with four syllables are given in (4).

(4)	a.	CV.CV.CVC.CV	ɖùgùlʊ́ŋ-ŋ́	'leopards' (leopard-PL)
	b.	CVC.CV.CV.CVC	kʊ́rkʊ̀-gɛ́nɛ́n	'their nails' (nail:PL-3PL)
	c.	CVVC.CV.CV.CV	nɪ́ɪj-g-ɛ̀n-ɛ̀nɪ́	'I cooked for you' (cook-BEN-PST-1SG>2SG)

Morphologically, a word consists of a root and zero or more non-radical morphemes. In verbs and in many nouns, the root is the first *CV(V)C* part of the word. Non-radical morphemes are either derivational or inflectional, and they are expressed by means of suffixes and/or changes in the root, which concern vowel quality, vowel length, final consonant, and/or tone. There are no prefixes.

3. Vowels

3.1 Inventory and distribution of vowels. Jumjum has ten vowel qualities, which are divided into two symmetric sets distinguished by the feature [ATR] (Advanced Tongue Root), as shown in Table 1.

Table 1. Vowel qualities

	[-ATR]		[+ATR]	
high	ɪ	ʊ	i	u
mid	ɛ	ɔ	[e]	[o]
low	a		ʌ	

In monosyllabic words, however, there are only eight vowel qualities, the mid [+ATR] vowels [e] and [o] not occurring in such words. Thus, [e] and [o] only occur in words in which an adjacent syllable contains /i/ or /u/, i.e. a high [+ATR] vowel, as illustrated in (5). Hence, [e] and [o] must be analysed as allophones of the [-ATR] phonemes /ɛ/ and /ɔ/, respectively.

(5)

a.	wéek-ìn	'we are crying'	(cry-1PLIN)
b.	bóoc-ìn	'we are afraid'	(fear-1PLIN)
c.	yèewùk	'dry season'	
d.	dóŋ-ú	'your neck'	(neck:SG-2SG)[5]
e.	níin-è	'you are lying down'	(lie-2PL)
f.	níin-òn	'we are lying down'	(lie-1PLEX)
g.	t̪úw-è	'you are dying'	(die-2PL)
h.	t̪úw-òn	'we are dying'	(die-1PLEX)

There is a binary length contrast for all eight phonemic vowel qualities, as illustrated by monosyllabic nouns in Table 2.

Table 2. Contrastive vowel qualities and lengths

	/ɪ/	wíŋ	'head'	/ɪɪ/	ʔɪ̀ɪŋ	'woman'
	/ɛ/	mɛ̀n	'person'	/ɛɛ/	d̪ɛ́ɛŋ	'cow'
[-ATR]	/a/	káŋ	'leopard'	/aa/	pâan	'moon'
	/ɔ/	dɔ́ŋ	'neck'	/ɔɔ/	ʔɔ̂ɔn	'man'
	/ʊ/	bʊ̀ŋ	'arm'	/ʊʊ/	gʊ̂ʊŋ	'dog'
	/i/	jíŋ	'stomach'	/ii/	díin	'bird'
[+ATR]	/ʌ/	ŋʌ́ŋ	'back'	/ʌʌ/	pʌ̂ʌm	'mountain'
	/u/	t̪ùk	'lip'	/uu/	kùun	'thorn'

3.2 [ATR] harmony. The allophony of /ɛ/ and /ɔ/ results from a more general rule of vowel harmony to the effect that a high [+ATR] vowel spreads its [ATR] value to a non-low [-ATR] vowel of an adjacent syllable. The [+ATR] spread may occur in either direction: from root to suffix, or from suffix to root.[6] The effect of this rule is illustrated in Table 3, which shows possessive inflection of some body part nouns. Before the 2nd person singular possessive suffix /-u/ 'your', the stem vowels /ɪ, ʊ, ɛ, ɔ/ become [i, u, e, o]. Moreover, the 1st person singular possessive suffix /-ɪ/ is manifested as [i] after stems with /i/ or /u/, and the 3rd person singular possessive suffix /-ɛ/ is manifested as [e] in the same environment.

[5] Singular nouns with the morphemic gloss ":SG" exhibit replacement of a root-final plosive with a homorganic nasal, see Andersen (to appear).

[6] A similar type of vowel harmony is found in the Northern Burun language Mayak, see Andersen (1999).

Table 3. Possessive inflection of body part nouns

		Unpossessed	1SG	2SG	3SG	
	/ɪ/	wíŋ	wìŋ-ì	wíŋ-ù	wíŋ-ɛ̀	'head'
	/ɛ/	lɛ̀k	lɛ̀k-ì	lek-u	lɛ́k-ɛ̀	'teeth'
[-ATR]	/a/	wáŋ	wàŋ-ì	wáŋ-ù	wáŋ-ɛ̀	'eye'
	/ɔ/	dɔ́ŋ	dɔ̀ŋ-ì	dɔ́ŋ-ú	dɔ́ŋ-ɛ́	'neck'
	/ʊ/	bʊ̀ŋ	bʊ̀ŋ-ì	bʊ̀ŋ-ù	bʊ̀ŋ-ɛ̀	'arm'
	/i/	ʔìn̰tʌ́	ʔìn̰t-ì	ʔìn̰t-ú	ʔin̰t-e	'hand'
[+ATR]	/ʌ/	kʌ̀n	kʌ̀n-ì	kʌ̀n-ù		'stomach'
	/u/	t̰ùk	t̰ùk-ì	t̰uk-u	t̰ùk-è	'lip'

In the verbs forms (6b) and (7b), similarly, the root vowel harmonizes with the [+ATR] cross-reference suffix /-ín/. That the root vowel is lexically [-ATR] is evidenced by the forms (6a) and (7a), whose cross-reference suffix /-ɔ́n/ is [-ATR].

(6) a. ʔʊ̀ʊl -ɔ́n 'he pushes us'
push:M-3SG>1PLEX

b. ʔùul -ín 'he pushes us'
push:M-3SG>1PLIN

(7) a. nɪ́ɪc -k -ɔ̀t̰ -ɔ́n 'they cook for us'
cook-BEN-PRS-3PL>1PLEX

b. níic -k -ìt̰ -ín 'they cook for us'
cook-BEN-PRS-3PL>1PLIN

3.3 Rounding harmony. In suffix position, the vowel [ʌ] varies with [ʊ] and [u]. The quality [ʌ] occurs after unrounded root vowels, while [ʊ] and [u] occur after and in [ATR] harmony with rounded root vowels. Thus, the suffix vowel harmonizes with the root vowel for rounding, and if the root vowel is [+round], the suffix vowel also harmonizes with the root vowel for [ATR].[7] In (8) this variation is shown in a *-CV* suffix that forms verbal nouns from verbal roots, and in (9) it is shown in the plural suffix *-gV*.

[7] [ATR] harmony restricted to rounded vowels seems not to have been attested in other Western Nilotic languages.

(8)		*Root*	*Verbal noun*	
	/ɪ/	lɪk-	lɪ̀ŋ-ŋʌ́	'to break'
	/ɛ/	yɛɛp-	yɛ̀ɛm-mʌ́	'to throw'
	/a/	kac-	kà̰ɲ-ɲʌ́	'to bite'
	/ɔ/	ʔɔl-	ʔɔ̀l-lʊ́	'to push'
	/ʊ/	yʊk-	yʊ̀ŋ-ŋʊ́	'to kick'
	/i/	piiṯ-	pɪ̀iṉ-ṉʌ́	'to sow'
	/ʌ/	nʌk-	nʌ̀ŋ-ŋʌ́	'to kill'
	/u/	kuuṯ-	kʊ̀uṉ-ṉʊ́	'to blow'

(9)		*Singular*	*Plural*	
	/ɪ/	kɪ̀ɪn	kɪ́ɪɖ-gʌ̀	'guinea-fowl'
	/ɛ/	jâan	jɛ̀n-gʌ̀	'tree'
	/a/	làŋ-ŋáɲ	làŋ-gʌ́	'fly'
	/ɔ/	bɔ́ṉ-ṉàn	bɔ́y-gʊ̀	'skin'
	/ʊ/	pɔ̂ɔɲ	pʊ́ʊj-gʊ́	'hare'
	/i/	yɪ̀m-máɲ	yɪ́m-gʌ̀	'blood'
	/ʌ/	ʔʌ̂n	ʔʌ́ʌr-gʌ̀	'house'
	/u/	kʊ̀m-mʊ́	kʊ́m-gʊ̀	'egg'

Another example is the 1st person singular subject suffix of intransitive verbs, *-V*, see (19) in section 4.2 below.

Suffixal [ʌ] always varies with [ʊ] and [u], and suffixal [ʊ] always varies with [ʌ] and [u], but suffixal [u] does not always vary with [ʌ] and [ʊ]. Thus, the 2nd person singular possessive suffix /-u/ 'your' is always realized as [u], and as shown in section 3.2 above, it spreads its [+ATR] feature to the root vowel. Hence, what is neutralized in suffix position is the contrast between underlying /ʌ/ and underlying /ʊ/.

3.4 Total harmony. In some word-medial suffixes the quality of the vowel is copied from the following vowel. Such vowels may be analysed as underlyingly unspecified. One example is the past tense suffix *-Vn*, as in (10), where it occurs between the root *ḏaam-* and suffixes which cross-reference a 3rd person plural subject and an object.

(10) a. ḏáam-án-à 'they looked at me'
b. ḏáam-ín-ì 'they looked at you (2SG)'
c. ḏáam-ìn-í 'they looked at us (1DUIN)'
d. ḏáam-ìn-ín 'they looked at us (1PLIN)'
e. ḏáam-ɔ̀n-ɔ́n 'they looked at us (1PLEX)'
f. ḏáam-ɛ̀n-ɛ́ 'they looked at you (2PL)'

4. Consonants

4.1 Inventory and distribution of consonants. The inventory of consonants is shown in Table 4.

Table 4. Inventory of consonants[8]

	bilabial	inter-dental	alveo-lar	palatal	velar	glottal
voiceless plosive	p	t̪	t	c	k	ʔ
voiced plosive	b	ḏ	d	j	g	
nasal	m	n̪	n	ɲ	ŋ	
lateral			l			
trill			r			
glide	w			y		

The occurrence of the consonants in three different positions of a word is exemplified in (11)-(12): initial position, final position of a monosyllable or disyllable, and intervocalic position. Some consonants are excluded from some of these positions: (i) The interdental nasal [n̪] does not occur word-initially, intervocalically or word-finally; (ii) the glottal stop [ʔ] occurs only word-initially; (iii) the voiced plosives and the alveolar voiceless plosive [t] do not occur word-finally.

[8] The transcription deviates from IPA in that [j] is a palatal plosive and [y] a palatal glide. Moreover, the diacritic [̪] indicates interdental rather than dental place of articulation.

(11)

	Word-initial			*Word-final in monosyllable*	
/p/	pɪ̂ɪk	'water'	/p/	lɛ̀p	'tongues'
/t̪/	t̪ɔ̂ɔn	'cock'	/t̪/	ʔɛ̀t̪	'faeces' (pl.)
/t/	tɔ̀ŋ	'spear'	/t/	–	
/c/	cáay	'ten'	/c/	ɖúʊc	'five'
/k/	kàaŋ	'snake'	/k/	yàk	'fish' (pl.)
/ʔ/	ʔáak	'milk'	/ʔ/	–	
/b/	bʊ̀ŋ	'arm'	/b/	–	
/ɖ/	ɖɛ́ɛŋ	'cow'	/ɖ/	–	
/d/	dɛ́ɛl	'goat'	/d/	–	
/j/	jâan	'tree'	/j/	–	
/g/	gɛ̀ɛl	'lion'	/g/	–	
/m/	mâaŋ	'fire'	/m/	pʌ̂m	'mountain'
/n̪/	–		/n̪/	–	
/n/	náaŋ	'calf'	/n/	mɛ̀n	'person'
/ɲ/	ɲáŋ	'crocodile'	/ɲ/	wɪ́ɲ	'head'
/ŋ/	ŋʌ́ɲ	'back'	/ŋ/	ʔɪ̀ɪŋ	'woman'
/l/	lɛ̂ɛɲ	'elephant'	/l/	wɪ̀il	'tail'
/r/	rʊ́ɲɪ̀t̪	'rainbow'	/r/	bʌ̀r	'mosquito'
/w/	wáŋ	'eye'	/w/	dàw	'monkey species'
/y/	yàan	'bull'	/y/	pʌ́y	'path'

(12)

	Intervocalic			*Word-final in disyllable*	
/p/	cʌ́ʌp-í	'she is cooking'	/p/	?[9]	
	(cook:ANTIP-3)				
/t̪/	núut̪-ù	'they teach him'	/t̪/	yʊ̀ɖ̪-ɪ̀t̪	'they are standing'
	(teach-3PL>3)			(stand-M?:3)	
/t/	pɛ́ɛtàt̪	'garbage'	/t/	–	
/c/	cícàm	'knife'	/c/	yɛɛ-n-ɪc	'your'
				(PRO-SG-2PL)	
/k/	t̪ùk-ì	'my lip' (lip-1SG)	/k/	ɲáalɔ̀k	'up'
/ʔ/	–		/ʔ/	–	
/b/	kàbál	'sheep' (sg.)	/b/	–	
/ɖ/	núuɖ̪-ù	'I teach him'	/ɖ/	–	
	(teach-1SG>3)				

[9] /p/ and /w/ have not been attested word-finally in disyllables, but that is possibly due to scarcity of data.

/d/	dɛ́ɛd-àŋ	'it is small' (be.small-3)	/d/	–	
/j/	kʌʌj-ɪn	'to come in' (enter:CP-NMLZ)	/j/	–	
/g/	dúugùk	'six'	/g/	–	
/m/	d̪áam-ʌ̀	'I look at it' (look.at-1SG>3)	/m/	cícàm	'knife'
/n̪/	–		/n̪/	–	
/n/	cùnúʊk	'eight'	/n/	ɲʌ́ʌk-càn	'louse' (louse-SG)
/ɲ/	rúɲìt̪	'rainbow'	/ɲ/	làŋ-ŋáɲ	'fly' (fly-SG)
/ŋ/	wàŋ-ì	'my eye' (eye-1SG)	/ŋ/	líyáŋ	'feather'
/l/	kɛ́ɛlɔ̀k	'one'	/l/	kàbál	'sheep' (sg.)
/r/	ŋɪ́ɪràn	'rib'	/r/	tàbúr	'dust'
/w/	yèewùk	'dry season'	/w/	?	
/y/	wʌy-ɔ	'my father' (father-1SG)	/y/	nùud̪-èy	'he is teaching you' (teach-3SG>2SG)

As seen in section 2 above, there are heterosyllabic consonant clusters. Many, but far from all logically possible, clusters have been attested, and some of the non-attested ones are excluded for phonotactic reasons rather than being accidental gaps. Table 5 shows, by means of "x" in the respective cells, which C_1C_2 combinations have been attested out of all logically possible ones. C_1 is shown vertically, C_2 horizontally.

The following gaps seem to be systematic:

- Plosives with different voice values cannot be adjacent.
- The sequence plosive + nasal does not occur. This is a result of assimilation, see section 4.2 below.
- Liquids and glides do not occur as C_2 in any cluster, except in geminates. The reason probably is that no suffixes underlyingly begin with any of these consonants.
- There are no heterorganic nasal clusters, except /n̪m/. This is a result of assimilation, see section 4.2 below.
- Labial plosives do not occur as C_2, except in geminates. This is probably an accidental gap due to the fact there are no suffixes which underlyingly begin with a labial plosive.

- The alveolar plosives /t/ and /d/ do not occur as C_1, except that /t/ occurs in a geminate. The reason for this gap is a historical sound change, see section 4.3 below.

Table 5. Heterosyllabic consonant clusters

		C_2																		
		p	t̲	t	c	k	b	d̲	d	j	g	m	n̲	n	ɲ	ŋ	l	r	w	y
C_1	p	x			x	x														
	t̲		x		x	x														
	t			x																
	c		x		x	x														
	k		x		x	x														
	b						x	x		x										
	d̲							x		x	x									
	d																			
	j							x		x	x									
	g									x	x									
	m					x		x		x	x	x								
	n̲		x									x	x							
	n			x		x			x		x			x						
	ɲ							x		x	x				x					
	ŋ					x		x		x	x					x				
	l		x		x	x		x		x	x				x		x			
	r				x	x		x			x				x	x		x		
	w				x	x		x			x			x					x	
	y				x	x		x			x			x	x					x

The large number of different consonant clusters is a feature that distinguishes Jumjum from the more well-known Western Nilotic languages, so it seems worthwhile to exemplify these clusters, as done in (13)-(17).[10]

[10] In some cases, the function of some of the morphemes contained in the words has not been identified (with certainty), as indicated by question marks.

(13) *Voiceless plosives as C_1*

/pp/	yɛ̀ɛp-p-ɛ́	'he threw it thither' (throw:CF-PST-3SG>3)
/pc/	yɛ́ɛp-c-ɛ́ḍ-ɛ́	'he throws it thither' (throw-CF-PRS-3SG>3)
/pk/	kʊ̀p-k-ì	'they opened for him' (open-BEN-PST:3PL>3)
/t̪t̪/	pìit̪-t̪-ʌ́	'he sowed' (sow:ANTIP-PST-3)
/t̪c/	gìt̪-cán	'leaf' (leaf-SG)
/t̪k/	gìt̪-kʌ́	'leaves' (leaf-PL)
/tt/	kìt-tʌ̀	'star' (star-SG)
/ct̪/	ŋʌʌc-t̪ʌŋ	'to smell' (smell-NMLZ?)
/cc/	wìɪc-c-ʌ́	'he swept' (sweep:ANTIP-PST-3)
/ck/	mʌ́c-kʌ̀	'fires' (fire-PL)
/kt̪/	wʌʌk-t̪ʌŋ	'to breathe' (breathe-NMLZ?)
/kc/	yák-càn	'fish' (fish-SG)
/kk/	láak-kʌ́	'urine' (urine-PL)

(14) *Voiced plosives as C_1*

/bb/	tíib-bʌ̀	'shadow' (shadow-SG)
/bḍ/	ŋʊ̀bḍɔ́n	'heel'
/bj/	yìb-j-ʌ́	'you throw them thither' (throw:M?-CF-2SG>3)
/ḍḍ/	kìḍ-ḍ-é	'he drives them' (drive-M-3SG>3)
/ḍj/	núuḍ-jón	'you teach us' (teach-2SG>1PLEX)
/ḍg/	t̪úḍ-gú	'cocks' (cock-PL)
/jḍ/	kʊ́j-ḍ-ʊ̀	'I pick up' (pick:ANTIP-?-1SG)
/jj/	ŋʌ́j-j-ʌ̀	'I know him' (know-CF-1SG>3)
/jg/	púʊj-gú	'hares' (hare-PL)
/gj/	yʊ́ʊg-j-ɛ́ḍ-ɛ́	'he kicks them thither' (kick:M-CF-PRS-3SG>3)
/gg/	t̪ʊ̀g-gú	'lips' (lip-PL)

(15) *Nasals as C_1*

/mm/	yìm-máŋ	'blood' (blood-SG)
/mn̪/	kíim-n̪àŋŋí	'hearts' (heart-PL)
/mj/	n̪ʌ́ʌm-j-ʌ́n̪-ʌ́	'I look thither (?)' (look.at:ANTIP-CF?-PRS-1SG)
/mk/	pʌ́m-kʌ̀	'mountains' (mountain-PL)
/mg/	kʊ́m-gʊ̀	'eggs' (egg-PL)
/n̪m/	káŋ̪mà	'work'
/n̪t/	ʔìŋ̪-t̪ʌ́	'hand' (hand-SG)
/n̪n̪/	wʌ́n̪-n̪ʌ̀	'buttock' (buttock-SG)
/nt/	nʌ́n-tʌ́	'place' (place-SG)

/nd/	dúndúl	'bell'
/nn/	t̪ín-nʌ̀	'breast' (breast-SG)
/nk/	ʔìn-kʌ́	'hands' (hand-PL)
/ng/	mʌ̀ʌn-gʌ̀	'women' (women-PL)
/ɲd̪/	ʔḭ̀ɲ-d̪-é	'he gives him (smth)' (give-?-3SG>3)
/ɲj/	ʔḭ́ɲ-já	'you give me (smth)' (give-2SG>1SG)
/ɲɲ/	t̪ṵ́ɲ-ɲù	'granary' (granary-SG)
/ɲg/	yúuɲ-gù	'they rub it' (rub-3PL:3)
/ŋd̪/	gòŋ-d̪-é	'he pulls it' (pull-M-3SG:3)
/ŋj/	dɛ̀ɛŋ-j-é	'he shoots it thither' (shoot-CF-3SG>3)
/ŋk/	méɛŋká	'spider'
/ŋg/	yʌ̀ŋ-gʌ̀	'meats' (meat-PL)
/ŋŋ/	yʌ̀ŋ-ŋʌ́	'meat' (meat-SG)

(16) *Liquids as C_1*

/l̪t̪/	bìl-t̪-í	'it is present' (be.present?-?-3)
/l̪d̪/	ɲʌ́ʌl-d̪àŋŋí	'pythons' (python-PL)
/ll/	bɛ̀ɛl-lʌ́	'cane' (cane-SG)
/lc/	pól-càn	'cloud' (cloud-SG)
/lj/	ʔòl-j-é	'he pushes him thither' (push-CF-3SG>3)
/lɲ/	dɛ̀l-ɲán	'penis' (penis-SG)
/lk/	ɲál-kʌ̀	'rains' (rain-PL)
/lg/	kɔ̀lg-ɔ́n	'fat' (fat-SG)
/rd̪/	tɔ́r-d̪-ìn	'to pull' (pull-M-NMLZ)
/rr/	yɔ̀ɔr-rú	'to see' (see-NMLZ)
/rc/	tɔ́ɔr-c-éd̪-é	'he pulls it thither' (pull-CF-PRS-3SG>3)
/rɲ/	d̪úr-ɲù	'young man' (young.man-SG)
/rk/	kúrkɔ̀n	'nail'
/rg/	díir-gʌ́	'birds' (bird-PL)
/rŋ/	búrŋù	'cloth'

(17) *Glides as C_1*

/ww/	yɛ́wwɛ̀	'two'
/wd̪/	pòw-d̪íní	'homes' (home-PL)
/wn/	ʔʌ́w-nʌ̀	'bone' (bone-SG)
/wc/	kʌ̀w-cán	'seed' (seed-SG)
/wk/	kʌ̀w-kʌ́	'seeds' (seed-PL)
/wg/	ʔʌ́w-gʌ̀	'bones' (bone-PL)

/yḏ/	ʔáay-ḏ-ìn	'to climb' (climb-M-NMLZ)
/yn/	kàay-nʌ́	'to pasture' (pasture-NMLZ)
/yc/	bʌ́ʌy-cɔ̀ndɛ́	'which is long' (be.long-?)
/yɲ/	kɛ̀y-ɲán	'calabash' (calabash-SG)
/yy/	ʔʌ̀y-yʌ́	'salt' (salt-SG)
/yk/	mʊ̀y-kʊ́	'oxen' (ox-PL)
/yg/	dɛ̀yg-ɔ́n	'porridge' (porridge-SG)

In verbs, all consonant clusters occur across morpheme boundaries. In nouns, by contrast, there are consonant clusters within morphemes, namely in some (presumably) monomorphemic disyllabic nouns, such as *ŋʊ̀bḏɔ́n* 'heel', *dʊ́ndʊ́l* 'bell' and *mɛ́ɛŋká* 'spider'.

4.2 Assimilation in /C-n/. Assimilations take place when a consonant-final stem is followed by a suffix which underlyingly begins with the alveolar nasal /n/. Table 6 shows the underlying representation (UR) and the surface representation (SR) of the consonant sequences in question. As can be observed, (i) the nasal spreads its nasality to a preceding plosive, which in return spreads its place of articulation to the nasal; (ii) stem-final nasals also spread their place of articulation to the suffixal nasal; (iii) the nasal totally assimilates to stem-final liquids; but (iv) no assimilation takes place if the stem-final consonant is a glide.

Table 6. Surface representation of underlying /C-n/

UR	p-n	ṯ-n	c-n	k-n	m-n	n-n	ɲ-n	ŋ-n	l-n	r-n	y-n	w-n
SR	m-m	n̪-n̪	ɲ-ɲ	ŋ-ŋ	m-m	n-n	ɲ-ɲ	ŋ-ŋ	l-l	r-r	y-n	w-n

One suffix that behaves in this way is *-nV*, which forms an abstract verbal noun from a verbal root, as illustrated in (18) for each of the twelve underlying consonants that can occur finally in a monosyllabic root. The root-final consonants surface more overtly in some verb forms, as also shown in (18). The verb forms cited consist of a transitive root and the suffix /-ɛ́/, which cross-references a third person singular subject and a third person object, except that in (18f), the verb consists of an intransitive root and the suffix /-ʌ̀/, which cross-references a first person singular subject. In these verb forms, root-final underlying plosives are manifested as voiced plosives. It might be suggested that the nasal of the nominalizing suffix is underlyingly unspecified for place of articulation. How-

ever, since it is alveolar after the labial glide /w/ and after the palatal glide /y/, it must be alveolar underlyingly.

(18)	*Root-final*	*Root-3SG>3*	*Verbal noun*	
a.	/p/	yɛ́ɛb-ɛ́	yɛ̀ɛm-mʌ́	'throw at'
b.	/t̪/	kúud̪-é	kùuŋ̪-ŋ̪ú	'blow'
c.	/c/	káj-é	kàɲ-ɲʌ́	'bite'
d.	/k/	líg-ɛ́	lɪ̀ŋ-ŋʌ́	'break'
e.	/m/	ʔám-ɛ́	ʔàm-mʌ́	'eat'
f.	/n/	níin-ʌ̀	níin-nʌ̀	'lie'
g.	/ɲ/	t̪ʊ́ɲ-ɛ́	t̪ʊ̀ɲ-ɲú	'light'
h.	/ŋ/	gɔ́ɔŋ-ɛ́	gɔ̀ɔŋ-ŋú	'pull'
i.	/l/	ʔɔ́l-ɛ́	ʔɔ̀l-lú	'push'
j.	/r/	ʔɛ́r-ɛ́	ʔɛ̀r-rʌ́	'cut'
k.	/y/	káay-ɛ́	kàay-nʌ́	'pasture'
l.	/w/	kɔ́ɔw-ɛ́	kɔ̀ɔw-nú	'take'

Another suffix that behaves in the way shown in Table 6 is the past tense suffix /-n/. In (19) it is exemplified after simple intransitive verb stems and before the 1st person singular subject suffix *-ʌ̀*, *-ù*, *-ù*. The underlying nature of the root-final consonants is revealed by the corresponding present tense forms, which have no tense suffix.

(19)	*Root-final*	*Root-1SG*	*Root-PST-1SG*	
a.	/c/	bɔ́ɔj-ù	bɔ́ɔɲ-ɲ-ù	'fear'
b.	/k/	wɛ́ɛg-ʌ̀	wɛ́ɛŋ-ŋ-ʌ̀	'cry'
c.	/n/	níin-ʌ̀	níin-n-ʌ̀	'lie'
d.	/l/	ʔɔ́ɔl-ù	ʔɔ́ɔl-l-ù	'sing'
e.	/y/	cʌ́ʌy-ʌ̀	cʌ́ʌy-n-ʌ̀	'sit'
f.	/w/	t̪úw-ù	t̪úw-n-ù	'die'

A third suffix with the same behaviour is the plural suffix /-ní/, which is illustrated in (20). Unlike the two other suffixes, this suffix also occurs after a vowel-final stem, as in (20a).

(20)	*Stem-final*	*Singular*	*Plural*	
a.	/a/	méɛŋká	méɛŋká-ní	'spider'
b.	/t̪/	rúɲìt̪	rúɲìn̪-n̪í	'rainbow'
c.	/k/	yílùk	yílùŋ-ŋ́	'rainy season'
d.	/n/	túupón	túupón-ní	'dust'
e.	/ŋ/	kɔ́ttàŋ	kɔ́ttàŋ-ŋ́	'tortoise'
f.	/r/	kárkár	kárkár-rí	'stony place'

The direction of the assimilation with respect to manner of articulation seems to be determined by the sonority of the consonants involved. Given the sonority hierarchy glide > liquid > nasal > obstruent, a less sonorous consonant assimilates to a more sonorous one. Thus, obstruents assimilate to nasals, and nasals assimilate to liquids.

The above-mentioned suffixes are productive. Thus, the nominalizing suffix *-nV* and the past tense suffix *-n* are used after all simple verb stems, and the plural suffix *-ní* seems to be the default productive plural suffix.

4.3 The interdental nasal [n̪]. As seen in section 4.1 above, the interdental nasal [n̪] has a very restricted distribution, and its phonemic status might be questioned. Thus, [n̪] only occurs word-internally in heterosyllabic clusters. It regularly occurs in a geminate [n̪n̪], as in (21a-c), and before the voiceless interdental plosive /t̪/, as in (21d-e), and in both cases [n̪] could result from assimilation, see below. But [n̪] has also been attested before /m/, as in the noun in (21f), and here [n̪] must have phonemic status, unless [n̪m] is derived from underlying /t̪m/, for which, so far, no independent evidence has been found.

(21)				
a.	bɔ́n̪-n̪àn	'skin'	(skin-SG)
b.	ʔɛ́n̪-n̪ʌ̀	'faeces'	(faeces-SG)
c.	màan̪-n̪ʌ́	'to drink'	(drink-NMLZ)
d.	yʌ̀n̪t̪ʌ́ŋ	'name'	
e.	ʔìn̪-t̪ʌ́	'hand'	(hand-SG)
f.	kán̪mà	'work'	

Before an interdental plosive, [n̪] can readily be analysed as an allophone of alveolar /n/, since [n] does not occur in that position. Moreover, geminate [n̪n̪] is often clearly the manifestation of an underlying root-final interdental /t̪/ plus an underlying alveolar /n/, as shown in section 4.2 above.

However, there are other instances of [n̪n̪] which cannot synchronically be analysed as underlying /t̪n/. Many disyllabic singular nouns end in a singular *-CV* suffix whose consonant is manifested almost like the underlying suffixal /n/ discussed in section 4.2 above. However, unlike the other suffixes, this suffix is not productive. Some examples are given in (22) together with the corresponding plural forms.

(22)	*Root-final*	*Singular*	*Plural*	
a.	/p/	lɛ́m-mʌ̀	lɛ̀p	'tongue'
b.	/t̪/	ʔɛ́n̪-n̪ʌ̀	ʔɛ̀t̪	'faeces'
c.	/c/	t̪ʊ́ŋ-ŋʊ̀	t̪ʊ́uc-kʊ̀	'granary'
d.	/k/	lɛ́ŋ-ŋʌ̀	lɛ̀k	'tooth'
e.	/m/	gím-mʌ̀	gím-gʌ̀	'cheek'
f.	/n/	t̪ín-nʌ̀	t̪ín-gʌ̀	'breast'
g.	/ŋ/	yʌ̀ŋ-ŋʌ́	yʌ̀ŋ-gʌ̀	'meat'
h.	/l/	wíl-lʌ̀	wìl-gʌ́	'guest'
i.	/r/	tìn-nʌ́	tír	'witch-doctor'
j.	/y/	wày-nʌ́	wáy-gʌ̀	'shoe'
k.	/w/	ʔʌ́w-nʌ̀	ʔʌ́w-gʌ̀	'bone'

The plural forms are either suffixless or end in a plural suffix *-kV* or *-gV*, and their roots exhibit non-assimilated final consonants. The singular forms exhibit exactly the same consonant clusters as in section 4.2 above and under almost the same circumstances. It is therefore tempting to analyse the consonant of the singular suffix as an underlying /n/ here too. However, this analysis does not work for roots that end in /r/, as in (22i), since the resulting cluster here is /nn/ rather than /rr/, which is the synchronically productive result of /r/ plus underlying /n/. Hence, the consonant of the singular suffix cannot be analysed as being an underlying /n/ for all the allomorphs of the suffix. Instead, the surface forms of the singular nouns must be taken to be underlying forms, and therefore the geminate interdental /n̪n̪/ in (22b) cannot be derived synchronically from /t̪n/. Consequently, [n̪] is a separate phoneme here.

At an earlier stage in the historical development of Jumjum, however, the consonant of the singular suffix must have been an underlying /n/ throughout. Thus, the alternation between root-final /r/ in the plural and root-final /n/ in the singular in (22i) is historically explainable as follows: The /r/ in the plural form goes back to an alveolar plosive */t/, which changed to /r/ in root-final position, and before this change took place, */t/ assimilated to the suffixal /n/ in the singu-

lar form. The change */t/ > /r/ also explains why /t/ does not occur word-finally today. In Mabaan, root-final /t/ has been retained, the cognates of Jumjum *tír* 'witch-doctors' and *cír* 'spoons' being *tíetʌ* and *cíetʌ*, respectively, in that language.

Geminate [n̪n̪] is also found in some singular nouns which have the singulative suffix *-n̪àn*, as in (23). Again, the alternants of the roots that occur in the plural forms must be taken to be the original forms, and their final consonant is /n/ or /y/. Hence, the interdental [n̪] of the suffix cannot have received its place of articulation from the root. So again we are forced to ascribe phonemic status to [n̪]. The sequence [n̪m] in (21f) above is also left unaccounted for, unless this conclusion is accepted.

(23)	*Singular*	*Plural*	
a.	ʔíɪn̪-n̪àn	ʔìɪn-gʌ̀	'intestine'
b.	bɔ́n̪-n̪àn	bɔ́y-gù	'skin'

5. Tones.

5.1 Tonal inventory and tonal processes. Jumjum is a tone language with two underlying tones: high (H) and low (L). They may combine to form a falling tone (H͡L).

The identification of tones may start by examining nouns in the tonal frame shown in (24). This frame is a possessive construction in which the empty slot is filled by a possessee. The latter is followed by a pronoun which agrees in number with the possessee (sg. *yèn* 'that of', pl. *yèk* 'those of') and which is modified by the following possessor.

(24)	a. [__ yɛ̀-n	ʔɔ̂ɔn]	b. [__ yɛ̀-k	ʔɔ̂ɔn]
	PRO-SG:AG	man:SG	PRO-PL:AG	man:SG
	'the man's __ '		'the man's __ '	

When uttered in isolation, monosyllabic nouns fall into two tonal classes: words with a low tone [ˋ] and words with a falling tone [ˆ]. However, as revealed when the words are used in frame (24), the low-toned class actually represents two different underlying tonal classes. This is illustrated in Table 7, which shows three monosyllabic nouns in isolation and in frame (24) as well as their posited underlying tonal representation. In isolation, *yaan* 'bull' and *d̪ɛɛŋ* 'cow' have a low tone, while *t̪ɔɔn* 'cock' has a falling tone. In frame (24) the situation is

different: Here *yaan* still has a low tone, but *ḍɛɛŋ* and *ṭɔɔn* now both have a high tone. The latter two nouns, however, are distinguished by the pitch of the following word *yɛn*, which has a low tone after *ṭɔɔn*, as it also has after *yaan*, while it has a downstepped (ˈ) high tone after *ḍɛɛŋ*. The underlying tones posited for the three nouns are low for /yàan/, high for /ḍɛ́ɛŋ/, and falling for /ṭɔ̂ɔn/. Arguments for this analysis are given below.

Table 7. Tonal classes of monosyllabic nouns

	Surface tones in isolation		Surface tones in frame (24)	Underlying tones		
a.	[yàan]	[L]	[yàan yɛ̀n ʔɔ̂ɔn]	/yàan/	/L/	'bull'
b.	[ḍɛ̀ɛŋ]	[L]	[ḍɛ́ɛŋ ˈyɛ́n ʔɔ̂ɔn]	/ḍɛ́ɛŋ/	/H/	'cow'
c.	[ṭɔ̂ɔn]	[HL̂]	[ṭɔ́ɔn yɛ̀n ʔɔ̂ɔn]	/ṭɔ̂ɔn/	/ HL̂/	'cock'

Table 8. Tonal classes of disyllabic nouns

	Surface tones in isolation		Surface tones in frame (24)	Underlying tones		
a.	[ṭùḍgù]	[LL]	[ṭúḍgú ˈyɛ́k ʔɔ̂ɔn]	/ṭúḍgú/	/HH/	'cocks'
b.	[wílˈlʌ̂]	[HˈHL̂]	[wílˈlʌ́ yɛ̀n ʔɔ̂ɔn]	/wíllʌ̀/	/HL/	'guest'
c.	[ḍìŋŋʌ̀]	[LL]	[ḍìŋŋʌ́ ˈyɛ́n ʔɔ̂ɔn]	/ḍìŋŋʌ́/	/LH/	'pestle'
d.	[bɛ̀ɛlgʌ̀]	[LL]	[bɛ̀ɛlgʌ̀ yɛ̀k ʔɔ̂ɔn]	/bɛ̀ɛlgʌ̀/	/LL/	'canes'
e.	[mɛ́rkʌ̀]	[HL]	[mɛ́rˈkʌ́ ˈyɛ́k ʔɔ̂ɔn]	/mɛ̂rkʌ́/	/HL̂H/	'children'
f.	[kúurà]	[HL]	[kúurà yɛ̀n ʔɔ̂ɔn]	/kûurà/	/HL̂L/	'ball'

The six disyllabic nouns shown in Table 8 fall into three tonal classes when uttered in isolation: (i) words in which both syllables have a low tone, (ii) words in which the first syllable has a high tone and the second syllable a low tone, and (iii) words in which the first syllable has a high tone and the second syllable a tone that falls from a high level lower than the preceding high, a downstepped falling tone. However, these three classes represent six different underlying tonal classes, as revealed when the six nouns are inserted into frame (24) in Table 8. Together with the following word, these six nouns here exhibit six different surface tone configurations. As the posited underlying tones indicate, the six disyllabic nouns utilize all six logically possible combinations of H, L and HL̂ in the first syllable and H and L in the second syllable. This analysis works in combination with the following three realization rules:

(i) Utterance-final Lowering: In utterance-final (or prepausal) position a sequence of one or more high tones are changed to low tones.
(ii) Downstepped Raising: After a high tone, a low tone is changed to a downstepped high tone in non-prepausal position and to a downstepped falling tone in prepausal position.
(iii) Fall Simplification: In non-prepausal position a falling tone H͡L is simplified to H, and a following high tone is downstepped.

The application of these tone rules depends only on the tonal context and the boundaries of the utterance. Thus, they are independent of word boundaries and phrase boundaries. Each rule is illustrated in the following subsections.

In the examples given below, forms in brackets show the surface tones, while forms without brackets, in the next line, show the underlying tones and also the morpheme boundaries involved.

5.2 Utterance-final Lowering. In utterance-final (or prepausal) position a high tone is manifested phonetically as a low pitch which is identical to the low pitch of a low tone in the same position. Thus, in isolation, the high-toned monosyllabic noun *ḍ́ɛ̀ɛ̀ŋ* 'cow' has the same (slightly falling) low pitch as the low-toned monosyllabic noun *yàan* 'bull'. Similarly, the final high tone of the disyllabic noun *ḍ̀ìŋŋʌ́* 'pestle' is manifested as a pitch that is identical to (or even lower than) the pitch of the preceding low tone. Thus *ḍ̀ìŋŋʌ́* gets the same pitch pattern as the low-toned word *bɛ̀ɛ̀lgʌ̀* 'canes'. Hence, Utterance-final Lowering changes an underlying high tone to a low tone in utterance-final position, thereby neutralizing the contrast between High and Low in that position.

Utterance-final Lowering also applies to a sequence of high tones. Thus the HH word *ṭ́úḍ́gú* 'cocks' has the same pitch sequence as the LL word *bɛ̀ɛ̀lgʌ̀* 'canes', namely a low pitch in the first syllable and an (extra) low pitch in the second syllable.

A high-toned word immediately preceding an utterance-final high-toned word also undergoes pitch lowering. Thus, while *ḍ́ʌʌmʌ́* surfaces with high tones before an underlyingly low-toned word in (25a), it surfaces with low tones before an underlyingly high-toned word in (25b).

(25) a. [ʔìkì ḏʌ́ʌmʌ́ kɪ̀ŋ] 'You are looking at a bee'
ʔìkì ḏʌ́ʌm -ʌ́ kɪ̀ŋ
2SG look.at:ANTIP-2SG bee:SG

b. [ʔìkì ḏʌ̀ʌmʌ̀ lɛ̀n] 'You are looking at an axe'
ʔìkì ḏʌ́ʌm -ʌ́ lɛ́n
2SG look.at:ANTIP-2SG axe:SG

It has not been examined whether there is any limit to the range of Utterance-final Lowering, but a sequence of lowered high tones may make up at least two words, as in (25b) and (26), and it may comprise at least five high tones, as in (26).

(26) a. [ʔìkɛ̀ pìiṭì mùkkìnì] 'He is sowing maize'
ʔìkɛ̀ píiṭ -í múkkí-ní
3SG sow:ANTIP-3 maize -PL

b. [ʔìkɛ̀ mʌ̀ʌjɔ̀ kùpkɛ̀nɛ̀] 'He opened for Määjo'
ʔìkɛ̀ mʌ́ʌjɔ́ kúp -k -ɛ́n -ɛ́
3SG Määjo open-BEN-PST-3SG>3

Utterance-final Lowering may even take effect at the very beginning of an utterance consisting of more than one word, as in (27a). The pitch sequence of this utterance is indistinguishable from the pitch sequence of utterance (27b), which underlyingly begins with a low tone followed by two high tones.

(27) a. [lɛ̀n ʔùlàŋ] 'The axe is black'
lɛ́n ʔúl -áŋ
axe:SG be.black-3

b. [tɔ̀ŋ ʔùlàŋ] 'The spear is black'
tɔ̀ŋ ʔúl -áŋ
spear be.black-3

5.3 Downstepped Raising. In non-prepausal position, a low tone is changed to a downstepped high tone (ꜜH) after a high tone, as in (28)-(30). Like the other tonal processes, this raising is independent of word boundaries and phrase boundaries. In (28), for instance, the final high tone of *kʌ́ttʌ́* causes the low tone of the fol-

lowing word *dɪ̀ɪk* to be raised to [ˈdɪ́ɪk], the process thus crossing a word boundary. In (30), on the other hand, where the raising applies three times, it each time applies within the boundary of a disyllabic word.

(28) [ʔìkɛ̀ kʌ̀ttʌ́ ˈdɪ́ɪk yàakɔ̀] 'He stole our goats'
ʔìkɛ̀ kʌ̀t -t -ʌ́ dɪ̀ɪk yáa -k -ɔ́
3SG steal:ANTIP-PST-3 goat:PL PRO-PL-1PL

(29) [ʔámí ˈkʌ́ gʊ̂ʊŋ] 'It has been eaten by the dog'[11]
ʔám-í kʌ̀ gʊ̂ʊŋ
eat -PST:3PL>3 PREP dog:SG

(30) [ʔíˈkɛ́n wáŋˈgɛ́n yúuŋˈgû] 'They are rubbing their eyes'
ʔíkɛ̀n wáŋ-g -ɛ̀n yúuŋ-gù
3PL eye -PL-3PL rub -3PL>3

There are two reasons why the raised low tone must be taken to be a high tone after the raising. First, the pitch of the raised tone is identical to the pitch of a following high tone in non-prepausal position, as in (30), and to the pitch of the high component of a following falling tone, as in (29). Second, the pitch of the raised tone is identical to the pitch of an underlying high tone that is downstepped after an underlying falling tone, see section 5.4 below.

A low tone following a raised low tone has a low pitch, so it does not itself undergo Downstepped Raising. Thus, in (31) the low tone of the syllable [t̰à] is left unaffected by the high tone of the preceding syllable [ˈbát̰], and in (32), similarly, the low tone of the syllable [wɛ̀] is left unaffected by the high tone of the preceding syllable [ˈkɛ́].

(31) [ʔáŋ ˈbát̰t̰à ʔà ʔɔ̀ɔt̰ɔ̀n] 'But he is not sleeping'
ʔáŋ bàt̰t̰à ʔà ʔɔ́ɔt̰ -ɔ́n
and not be:3 sleep:?-PTCP

(32) [ʔìkɛ̀ bùggɛ́ ˈkɛ́ t̰ír ˈkɛ́ wɛ̀nɔ̀k] 'His arms and legs swell'
ʔìkɛ̀ bùg-g-ɛ́ kɛ̀ t̰ír -k -ɛ̀ wɛ̀n -ɔ̀k
3SG arm-PL-3SG COM leg-PL-3SG swell-M:3

[11] A postverbal third person singular subject noun (optionally preceded by the preposition *kʌ̀*) is cross-referenced as 3PL in the verb.

In utterance-final position after a high tone, a low tone is not realized as a downstepped high tone, but as a downstepped falling tone. This is illustrated in (33)-(35) and can also be observed in (30) above. Thus, while *tíŋàl* surfaces as [tíˈŋál] in non-prepausal position in (33b), it surfaces as [tíˈŋâl] in prepausal position in (33a), here ending in a downstepped falling tone. The same variation is shown by *t̪úwù* in (34), and in (35) the monosyllable *ʔɪ̀ŋ* surfaces as [ˈʔɪ̀ŋ] prepausally.

(33) a. [tíˈŋâl] 'sand'
b. [tíˈŋál yɛ̀k ʔɔ̂ɔn] 'the man's sand'
tíŋàl yɛ̀ -k ʔɔ̂ɔn
sand(PL)[12] PRO-PL:AG man:SG

(34) a. [ʔì̀kà bí t̪úˈwû] 'I shall die'
ʔì̀kà bí t̪úw-ù
1SG FUT die -1SG

b. [ʔì̀kà bí t̪úˈwú t̪ì̀nn̪ʌ̀k] 'I shall die tomorrow'
ʔì̀kà bí t̪úw-ù t̪ì̀nn̪ʌ̀k
1SG FUT die -1SG tomorrow

(35) [ʔì̀kɛ̀ tʌ́kí ˈʔɪ̀ŋ] 'He wants a woman'
ʔì̀kɛ̀ tʌ́k -í ʔɪ̀ŋ
3SG want:ANTIP-3 woman:SG

5.4 Fall Simplification. The behaviour of an underlying falling tone (H͡L) shows that it is a complex tone consisting of two simple tones, a high tone and a following low tone. A falling tone is manifested as a falling pitch in utterance-final position only, as in (36a) and (37a). In other positions the falling tone is manifested as a high level pitch, and a following high tone is downstepped. Thus, while *ʔì̀kɔ̂ɔn* surfaces with a falling tone in (36a), it surfaces with a final high tone in (36b), and the initial high tone of the following word, *ʔʌ́mɔ̀n*, surfaces as a downstepped high tone. The same type of variation obtains in (37). The downstep resulting from Fall Simplification must reflect the low component which is set afloat when the falling tone is simplified.

[12]Plural nouns with the morphemic gloss "(PL)" have no plural suffix.

(36) a. [ʔìkɔ̂ɔn] 'we'
b. [ʔìkɔ́ɔn ˈʔʌ́ˈmɔ̂n] 'We are eating'
ʔìkɔ̂ɔn ʔʌ́m -ɔ̀n
1PLEX eat:ANTIP-1PLEX

(37) a. [ʔìkîin] 'we'
b. [ʔìkíin ˈbí ʔʌ́ˈmîn] 'We will eat'
ʔìkîin bí ʔʌ́m -ìn
1PLIN FUT eat:ANTIP-1PLIN

The downstep effect also applies to a following underlyingly falling tone, as in (38), where *jâan* becomes [ˈjáan] after *ʔɔ̂ɔn*. By contrast, a low tone is left unaffected by a preceding underlyingly falling tone, as seen in (39), where *kʌ̂ŋ* does not affect the realization of *yèn*.

(38) [ʔɔ́ɔn ˈjáan ˈʔúʊlɛ́ ˈt̪ʌ́ŋŋàŋ] 'The man is pushing the tree now'
ʔɔ̂ɔn jâan ʔúʊl -ɛ́ t̪ʌ̀ŋŋáŋ
man:SG tree:SG push:M-3SG>3 now

(39) a. [kʌ̂ŋ] 'hunger'
b. [kʌ́ŋ yɛ̀n ʔɔ̂ɔn] 'the man's hunger'
kʌ̂ŋ yɛ̀ -n ʔɔ̂ɔn
hunger:SG PRO-SG:AG man:SG

There is no downstepped raising after a high tone that manifests a falling tone, as illustrated twice in (40). Here the initial low tone of *bìccàn* is not raised after [ʔɔ́ɔn], which is underlyingly *ʔɔ̂ɔn*, and similarly, the initial low tone of *tɔ̀rd̪ɛ́* is not raised after [jáan], which is underlyingly *jâan*. This can be explained by assuming that the low component of the falling tone is not deleted, but left floating, as already assumed on independent grounds.

(40) [ʔɔ́ɔn bìiccàn jáan tɔ̀rd̪ɛ̀] 'The man is pulling the root of the tree continuously'
ʔɔ̂ɔn bìic -càn jâan tɔ̀r -d̪ -ɛ́
man:SG root-SG:AG tree:SG pull-M-3SG>3

Syllables that are not word-final never have a falling pitch. Nevertheless, an underlying falling tone must be posited for a non-final syllable of some words in order to explain their pitch patterns and their effect on a following word.

Consider first the noun *mɛrkʌ* 'children' in (42) and compare it with the noun *willʌ* 'guest' in (41).

(41) a. [wíl$^{\downarrow}$lî] 'guest'
b. [wíl$^{\downarrow}$lʌ́ yɛ̀n ʔɔ̂ɔn] 'the man's guest'
wíl -lʌ̀ yɛ̀ -n ʔɔ̂ɔn
guest-SG PRO-SG:AG man:SG

(42) a. [mɛ́rkʌ̀] 'children'
b. [mɛ́r$^{\downarrow}$kʌ́ $^{\downarrow}$yɛ́k ʔɔ̂ɔn] 'the man's children'
mɛ̂r-kʌ́ yɛ̀ -k ʔɔ̂ɔn
child-PL PRO-PL:AG man:SG

Both *wɪllʌ* and *mɛrkʌ* surface with a high tone on their first syllable, but in utterance-final position the pitches of their last syllable are different from each other. While [wíl$^{\downarrow}$lî] in (41a) ends in downstepped falling tone, the second syllable of [mɛ́rkʌ̀] in (42a) has a low tone. Before another word, both *wɪllʌ* and *mɛrkʌ* have the surface tone pattern [H$^{\downarrow}$H], as seen in (41b) and (42b). However, while *wɪllʌ* does not trigger Downstepped Raising in the following word, *mɛrkʌ* does. Hence, while *wɪllʌ* must be taken to end in a low tone underlyingly, *mɛrkʌ* must be taken to end in a high tone underlyingly, see section 5.3 above. So while the downstep in [wíl$^{\downarrow}$lʌ́] in (41b) must be caused by Downstepped Raising, the downstep in [mɛ́r$^{\downarrow}$kʌ́] in (42b) cannot be the result of this rule. Instead, it must be taken to be the result of the other rule that produces a downstep, viz. Fall Simplification. The implication is that *mɛrkʌ* has an underlyingly falling tone on its first syllable, so that its underlying form is *mɛ̂rkʌ́*. This analysis also explains the tonal difference between *wíllʌ̀* and *mɛ̂rkʌ́* in prepausal position: While the final downstepped falling tone in [wíl$^{\downarrow}$lî] is a result of Downstepped Raising triggered by the preceding high tone, the final low tone in [mɛ́rkʌ̀] is a result of Utterance-final Lowering after the floating low component of the preceding falling tone.

Consider next the noun *kuura* 'ball' in (43).

(43) a. [kúurà] 'ball'
b. [kúurà yɛ̀n ʔɔ̂ɔn] 'the man's ball'
kûurà yɛ̀ -n ʔɔ̂ɔn
ball PRO-SG:AG man:SG

This noun has the same pitch pattern as *mêrkʌ́* 'children' in utterance-final position, see (43a) and (42a), respectively. In non-prepausal position, however, their pitch patterns differ from each other. Thus, while *mêrkʌ́* in (42b) has the surface tones [H$^{\downarrow}$H], *kuura* in (43b) has the surface tones [HL], and its underlying tone pattern must, therefore, be different from that of *mêrkʌ́*, which was analysed as H$\widehat{\text{L}}$H above. The surface tone pattern [HL] of *kuura* cannot be its underlying tone pattern, since if it were, then its utterance-final surface tone pattern would be [H$^{\downarrow}$H$\widehat{\text{L}}$], and its non-prepausal surface tone pattern would be [H$^{\downarrow}$H]. Instead, its behaviour can be explained by taking its underlying tone pattern to be H$\widehat{\text{L}}$L, i.e. with a falling tone on the first syllable and a low tone on the final syllable. Thus, the falling tone is changed to a high tone by Fall Simplification, and the low tone set afloat by Fall Simplification prevents the low tone of the second syllable from undergoing Downstepped Raising.

5.5 Functions of tone. The function of tone is both lexical and grammatical, as exemplified below.

As seen in section 5.1 above, (singular or plural) nouns fall into tonal classes. There are also minimal pairs of nouns distinguished solely by tone, such as the monosyllabic (singular or plural) nouns in (44)-(45) and the disyllabic plural nouns in (46)-(48).

(44) a. H kúl 'wart-hog'
b. L kùl 'deep water'

(45) a. H$\widehat{\text{L}}$ ĵɪ̀k 'words'
b. L jɪ̀k 'hairs'

(46) a. HH kíygʌ́ 'streams'
b. LH kìygʌ́ 'feet'

(47) a. HH kʌ́ʌjgʌ́ 'leopards'
b. HL kʌ́ʌjgʌ̀ 'hungers'

(48) a. HL ʔʌ́ŋkʌ̀ 'suns'
b. LL ʔʌ̀ŋkʌ̀ 'fishing nets'

Unlike nouns, transitive verbal roots seem not to fall into tonal classes. Thus, they all behave in the same way tonally with respect to derivation and inflection. However, tone has a high functional load in person inflection of verbs with such roots. This is illustrated in Table 9, which shows the present tense forms with the simple transitive stem *ḍaam-* 'look at'. Transitive verb stems take portmanteau suffixes which cross-reference both the subject and the object with respect to person and number, except that no number distinction is made for a third person object. Note also that a distinction is made between 1st person dual inclusive (1DUIN), 1st person plural inclusive (1PLIN) and 1st person plural exclusive (1PLEX). The vertical dimension of the table indicates the subject parameter (S), the horizontal dimension the object parameter (O).

Table 9. Present tense forms with the simple transitive stem *ḍaam-* 'look at'

O→ S↓	1SG	2SG	3	1DUIN	1PLIN	1PLEX	2PL
1SG	–	ḍáam-ɛ̀ní	ḍáam-ʌ̀	–	–	–	ḍâam-ɛ́
2SG	ḍáam-já	–	ḍáam-ʌ́	–	–	ḍáam-jɔ́n	–
3SG	ḍàam-à	ḍàam-ɛ̀y	ḍáam-ɛ́	ḍàam-í	ḍàam-ín	ḍàam-ɔ́n	ḍàam-ɛ́
1DUIN	–	–	ḍáam-ì	–	–	–	–
1PLIN	–	–	ḍáam-ìn	–	–	–	–
1PLEX	–	ḍáam-gì	ḍáam-ɔ̀n	–	–	–	ḍâam-gɛ́
2PL	ḍâam-à	–	ḍáam-ɛ̀	–	–	ḍâam-ɔ̀n	–
3PL	ḍáam-gà	ḍáam-gì	ḍáam-gʌ̀	ḍâam-gí	ḍâam-gín	ḍâam-gɔ́n	ḍâam-gɛ́

The paradigm in Table 9 includes six subsets of segmentally identical, but tonally distinct forms. Four of these subsets each contains two forms. For instance, the two forms with the segment sequence *ḍaama* are distinguished tonally as spelt out in (49).

(49) a. LL ḏàam-à 'he is looking at me'
look.at-3SG>1SG

b. HL̂L ḏâam-à 'you are looking at me'
look.at-2PL>1SG

One subset contains three forms, as shown in (50), and one subset contains four forms, as shown in (51).

(50) a. HL ḏáam-ɔ̀n 'we are looking at him'
look.at-1PLEX>3

b. LH ḏàam-ɔ́n 'he is looking at us'
look.at-3SG>1PLEX

c. HL̂L ḏâam-ɔ̀n 'you are looking at us'
look.at-2PL>1PLEX

(51) a. HH ḏáam-ɛ́ 'he is looking at him'
look.at-3SG>3

b. HL ḏáam-ɛ̀ 'you are looking at him'
look.at-2PL>3

c. HL̂LH ḏâam-ɛ́ 'I am looking at you'
look.at-1SG>2PL

d. LH ḏàam-ɛ́ 'he is looking at you'
look.at-3SG>2PL

Another example of the use of tone in the morphology is its role in case inflection of nouns. As seen in section 5.1 above, there are few constraints on the tones of nouns in their lexical form, which may be called the "absolutive" case. But when a noun is modified by a following possessor noun, as in (52b), all of its syllables have low tones, whatever its lexical tone pattern. Thus, the head of the possessive construction, the possessee, has a morphologically marked form, which I call the "antigenitive" case, while the possessor has the absolutive case. This possessive construction is an alternative to the construction in (52a), which was used as a tonal frame in section 5.1 above. Here the possessee has the abso-

lutive case and is followed by a coreferential pronoun which is followed by the possessor in the absolutive case. The intervening pronoun agrees in number with the possessee (sg. *yɛ̀n*, pl. *yɛ̀k*) and has a form which seems to be the antigenitive case.

(52) a. [bùrúŋgú ˈyɛ́k ʔɔ̂ɔn] 'the man's clothes'
bùrúŋ-gú yɛ̀ -k ʔɔ̂ɔn
cloth -PL PRO-PL:AG man:SG

b. [bùrùŋ-gù ʔɔ̂ɔn] 'the man's clothes'
bùrùŋ-gù ʔɔ̂ɔn
cloth -PL:AG man:SG

The formal difference between the absolutive case and the antigenitive case is exemplified in (53) with some monosyllabic, disyllabic and trisyllabic nouns with various tone patterns in the absolutive. As can be observed, all tones are low in the antigenitive case, whereby the lexical tonal contrasts are neutralized.

(53)

	Absolutive		*Antigenitive*			
a.	H	ɖɛ́ɛŋ	L	ɖɛ̀ɛŋ	'cow'	
b.	H͡L	yîɪn	L	yìɪn	'giraffe'	(giraffe:SG)
c.	L	kùun	L	kùun	'thorn'	(thorn:SG)
d.	HH	díir-gʌ́	LL	dìir-gʌ̀	'birds'	(bird-PL)
e.	HL	cícàm	LL	cìcàm	'knife'	
f.	LH	cʌ̀w-nʌ́	LL	cʌ̀w-nʌ̀	'arrow'	(arrow-SG)
g.	LL	mʌ̀ʌn-gʌ̀	LL	mʌ̀ʌn-gʌ̀	'women'	(women-PL)
h.	HHH	líyʌ́ŋ-gʌ́	LLL	lìyʌ̀ŋ-gʌ̀	'feathers'	(feather-PL)
i.	HLH	mín-nɛ̀ní	LLL	mìn-nɛ̀nì	'child'	(child-SG)
j.	LHH	bùrúŋ-gú	LLL	bùrùŋ-gù	'clothes'	(cloth-PL)

REFERENCES

Andersen, Torben. 1999. "Vowel harmony and vowel alternation in Mayak (Western Nilotic)". *Studies in African Linguistics* 28: 1-29.

Andersen, Torben. (to appear). "Layers of number inflection in Mabaan (Western Nilotic)". *Journal of African Languages and Linguistics.*

Bender, M. Lionel. 1971. "The languages of Ethiopia". *Anthropological Linguistics* 13, No. 5.

Evans-Pritchard, E. E. 1932. "Ethnological observations in Dar Fung". *Sudan Notes and Records* 15: 1-61.

Köhler, Oswin. 1955. "Geschichte der Erforschung der nilotischen Sprachen". *Afrika und Übersee*. Beiheft 28.

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[Received September 16, 2004
accepted November 27, 2004]