

The Päre Vowel System with an Internal Reconstruction of Its Historical Development

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1. INTRODUCTION

Päre is a Western Nilotic language spoken by the Päre, who live around Lafon Hill in the Torit District of Eastern Equatoria Province in the southern Sudan. In the present article, I describe the vowel system of Päre, and I demonstrate by means of internal reconstruction how this system has developed through a number of stages.

In section 2, I show that Päre has 24 vowel phonemes, which, from a phonetic point of view, form a completely symmetrical system. However, the actual number of vowel contrasts depends on the position in the word. Moreover, some stem vowels have a defective distribution.

In section 3, I point out some phonetic asymmetries in morphophonological alternations of stem vowels, and I argue that they are due to a number of historical changes in the vowel system. The identification of these changes is partly directed by a consideration of tones.

For information about the systems of consonants and tones in Päre, see Andersen 1988a and 1988c.¹ An introduction to the syntax of Päre is given in Andersen 1988b.

2. THE VOWEL SYSTEM

2.0. Overview

A Päre word consists of at most three segmental morphs: a stem and, optionally, a prefix and/or a suffix. In general, the segmental structure of a word conforms to formula (1), in which parentheses enclose optional segments.

- | | | | |
|-----|---------|-----------------|--------|
| (1) | ((C)V-) | C(w)V(V)(C)((C) | -V) |
| | prefix | stem | suffix |

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Note that the stem vowel, whether it is short or long, can be followed by a consonant cluster, which is either a geminate sonorant, a geminate voiceless stop, or a nasal plus a homorganic voiced stop. However, consonant clusters cannot occur in word-final position. Note also that the stem-initial consonant can be followed by the glide /w/ but not by the glide /y/.

Päri has 24 vowels, whose phonetic properties are shown in Table 1.

Table 1. Phonetic classification of the vowel phonemes

			monophtongal				diphthongal	
			short		long			
			-ATR	+ATR	-ATR	+ATR	-ATR	+ATR
un- rounded	front	high	<i>ɪ</i>	<i>i</i>	<i>u</i>	<i>ii</i>	<i>ɪɛ</i>	<i>ie</i>
		mid	<i>ɛ</i>	<i>e</i>	<i>ɛɛ</i>	<i>ee</i>		
	central	low	<i>a</i>	<i>ʌ</i>	<i>aa</i>	<i>ʌʌ</i>		
rounded	back	mid	<i>ɔ</i>	<i>o</i>	<i>ɔɔ</i>	<i>oo</i>	<i>oɔ</i>	<i>uo</i>
		high	<i>ɤ</i>	<i>u</i>	<i>ɤɤ</i>	<i>uu</i>		

The binary feature \pm Advanced Tongue Root (ATR) divides the system into two sets that are mirror images of each other in terms of the other features, although the -ATR vowels seem perceptually lower than their +ATR counterparts. Both sets consist of five short monophthongs, five long monophthongs, and two diphthongs. Diphthongs apart, the vowel system is also symmetrical with respect to length: For each short vowel there is a phonetically similar long vowel, and vice versa. Within each of the four sets of monophthongs distinguished by ATR and length, the five members are distinguished from each other by the three features Rounding, Backness and Height in the combinations that are usual for five-vowel systems. The diphthongs, in which there is no length contrast, are composed of a high vowel and a homorganic mid vowel, that is, diphthongs are either unrounded and front, or rounded and back. Thus the vowel system as a whole is symmetrical and has no obvious gaps.

All of the 24 vowels have phonemic status, as shown in the following subsections. However, there are constraints on the occurrence of the vowels in terms of their position in the word:

- (a) Diphthongs and long monophthongs can only occur in stems.
- (b) The phonemic status of the short monophthongs /ɛ ɔ e o/ is marginal in stems.
- (c) Affix vowels agree with the stem vowel in terms of the feature ATR, except that the -ATR vowel /a/ has no +ATR counterpart in affixes.
- (d) Mid vowels do not occur in prefixes.

The number of vowel contrasts thus varies between 20 (+4) in stems, 5 in suffixes, and 3 in prefixes. In the following subsections, I deal with stem vowels and affix vowels separately.

2.1. Stem vowels

2.1.1. Long monophthongs

All of the ten long monophthongs are common in stems. The segmentally minimal pairs in (2)-(3) document the contrasts between adjacent articulatory positions in either ATR set.²

(2) /u/ á-twùɲj'-é 'he pinched him' (C-V+M-3S)	/εε/ á-twèɛɲj'-é 'he straightened it' (C-V+M-3S)
/εε/ mεɛr 'to intoxicate'	/aa/ maar 'to love'
/aa/ thaal 'to cook'	/ɔɔ/ thóɔl 'rope'
/ɔɔ/ á-kòɔyy-é 'she winnowed it' (C-V+M-3S)	/ɔɔ/ á-kòɔyy'-é 'they guarded it' (C-V-3P)
(3) /ii/ ùlíip 'clitoris'	/ee/ ùléep 'ear-lobe'
/ee/ pèem 'platform'	/ΛΛ/ p̀ΛΛm 'grinding stone'
/ΛΛ/ c̀ΛΛdh-ò 'he is walking' (V+M-SUF)	/oo/ c̀oodh-ó 'he is scooping' (V+M+AP-SUF)
/oo/ bòol 'handle'	/uu/ bùul 'drum'

The contrast between -ATR and +ATR in all of the five articulatory positions is shown by the following minimal pairs of verb forms, where +ATR stems indicate movement towards the deictic centre (which is typically the speaker).

- (4) /u/ : /ii/
á-ʔùɲy'-è (C-V-3S)

		'he woke him up'
<i>á-ʔiɪy-é</i>	(C-V+CP-3S)	
/εε/:/ee/		
<i>á-lèεη'-ì</i>	(C-V-2S)	
		'you threw it'
<i>á-lèεη'-ì</i>	(C-V+CP-2S)	
/aa/:/ΛΛ/		
<i>á-báay-ò'</i>	(C-V-IPIN)	
		'we threw it'
<i>á-báay-ò'</i>	(C-V+CP-IPIN)	
/ɔɔ/:/oo/		
<i>á-lòɔr'-ò</i>	(C-V-SUF)	
		'it rolled'
<i>á-lòɔr'-ò</i>	(C-V+CP-SUF)	
/ɔɔ/:/uu/		
<i>á-pòɔy'-é</i>	(C-V-3S)	
		'he wiped it'
<i>á-pùuy'-é</i>	(C-V+CP-3S)	

2.1.2. Short monophthongs

All of the ten short monophthongs occur in stems, where they contrast with their long counterparts as shown by the following (sub)minimal pairs:

- (5)
- | | |
|--------------------|---|
| /ɪ/:/u/ | |
| <i>thình'</i> | 'they are few' |
| <i>thìunh'</i> | 'it is small' |
| /ε/:/εε/ | |
| <i>tèkk'-ò</i> | 'they are hard' (V+M-SUF) |
| <i>tèek'</i> | 'it is hard' |
| /a/:/aa/ | |
| <i>cam</i> | 'to eat' |
| <i>càam</i> | 'left-hand side' |
| /ɔ/:/ɔɔ/ | |
| <i>tòηg-á</i> | 'my egg' (N-1S) |
| <i>tòɔηg'-â</i> | 'my spears' (N-1S) |
| /ɔ/:/ɔɔ/ | |
| <i>á-pòtth'-ì</i> | 'you showed it (repeatedly)' (C-V+M-2S) |
| <i>á-pòɔtth'-ì</i> | 'you showed it' (C-V-2S) |
- (6)
- | | |
|------------------|-------------------------------------|
| /i/:/ii/ | |
| <i>thìnnh-ò</i> | 'they will become few' (V+INGR-SUF) |
| <i>thìinnh-ò</i> | 'it will become small' (V+INGR-SUF) |
| /e/:/ee/ | |
| <i>dènd-ì</i> | 'skins' |
| <i>dèend-í</i> | 'your skin' (N-2S) |
| /Λ/:/ΛΛ/ | |

<i>cànn-ò</i>	'he will become poor' (V+INGR-SUF)
<i>cànnn-ò</i>	'he will become near' (V+INGR-SUF)
/o/:/oo/	
<i>á-gòyy'-é</i>	'he wrote them (one by one)' (C-V+M-3S)
<i>á-gòoyy'-é</i>	'they wrote it' (C-V-3P)
/u/:/uu/	
<i>búr</i>	'ashes'
<i>bùur</i>	'hole'

However, only six of the ten short monophthongs are unrestricted in their occurrence: /i a ɔ i ʌ u/. The other four, /ɛ ɒ e o/, do not occur in simple verb stems, although three of them, /ɛ ɒ o/, occur more or less systematically in certain classes of derived verb stems, cf. the examples in (5)-(6). Moreover, /ɛ/ and /ɒ/ are very rare in noun stems.

The +ATR vowels [e] and [o] are a special problem. Both of them vary freely with [ʌ] in some words, but with a complementary distribution. Examples of [e] ~ [ʌ] and [o] ~ [ʌ] are shown in (7) and (8).

- (7) a. *cèŋ ~ cʌŋ* 'sun'
b. *kèc ~ kʌc* 'hunger'
c. *dwèd-i ~ dwʌd-i* 'months'
- (8) a. *bòŋg-ò ~ bʌŋg-ò* 'it is absent'
b. *kwòn ~ kwʌn* 'food'
c. *rwòth ~ rwʌth* 'chief'

The variation [e] ~ [ʌ] is especially common when the vowel is adjacent to a palatal consonant, as in (7a-b), or when the stem is followed by a suffixal front vowel, as in (7c). The variation [o] ~ [ʌ], on the other hand, has only been attested in words where the vowel is preceded by a labial consonant and where there is no suffixal front vowel. In words like those in (7)-(8), [e] and [o] must be considered allophones of /ʌ/. However, there are also words with [e] and [o] in which these two vowels do not vary with [ʌ], and where they must hence be ascribed independent phonemic status. This kind of [o] occurs in some categories of derived verb stems, cf. above, and also in some but apparently not many nouns, where it is not preceded by a labial consonant.

- (9) *dhòk* 'cows' *à'-dòg-ó* 'three'
gól 'mane' *kônnh-ó* 'seed'

[e], on the other hand, seems in most cases to vary with [ʌ], one of the exceptions being /dènd-i/ 'skins' in (6).

In spite of the restricted occurrence of /ɛ/ and /ɒ/, the contrast between any two adjacent articulatory positions among the -ATR vowels can be documented with minimal or subminimal pairs:

- (10) /ɪ/:/ε/:/a/
 ɲìc' 'it is cold'
 kècc'-ò 'they are bitter' (V+M-SUF)
 kac 'to bite'
 /a/:/ɔ/
 kaŋ 'to hoe'
 kòŋ' 'pangolin'
 /ɔ/:/ɔ/
 á-kòŋj-é 'they helped him' (C-V-3P)
 á-kòŋj'-é 'he dug them' (C-V+M-3S)

Among the +ATR vowels, the contrasts between /i/ and /ɪ/ and between /ɪ/ and /u/ can easily be demonstrated:

- (11) /i/:/ɪ/
 cwìcc'-ò 'he is going to suck' (V+CF+AP-SUF)
 cwλcc'-ò 'he is going to mould' (V+CF+AP-SUF)
 /ɪ/:/u/
 kλŋŋ-ò 'he is coming to bite' (V+CP+AP-SUF)
 kùŋŋ-ò 'he is coming to help' (V+CP+AP-SUF)

There are also minimal pairs showing the contrasts between /ɪ/ and /o/ and between /o/ and /u/:

- (12) /ɪ/:/o/
 yλtt'-ò 'he is going to insult' (V+CF+AP-SUF)
 yòtt'-ò 'they are light' (V+M-SUF)
 /o/:/u/
 còtt'-ò 'they will break' (V+M-SUF)
 cùtt'-ò 'he is going to pay' (V+CF+AP-SUF)

The contrast between -ATR and +ATR in the short vowels can be demonstrated with segmentally minimal pairs for four of the five articulatory positions:

- (13) /ɪ/:/i/
 á-lìm-é 'he collected them' (C-V-3S)
 á-lìm'-é 'he collected them (in this direction)'
 (C-V+CP-3S)
 /a/:/ɪ/
 á-yàb-é 'he opened it' (C-V-3S)
 á-yàb'-é 'he opened it (in this direction)'
 (C-V+CP-3S)
 /ɔ/:/o/
 dhók 'mouth'
 dhòk 'cows'

/ɔ/:/u/

á-jòtth'-ì rwàtth-ì 'the chief showed it (repeatedly)'
C-show+M-SUF chief-ERG

á-jùtth'-ì rwàth 'you showed it to the chief'
C-show+BEN-2S chief

No minimal pairs have been found for the mid front vowels, except ones in which [e] varies with [ʌ]:

(14) /ɛ/:[e]

tèkk'-ò 'they are hard' (V+M-SUF)

tèkk-ò ~ tʌkk-ò 'he will start' (V-SUF)

It should be clear from this outline that the phonemic status of /ɛ ɔ e o/ is marginal. Thus, after all, the set of short monophthongs is not an exact parallel to the set of long monophthongs, since all ten members of the latter have full phonemic status. The set of short monophthongs itself is balanced in the sense that both of its ATR subsets have three full members and two marginal ones, the latter being enclosed in parentheses in (15).

(15)	-ATR	+ATR
	ɪ	(ɔ)
	i	u
	(ɛ)	ɔ
	(e)	(o)
	a	ʌ

However, it is asymmetrical in the sense that corresponding positions in the two subsets are not invariably both full members or both marginal members.

2.1.3. Diphthongs

All four diphthongs are lexically frequent. The contrast between -ATR and +ATR is shown by the following pairs:

(16) /ɪɛ/:/ie/

lɛc

'elephant'

liéc

'elephants'

/ɔɔ/:/uo/

bɔɔc

'castrated bull'

buóc

'castrated bulls'

The first component of a diphthong is phonetically clearly vocalic rather than consonantal. Thus [ɔ] and [u] in /ɔɔ/ and /uo/ differ from the

glide /w/ that follows a stem-initial consonant. There are also a number of structural reasons for distinguishing between glides on the one hand and the high components of diphthongs on the other.

Firstly, /w/ does not occur after labial and interdental consonants, whereas there is no such constraint on the distribution of the diphthongs. Examples (17)-(19) document the occurrence of /w/, rounded diphthongs and unrounded diphthongs, respectively, after each of the stem-initial consonants, unfilled slots reflecting what I presume to be accidental gaps in my data.

- | | | | |
|------|------|--------------------|---------------------------------------|
| (17) | /t/ | <i>twic</i> | 'to pinch' |
| | /d/ | <i>dwɔlɔ</i> | 'fat' |
| | /n/ | | |
| | /c/ | <i>cwàak</i> | 'front part of neck' |
| | /j/ | <i>jwáan'</i> | 'small hut' |
| | /ɲ/ | <i>ɲwaŋ</i> | 'to make dirty' |
| | /k/ | <i>kwèɛɾi</i> | 'hoe' |
| | /g/ | <i>gwàŋ'</i> | 'wild-cat' |
| | /ŋ/ | <i>à'-ŋwèɛnɔ</i> | 'four' |
| | /r/ | <i>rwàath</i> | 'bull' |
| | /l/ | <i>lwàak</i> | 'people' |
| | /y/ | <i>á-ywèɛcc'-é</i> | 'he swept it (repeatedly)' (C-V+M-3S) |
| | /ʔ/ | | |
| | | | |
| (18) | /p/ | <i>puot</i> | 'to beat' |
| | /b/ | <i>bɔɔc</i> | 'castrated bull' |
| | /m/ | <i>muòc'</i> | 'it will explode' |
| | /th/ | <i>thuòl</i> | 'snake' |
| | /dh/ | <i>dhuòŋ'-ò</i> | 'type of basket' |
| | /nh/ | | |
| | /t/ | <i>à'-tɔɔd'-á</i> | 'wound' |
| | /d/ | <i>dɔɔŋ'</i> | 'it is big' |
| | /n/ | | |
| | /c/ | <i>cɔɔr</i> | 'blind one' |
| | /j/ | <i>jɔɔk</i> | 'spirit' |
| | /ɲ/ | <i>ɲɔɔl</i> | 'to give birth' |
| | /k/ | <i>kuòt</i> | 'shield' |
| | /g/ | <i>guòk</i> | 'dog' |
| | /ŋ/ | <i>ŋɔɔl</i> | 'limping one' |
| | /r/ | <i>ruòk</i> | 'type of fish trap' |
| | /l/ | <i>luòkk'-i</i> | '(pre)molars' |
| | /y/ | <i>à'-yɔɔm</i> | 'kind of monkey' |
| | /w/ | <i>wɔɔr</i> | 'to respect' |
| | /ʔ/ | | |

(19)	/p/	<i>pièn</i>	'bed'
	/b/	<i>bièy</i>	'kind of ant'
	/m/	<i>mièrì</i>	'villages'
	/th/	<i>thièl</i>	'to press'
	/dh/	<i>dhièŋ</i>	'cow'
	/nh/		
	/t/	<i>tièlò</i>	'leg'
	/d/	<i>dièl</i>	'goat'
	/n/	<i>nièŋ</i>	'canes'
	/c/	<i>à'-cièlò</i>	'one'
	/j/		
	/ɲ/		
	/k/	<i>òkiéc</i>	'kind of bird'
	/g/		
	/ŋ/	<i>ŋiɛw</i>	'to sell'
	/r/	<i>riéw'</i>	'thirst'
	/l/	<i>liéc</i>	'elephant'
	/y/	<i>yiey</i>	'to agree to'
	/w/		
	/ʔ/		

Secondly, while the two components of a diphthong are both either rounded or unrounded, there is no such agreement between /w/ and the following vowel. On the contrary, /w/ only occurs before unrounded vowels (cf. (17)), except in cases where [o] is an allophone of /ʌ/ as in (8b-c) above.

Thirdly, the second component of a diphthong can only be mid, whereas /w/ occurs before vowels of any height, as shown by the examples in (17).

Fourthly, there is no length contrast in diphthongs, whereas /w/ may be followed by both short and long vowels, cf. the following minimal pairs:

(20)	<i>á-cwìcc'-é</i>	'he sucked it (repeatedly)' (C-V+M-3S)
	<i>á-cwìucc'-é</i>	'they sucked them' (C-V-3P)
(21)	<i>á-cwàcc'-é</i>	'she moulded them (one by one)' (C-V+M-3S)
	<i>á-cwàacc'-é</i>	'they moulded them' (C-V-3P)

Fifthly, the high component of a diphthong takes part in morphophonological vowel alternations, while /w/ does not. Compare for instance the pairs of verb forms in (20)-(21) with the morphologically similar pairs in (22)-(23).

(22)	<i>á-tòocc'-é</i>	'he tied it (repeatedly)' (C-V+M-3S)
	<i>á-tuòcc'-é</i>	'they tied it' (C-V-3P)

- (23) *á-pèemb-é* 'he opposed him (repeatedly)'
 (C-V+M-3S)
á-pièmb'-è 'they opposed him' (C-V-3P)

As illustrated by (22)-(23), roots with diphthongs in simple stems have long monophthongs in multiplicative stems. By contrast, as illustrated by (20)-(21), roots with long monophthongs in simple stems have short monophthongs in multiplicative stems, /w/ remaining unaffected.

Thus there are many reasons for distinguishing between diphthongs, on the one hand, and /w/ plus monophthongs, on the other. The distinction is further justified by the fact that unrounded diphthongs can cooccur with /w/:

- (24) *gwɪɛnɔ̃* 'hen'
ywièc 'broom'
twɪɛɲ 'to straighten'
kwɪɛɾ 'to deny'

2.2. Affix vowels

The number of vocalic contrasts is much smaller in affixes than in stems. Firstly, as mentioned above, affixes can only have short monophthongs, not long monophthongs nor diphthongs. Secondly, the ATR value of an affix vowel is determined by and equals the ATR value of the stem vowel, except that /ʌ/ does not occur in affixes. Thus vowel harmony neutralizes the contrast between +ATR and -ATR, thereby reducing the number of contrasting vowels to five.

The ATR variability of the suffix vowels is shown by the noun forms in (25) and by the verb forms in (26). The suffixes in (25) express person and number of the possessor of the noun, and those in (26) express person and number of the subject of the verb, the prefix /á-/ indicating the completive aspect.

- | | | | |
|------|------------|-------------------|------------------|
| (25) | | -ATR | +ATR |
| | | 'bird' | 'meat' |
| | /ɪ/ ~ /i/ | <i>wìnj-í</i> | <i>rìng-í</i> |
| | /ɛ/ ~ /e/ | <i>wìnj-è</i> | <i>rìng-è</i> |
| | /a/ | <i>wìnj-á</i> | <i>rìng-á</i> |
| | /ɔ/ ~ /o/ | <i>wìnj-ó</i> | <i>rìng-ó</i> |
| | /ɔ̃/ ~ /u/ | <i>wìnj-ɔ̃</i> | <i>rìng-ú</i> |
| (26) | | -ATR | +ATR |
| | | 'ground it' | 'shot it' |
| | /ɪ/ ~ /i/ | <i>á-ròɔtt'-ì</i> | <i>á-kèel'-ì</i> |
| | /ɛ/ ~ /e/ | <i>á-ròɔd'-è</i> | <i>á-kèel-é</i> |
| | /a/ | <i>á-ròɔd'-à</i> | <i>á-kèel-á</i> |

/ɔ/ ~ /o/	'we' (1PIN)	á-róod-ò'	á-kéel-ò'
/ə/ ~ /u/	'you' (2P)	á-rəott'-ə	á-kèend-ú

In prefixes, the five-way contrast is further reduced, since mid vowels do not occur in that position. Thus, in nouns with a vowel prefix, the prefix vowel can only be /i i/, /a/ or /ə u/, the high front vowel furthermore being very rare:

(27)	-ATR		+ATR	
/i i/	ì-górá	'small stream'	ì'-ḡwàk'	'beer flour'
/a/	à'-bèel'-á	'stick'	à-b'áe	'maize'
/ə u/	ə'-pìj'-à	'mouse'	ù-bím	'gibbon'

The same three vowels are also the only ones that occur as prefixes in verbs, for instance as person prefixes:

(28)	-ATR		+ATR	
/i i/	ì-dòók		ì-pòod'-ò	
	2S-return		2S-beat+M+AP-SUF	
	'you are returning'		'you are beating'	
/a/	á-dòók		á-pòod'-ò	
	'I am returning'		'I am beating'	
/ə u/	ə-dòók		ù-pòod'-ò	
	'you (2P) are returning'		'you (2P) are beating'	

3. INTERNAL RECONSTRUCTION

The defective distribution of the four short monophthongs /ɛ ə e o/ in stems can be explained historically. By considering vowel alternation and certain interdependencies between vowels and tones, it is thus possible to reconstruct a number of stages through which the system of stem vowels has developed.

3.1. Lowering

Consider first ATR alternation. Several categories of derived verb stems are characterized by having a +ATR vowel. This gives rise to vowel alternation if the vowel of the simple verb stem, which is the root vowel, is -ATR. What is remarkable is that while the short -ATR root vowels /i/ and /a/ only change their ATR feature, thus becoming /i/ and /a/, the third short -ATR root vowel /ɔ/ becomes /u/, that is, it changes from mid to high. These alternations can be observed for instance in the formation of centripetal stems, antipassive stems and ingressive stems:

(29)	C-V-3S	C-V+CP-3S	'he __-ed it (in that/ this direction)'
	/ɪ/ á- <i>l</i> im-é	/i/ á- <i>l</i> im'-é	'collect'
	/a/ á- <i>y</i> àb-é	/ʌ/ á- <i>y</i> àb'-é	'open'
	/ɔ/ á- <i>ɲ</i> òd-é	/u/ á- <i>ɲ</i> ùd'-é	'cut'
(30)	C-V-3S	V+M+AP-SUF	'he __-ed it'/'he is __-ing'
	/ɪ/ á- <i>p</i> ìb-é	/i/ <i>p</i> ìb-ò	'light'
	/a/ á- <i>c</i> àm-é	/ʌ/ <i>c</i> àm-ò	'eat'
	/ɔ/ á- <i>k</i> òɲ-é	/u/ <i>k</i> ùɲ-ò	'help'
(31)	V	V+INGR-SUF	'it is __'/'it will be- come __'
	/ɪ/ <i>ɲ</i> ìc'	/i/ <i>ɲ</i> ìɲɲ-ò	'cold'
	/a/ <i>t</i> àr'	/ʌ/ <i>t</i> àrr-ò	'white'
	/ɔ/ <i>c</i> òl'	/u/ <i>c</i> ùll-ò	'black'

The alternation /ɔ/ ~ /u/ can readily be explained by hypothesizing that /ɔ/ comes from */ɔ̄/, which is the -ATR counterpart of /u/:

- (32) Lowering
*/ɔ̄/ > /ɔ/

3.2. Lengthening

Consider next a case of interdependency between vowels and tones. There are three tonal classes of simple transitive verb stems, as manifested by three distinct tone patterns of, for instance, third person singular completive forms:³

(33)	Class I	Class II	Class III
Underlying tones	H-L-H	H-LH-L	H-LH-H
Surface tones	H-L-H	H-H-E	H-H!L!-H
Examples	á- <i>l</i> èɛɲ-é	á- <i>y</i> àaɲ'-é	á- <i>t</i> hàal'-é
'he __ed it'	'throw'	'slaughter'	'cook'

What is remarkable is that Classes I and II have complementary distribution in terms of the length and the height of the stem vowels: Class I stems have either a short monophthong or a long mid monophthong, and Class II stems have either a long non-mid monophthong or a diphthong, cf. the examples with each of the 20 stem vowels in (34).

(34)	Class I			Class II			
	-ATR	/ɪ/	<i>ɲɪp</i>	'light'	/u/	<i>ruth</i>	'sew'
		/ɛɛ/	<i>nɛɛn</i>	'see'	/ɪɛ/	<i>pɪɛm</i>	'oppose'
		/a/	<i>cam</i>	'eat'	/aa/	<i>waan</i>	'burn'
		/ɔɔ/	<i>dhɔɔth</i>	'suck'	/ɔɔ/	<i>kɔɔc</i>	'mend'
		/ɔ/	<i>ɲɔt</i>	'cut'	/ɔɔ/	<i>ɲɔɔth</i>	'show'
	+ATR	/i/	<i>tiŋ</i>	'lift'	/ii/	<i>tiic</i>	'make'
		/ee/	<i>keel</i>	'shoot'	/ie/	<i>gwieth</i>	'bless'
		/ʌ/	<i>nʌk</i>	'kill'	/ʌʌ/	<i>lwʌʌc</i>	'milk'
		/oo/	<i>coor</i>	'push'	/uo/	<i>puot</i>	'beat'
		/u/	<i>bul</i>	'roast'	/uu/	<i>tuut</i>	'pull'

Class III, on the other hand, contains stems with any of the 20 vowels:

(35)

Class III

-ATR	/ɪ/	<i>yɪk</i>	'repair'	/u/	<i>ruc</i>	'squeeze'
	/ɛɛ/	<i>tɛɛŋ</i>	'shake'	/ɪɛ/	<i>dɪɛm</i>	'thresh'
	/a/	<i>kan</i>	'hide'	/aa/	<i>maath</i>	'drink'
	/ɔɔ/	<i>kɔɔl</i>	'drive'	/ɔɔ/	<i>cɔɔp</i>	'pierce'
	/ɔ/	<i>cɔk</i>	'smash'	/ɔɔ/	<i>pɔɔc</i>	'wipe'
+ATR	/i/	<i>pip</i>	'pursue'	/ii/	<i>diir</i>	'bury'
	/ee/	(not attested)		/ie/	<i>riep</i>	'cover'
	/ʌ/	<i>wʌr</i>	'sing'	/ʌʌ/	<i>cwʌʌc</i>	'mould'
	/oo/	<i>goor</i>	'write'	/uo/	<i>tuoc</i>	'tie'
	/u/	<i>mul</i>	'taste'	/uu/	<i>puur</i>	'culti- vate'

The complementary distribution of Classes I and II would seem to indicate either (i) that they were originally one tonal class, which was later split, and that the split was conditioned by the nature of the stem vowel, or (ii) that stem tones were originally dependent on the nature of the stem vowel, and perhaps that two tonal classes have merged into Class III. Whichever was the case, the long mid monophthongs must originally have been short monophthongs, since otherwise the vowels of Class I stems would not have been a phonetically natural class for tones to interact with. Thus we can assume the following change:

- (36) Lengthening
 $*/\varepsilon \text{ } \text{ } e \text{ } o/ > / \varepsilon \varepsilon \text{ } \text{ } ee \text{ } oo/$

This hypothesis fits very well with the fact that there are presently no simple stems with the short mid vowels $/\varepsilon \text{ } e \text{ } o/$, and with the hypothesis that the present short mid vowel $/ɔ/$ was originally $*/\omega/$. Lengthening must have preceded Lowering, since otherwise $*/\omega/$ would have become $/ɔɔ/$.

3.3. Diphthongization

The distribution of vowels in the tonal stem classes I and II in (33) warrants the further hypothesis that diphthongs were originally long mid monophthongs:

- (37) Diphthongization
 $*/\varepsilon\varepsilon \omega\omega ee oo/ > /i\varepsilon \omega\omega ie uo/$

This hypothesis would make the vowels of Class II stems a completely natural class, and furthermore, it would fill the gaps created by the hypothesis that the present long mid monophthongs were originally short. Diphthongization must have preceded Lengthening, since otherwise, original short and long mid vowels would have merged.

Independent evidence for Diphthongization is found in causative verb stems. Such stems were once derived from both intransitive and transitive verbal roots, but the derivation is no longer productive. Not all causative stems differ from the corresponding roots with respect to the vowel, but when there is a difference, a short root vowel corresponds to a long vowel in the causative stem:

- | | | |
|------|--|---|
| (38) | root | causative stem |
| a. | <i>mòr'</i>
'it is warm' | <i>á-mòòr'-è</i>
'he heated it' (C-V+CAUS-3S) |
| b. | <i>kwàŋ'-ò</i>
'he will swim' | <i>á-kwàaŋ'-è</i>
'he took it across by swimming'
(C-V+CAUS-3S) |
| c. | <i>á-càm-é</i>
'he ate it' (C-V-3S) | <i>á-càam'-è</i>
'he spoon-fed him' (C-V+CAUS-3S) |

Thus the formation of causative stems must have involved lengthening of the root vowel. What is striking is that an originally short but now long mid vowel in the root corresponds to a diphthong in the causative stem:

- | | | |
|------|--------------------------------------|---|
| (39) | root | causative stem |
| a. | <i>dòòk</i>
'he will return' | <i>á-dòòg-é</i>
'he returned it' (C-V+CAUS-3S) |
| b. | <i>lòòr'-ò</i>
'it will roll' | <i>á-lòòr'-è</i>
'he rolled it' (C-V+CAUS-3S) |
| c. | <i>á-dhòòdh-é</i>
'he sucked her' | <i>á-dhòòdh'-è</i>
'she suckled him' (C-V+CAUS-3S) |

This alternation is explained by the Diphthongization hypothesis.

Further evidence for Diphthongization and Lengthening is found in the formation of transitive multiplicative stems from transitive roots. Synchro-

nically, the formation rule, which seems to be productive, consists of four subrules, each of which deals with a subset of root vowels:

(40) Transitive Multiplicative Stem Formation (vocalism):

- a. Short vowels become long.
- b. Long non-mid vowels become short.
- c. Long mid vowels remain long or become short.
- d. Diphthongs become long mid vowels.

The application of this rule is exemplified in (41).

(41)		C-V-3S		C-V+M-3S	'he __ed it'
a.	/ɪ/	á-cwìɲ-é	/u/	á-cwùɲj'-é	'light'
	/a/	á-càm-é	/aa/	á-càamb'-é	'eat'
	/ɔ/	á-kòɲ-é	/ɔɔ/	á-kòɔɲj'-é	'help'
	/i/	á-cìb-é	/ii/	á-cìimb'-é	'give'
	/ʌ/	á-kʌd-é	/ʌʌ/	á-kʌʌnd'-é	'plait'
	/u/	á-bùl-é	/uu/	á-bùund'-é	'roast'
b.	/ɪ/	á-ʔìɪy'-è	/ɪ/	á-ʔìcc-é	'wake up'
	/aa/	á-kwàan'-è	/a/	á-kwànd-é	'count'
	/ɔɔ/	á-còɔl'-é	/ɔ/	á-cònd'-é	'pay'
	/ii/	á-pìiy'-é	/i/	á-pìcc'-é	'twirl'
	/ʌʌ/	á-ɲwʌɲy'-é	/ʌ/	á-ɲwʌcc'-é	'smell'
	/uu/	á-pùur'-é	/u/	á-pùyy'-é	'cultivate'
c.	/ɛɛ/	á-tèel-é	/ɛɛ/	á-tèend'-é	'throw'
		á-ɲwèɛɲ-é	/ɛ/	á-ɲwèɲj'-é	'pinch'
	/ɔɔ/	á-dòɔy-é	/ɔɔ/	á-dòɔyy'-é	'weed'
	/ee/	á-kèel-é	/ee/	á-kèend'-é	'shoot'
	/oo/	á-gòol-é	/oo/	á-gòond'-é	'scratch'
		á-dhòoɲ-é	/o/	á-dhòɲg'-é	'push'
d.	/ɪɛ/	á-thìel'-é	/ɛɛ/	á-thèendh'-é	'press'
	/ɔɔ/	á-kòɔy'-è	/ɔɔ/	á-kòɔcc-é	'mend'
	/ie/	á-thìedh'-é	/ee/	á-thèetth'-é	'bewitch'
	/uo/	á-tùoy'-é	/oo/	á-tòocc'-é	'tie'

Judging by subrules a and b, multiplicative stems were originally formed by a polarity rule whereby the multiplicative stem vowel got the opposite length of the root vowel. Notice that subrule d also reflects this polarity if, as hypothesized, diphthongs were originally long mid vowels, and long mid vowels originally short mid vowels. On the other hand, the multiplicative stems that are derived from roots with long mid vowels (subrule c) cannot be direct descendents of the original multiplicative stems, since their vowels are monophthongs rather than diphthongs. They must have resulted from analogical leveling. But such leveling has also taken place in multiplicative stems derived from roots with /ɔ/ (subrule a) and with /ɔɔ/ (subrule b), since their vowels are /ɔɔ/ and /ɔ/, respectively, rather

than / $\omega\omega$ / and / \mathfrak{O} / as predicted by the hypothesized sound change of Lowering (32).

3.4. Vowel alternation in nouns

The hypotheses of regular vowel changes proposed above are based on vowel alternation in verbs. Vowel alternation is also pervasive in number inflection of nouns. Thus, in many nouns, the vowel of the singular stem and that of the plural stem differ with respect to ATR, length and/or height. However, there is an important difference between verbal and nominal morphology: In verbs, vowel alternation is predictable, but in nouns it is not. In verbs, as illustrated above, the stem vowel is predictable given (i) the root vowel, (ii) the tonal class of the root, and (iii) the morphological status of the stem (in casu, its derivational class). In nouns, on the other hand, the plural stem is not predictable from the singular stem, nor vice versa.

Although vowel alternation is unpredictable in nouns, it does show some regularity there, too. Thus the alternations can be generalized into an alternation system consisting of five discrete alternation series such that, for most nouns, the vowel of the singular stem and that of the plural stem belong to the same series. Each series consists of four different vowels as shown in Table 2.

Table 2. Vowel alternation in noun stems.

	originally long monophthongs		originally short monophthongs	
	-ATR	+ATR	-ATR	+ATR
s e r i e s	\mathfrak{u}	\mathfrak{ii}	$\mathfrak{ɪ}$	\mathfrak{i}
	$\mathfrak{ɛ}$	\mathfrak{ie}	\mathfrak{e}	\mathfrak{ee}
	\mathfrak{a}	\mathfrak{A}	\mathfrak{a}	\mathfrak{A}
	$\omega\mathfrak{O}$	$\mathfrak{u}\mathfrak{O}$	\mathfrak{O}	\mathfrak{oo}
	$\omega\omega$	\mathfrak{uu}	\mathfrak{O}	\mathfrak{u}

The four vowels that constitute each series are two long monophthongs and either two short monophthongs or two diphthongs, each pair being differentiated by the feature ATR. The altogether 20 vowels are those

that were classified as being full members of the system of stem vowels in section 2. Thus the four short monophthongs /ε e ɔ o/ do not belong to the alternation system. Examples of nouns belonging to each of the five series are given in (42)-(46). The number of the forms is indicated by subscripts, "SG" indicating the singular, and "PL" indicating the plural.

(42) /u/-series

/u/	/ii/	/ɪ/	/i/	
ʔiuth _{SG}	ʔiidhi _{PL}			'scorpion'
cwùr _{SG}		cwùr'-ê _{PL}		'rainy season'
	kíittè _{PL}		kìdì _{SG}	'stone'
		ɲìy _{SG}	ɲìdì _{PL}	'child'

(43) /ɛ/-series

/ɛ/	/ie/	/ee/	/ee/	
dùèl _{SG}	dièk _{PL}			'goat'
nièŋ _{PL}		nèeŋɔ́ _{SG}		'cane'
lièl _{SG}			lèet _{PL}	'ant-hill'
	ù'-tiél _{SG}		ù'-tèend'-ì _{PL}	'elbow'
		cèer _{PL}	cèeró _{SG}	'star'

(44) /aa/-series

/aa/	/AA/	/a/	/A/	
kàalɔ́ _{SG}	kAAɔ́ _{PL}			'kraal'
láaŋɔ́ _{PL}		lâŋɔ́ _{SG}		'foreigner'
nàamɔ́ _{SG}			nám _{PL}	'river'
	bAAɔ́ _{PL}	bât _{SG}		'arm'
	lAAr _{PL}		lârró _{SG}	'vein'
		ràw _{SG}	râw'-ê _{PL}	'hippopotamus'

(45) /ɔɔ/-series

/ɔɔ/	/uo/	/ɔɔ/	/oo/	
bɔɔɔ _{SG}	buóc _{PL}			'castrated bull'
kɔɔŋ _{PL}		kɔɔŋ'-ò _{SG}		'beer'
à'-yɔɔm _{SG}			à'-yòom'-ò _{PL}	'kind of monkey'
	kuòt _{SG}		kòod'-ò _{PL}	'shield'
		ŋòom _{PL}	ŋòomó _{SG}	'sand'

(46) /oo/-series

/oo/	/uu/	/ɔ/	/u/	
còor _{SG}		còr'-ò _{PL}		'kind of bird of prey'
	kúundhè _{PL}	kòth _{SG}		'rain'
	bùur _{SG}		bùr'-ì _{PL}	'hole'
		còŋg'-ì _{PL}	cúŋ _{SG}	'knee'

On the basis of the /*u*/-series and the /*aa*/-series, the following generalization can be made: The vowels of a singular stem and a plural stem may differ with respect to length and/or ATR but not in any other respect. The three other series deviate from this general rule, but, strikingly, the deviations are exactly those predicted by the hypotheses of Diphthongization, Lengthening and Lowering.

The /*oo*/-series consists of the three high back vowels /*oo uu u*/ and the mid back vowel /*o*/ . Thus this series shows height alternation in addition to length and ATR alternation. However, given the change **/oo/ > /o/*, there was no height alternation originally, cf. for instance singular /*kòth*/ < **/kòth/* 'rain' versus plural /*kúundhè*/.

The /*ie*/-series and the /*ow*/-series consist of two diphthongs and two long mid monophthongs. Thus these series show no length alternation, and furthermore, they show height alternation. However, given Diphthongization and Lengthening, the alternations in these series were originally ones of length (and of ATR), just like in the /*u*/-series, the /*aa*/-series and the /*oo*/-series, cf. for instance singular /*nèengó*/ < **/nèengó/* 'cane' versus plural /*nièñ*/ < **/nèeng/*, and singular /*kòwñ'-ò*/ < **/kòñ'-ò/* 'beer' versus plural /*kowòñ*/ < **/kòwñ/*.

3.5. Raising

In section 2.1.2, we observed that [*ʌ*] sometimes varies freely with [*e*] or [*o*]. Nouns exhibiting this variation belong to the /*aa*/-series, since [*ʌ*] ~ [*e*] and [*ʌ*] ~ [*o*] alternate with /*aa*/, /*ʌʌ*/ or /*a*/:

(47)	Singular	Plural	
	<i>dwʌʌlò</i>	<i>dwʌl' -ê ~ dwèl' -ê</i>	'fat'
	<i>dwʌʌy</i>	<i>dwʌdì ~ dwèdì</i>	'month'
	<i>kʌc ~ kèc</i>	<i>kʌʌjè</i>	'famine'
(48)	Singular	Plural	
	<i>kwʌn ~ kwòn</i>	<i>kwànè</i>	'food'
	<i>rwʌth ~ rwòth</i>	<i>rwʌʌndhè</i>	'chief'
	<i>rwàath</i>	<i>rwʌdhò ~ rwòdhò</i>	'bull'

From these alternations, we can infer that [*ʌ*] is the historically original variant. Thus we are witnessing the following sound change in progress:

- (49) Raising
/ʌ/ > /e o/

3.6. Developmental stages

The effects of the ordered set of regular sound changes assumed to have affected stem vowels are summarized in Table 3.

Table 3. Hypothesized development of the system of stem vowels.

	-ATR	+ATR
Stage I	u εε aa ɔɔ ɔɔ	ii ee ʌʌ oo uu
Diphthongization	↓ ↓	↓ ↓
Stage II	u ιε aa ɔɔ ɔɔ	ii ie ʌʌ uo uu
Lengthening		
Stage III	u ιε aa ɔɔ ɔɔ	ii ie ʌʌ uo uu
Lowering		
Stage IV	u ιε aa ɔɔ ɔɔ	ii ie ʌʌ uo uu
Raising		
Stage V	u ιε aa ɔɔ ɔɔ	ii ie ʌʌ uo uu

	-ATR	+ATR
Stage I	ι ε a ɔ ɔ	i e ʌ o u
Diphthongization		
Stage II	ι ε a ɔ ɔ	i e ʌ o u
Lengthening	↓ ↓	↓ ↓
Stage III	ι εε a ɔɔ ɔ	i ee ʌ oo u
Lowering	↓	
Stage IV	ι εε a ɔɔ ɔ	i ee ʌ oo u
Raising		↓
Stage V	ι εε a ɔɔ ɔ	i ee eo oo u

This set of changes implies (i) that the original system of stem vowels (Stage I) was a completely symmetrical system with ten long and ten short monophthongs and no diphthongs, (ii) that it passed two intermediate stages (Stages II and III) in its development towards the present situation, and (iii) that it is currently passing another stage (Stage IV) towards the nearest future one (Stage V). First the long mid vowels */εε ɔɔ ee oo/ underwent Diphthongization, which introduced the diphthongs /ιε ɔɔ ie uo/. Next, the short mid vowels */ε ɔ e o/ were exposed to Lengthening, which reintroduced the long mid vowels /εε ɔɔ ee oo/. Then */ɔ/ underwent Lowering, which reintroduced /ɔ/. Finally, /ʌ/ was, and is still being, exposed to Raising, which reintroduced, and is still reintroducing, /e/ and /o/.

It should be emphasized that the changes are posited purely on internal evidence, which may not result in a complete picture of the history of the vowel system. Comparative evidence from other (Western) Nilotic languages may thus add to or require modifications of the picture given here.

NOTES

1. The monograph by Simeoni (1978), which is the first published work dealing with the Pāri language, does not devote much attention to phonological matters.
2. The following abbreviations are used in morpheme-by-morpheme translations:

1S/2S/3S	=	first/second/third person singular
1PIN	=	first person plural inclusive
2P/3P	=	second/third person plural
AP	=	antipassive
BEN	=	benefactive
C	=	completive
CAUS	=	causative
CF	=	centrifugal
CP	=	centripetal
ERG	=	ergative
INGR	=	ingressive
M	=	multiplicative
N	=	noun stem
SUF	=	suffix
V	=	verbal root

Words glossed with an infinitive phrase, i.e. 'to ...', are verbal nouns. Their tones are not indicated.

The following tone marks are used: / \acute{V} / = H(igh tone), / \grave{V} / = L(ow tone), / \hat{V} / = H(igh)-L(ow tone), /' / = floating H(igh tone).

3. "E" is an extra low surface tone. "!" indicates downstep, which can occur after a low tone as well as after a high tone.

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