

The Phonology of Mbuko

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May 1999

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1 Introduction

1.1 The Mbuko People

The Mbuko people live in the Far North province of Cameroon, mostly in the canton of Doulek, in the district of Meri in the department of the Diamaré, but with some in the district of Tokombere in the department of Mayo-Sava.

The population numbers between 12,000 and 15,000, spread on and around a string of mountains at the Eastern edge of the Mandara mountains. The principle crops are millet, peanuts and cotton. Livestock such as goats, sheep and chickens are kept in surprisingly large quantities.

The Mbuko neighbour the Moloko, Dugwor, Mofu-nord, Merey, Muyang and Gemzek. There is also contact with Guiziga and Fulani traders within the language area. Many men take wives from neighbouring groups, and there are a number of Mbuko who also speak or understand one of the other local languages. A large number of Mbuko also speak Fulfulde, the trade language of the area. Fulfulde is used when communicating with people from another language group and in some aspects of the life of the church. French is used in schools and for official purposes, though it is less widely spoken than Fulfulde.

1.2 Language Classification

Mbukuo is classified as follows (ALCAM p357):

Family	Chadic
branch	Centre
sub-branch	Centre-West
combined group	Wandala-Mafa
group	Mafa
sub-group	Northeast
language	Mbukuo (132)

1.3 Research Work

This research was carried out for the most part in the town of Meri with language consultants from various Mbukuo villages. Research for this paper ran from November 1996 to April 1999. Some limited research on Mbukuo was carried out in 1990 by Mr Tanyi Mbuagbaw of CABTA.

Thanks and appreciation go to Robert Nelezek for welcoming us and helping establish us in our compound in Meri, and also for his work, along with Robert Calalaw and Ousman Charles, during the collection and analysis of data. Our thanks also go to Joseph Koron in whose compound we have been living.

1.4 Grammar Overview

Mbukuo has SVO as its basic word order. Adjectives, numerals and other qualifiers follow the noun. The language uses prepositions, rather than postpositions, which are attached to nouns as prefix clitics. Verbs have limited morphology, which serves to mark subject agreement, indirect object agreement or past tense. Particles in the verb phrase mark subject person and number, aspect, future tenses, and direction. Verbs mostly do not carry lexical tone.

2The Syllable

The syllable in Mbuko contains a single vowel that bears a single level tone. Four syllable types are found: V, CV, VC and CVC.

2.1 Syllable Type V

The syllable type V is found almost exclusively in the word initial position. The only exceptions are in a few words containing “long” vowels (see 2.4 below).

Examples:

[⊕#.π⊕#]	“fodder”
[ɪ#.λE≡]	“soup”
[ʊ#.κΩ ≡]	“fire”

2.2 Syllable Type CV

The syllable type CV is by far the most common syllable type, occurring in any position in the word.

Examples:

[ʁ⊕#]	“cow”
[ζ⊕≡.v⊕≡]	“clothes”
[μ⊕#.τ⊕#.τ⊕#λ]	“rope”
[μ↔#.γ↔#.v⊕#]	“collective work”

2.3 Syllable Type CVC

The syllable type CVC occurs mostly as the final syllable in a word, though it is also found in other positions. In the non-word final cases the final consonant appears to be restricted to [ϕ], [ω], [λ] or [ρ], or occasionally a fricative.

Examples:

[μE≡ζ]	“blood”
[ʁ⊕#N]	“tooth”
[ΛE≡]	“wall”
[τ↔#.μ⊕#N]	“sheep”
[δʊ≡ω.δE#ω]	“drum (type)”
[μ↔≡.τI≡λ.γE≡μ]	“caterpillar”

2.4 Long Vowels

A very few words in Mbuko contain phonetic long vowels. These long vowels may be the result of the deletion of a consonant. The following alternations have been observed.

E.g.

[ζ⊕≡⊕≡⊕]	~	[ζ⊕≡η⊕≡⊕]	“descendant”
[σ⊕#⊕≡]	~	[σ⊕#σ⊕↔]	“in order to”
[⊕#⊕≡N]	~	[⊕#ω⊕≡N]	“ <i>adjectiviser marking unchanging state</i> ”

Long vowels are thus treated as a sequence of two vowels VV, and thus as two phonological syllables.

2.5 Syllable Type VC

The syllable type VC is the rarest syllable type. It is found only in words containing long vowels where

The Syllable

consonant deletion has occurred.

E.g.

[ζ̣⊕⊕⊕⊕] ~ [ζ̣⊕⊕η⊕⊕⊕] “descendant”

[⊕#⊕≡N] ~ [⊕#ω⊕≡N] “*adjectiviser marking unchanging state*”

The word [⊕⊕μ] “mouth” is not phonologically a VC syllable. Although there is phonetically a glottal stop at the beginning of this word, this is a phonological feature of all words commencing with a vowel, e.g. [⊕#μ⊕≡ρ] “oil”. For this reason one might consider [⊕⊕μ] to be a VC syllable. However, whilst elision normally takes place when a preposition precedes such nouns, this is not the case with [⊕⊕μ].

E.g.

[τ⊕≡]	“with”	
[⊕⊕μ]	“mouth”	
[τ⊕≡/⊕⊕μ]	“with the mouth”	(no elision)
[⊕#μ⊕≡ρ]	“oil”	
[τ⊕#μ⊕≡ρ]	“with the oil”	(elision)

Thus [⊕⊕μ] has the phonemic form /'àm/ and is thus a CVC, and not a VC syllable.

2.6 Comments

The CV syllable, being by far the most common syllable type, appears to be the standard syllable form. The V syllable appears to be restricted to the word initial position, or as part of a phonetically long vowel. The VC syllable occurs solely as the result of a consonant deletion in a CVC syllable. The syllable type CVC occurs almost exclusively word finally.

It may be reasonable to suppose that all words have come from forms made up exclusively of CV syllables, with possibly a final syllable of type CVC. The V syllable may historically be a morpheme ‘a’ prefixed to words (e.g. /pa/ “eat”, /āpā/ “fodder”). Deletion of an underlying schwa after /w/, /j/, /l/, /r/ may explain the occurrence of CVC syllables other than at the end of the word (e.g. [μν≡ωσ⊕#] “twin” cf. Mofu-Gudur [μ↔ωσ⊕]).

2.7 Syllable Patterns of Words

V	[⊕≡]	“to, at”
CV	[v⊕≡]	“when”
CVC	[τ⊕μ]	“to sew”
V.CV	[v#.κΩ ≡]	“fire”
V.CVC	[⊕#.μ⊕≡ρ]	“oil”
V.VC	[⊕#.⊕≡N]	“ <i>Adjectiviser - unchanging state</i> ”
CV.V	[σ⊕#.⊕≡]	“in order to”
CV.CV	[δ↔→⊕.v⊕≡]	“girl”
CV.CVC	[μβυ#.ρ #μ]	“sky”
CVC.CV	[μβ↔→≡ρ.κ⊕#]	“six”
CVC.CVC	[vδ↔→#ρ.ω⊕#Ṙ]	“snail”
V.CV.CV	[⊕#.β⊕#.γ⊕#]	“rain shower”
V.CV.CVC	[⊕#.≡↔→#.ρ⊕#Λ]	“agony”
CV.V.CV	[μ∇↔.∇↑.δZE≡]	“grandmother”
CV.V.CVC	[μ⊕≡.⊕≡.κ⊕#N]	“three”
CV.CV.CV	[δ∇↔.σ∇↔.σE≡]	“remedy”
CV.CV.CVC	[μν≡.φ↔→⊕.λ ≡κ]	“window”
CV.CVC.CV	[μ⊕⊕.vδ↔→≡ρ.κΩ⊕⊕]	“calabash”
CV.CVC.CVC	[μ⊕⊕.τ∇↔↔λ.γE⊕μ]	“caterpillar”
CVC.CV.CV	[δ↔→⊕ρ.λ∇↔↔.NγE#]	“hyena”
CVC.CV.CVC	[κ↔→⊕ρ.κ⊕≡.φ⊕#κ]	“tortoise”
CV.CV.V.CVC	[δζ↔→⊕.μ⊕≡.⊕≡.κ⊕#N]	“eight”
CV.CV.CV.CV	[μE⊕.τE⊕.λE⊕.γΩE≡]	“hockey stick”
CV.CV.CV.CVC	[μ↔→≡.δ↔→#.δυ#.ω⊕#N]	“rat”

CV.CVC.CV.CV
CV.CVC.CV.CVC
CV.CV.CV.CV.CV
CV.CV.CV.CV.CV.CV

[$\mu \leftrightarrow \varepsilon . \Lambda \leftrightarrow \exists \rho . \pi \leftrightarrow \varepsilon . \pi \oplus \#$]
[$\kappa \oplus \varepsilon . \kappa \oplus \varepsilon \rho . \gamma \leftrightarrow \exists . \lambda \oplus \varepsilon \kappa$]
[$\mu \leftrightarrow \varepsilon . \kappa \varepsilon \varepsilon . \tau \varepsilon \varepsilon . \kappa \varepsilon \varepsilon . \tau \varepsilon \varepsilon$]
[$\mu \leftrightarrow \varepsilon . \pi \leftrightarrow \exists . \rho \leftrightarrow \exists . \kappa \varepsilon \exists . \omega \varepsilon \exists . \kappa$
 $\varepsilon \exists . \omega \varepsilon \exists$]

“spider”
“cock-a-doodle-doo”
“moth”
“insect (type)”

3 Contrastive Units

3.1 Consonants

Mbukho has the following 32 contrastive consonant phonemes:

	Labial	Alveolar	Post-alveolar	Velar	Labio-velar
Voiceless plosive	/p/	/t/	/ts/	/k/	/kʷ/
Voiced plosive	/b/	/d/	/dz/	/g/	/gʷ/
Implosive	/ɓ/	/ɗ/		///	
Voiceless fricative	/f/	/ʃ/	/s/	/h/	/hʷ/
Voiced fricative	/v/	/ʒ/	/z/		
Nasal	/m/	/n/			
Prenasalised plosive	/mb/	/nd/	/ndz/	/ng/	/vʷ/
Trill		/r/			
Approximant		/l/	/j/		/w/

3.1.1 Distribution

All consonants are found in syllable initial position. In the syllable final position all consonants can occur, except voiced plosives and affricates, prenasalized phonemes and the glottal plosive.

When a CVC syllable occurs other than as the last syllable of a word, only the consonants /r/, /l/, /w/ and /dz/ may occur in syllable final position. In this case the CVC syllable is the result of the deletion of underlying /ə/ after these four consonants. E.g.:

[μ↔⇒p⊕#κ] “brother”
 [μv⇒pκ ≡] “my brother”

3.1.2 Table of Distribution

All consonants are found in syllable initial position. In the syllable final position all consonants can occur, except voiced plosives and affricates, prenasalized phonemes and the glottal plosive.

Phoneme	Syllable-initial	Syllable-final	Phoneme	Syllable-initial	Syllable-final
/b/	✓	✗	/m/	✓	✓
/ɓ/	✓	✓	/mb/	✓	✗
/d/	✓	✗	/n/	✓	✓
/dz/	✓	✗	/nd/	✓	✗
/ɗ/	✓	✓	/ndz/	✓	✗
/f/	✓	✓	/vʷ/	✓	✗
/g/	✓	✗	/vʷ/	✓	✗
/gʷ/	✓	✗	/p/	✓	✓
/h/	✓	✓	/r/	✓	✓
/hʷ/	✓	✓	/s/	✓	✓
/k/	✓	✓	/t/	✓	✓
/kʷ/	✓	✓	/ts/	✓	✓
/l/	✓	✓	/v/	✓	✓
/lʷ/	✓	✓	/w/	✓	✓
/ʃ/	✓	✓	/z/	✓	✓
/ʒ/	✓	✓	///	✓	✗

3.1.3 Description of Phonemes

In the following data tone is not marked on verbs, since they do not normally carry lexical tone.

- /p/ Voiceless labial plosive phoneme, with realisation
- [π] voiceless unaspirated bilabial plosive with egressive lung air
 /pāts/ [π⊕#τσ] ‘sun’
 /mā́tápā́ʒ/ [μ⊕#τ⊕≡π⊕#ʒ] ‘cloud’
 /ʒəʒep/ [ʒ↔ʒEπ] ‘to make rope’
- /b/ Voiced labial plosive phoneme, with realisation
- [β] voiced unaspirated bilabial plosive with egressive lung air
 /ban/ [β⊕N] ‘to tie’
 /tə̀bélèm/ [τ↔β↔≡λEβμ] ‘lip’
- /ɓ/ Labial implosive phoneme, with realisation
- [≡] voiced bilabial plosive with ingressive pharynx air
 /ɓàlāj/ [≡⊕λ⊕#φ] ‘trap’
 /gə̀ɓa/ [γ↔≡⊕] ‘to take’
 /āngā̀ɓ/ [⊕#Nγ⊕#≡] ‘okra’
- /f/ Voiceless labial fricative phoneme, with realisation
- [ϕ] voiceless labio-dental fricative with egressive lung air
 /fataj/ [ϕ⊕τ⊕φ] ‘to fly’
 /fə̀fet/ [ϕ↔φEτ] ‘to whistle’
 /kéléf/ [κ↔≡λE≡φ] ‘fish’
- /v/ Voiced labial fricative phoneme, with realisation
- [Ϟ] voiced labio-dental fricative with egressive lung air
 /və̀dzè/ [Ϟ↔≡δZEβ] ‘monkey’
 /ā̀vā̀/ [α#Ϟα#] ‘year’
 /zúlṑv/ [ζυ#λ #Ϟ] ‘dibber’
- /m/ Labial nasal phoneme, with realisation
- [μ] voiced bilabial nasal with egressive lung air
 /máákā̀n/ [μ⊕≡κ⊕#N] ‘three’
 /ū̀mṑm/ [υ#μ #μ] ‘bee’
 /mbūrṑm/ [μβυ#ρ #μ] ‘sky’
- /mb/ Labial pre-nasalised plosive phoneme, with realisation
- [μβ] voiced pre-nasalised bilabial nasal with egressive lung air
 /mbā̀nā̀/ [μβ⊕#ν⊕#] ‘peanut’
 /bā̀mbà̀/ [β⊕≡μβ⊕≡] ‘vulture’

Contrastive Units - Consonants

/t/ Voiceless alveolar plosive phoneme, with realisation

[τ]	voiceless unaspirated alveolar plosive with egressive lung air		
/tíréz/	[τ#ρE≅ζ]		‘axe’
/gùtér/	[γυ≅τE≅ρ]		‘tail’
/sēkāt/	[σ↔#κ⊕#τ]		‘hundred’

/d/ Voiced alveolar plosive phoneme, with realisation

[δ]	voiced unaspirated alveolar plosive with egressive lung air		
/dōh/	[δ #ξ]		‘house’
/àdák/	[⊕⊖δ⊕≅κ]		‘thorn’

/d/ Alveolar implosive phoneme, with realisation

[ɓ]	voiced alveolar plosive with ingressive pharynx air		
/dò/	[ɓ ⊖]		‘person’
/ɪdé/	[ɪ#ɓE≅]		‘eye’
/mád/	[μ⊕≅ɓ]		‘wind’

/ʁ/ voiceless alveolar fricative phoneme, with realisation

[ʁ]	voiceless alveolar lateral fricative with egressive lung air		
/ʁā/	[ʁ⊕#]		‘cow’
/bāʁáj/	[β⊕#ʁ⊕≅φ]		‘to count’
/mātápāʁ/	[μ⊕#τ⊕≅π⊕#ʁ]		‘cloud’

/ʌ/ Voiced alveolar fricative phoneme, with realisation

[ʌ]	voiced alveolar lateral fricative, with egressive lung air		
/ʌα/	[ʌ⊕]		‘to go’
/bèʌòm/	[≅↔≅ʌ ⊖μ]		‘mountain’
/gùnγΩàʌ/	[γυ≅NγΩ⊕≅ʌ]		‘cock’

/n/ Alveolar nasal phoneme, with realisations

[v] voiced alveolar nasal with egressive lung air, occurring word initially and word medially

/náv/	[v⊕≅ω]		‘bean’
/mbānā/	[μβ⊕#v⊕#]		‘peanut’

[N] voiced velar nasal with egressive lung air, occurring word finally

/wán/	[ω⊕≅N]		‘child’
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/nd/ Pre-nasalised alveolar plosive phoneme, with realisation

[vδ]	voiced pre-nasalised alveolar plosive with egressive lung air		
/ndáv/	[vδ⊕≅ω]		‘millet’
/indè/	[ɪ≅vδE≅]		‘inside’

/l/ alveolar approximant phoneme, with realisation:

[λ]	voiced alveolar lateral approximant with egressive lung air
/lúngō/	[λυ≡Nγ #] 'leopard'
/dáláj/	[⊕#λ⊕≡φ] 'arm'
/bál/	[≡⊕λ] 'to hunt'

/r/ alveolar trill phoneme, with realisation

[ρ]	voiced alveolar trill with egressive lung air
/rèdzè/	[ρ↔⊕δZE⊕] 'scorpion'
/kúráj/	[κυ≡ρ⊕≡φ] 'to dry'
/ndzèkàr/	[vζ↔⊕κ⊕⊕ρ] 'chicken'

/ts/ voiceless post-alveolar plosive phoneme, with realisations

[τσ]	voiceless alveolar affricate, with egressive lung air, occurring in any position
/tsa/	[τσ⊕] 'to see'
/mētsáh/	[μ↔#τσ⊕≡ξ] 'porcupine'
/mats/	[μ⊕τσ] 'to die'

[τΣ]	voiceless alveolo-palatal affricate with egressive lung air, occurring in free variation with [τσ] before front and back vowels
/tsēw/	[τΣE#ω] 'two'
/wītsé/	[ω#τΣE≡] 'to decorate'

/dz/ Voiced post-alveolar plosive phoneme, with realisations:

[δζ]	voiced alveolar affricate with egressive lung air, occurring in any position:
/dza/	[δζ⊕] 'to speak'
/hèdzak/	[η↔δζ⊕κ] 'to bend down'

[δZ]	voiced alveolo-palatal affricate with egressive lung air, occurring in free variation with [δζ] before front and back vowels
/dzùgòm/	[δZυ⊕γ ⊕μ] 'shoulder'
/vèdzè/	[Ϟ↔⊕δZE⊕] 'monkey'

/s/ voiceless post-alveolar fricative phoneme, with realisations

[σ]	voiceless alveolar grooved fricative with egressive lung air, occurring in all positions
/sē/	[σE#] 'tree'
/kūsāj/	[κυ#σ⊕#φ] 'harmattan'
/gós/	[γ ≡σ] 'thigh'

[Σ]	voiceless alveolo-palatal fricative with egressive lung air, occurring in free variation with [σ] before front or back vowels
/sìbèk ^w /	[Σι⊕β.⊕⊕κ] 'hair'

Contrastive Units - Consonants

/z/ voiced post-alveolar fricative phoneme, with realisations

[ʒ] voiced alveolar grooved fricative with egressive lung air, occurring in all positions
/zũlõv/ [ʒv#λ #w] 'dibber'
/lize/ [λɪʒE] 'to lose'
/dɔdɔz/ [lɔ#lɔʒ] 'red'

[ʒ] voiced alveolo-palatal fricative with egressive lung air, occurring in free variation with [ʒ] after front and back vowels
/zĩjél/ [ʒɪɔpE#λ] 'lion'

/ndz/ post-alveolar pre-nasalised plosive phoneme, with realisations

[vʒ] voiced pre-nasalised alveolar grooved fricative with egressive lung air, occurring before central vowels
/ndzèkàr/ [vʒ↔ɔkɔɔp] 'chicken'
/làndzà/ [λɔɔvʒɔɔ] 'hail'

[vδʒ] voiced pre-nasalised alveolo-palatal affricate with egressive lung air, occurring before front and back vowels
/ndzĩvré/ [vδʒɪ#pE#] 'sesame'
/dzĩndzilék/ [δʒɪɔvδʒɪ#λE#k] 'millet stem'

/j/ post-alveolar approximant phoneme, with realisation:

[ɸ] voiced unrounded palatal approximant with egressive lung air
/jam/ [ɸɔμ] 'to cry'
/ãjáh/ [ɔ#ɸɔ#ξ] 'squirrel'
/záj/ [ʒɔ#ɸ] 'peace'

/k/ voiceless velar plosive phoneme, with realisation

[k] voiceless unaspirated velar plosive with egressive lung air
/kad/ [kɔ] 'to break'
/ʒəka/ [ʒ↔kɔ] 'knife'
/pak/ [pɔk] 'to pour'

/g/ voiced velar plosive phoneme, with realisation

[ɣ] voiced unaspirated velar plosive with egressive lung air
/gàngàn/ [ɣɔɔNɣɔɔN] 'drum'
/dzúgõ/ [δʒvɔɣΩ #] 'hat'

/h/ voiceless velar fricative phoneme, with realisations

[ɬ] voiceless glottal fricative, with egressive lung air, occurring word or syllable initially
/haw/ [ɬɔw] 'to run'
/mãháj/ [μɔ#ɬɔ#ɸ] 'millet beer'

[ξ] voiceless velar fricative with egressive lung air, occurring word finally
/rah/ [pɔξ] 'to fill'

/ng/	velar pre-nasalised plosive phoneme, with realisation		
[Nɣ]	voiced pre-nasalised velar affricate with egressive lung air		
/ngā/	[Nɣ⊕#]	‘head’	
/lúngō/	[λv≡Nɣ #]	‘panther’	
///	Velar implosive phoneme, with realisation		
[ʎ]	glottal plosive		
//àm/	[ʎ⊕≡μ]	‘mouth’	
/ā/ám/	[⊕#/#⊕≡μ]	‘water’	
/κΩ/	voiceless labio-velar plosive phoneme, with realisation		
[κ ^o]	voiceless labialised velar plosive with egressive lung air		
/κΩánāj/	[κ ^o ⊕≡v⊕#φ]	‘you (pl.)’	
/dékΩén/	[ʎv≡κ ^o E≡N]	‘also’	
/ɣΩ/	voiced labio-velar plosive phoneme, with realisation		
[ɣ ^o]	voiced labialised velar plosive with egressive lung air		
/ɣΩídēn/	[ɣ ^o ι#δE#N]	‘toilet’	
/ɣΩàɣΩárá/	[ɣ ^o ⊕≡ɣ ^o ⊕≡ρ⊕≡]	‘ram’	
/ηΩ/	voiceless labio-velar fricative phoneme, with realisation		
[η ^o]	voiceless labialised glottal fricative with egressive lung air		
/ηΩíjá/	[η ^o ι≡φ⊕≡]	‘always’	
/tùηΩéhΩé/	[τv⊕η ^o E≡η ^o E≡]	‘aardvark’	
/nɣΩ/	prenasalised labio-velar plosive phoneme, with realisation		
[Nɣ ^o]	voiced prenasalised labialised velar plosive with egressive lung air		
/gùnɣΩàΛ/	[ɣv⊕vɣ ^o ⊕≡Λ]	‘cock’	
/w/	labio-velar approximant, with realisation		
[ω]	voiced rounded velar approximant with egressive lung air		
/wán/	[ω⊕≡N]	‘child’	
/kāwá/	[κ⊕#ω⊕≡]	‘like’	
/ndàw/	[vδ⊕≡ω]	‘millet’	

3.1.4 The Post-alveolar Consonants

The term ‘post-alveolar’ is used to describe these phonemes, though the most common realisations of many of them are really alveolar. The term is used to distinguish them from the alveolar consonants, as there is clearly a separate point of articulation implied by the distribution of the phonemes.

All the post-alveolar consonants except /j/ have two realisations, one alveolar and one alveolo-palatal. It is difficult to give exact constraints for when each may be used. The general tendency is to use the post-alveolar allophones after front and back vowels and the alveolar allophone after central vowels. However this varies from speaker to speaker, with some using the post-alveolar allophone more frequently than others.

3.1.5 /h/ Deletion

The phoneme /h/ is deleted in the segmental form of certain morphemes, though the phonological behaviour of the morpheme demands its presence at the underlying level.

Certain verbs ending in /h/ lose the /h/ when there is no suffix:

Contrastive Units - Consonants

UF	1Simp	2Pimp	Gloss
/vəneh/	ni vəne	ki vənihen	“vomit”
/cəceh/	ni cəce	ki cəcihen	“ask”
/mbədəh/	ni mbəda	ki mbədəihen	“reply”

Certain nouns beginning with /hə/ have lost the /h/ and in some cases the /ə/. When prefix prepositions are added the word behaves as a two syllable word, even though it is phonetically monosyllabic. This can be seen because the vowel in the preposition is /ə/, whereas it would be /a/ before a monosyllable:

UF	Segmental	“with”+N	Gloss
/həmad/	əmad	təmad	“cold”
/həwar/	uwar	təwar	“wife”
/həwaj/	waj	təwaj	“thing”
/hənaw/	naw	tənaw	“beans”

The /h/ is present in the cognates in related languages:

Mbuko	Moloko	Pelasia	Gloss
mad	həmad	həmade	“cold, wind”
uwar	hor	hərmana	“woman”
waj	-	awaj	“thing”
naw	-	hənaw	“bean”

3.1.6 Distinctive Features for Consonants

3.1.6.1 Labial Consonants

	π	β	≡	φ	Ϝ	μ	μβ	ω
Anterior	+	+	+	+	+	+	+	+
Coronal	-	-	-	-	-	-	-	-
Voiced	-	+	+	-	+	+	+	+
Continuous	-	-	-	+	+	+	-	+
Nasal	-	-	-	-	-	+	+	-
Rounded	-	-	-	-	-	-	-	-
Glottal	-	-	+	-	-	-	-	-
Obstruant	+	+	+	+	+	+	+	-
Trill	-	-	-	-	-	-	-	-

3.1.6.2 Alveolar Consonants

	τ	δ	└	ʀ	Λ	v	vδ	λ	ρ
Anterior	+	+	+	+	+	+	+	+	+
Coronal	+	+	+	+	+	+	+	+	+
Voiced	-	+	+	-	+	+	+	+	+
Continuous	-	-	-	+	+	+	-	+	+
Nasal	-	-	-	-	-	+	+	-	-
Rounded	-	-	-	-	-	-	-	-	-
Glottal	-	-	+	-	-	-	-	-	-
Obstruant	+	+	+	+	+	+	+	-	+
Trill	-	-	-	-	-	-	-	-	+

3.1.6.3 Post-alveolar Consonants

	τσ	δζ	σ	ζ	vδζ	φ
Anterior	-	-	-	-	-	-
Coronal	+	+	+	+	+	+
Voiced	-	+	-	+	+	+
Continuous	-	-	+	+	-	+
Nasal	-	-	-	-	+	-

3.1.7 Evidence of Contrast

In order to establish the identity of phonemes, suspect pairs are contrasted. Pairs are classed as suspect if they share the same place of articulation (either primary or secondary). Thus all phonemes with labial articulation are compared, all with alveolar, post-alveolar or palatal articulation are compared, and all with velar or palatal articulation are compared. In addition all nasal and nasalized phonemes are compared, as are all liquids and approximants. Implosives are also contrasted with the glottal phoneme.

A double arrow shows contrast in identical environments, a single arrow shows contrast in analogous environments. An arrow with no data indicates that no good contrast has been found, though both phonemes appear in that environment.

For verbs, the gloss is given in the infinitive, to distinguish them from nouns, though the form given is the root which is also the 2S imperative. Since most verbs do not carry lexical tone their tone is not marked. Glosses in italics indicate grammatical functions.

p / b

Word Initial	[π⊕]	'to eat'	↔	[β⊕]	'to wait'
	[π⊕κ]	'to pour'	↔	[β⊕#κ]	'cloth for carrying babies'
Word Medial	[⊕#π⊕#]	'animal food'	↔	[⊕#β⊕Ξ]	'weight'
	[τ⊕#π⊕≡κ]	'palm (of hand)'	↔	[ʁ⊕β⊕κ]	'to rise'

p / ɸ

Word Initial	[π⊕]	'to eat'	↔	[≡⊕]	'already'
	[π⊕#τσ]	'sun'	↔	[≡⊕λ]	'to hunt'
Word Medial	[τσ⊕π⊕φ]	'to plaster'	↔	[τσ⊕≡⊕φ]	'to annoy'
			↔		
Word Final	[δZυη π]	'to wet'	↔	[δZυδZ ≡]	'to soak'
	[δE#π]	'surprise'	↔	[τΣ┘≡]	'to position'

p / f

Word Initial	[π⊕]	'to eat'	↔	[φ⊕]	'to play (instrument)'
	[π⊕σ⊕φ]	'to iron'	↔	[φ⊕τ⊕φ]	'to fly'
Word Medial	[π↔πEτ]	'to cut'	↔	[φ↔φEτ]	'to whistle'
			↔		
Word Final	[ʁ↔ʁEπ]	'to make rope'	↔	[κ↔≡λE≡φ]	'fish'
	[δYνδυλ π]	'floor'	↔	[μ ≡τ ≡τ ≡φ]	'moisture'

p / v

Word Initial	[π⊕#τσ]	'sun'	↔	[Ϟ⊕┘]	'to hit'
	[π⊕κ]	'to pour'	↔	[Ϟ⊕κ]	'to grill'
Word Medial	[⊕#π⊕#]	'animal food'	↔	[⊕#Ϟ⊕#]	'year'
	[τ⊕#π⊕≡κ]	'palm (of hand)'	↔	[τ⊕Ϟ⊕κ]	'to carry on the head'
Word Final	[δYνδυλ π]	'floor'	↔	[βυΞμβυ≡λ ΞϞ]	'stomach'
	[δζυη π]	'to soak'	↔	[ζυ#λ #Ϟ]	'dibber'

p / m				
Word Initial	[π⊕]	‘to eat’	↔	[μ⊕] ‘to help’
	[π⊕#τσ]	‘sun’	↔	[μ⊕τσ] ‘to die’
Word Medial	[⊕#π⊕#]	‘animal food’	↔	[⊕Ξμ⊕Ξ] ‘but’
	[τσ⊕π⊕φ]	‘to plaster’	↔	[τσ⊕μ⊕φ] ‘to judge’
Word Final	[ῥ↔ῥΕπ]	‘to make rope’	↔	[μΙΞδεΞμ] ‘male in-law’
	[δΖυη π]	‘to soak’	↔	[ρυ#η #μ] ‘dirt’
p / mb				
Word Initial	[π⊕]	‘to eat’	↔	[μβ⊕] ‘to be able’
	[π⊕#τσ]	‘sun’	↔	[μβ⊕Ξτσ] ‘chest’
Word Medial	[⊕#π⊕#]	‘animal food’	↔	[⊕#μβ⊕#] ‘constipation’
	[τ⊕#π⊕Ξκ]	‘palm (of hand)’	↔	[τ↔Ξμβ⊕Ξλ] ‘drum (for four people)’
p / w				
Word Initial	[π⊕]	‘to eat’	↔	[ω⊕] ‘to say’
	[π⊕Ξφ]	‘milk’	↔	[ω⊕Ξφ] ‘thing’
Word Medial	[δζ⊕π⊕φ]	‘to mix’	↔	[δζ⊕ω⊕φ] ‘to fasten’
	[τ⊕#π⊕Ξκ]	‘palm (of hand)’	↔	[μ↔Ξτ⊕Ξω⊕Ξκ] ‘poor’
Word Final	[δε#π]	‘surprise’	↔	[δεΞω] ‘dawn’
	[ῥ↔ῥΕπ]	‘to make rope’	↔	[δ↔ΞδεΞω] ‘snake’
p / κΩ				
Word Initial	[π⊕]	‘to eat’	↔	[κΩ⊕Ξ] ‘multiple’
	[π⊕#τσ]	‘sun’	↔	[κΩ⊕τσ] ‘a little’
Word Medial	[π↔Ξπ⊕Ξτ⊕Ξ]	‘Wednesday’	↔	[μν#κΩ⊕Ξζ⊕#] ‘first time’
	[μ⊕Ξπ⊕#π⊕#ρ]	‘fencing mat’	↔	[μ⊕#κΩ⊕#κΩ⊕#λ] ‘mosquito’
p / γΩ				
Word Initial	[π⊕ῥ⊕φ]	‘to pour’	↔	[γΩ⊕#ῥ⊕Ξφ] ‘child’
	[πισΕ]	‘to forgive’	↔	[γΩι#δε#N] ‘toilet’
Word Medial	[κ⊕#λιΞπεΞρ]	‘crest (of cockerel)’	↔	[μ↔ΞιΞγΩΕΞ] ‘cold, flu’
			↔	
p / ηΩ				
Word Initial	[πισΕ]	‘to forgive’	↔	[ηΩιΞφ⊕Ξ] ‘always’
			↔	
Word Medial	[ηΕπΕπΕ]	‘sharp’	↔	[τν#ηΩΕΞωΕ Ξ] ‘aardvark’
			↔	
p / νγΩ				
Word Initial			↔	
			↔	
Word Medial	[τ⊕#π⊕Ξκ]	‘palm of hand’	↔	[δ⊕NγΩ⊕ζ] ‘to sleep’
			↔	

Contrastive Units - Consonants

b / ≡

Word Initial	[β⊕]	‘to wait’	↔	[≡⊕≡]	‘already’
	[β⊕ρ]	‘to walk’	↔	[≡⊕λ]	‘to hunt’
Word Medial	[ʁ⊕β⊕κ]	‘to rise’	↔	[μ⊕#≡⊕#ζ]	‘bilharzia’
	[σ⊕≡β⊕⊕φ]	‘no longer’	↔	[τσ⊕≡⊕φ]	‘to annoy’

b / φ

Word Initial	[β⊕]	‘to wait’	↔	[φ⊕]	‘to play (instrument)’
	[β⊕ν⊕φ]	‘to wash’	↔	[φ⊕δ⊕φ]	‘to sweep’
Word Medial	[β↔βEτ]	‘to peel’	↔	[φ↔φEτ]	‘to whistle’
	[β↔⊕β⊕⊕N]	‘father’	↔	[φ↔φ⊕N]	‘to scratch’

b / ϖ

Word Initial	[β⊕N]	‘to catch’	↔	[ϖ⊕#N]	‘grinding stone’
	[β⊕ρ]	‘to walk about’	↔	[ϖ⊕ρ]	‘to give’
Word Medial	[⊕#β⊕⊕]	‘weight’	↔	[⊕#ϖ⊕#]	‘year’
	[⊕β⊕φ]	‘before’	↔	[⊕⊕ϖ⊕⊕φ]	‘melon’

b / μ

Word Initial	[β⊕]	‘to wait’	↔	[μ⊕]	‘to go back’
	[β⊕N]	‘to catch’	↔	[μ⊕#N]	‘place’
Word Medial	[⊕#β⊕⊕]	‘weight’	↔	[⊕⊕μ⊕≡]	‘but’
	[σ⊕≡β⊕⊕φ]	‘no longer’	↔	[τσ⊕μ⊕φ]	‘to judge’

b / μβ

Word Initial	[β⊕]	‘to wait’	↔	[μβ⊕]	‘to be able’
	[β⊕ρ]	‘to walk’	↔	[μβ⊕ρ]	‘to heal’
Word Medial	[⊕#β⊕⊕]	‘weight’	↔	[⊕#μβ⊕#]	‘constipation’
	[β↔β⊕Λ]	‘to prepare a field for sowing’	↔	[β↔μβ⊕⊕]	‘to change’

b / ω

Word Initial	[β⊕]	‘to wait’	↔	[ω⊕]	‘to say’
	[β⊕N]	‘to catch’	↔	[ω⊕≡N]	‘child’
Word Medial	[⊕β⊕φ]	‘before’	↔	[⊕#ω⊕≡φ]	‘yes’
	[σ⊕≡β⊕⊕φ]	‘no longer’	↔	[ζ⊕#ω⊕≡φ]	‘thread’

b / κΩ

Word Initial	[β⊕]	‘to wait’	↔	[κΩ⊕≡]	‘multiple’
	[β⊕≡μβ⊕⊕]	‘vulture’	↔	[κΩ⊕≡κΩ⊕≡]	‘earlier’
Word Medial	[δ⊕β⊕σ⊕μ]	‘thick’	↔	[μ⊕#κΩ⊕#κΩ⊕#⊕]	‘mosquito’
	[γ↔ρβ⊕ʁ⊕φ]	‘wing’	↔	[κυρκΩ⊕ζ⊕φ]	‘grasshopper’

b / γΩ

Word Initial	[βι#τE≡N]	‘today’	↔	[γΩι#δE#N]	‘toilet’
	[β⊕ʁ⊕φ]	‘to count’	↔	[γΩ⊕#ʁ⊕≡φ]	‘child’
Word Medial	[⊕#β⊕#γ⊕#]	‘shower’	↔	[⊕⊕γΩ⊕⊕δ⊕⊕]	‘cup’
	[τ↔⊕κ⊕βE≡λ]	‘lid’	↔	[μ↔⊕⊕⊕⊕γΩE⊕⊕]	‘cold, flu’

b / ηΩ

Word Initial	[βι⊕σE≡]	‘soon’	↔	[ηΩι⊕φ⊕≡]	‘always’
			↔		
Word Medial	[δ↔⊕β↔⊕λ⊕ ⊕]	‘first child born after twins’	↔	[τν⊕ηΩE≡ηΩ E≡]	‘small burrowing animal’

↔

b / vγΩ

Word Initial

↔

Word Medial

[ʁ⊕β⊕κ]

‘to rise’

↔

[δ⊕NγΩ⊕ζ]

‘to sleep’

[λ↔⇒β⊕≡ρ⊕
≡]

‘news’

↔

[β⊕#NγΩ⊕#ρ⊕
#]

‘machete’

β / φ

Word Initial

[≡⊕≡]

‘already’

↔ [φ⊕]

‘to play (music)’

[≡⊕⇒λ⊕#φ]

‘trap’

↔ [φ⊕τ⊕φ]

‘to fly’

Word Medial

[δζ↔⇒⇒≡⊕≡N]

‘partition in a grain store’

↔ [φ↔⇒φ⊕N

‘to scratch’

]

Word Final

[Λ⊕≡]

‘to thresh’

↔

[Λ⊕φ]

‘to put’

[ηυρ ≡]

‘damp’

↔ [ηυ⇒ρ ≡

‘blind’

φ]

β / ρ

Word Initial

[≡⊕λ]

‘to hunt’

↔ [Ϟ⊕ρ]

‘to give’

[≡↔⇒λE⇒μ]

‘hill’

↔ [Ϟ↔⇒ΛEN]

‘to breathe’

Word Medial

[≡υ≡ κ]

‘to stroke’

↔ [δZυ⇒Ϟ #κ]

‘guest hut’

[μ⊕#≡⊕#ζ]

‘bilharzia’

↔ [Ϟ⊕Ϟ⊕τ⊕σ]

‘eaves’

Word Final

[τσ⊕≡]

‘to extend’

↔ [ζ⊕Ϟ]

‘to grow’

[νδ↔⇒λ ≡]

‘to pluck’

↔ [ζυ#λ #Ϟ]

‘dibber’

β / μ

Word Initial

[≡⊕≡]

‘already’

↔ [μ⊕]

‘to go back’

[≡⊕λ]

‘to hunt’

↔ [μ⊕≡]

‘cold’

Word Medial

[τ↔⇒≡⊕]

‘to open’

↔ [τ↔⇒μ⊕]

‘to accept’

[≡υ≡ κ]

‘to stroke’

↔ [μυ≡μ ⇒κ]

‘termite’

Word Final

[Λ⊕≡]

‘to thresh’

↔ [Λ⊕μ]

‘to slink’

[κ⊕τ⊕≡]

‘to try’

↔ [κ⊕⇒λ⊕⇒μ]

‘antelope’

β / μβ

Word Initial

[≡⊕≡]

‘already’

↔ [μβ⊕]

‘to be able’

[≡⊕λ]

‘to hunt’

↔ [μβ⊕ρ]

‘to heal’

Word Medial

[ʁ↔⇒≡⊕]

‘to eat’

↔ [Λ↔⇒μβ⊕]

‘to knock over’

[ζ↔⇒≡⊕φ]

‘to bring’

↔ [γ↔⇒μβ⊕φ]

‘to refuse’

Contrastive Units - Consonants

β / ω

Word Initial	[≡⊕≡] [≡⊕∃λ⊕#φ]	‘already’ ‘trap’	↔	[ω⊕] [ω⊕#λ⊕≡φ]	‘to say’ ‘western Mbuko’
Word Medial	[μ⊕#≡⊕#ζ]	‘bilharzia’	↔	[μ⊕≡ω⊕#ρ]	‘Moloko mountain’
Word Final	[τσ⊕≡⊕φ] [μ⊕νδ⊕≡] [Λ⊕≡]	‘to annoy’ ‘sticky’ ‘to thresh’	↔ ↔ ↔	[ζ⊕#ω⊕≡φ] [μ⊕≡νζ⊕∃ω] [νδ⊕∃ω]	‘thread’ ‘paste’ ‘millet’

β / κΩ

Word Initial	[≡⊕≡] [≡⊕∃λ⊕#φ]	‘already’ ‘trap’	↔	[κΩ⊕≡] [κΩ⊕≡ν⊕#φ]	‘multiple’ ‘you (pl.)’
Word Medial	[κ↔∃τ⊕#≡⊕≡ ρ]	‘serving calabash’	↔	[μ⊕#κΩ⊕#κΩ⊕# _]	‘mosquito’
			↔		

β / γΩ

Word Initial	[≡⊕∃λ⊕#φ]	‘trap’	↔	[γΩ⊕#ϱ⊕≡φ]	‘child’
Word Medial	[λι#≡E≡ρ] [τσ↔∃τσ⊕≡≡⊕ ∃φ]	‘rope’ ‘twigs’	↔ ↔	[μι#γΩE#ξ] [μ⊕∃γΩ⊕≡γΩ⊕∃ φ]	‘snake’ ‘present’

β / ηΩ

Word Initial	[≡ι#λE#]	‘slave’	↔	[ηΩι≡φ⊕≡]	‘always’
Word Medial	[≡υ≡υρ]	‘bag (type of)’	↔	[τν∃ηΩE≡ηΩE ≡]	‘armadillo’
			↔		

β / νγΩ

Word Initial			↔		
Word Medial	[μ⊕#≡⊕#ζ] [≡υ≡υρ]	‘bilharzia’ ‘bag (type of)’	↔	[δ⊕NγΩ⊕ζ] [β⊕#NγΩ⊕#ρ⊕ #]	‘to sleep’ ‘machete’

β / /

Word Initial	[≡⊕λ]	‘to hunt’	↔	[/⊕∃μ]	‘mouth’
Word Medial	[μ⊕#≡⊕#ζ] [κ↔∃τ⊕#≡⊕≡ ρ]	‘bilharzia’ ‘serving calabash’	↔	[η⊕≡/⊕∃μ] [γ↔∃σ⊕#/⊕≡μ]	‘yawn’ ‘drinking calabash’

f / ω

Word Initial	[φ↔≡_ #] [φ↔τE_]	‘four’ ‘to cut’	↔	[Ϟ↔∃δZE∃] [Ϟ↔∃ρE∃Λ]	‘monkey’ ‘wrist’
Word Medial	[φ↔φEτ] [μν≡φ↔∃λ ≡ κ]	‘to whistle’ ‘window’	↔	[γ↔∃ϞE≡τ] [μ↔≡Ϟν∃η ∃μ _]	‘calabash’ ‘bird’
Word Final	[δζ⊕φ] [⊔⊕φ]	‘to throw’ ‘to put’	↔	[δζ⊕Ϟ] [δ⊕Ϟ]	‘to plant’ ‘to shine’

f / μ					
Word Initial	[φ⊕]	‘to play (music)’	↔	[μ⊕]	‘to help’
Word Medial	[φιτΣΕ┘]	‘to cut’	↔	[μι#τΣΕ┘]	‘old’
	[φ↔φ⊕N]	‘to scratch’	↔	[τ↔#μ⊕#N]	‘sheep’
	[μ↔≡κ↔#σ↔#φ ⊕#φ]	‘rainy season’	↔	[μ↔≡λ↔≡γ↔≡μ ⊕≡φ]	‘chin’
Word Final	[┘⊕φ]	‘to put’	↔	[τ⊕μ]	‘to sew’
	[σ⊕∃σ⊕∃φ]	‘forest’	↔	[κ⊕∃λ⊕∃μ]	‘antelope’
f / μβ					
Word Initial	[φ⊕]	‘to play (music)’	↔	[μβ⊕]	‘to be able’
Word Medial	[φ⊕κ⊕φ]	‘to push’	↔	[μβ⊕κ⊕φ]	‘to move out’
	[φ↔φ⊕N]	‘to scratch’	↔	[β↔μβ⊕┘]	‘to change’
	[μν≡φ↔∃λ ≡ κ]	‘window’	↔	[μν≡μβν#λ #μ]	‘food stuck to the side of the pan’
f / ω					
Word Initial	[φ⊕]	‘to play (music)’	↔	[ω⊕]	‘to say’
Word Medial	[φ⊕τ⊕φ]	‘to fly’	↔	[ω⊕λ⊕φ]	‘to choose’
	[σι≡φ⊕≡]	‘life’	↔	[σι≡ω⊕#]	‘when’
	[φ↔φEτ]	‘to whistle’	↔	[ϣν≡ωE┘]	‘meat’
Word Final	[┘⊕φ]	‘to put’	↔	[┘⊕≡ω]	‘question marker’
	[κ↔≡λE≡φ]	‘fish’	↔	[τ↔≡λE# ω]	‘hornbill’
f / κΩ					
Word Initial	[φ⊕]	‘to play (music)’	↔	[κΩ⊕≡]	‘multiple’
Word Medial	[φ⊕τ⊕φ]	‘to fly’	↔	[κΩ⊕σ⊕φ]	‘to ferment’
	[φ↔φEτ]	‘to whistle’	↔	[┘ν≡κΩE≡N]	‘also’
			↔		
f / γΩ					
Word Initial	[φιτΣΕ┘]	‘to cut’	↔	[γΩι#δε#N]	‘toilet’
	[φ⊕τ⊕φ]	‘to fly’	↔	[γΩ⊕#ϣ⊕≡φ]	‘child’
Word Medial	[φ↔φEτ]	‘to whistle’	↔	[γνγΩEσ]	‘to shake’
			↔		
f / ηΩ					
Word Initial	[φ↔≡┘ #]	‘four’	↔	[ηΩι≡φ⊕≡]	‘always’
			↔		
Word Medial			↔		
			↔		
f / νγΩ					
Word Initial			↔		
			↔		
Word Medial	[φ↔φ⊕N]	‘to scratch’	↔	[γνNγΩ⊕ζ]	‘to murmur’
			↔		
v / μ					
Word Initial	[ω⊕┘]	‘to hit’	↔	[μ⊕┘]	‘cold’
	[ω⊕#N]	‘grinding’	↔	[μ⊕#N]	‘place’

Contrastive Units - Consonants

		stone'			
Word Medial	[⊕#⊗⊕#]	'year'	↔	[⊕⊖μ⊕≡]	'but'
	[δΖυ≡⊗ #κ]	'guest hut'	↔	[μυ≡μ #κ]	'termite'
Word Final	[δζ⊕⊗]	'to plant'	↔	[δζ #μ]	'thirst'
	[δ↔#λ #⊗]	'lake'	↔	[δ↔λ μ]	'to fall into a hole'
v / μβ					
Word Initial	[⊗⊕κ]	'to grill'	↔	[μβ⊕#κ]	'kitchen'
	[⊗⊕⊖φ]	'sting'	↔	[μβ⊕⊖φ]	'manioc'
Word Medial	[⊕#⊗⊕#]	'year'	↔	[⊕#μβ⊕#]	'constipation'
	[⊗↔#⊗⊕#ρ]	'roof'	↔	[β⊕μβ⊕φ]	'lungs'
v / ω					
Word Initial	[⊗⊕κ]	'to grill'	↔	[ω⊕≡N]	'child'
	[⊗ι⊖φ⊕≡]	'rains'	↔	[ωι≡φ⊕#]	'new'
Word Medial	[τ⊕⊗⊕κ]	'to carry on the head'	↔	[μ↔≡τ⊕≡ω ⊕≡κ]	'poor'
	[λ⊕⊗⊕φ]	'to trace'	↔	[λ⊕ω⊕φ]	'to hang up'
Word Final	[νδ⊕⊗]	'to finish'	↔	[νδ⊕⊖ω]	'millet'
	[γ↔ρ⊕⊗]	'to dance'	↔	[γ⊕ρ⊕ω]	'to weed'
v / κΩ					
Word Initial	[⊗⊕L]	'to hit'	↔	[κΩ⊕τσ]	'a little'
	[⊗↔#⊗⊕#ρ]	'roof'	↔	[κΩ⊕L⊕ξ]	'to boil'
Word Medial	[ι⊖⊗E≡N]	'rain'	↔	[ι≡κΩE≡N]	'you (pl.) (object)'
	[μ⊕≡⊗⊕⊖⊗⊕≡ ρ]	'window'	↔	[μ⊕#κΩ⊕#κΩ⊕#L]	'mosquito'
v / γΩ					
Word Initial	[⊗ι⊖φ⊕≡]	'rains'	↔	[γΩι⊖φ⊕≡]	'hockey'
			↔		
Word Medial	[μι⊖⊗E≡λ]	'liver'	↔	[μ#γΩE#ξ]	'snake'
	[μ⊕#⊗⊕#⊗⊕# φ]	'mongoose'	↔	[μ⊕⊖γΩ⊕≡γΩ⊕⊖φ]	'present'
v / ηΩ					
Word Initial	[⊗ι⊖φ⊕≡]	'rains'	↔	[ηΩι≡φ⊕≡]	'always'
			↔		
Word Medial	[⊗↔⊖⊗ι≡λE≡]	'whirlwind'	↔	[τ⊖⊖ηΩE≡ηΩE ≡]	'armadillo'
			↔		
v / νγΩ					
Word Initial			↔		
			↔		
Word Medial	[νζ⊕#⊗⊕#ρ]	'young'	↔	[δ⊕NγΩ⊕ζ]	'to sleep'
	[τ⊕⊖⊖⊗⊕≡N]	'falcon'	↔	[γ⊖⊖NγΩ⊕≡Λ]	'cock'

m / μβ					
Word Initial	[μ⊕]	‘to go back’	↔	[μβ⊕]	‘to be able’
	[μ⊕φ]	‘to return’	↔	[μβ⊕⊖φ]	‘manioc’
Word Medial	[⊕⊖μ⊕⊖]	‘but’	↔	[⊕#μβ⊕#]	‘constipation’
	[⊕#μ⊕⊖ρ]	‘cooking oil’	↔	[⊕⊖μβ⊕⊖ρ]	‘leather’
m / ω					
Word Initial	[μ⊕]	‘to go back’	↔	[ω⊕]	‘to say’
	[μ⊕#N]	‘place’	↔	[ω⊕⊖N]	‘child’
Word Medial	[μ⊕#μ⊕#Ბ]	‘middle’	↔	[μ⊕⊖ω⊕#ρ]	‘Moloko mountain’
Word Final	[δ<→⊖ρμ⊕⊖κ]	‘also’	↔	[νδ<→#ρω⊕#Ბ]	‘snail’
	[δE≡μ]	‘sickle’	↔	[δE≡ω]	‘dawn’
	[γ⊕#δ⊕#μ]	‘arrow’	↔	[γ⊕ρ⊕ω]	‘to weed’
m / κΩ					
Word Initial	[μ⊕]	‘to go back’	↔	[κΩ⊕⊖]	‘multiple’
	[μ⊕τσ]	‘to die’	↔	[κΩ⊕τσ]	‘a little’
Word Medial	[γν⊖γν⊖μ⊕⊖φ]	‘cotton’	↔	[κν#νν#κΩ⊕⊖ φ]	‘Gemzek (ethnic group)’
	[γ<→⊖ρμE≡τσ]	‘knee’	↔	[κν#ρκΩE#ρ]	‘meanwhile’
m / γΩ					
Word Initial	[μ⊖φ⊕⊖]	‘together’	↔	[γΩ⊖⊖φ⊕⊖]	‘hockey’
	[μ⊖δE⊖μ]	‘brother-in-law’	↔	[γΩ⊖#δE#N]	‘toilet’
Word Medial	[γ<→⊖ρμE≡τσ]	‘knee’	↔	[γ⊖ργΩE⊖N]	‘clan’
	[μ<→#δ⊕#μ⊕#φ]	‘sister-in-law’	↔	[μ⊕⊖γΩ⊕⊖≡γΩ⊕⊖⊖φ]	‘present’
m / ηΩ					
Word Initial	[μ⊖φ⊕⊖]	‘together’	↔	[ηΩ⊖⊖φ⊕⊖]	‘always’
			↔		
Word Medial	[Λν⊖γΩE⊖μE ⊖]	‘camel’	↔	[τν⊖ηΩE≡ηΩE ≡]	‘aardvark’
			↔		
m / νγΩ					
Word Initial	μE≡τσE⊖κE⊖E ≡	‘name’	↔	NγωE⊖E⊖E⊖E⊖E #	‘crying’
			↔		
Word Medial	[μ⊕#μ⊕#Ბ]	‘middle’	↔	[δ⊕NγΩ⊕ζ]	‘to sleep’
	[η⊕μ⊕μ⊕]	‘bitter, acid’	↔	[β⊕#NγΩ⊕#ρ⊕ #]	‘machete’
m / ν					
Word Initial	[μ⊕]	‘to go back’	↔	[ν⊕⊖]	‘topic’
	[μ⊕#η⊕⊖φ]	‘wine’	↔	[ν⊕η⊕⊖φ]	‘to incubate’
Word Medial	[Ბ<→≡μ⊕⊖φ]	‘ear’	↔	[Ბ<→ν⊕⊖φ]	‘to send back’
	[μ⊕#μ⊕⊖φ]	‘mother’	↔	[μ⊕⊖ν⊕⊖φ]	‘we’
Word Final	[δζ #μ]	‘thirst’	↔	[δζ⊕N]	‘to climb’
	[δ<→⊖δ ⊖μ]	‘wood’	↔	[δ<→#δ #N]	‘wall’

Contrastive Units - Consonants

m / vδ

Word Initial	[μ⊕] [μ⊕#ω]	‘to go back’ ‘what’	↔	[vδ⊕] [vδ⊕∃ω]	‘to sting’ ‘millet’
Word Medial	[μv≡μ ∃κ] [μ⊕#μ⊕#ϱ]	‘termite’ ‘middle’	↔	[κv∃vδ ≡κ] [μ⊕vδ⊕≡]	‘larynx’ ‘sticky’

m / vδζ

Word Initial	[μ⊕≡⊔] [μ⊕#ω⊕≡ρ]	‘cold’ ‘Moloko mountain’	↔	[vζ⊕⊔] [vζ⊕#ω⊕#ρ]	‘to find’ ‘young’
Word Medial	[⊕#μ⊕≡ρ] [μ⊕#μ⊕≡ρ]	‘cooking oil’ ‘mother’	↔	[⊕∃vζ⊕#ρ] [μ⊕∃vζ⊕∃φ]	‘grass’ ‘bracelet’

m / vγ

Word Initial	[μ⊕] [μ⊕#μ⊕≡φ]	‘to go back’ ‘mother’	↔	[Nγ⊕#] [Nγ⊕μ⊕φ]	‘head’ ‘to call’
Word Medial	[⊕∃μ⊕≡] [μv≡μ ∃κ]	‘but’ ‘termite’	↔	[⊕≡Nγ⊕#] [μv∃Nγ ∃κ]	‘because’ ‘sin’

mb / ω

Word Initial	[μβ⊕] [μβ⊕∃φ]	‘to be able’ ‘manioc’	↔	[ω⊕] [ω⊕∃φ]	‘to say’ ‘thing’
Word Medial	[τ⊕μβ⊕λ] [Λ⊕μβ⊕λ]	‘drum for four people’ ‘to throw’	↔	[τ⊕ω⊕⊔] [Λ⊕#ω⊕#N]	‘to jump’ ‘fear’

mb / κΩ

Word Initial	[μβ⊕] [μβ⊕≡τσ]	‘to be able’ ‘chest’	↔	[κΩ⊕≡] [κΩ⊕τσ]	‘multiple’ ‘a little’
Word Medial	[β↔μβ⊕⊔] [μ⊕≡μβ⊕∃⊔⊕≡κ]	‘to trade’ ‘fat’	↔	[βv∃κΩ⊕≡⊔] [μ⊕#κΩ⊕#κΩ⊕#⊔]	‘liana’ ‘mosquito’

mb / γΩ

Word Initial	[μβ⊕≡ρ⊕≡φ]	‘shield’	↔	[γΩ⊕#ϱ⊕≡φ]	‘child’
Word Medial	[β↔μβ⊕⊔]	‘to trade’	↔	[γvγΩ⊕ρ]	‘to prune’

mb / ηΩ

Word Initial	[μβι∃κ⊕∃]	‘Mada (ethnic group)’	↔	[ηΩι≡φ⊕≡]	‘always’
Word Medial	[μ↔∃μβE≡⊔E≡τσ]	‘tight’	↔	[τv∃ηΩE≡ηΩ E≡]	‘aardvark’

mb / vγΩ

Word Initial			↔		
Word Medial	[δ↔μβ⊕⊔] [μ⊕≡μβ⊕∃⊔⊕≡κ]	‘ligament’ ‘fat’	↔	[δ⊕NγΩ⊕ζ] [μv#NγΩ⊕#λ⊕#φ]	‘to sleep’ ‘lie’

mb / v

Word Initial	[μβ⊕]	‘to be able’	↔	[v⊕≡]	‘topic’
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Word Medial	[μβ⊕Ξφ]	‘manioc’	↔	[ν⊕φ]	‘to come’
	[⊕#μβ⊕#]	‘constipation’	↔	[⊕#ν⊕#]	‘of’
	[β⊕≡μβ⊕Ξ]	‘vulture’	↔	[μβ⊕#ν⊕#]	‘peanut’
mb / νδ					
Word Initial	[μβ⊕]	‘to be able’	↔	[νδ⊕]	‘to sting’
	[μβ⊕Λ]	‘to damage’	↔	[νδ⊕Λ]	‘to burst’
Word Medial	[κνμβ ξ]	‘to wrap’	↔	[κνΞνδ ≡κ]	‘larynx’
	[ΛΙΞμβιΞλE≡ ρ]	‘tree (with pink flowers)’	↔	[δΙΞνδι≡λE# κ]	‘small sticks’
mb / νδζ					
Word Initial	[μβ⊕#κ]	‘kitchen’	↔	[νζ⊕κ]	‘to gather’
	[μβ⊕κ⊕φ]	‘to move out’	↔	[νζ⊕η⊕φ]	‘to rest’
Word Medial	[⊕Ξμβ⊕Ξρ]	‘leather’	↔	[⊕Ξνζ⊕#ρ]	‘grass’
	[β⊕μβ⊕φ]	‘lungs’	↔	[μ⊕≡νζ⊕Ξω]	‘paste’
mb / νγ					
Word Initial	[μβ⊕]	‘to be able’	↔	[Nγ⊕#]	‘head’
	[μβ↔#λ⊕#κ]	‘wound’	↔	[Nγ↔λ⊕κ]	‘crane’
Word Medial	[⊕#μβ⊕#]	‘constipation’	↔	[⊕≡Nγ⊕#]	‘because’
	[γνμβ ζ]	‘bellows’	↔	[γν#Nγ #ζ]	‘flute (type of)’
w / κΩ					
Word Initial	[ω⊕]	‘to say’	↔	[κΩ⊕≡]	‘multiple’
	[ω⊕ ⊕]	‘to dry’	↔	[κΩ⊕ ⊕ξ]	‘to boil’
Word Medial	[τνΞωEΞζ]	‘pot’	↔	[ν≡κΩE≡N]	‘also’
	[μ↔≡τν#ω⊕# ρ]	‘child minder’	↔	[μ↔≡τν#κΩ⊕≡ ρ]	‘back of head’
w / γΩ					
Word Initial	[ωι≡φ⊕#]	‘new’	↔	[γΩιΞφ⊕≡]	‘hockey’
	[ω⊕ϱ⊕φ]	‘to skin’	↔	[γΩ⊕#ϱ⊕≡φ]	‘child’
Word Medial	[δζνω⊕ρ]	‘to sprinkle onto water’	↔	[δZνγΩ⊕ρ]	‘to keep’
	[φνΞω⊕Ξρ]	‘antelope’	↔	[γνγΩ⊕ρ]	‘to prune’
w / ηΩ					
Word Initial	[ωι≡φ⊕#]	‘new’	↔	[ηΩι≡φ⊕≡]	‘always’
Word Medial	[μ↔≡δEΞωδEΞωE Ξ]	‘egret’	↔	[τνΞηΩE≡ηΩ E≡]	‘armadillo’
			↔		
w / νγΩ					
Word Initial			↔		
Word Medial	[τ⊕ω⊕]	‘to jump’	↔	[δ⊕NγΩ⊕ζ]	‘to sleep’
	[σ⊕≡ω⊕≡ρ⊕#]	‘jaundice’	↔	[β⊕#NγΩ⊕#ρ⊕ #]	‘machete’

Contrastive Units - Consonants

w / κ

Word Initial	[ω⊕]	‘to say’	↔	[κ⊕]	‘to show’
	[ω≡φ⊕#]	‘new’	↔	[κ≡φ⊕#]	‘moon’
Word Medial	[τ⊕ω⊕⊔]	‘to jump’	↔	[τ⊕κ⊕⊔]	‘to wipe’
	[κ↔→∃λ⊕≡ω⊕#]	‘pot’	↔	[γ⊕∃λ⊕≡κ⊕#]	‘monkey (type)’
Word Final	[δE≡ω]	‘dawn’	↔	[δE∃κ]	‘big’
	[Nγ↔→≡λ⊕∃ω]	‘nobility’	↔	[Nγ↔→λ⊕κ]	‘crane’

w / γ

Word Initial	[ω⊕]	‘to say’	↔	[γ⊕]	‘to do’
	[ω⊕≡N]	‘child’	↔	[γ⊕N]	‘to grind’
Word Medial	[⊕#ω⊕≡φ]	‘yes’	↔	[⊕#γ⊕≡φ]	‘home’
	[λ⊕ω⊕φ]	‘to hang up’	↔	[λ⊕γ⊕φ]	‘to accompany’

w / /

Word Initial	[ω⊕≡N]	‘child’	↔	[/⊕∃μ]	‘mouth’
			↔		
Word Medial	[⊕#ω⊕≡φ]	‘yes’	↔	[⊕∃/⊕≡φ]	‘no’
	[⊕∃ω⊕#N]	‘thing’	↔	[⊕#/⊕≡μ]	‘water’

w / ν

Word Final	[μ⊕#ω]	‘what’	↔	[μ⊕#N]	‘place’
	[η⊕ω]	‘to run’	↔	[η⊕N]	‘to make’

w / νγ

Word Initial	[ω⊕]	‘to say’	↔	[Nγ⊕#]	‘head’
	[ω∃ρ⊕≡ϝ]	‘in two’	↔	[Nγ∃ρ⊕∃Λ]	‘weaver bird’
Word Medial	[Λ⊕#ω⊕#N]	‘fear’	↔	[Λ⊕Nγ⊕N]	‘to meet’
	[δζ⊕ω⊕φ]	‘to fasten’	↔	[δζ⊕Nγ⊕φ]	‘to read’

w / η

Word Initial	[ω⊕]	‘to say’	↔	[η⊕]	‘to grow’
	[ω⊕≡N]	‘child’	↔	[η⊕N]	‘to make’
Word Medial	[⊕#ω⊕≡φ]	‘yes’	↔	[⊕≡η⊕≡φ]	‘plural’
	[Λ⊕#ω⊕#N]	‘fear’	↔	[Λ⊕η⊕N]	‘to shout’
Word Final	[νδ⊕∃ω]	‘millet’	↔	[Nγ⊕ξ]	‘to get water from a well’
	[⊕≡φ⊕#ω]	‘yes’	↔	[⊕#φ⊕≡ξ]	‘squirrel’

w / φ

Word Initial	[ω⊕]	‘to say’	↔	[φ⊕]	‘to tire’
	[ωτΣE]	‘to decorate’	↔	[φτΣE]	‘sting’
Word Medial	[φ⊕≡ω⊕∃]	‘thank you’	↔	[φ⊕∃φ⊕∃]	‘rope’
	[⊕#ω⊕#κ]	‘goat’	↔	[⊕≡φ⊕#κ]	‘there’
Word Final	[μ⊕#ω]	‘what’	↔	[μ⊕≡φ]	‘mother’
	[⊕≡η⊕#ω]	‘where’	↔	[⊕≡η⊕≡φ]	‘plural’

w / ρ

Word Initial	[ω⊕] [ω⊕∃φ]	‘to say’ ‘thing’	↔	[ρ⊕] [ρ⊕φ]	‘to take’ ‘to bring’
Word Medial	[ω⊕∃ω⊕≡φ] [μ↔≡τ⊕≡ω⊕ ≡κ]	‘challenge’ ‘poor’	↔	[ω⊕#ρ⊕≡φ] [δ⊕ρ⊕κ]	‘shame’ ‘to tap’
Word Final	[⊔⊕≡ω] [η⊕ω]	‘question’ ‘to run’	↔	[⊔Eρ] [η⊕ρ]	‘to hide’ ‘to grow’

w / λ

Word Initial	[ω⊕] [ω⊕∃ω⊕≡φ]	‘to say’ ‘challenge’	↔	[λ⊕] [λ⊕ω⊕φ]	‘to dig’ ‘to hang up’
Word Medial	[⊕#ω⊕≡φ] [δζ⊕ω⊕φ]	‘yes’ ‘to fasten’	↔	[⊕#λ⊕≡φ] [δζ⊕λ⊕φ]	‘hand’ ‘to think’
Word Final	[⊔⊕≡ω] [μ⊕#ω]	‘question’ ‘what’	↔	[δζ⊕∃λ] [≡⊕λ]	‘fence’ ‘to hunt’

t / δ

Word Initial	[τ⊕] [τE∃τE∃]	‘to tear’ ‘capable’	↔	[δ⊕] [δE#δE≡]	‘to cook’ ‘Daddy’
Word Medial	[γυ∃τE≡ρ] [κ⊕τ⊕≡]	‘tail’ ‘to try’	↔	[κυ≡δE≡σ] [γ⊕#δ⊕#μ]	‘testicle’ ‘arrow’

t / ⊔

Word Initial	[τ⊕] [τ⊕ρ]	‘to tear’ ‘to throw’	↔	[⊔⊕] [⊔⊕ρ]	‘to soak’ ‘to hide’
Word Medial	[ιτE] [κ↔≡ρτE#κ]	‘also’ ‘one’	↔	[ι#⊔E≡] [ωυ≡ρ⊔E#κ]	‘eye’ ‘ring’
Word Final	[γ↔∃⊔E≡τ] [σ↔#κ⊕#τ]	‘calabash’ ‘hundred’	↔	[τΣ↔∃⊔E∃⊔] [τσ⊕κ⊕⊔]	‘road’ ‘to clean’

t / ʁ

Word Initial	[τ⊕] [τ↔#≡⊕#]	‘to tear’ ‘tree (type)’	↔	[ʁ⊕] [ʁ↔≡⊕]	‘to cut’ ‘to eat’
Word Medial	[φ⊕τ⊕φ] [Nγ⊕∃τ⊕≡φ]	‘to fly’ ‘patience’	↔	[β⊕ʁ⊕φ] [γΩ⊕#ʁ⊕≡φ]	‘to count’ ‘child’
Word Final	[σ↔#κ⊕#τ] [ζ↔∃ρ⊕∃τ]	‘hundred’ ‘a moment’	↔	[δζυ#κΩ⊕≡ ʁ] [δ↔δ⊕ʁ]	‘millet stem’ ‘to pack down earth’

t / Λ

Word Initial	[τ⊕] [τ⊕μ]	‘to tear’ ‘to sew’	↔	[Λ⊕] [Λ⊕μ]	‘to go’ ‘to slink’
Word Medial	[κυ≡τ ≡⊔] [κ⊕τ⊕≡]	‘belly’ ‘to try’	↔	[≡υ≡Λ #μ] [μ⊕Λ⊕≡]	‘cheek’ ‘glory’
Word Final	[σ↔#κ⊕#τ] [ζ↔∃≡⊕≡τ]	‘hundred’ ‘bean leaves’	↔	[γυ∃NγΩ⊕∃Λ] [β↔β⊕Λ]	‘cock’ ‘to prepare a field for sowing’

Contrastive Units - Consonants

t / v

Word Initial	[τ⊕] [τ⊕η⊕ᶯ]	‘to tear’ ‘to sin’	⇔ [v⊕≡] ↔ [v⊕η⊕⊕]	‘topic’ ‘to incubate’
Word Medial	[δ⊕ᶯτ⊕ᶯ] [βι#τE≡N]	‘world’ ‘today’	↔ [ζ⊕≡v⊕≡] ↔ [ωι≡vE#N]	‘clothes’ ‘he’
Word Final	[ζ↔ᶯ≡⊕≡τ] [ζ↔ᶯρ⊕ᶯτ]	‘bean leaves’ ‘moment’	↔ [τ↔#μ⊕#N] ↔ [γ↔ᶯλ⊕≡N]	‘sheep’ ‘threshing floor’

t / vδ

Word Initial	[τ⊕] [τι#ρE≡ζ]	‘to tear’ ‘axe’	⇔ [vδ⊕] ↔ [vδιᶯλE≡σ]	‘to sting’ ‘beans (type)’
Word Medial	[ιτE] [κυ≡τ ≡κ]	‘also’ ‘then’	⇔ [ιᶯvδEᶯ] ↔ [κυᶯvδ ≡κ]	‘inside’ ‘larynx’

t / λ

Word Initial	[τ⊕] [τ⊕⊕⊕⊕]	‘to tear’ ‘to finish’	⇔ [λ⊕] ↔ [λ⊕⊕⊕⊕]	‘to dig’ ‘to trace out’
Word Medial	[ιτE] [γυᶯτ⊕≡]	‘also’ ‘skin’	↔ [ι#λE≡] ↔ [γυᶯλ⊕≡]	‘vegetable (type)’ ‘left (side)’
Word Final	[ζ↔ᶯ≡⊕≡τ] [γ↔ᶯᶯE≡τ]	‘bean leaves’ ‘calabash’	↔ [ζ⊕#μβ⊕#λ] ↔ [μιᶯᶯEᶯλ]	‘threshing stick’ ‘liver’

t / ρ

Word Initial	[τ⊕] [τ↔≡⊕]	‘to tear’ ‘to open’	⇔ [ρ⊕] ↔ [ρ↔#≡⊕#]	‘to take’ ‘ashes’
Word Medial	[κυ≡τ ≡κ] [τ↔τ⊕κ]	‘then’ ‘to learn’	↔ [κυ#ρ ≡κ] ↔ [σ↔≡ρ⊕≡κ]	‘spring’ ‘jealous’
Word Final	[σ↔#κ⊕#τ] [ζ↔ᶯ≡⊕≡τ]	‘hundred’ ‘bean leaves’	↔ [σ↔≡κ⊕≡ρ] ↔ [Ϟ↔#Ϟ⊕#ρ]	‘idol’ ‘roof’

t / τσ

Word Initial	[τ⊕] [τ⊕ρ]	‘to tear’ ‘to throw’	⇔ [τσ⊕] ↔ [τσ⊕ρ]	‘to see’ ‘to cut’
Word Medial	[ϕ↔τE┘] [Nγ⊕ᶯτ⊕≡ϕ]	‘to cut’ ‘patience’	↔ [μ↔#τΣE┘] ↔ [μβ⊕τσ⊕⊕]	‘old’ ‘to extinguish’
Word Final	[ζ↔ᶯᶯρ⊕ᶯτ] [ζ↔ᶯ≡⊕≡τ]	‘moment’ ‘bean leaves’	↔ [γυρ⊕τσ] ↔ [Ϟ⊕⊕⊕τσ]	‘to drink mayo water’ ‘eaves of house’

t / δζ

Word Initial	[τ⊕] [τ⊕μ]	‘to tear’ ‘to sew’	⇔ [δζ⊕] ↔ [δζ #μ]	‘to say’ ‘thirst’
Word Medial	[γυᶯτE≡ρ] [τ↔τ⊕κ]	‘tail’ ‘to learn’	↔ [γυᶯδZEᶯ] ↔ [η↔δζ⊕κ]	‘grass’ ‘to bow down’

t / σ				
Word Initial	[τ⊕]	‘to tear’	↔	[σ⊕] ‘to drink’
	[τ↔≡]	‘with’	↔	[σ↔#] ‘of’
Word Medial	[⊕#τ⊕#]	‘there’	↔	[⊕#σ⊕≡] ‘again’
	[τ#τE≡ω]	‘sparrow hawk’	↔	[τ#σE≡ω] ‘lazy’
Word Final	[π↔πEτ]	‘to cut’	↔	[π↔λEσ] ‘horse’
	[ζ↔≡⊕≡τ]	‘bean leaves’	↔	[ρ↔β⊕σ] ‘to smell’
t / ζ				
Word Initial	[τ⊕ρ]	‘to throw’	↔	[ζ⊕≡ρ] ‘kidney’
	[τ↔≡⊕]	‘to open’	↔	[ζ↔≡⊕] ‘to carry’
Word Medial	[βτ#τE≡N]	‘today’	↔	[ττ≡ζE≡N] ‘snake (type)’
	[ϕ⊕τ⊕ϕ]	‘to fly’	↔	[β⊕ζ⊕ϕ] ‘to feed someone by hand’
Word Final	[ζ↔≡ρ⊕≡τ]	‘moment’	↔	[β⊕#ρ⊕#ζ] ‘veranda’
	[ζ↔≡⊕≡τ]	‘bean leaves’	↔	[μ⊕#≡⊕#ζ] ‘bilharzia’
t / vδζ				
Word Initial	[τ↔κ⊕ρ]	‘to tell’	↔	[vζ↔≡κ⊕≡ρ] ‘chicken’
	[τ⊕η⊕ϱ]	‘to sin’	↔	[vζ⊕η⊕ϕ] ‘to rest’
Word Medial	[δ⊕≡τ⊕≡]	‘world’	↔	[λ⊕≡vζ⊕≡] ‘hail’
	[ϕ⊕τ⊕ϕ]	‘to fly’	↔	[μ⊕≡vζ⊕≡ϕ] ‘bracelet’
t / ϕ				
Word Initial	[τ⊕]	‘to tear’	↔	[ϕ⊕] ‘to be tired’
	[τ⊕μ]	‘to sew’	↔	[ϕ⊕μ] ‘to cry’
Word Medial	[⊕#τ⊕#]	‘there’	↔	[⊕≡ϕ⊕≡] ‘plural’
	[π↔≡π⊕≡τ⊕≡]	‘Wednesday’	↔	[μ↔#μ⊕#ϕ⊕#]
Word Final	[ζ↔≡⊕≡τ]	‘bean leaves’	↔	[ζ↔≡⊕ϕ] ‘to bring’
	[σ↔#κ⊕#τ]	‘hundred’	↔	[ρ↔≡γ⊕≡ϕ] ‘abandoned house’
d / ʌ				
Word Initial	[δ⊕]	‘to cook’	↔	[ʌ⊕] ‘to wet’
	[δτvδE≡]	‘intestines’	↔	[ʌτNγE] ‘to reach (a height)’
Word Medial	[γ⊕#δ⊕#μ]	‘arrow’	↔	[γ⊕#ʌ⊕#ζ] ‘biceps’
	[μτδE≡μ]	‘male in-law’	↔	[ʌτ≡E≡μ] ‘truth’
d / ϱ				
Word Initial	[δ⊕]	‘to cook’	↔	[ϱ⊕] ‘to cut’
	[δ⊕#ϕ]	‘surroundings’	↔	[ϱ⊕≡ϕ] ‘egg’
Word Medial	[γ⊕#δ⊕#μ]	‘arrow’	↔	[δ⊕≡ϱ⊕≡μ]
	[δ↔≡δ ≡μ]	‘wood’	↔	[ρ↔#ϱ #μ]
d / Λ				
Word Initial	[δE≡]	‘grain store’	↔	[ΛE≡] ‘well’
	[δ⊕]	‘to cook’	↔	[Λ⊕] ‘to go’
Word Medial	[στδE]	‘to witness’	↔	[ΛτΛE] ‘to cough’
	[⊕≡δ⊕≡κ]	‘thorn’	↔	[μ⊕Λ⊕≡] ‘glory’

Contrastive Units - Consonants

d / v

Word Initial	[δ⊕]	‘to cook’	↔	[v⊕≡]	‘topic’
	[δ⊕#φ]	‘surroundings’	↔	[v⊕φ]	‘to come’
Word Medial	[⊕∃δ⊕≡κ]	‘thorn’	↔	[⊕∃v⊕∃κ]	‘your’
	[γΩι#δE#N]	‘toilet’	↔	[ωι#vE≡N]	‘he’

d / vδ

Word Initial	[δ⊕]	‘to cook’	↔	[vδ⊕]	‘to sting’
	[δ⊕⊖]	‘to shine’	↔	[vδ⊕⊖]	‘to finish’
Word Medial	[μι∃δE∃μ]	‘male in-law’	↔	[μι#vδE#λ]	‘stupid’
	[γ<->#δE#κ]	‘begun’	↔	[γ<->∃vδE∃κ]	‘fat’

d / λ

Word Initial	[δ⊕]	‘to cook’	↔	[λ⊕]	‘to dig’
	[δι∃vδE∃]	‘umbilical cord’	↔	[λι≡NγE∃]	‘bow (weapon)’
Word Medial	[μυ≡δ ∃]	‘new-born’	↔	[μβυ∃λ ≡]	‘thousand’
	[⊕≡δ⊕∃φ]	‘then’	↔	[⊕#λ⊕≡φ]	‘hand’

d / ρ

Word Initial	[δ⊕]	‘to cook’	↔	[ρ⊕]	‘to take’
	[δ⊕τσ]	‘to hit’	↔	[ρ⊕τσ]	‘to chew’
Word Medial	[⊕#δ⊕#]	‘form of address’	↔	[⊕#ρ⊕#]	‘song’
	[γ<->∃δ⊕∃μ]	‘caiman’	↔	[γ<->ρ⊕⊖]	‘to dance’

d / τσ

Word Initial	[δ⊕]	‘to cook’	↔	[τσ⊕]	‘to see’
	[δE≡ω]	‘dawn’	↔	[τσE#ω]	‘two’
Word Medial	[μι∃δE∃μ]	‘male in-law’	↔	[μι≡τσ∟#≡]	‘foundations’
	[⊕∃δ⊕≡κ]	‘thorn’	↔	[μ⊕∃τσ⊕∃⊖]	‘kite’

d / δζ

Word Initial	[δ⊕]	‘to cook’	↔	[δζ⊕]	‘to say’
	[δ⊕⊖]	‘to shine’	↔	[δζ⊕⊖]	‘to plant’
Word Medial	[κυ≡δE≡σ]	‘testicle’	↔	[γυ∃δζE∃∟]	‘grass’
	[γυ∃δ⊕∃ρ]	‘youngest child’	↔	[γυδζ⊕ρ]	‘hole, ditch’

d / σ

Word Initial	[δE≡]	‘granary’	↔	[σE#]	‘tree’
	[δ⊕]	‘to cook’	↔	[σ⊕]	‘to drink’
Word Medial	[⊕#δ⊕#]	‘form of address’	↔	[⊕#σ⊕≡]	‘again’
	[σιδE]	‘to witness’	↔	[σι#σE≡]	‘shade’

d / ζ

Word Initial	[δE∃κ]	‘big’	↔	[ζE≡κ]	‘body’
	[δ⊕#φ]	‘surroundings’	↔	[ζ⊕≡φ]	‘peace’
Word Medial	[⊕≡δ⊕∃φ]	‘then’	↔	[⊕∃ζ⊕∃φ]	‘excrement’
	[γ<->#δE#κ]	‘begun’	↔	[ζ<->ζEκ]	‘to rest’

d / vδζ					
Word Initial	[δ⊕τσ]	‘to hit’	↔	[vζ⊕]	‘to find’
	[δ↔→≡κE≡ρ]	‘walking stick’	↔	[vζ↔→≡κ⊕≡ρ]	‘chicken’
Word Medial	[γΩι#δE#N]	‘toilet’	↔	[δZ↔→≡vZE≡N]	‘mortar (for pounding)’
	[⊕≡δ⊕≡κ]	‘thorn’	↔	[⊕≡vζ⊕#ρ]	‘grass (type)’
d / φ					
Word Initial	[δ⊕]	‘to cook’	↔	[φ⊕]	‘to be tired’
	[δυ≡Nγ #]	‘neck’	↔	[φυ≡γ #]	‘dust’
Word Medial	[⊕#δ⊕#]	‘form of address’	↔	[⊕≡φ⊕≡]	‘plural’
	[⊕≡δ⊕≡κ]	‘thorn’	↔	[⊕≡φ⊕#κ]	‘to there’
d / Ϻ					
Word Initial	[⊕]	‘to wet’	↔	[Ϻ⊕]	‘to cut’
	[⊕↔→≡κ⊕#]	‘opposite’	↔	[Ϻ↔→κ⊕]	‘knife’
Word Medial	[μβ↔→⊕]	‘to turn over’	↔	[γ↔→≡Ϻ⊕≡]	‘clay pot (type)’
	[κΩ⊕⊕⊕ξ]	‘to boil’	↔	[γΩ⊕#Ϻ⊕≡ φ]	‘child’
Word Final	[vζ⊕]	‘to find’	↔	[τσ⊕Ϻ]	‘to sow’
	[φιτΣE⊕]	‘to cut’	↔	[μι#ρE≡Ϻ]	‘tongue’
d / Λ					
Word Initial	[⊕]	‘to wet’	↔	[Λ⊕]	‘to go’
	[⊕↔→ΛE]	‘to belch’	↔	[Λ↔→ΛE]	‘to cough’
Word Medial	[δ↔→≡⊕E≡]	‘genet’	↔	[δ↔→ΛE]	‘to arrive’
	[⊕⊕⊕ζ]	‘red’	↔	[⊕Λ⊕N]	‘to begin’
Word Final	[μ⊕≡⊕]	‘cold’	↔	[μβ⊕Λ]	‘to damage’
	[vζ⊕]	‘to find’	↔	[vδ⊕Λ]	‘to burst’
d / N					
Word Initial	[⊕]	‘to wet’	↔	[v⊕≡]	‘topic’
	[⊕≡ω]	‘question’	↔	[v⊕≡ω]	‘beans’
Word Medial	[φ↔→≡⊕ #]	‘four’	↔	[βυ≡ν ≡]	‘towel’
	[τ↔→≡⊕E≡]	‘right’	↔	[Ϻ↔→vE]	‘to hear’
Word Final	[γ⊕]	‘to cut’	↔	[γ⊕N]	‘to grind’
	[μ⊕≡⊕]	‘cold’	↔	[μ⊕#N]	‘mother’
d / vδ					
Word Initial	[⊕]	‘to wet’	↔	[vδ⊕]	‘to sting’
	[⊕⊕]	‘to put’	↔	[vδ⊕⊕]	‘to finish’
Word Medial	[ι#E≡]	‘eye’	↔	[ι≡vδE≡]	‘inside’
	[μβ↔→⊕]	‘to turn over’	↔	[μ↔→≡vδ⊕≡]	‘on the ground’
d / λ					
Word Initial	[⊕]	‘to wet’	↔	[λ⊕]	‘to dig’
	[⊕ρ]	‘to hide’	↔	[λ⊕ρ]	‘to throw’
Word Medial	[ι#E≡]	‘eye’	↔	[ι#λE≡]	‘vegetable (type)’
	[δ↔→≡⊕E≡]	‘genet’	↔	[δ↔→#λE#]	‘fiancée’
Word Final	[vζ⊕]	‘to find’	↔	[δζ⊕≡λ]	‘fence’
	[τσ⊕κ⊕]	‘to clean’	↔	[τσ⊕κ⊕λ]	‘to collect’
d / ρ					
Word Initial	[⊕]	‘to wet’	↔	[ρ⊕]	‘to take’
	[⊕↔→≡μ⊕≡]	‘pain’	↔	[ρ↔→≡⊕#]	‘ashes’
Word Medial	[ω⊕E]	‘to search’	↔	[κυ≡ρE≡]	‘before’
	[τ↔→≡⊕E≡]	‘good’	↔	[τ↔→ρE]	‘to quarrel’
Word Final	[γ⊕]	‘to cut’	↔	[γ⊕ρ]	‘to invite’

Contrastive Units - Consonants

	[Ϟ⊕]	‘to hit’	↔	[Ϟ⊕ρ]	‘to give’
ɖ / τσ					
Word Initial	[⊕]	‘to wet’	↔	[τσ⊕]	‘to see’
	[⊕ρ]	‘to hide’	↔	[τσ⊕ρ]	‘to cut’
Word Medial	[τΣ↔⊕E]	‘to dawn’	↔	[τΣ↔τΣE]	‘to ask’
	[ϕ⊕⊕ϕ]	‘to sweep’	↔	[τ⊕τσ⊕ϕ]	‘to shut’
Word Final	[μ⊕≡]	‘cold’	↔	[μ⊕τσ]	‘to die’
	[κ⊕]	‘to break’	↔	[κΩ⊕τσ]	‘a little’
ɖ / δζ					
Word Initial	[⊕]	‘to wet’	↔	[δζ⊕]	‘to say’
	[⊕ϕ]	‘to put’	↔	[δζ⊕ϕ]	‘to pound’
Word Medial	[⊕⊕ζ]	‘red’	↔	[δζ⊕δζ⊕ρ]	‘to be afraid’
	[τ↔≡E]	‘good’	↔	[ρ↔≡δZE]	‘scorpion’
ɖ / σ					
Word Initial	[⊕]	‘to wet’	↔	[σ⊕]	‘to drink’
	[⊕ρ]	‘to hide’	↔	[σ⊕≡ρ]	‘way of throwing’
Word Medial	[⊕≡Eκ]	‘truth’	↔	[νδ⊕σE≡κ]	‘mouse (type)’
	[ω⊕E]	‘to search’	↔	[κν⊕σE≡]	‘fortunately’
Word Final	[γν⊕δZE]	‘grass’	↔	[κν⊕δE≡σ]	‘testicle’
	[νζ⊕λE]	‘narrow’	↔	[νδ⊕λE≡σ]	‘type of beans’
ɖ / ζ					
Word Initial	[⊕ρ]	‘to hide’	↔	[ζ⊕≡ρ]	‘kidney’
	[⊕≡ρ⊕#]	‘five’	↔	[ζ⊕λ⊕ϕ]	‘to exceed’
Word Medial	[μβ↔⊕]	‘to turn over’	↔	[Nγ↔ζ⊕]	‘to drag’
	[ϕ⊕⊕ϕ]	‘to sweep’	↔	[δ⊕ζ⊕ϕ]	‘to descend’
Word Final	[μ⊕≡]	‘cold’	↔	[μβ⊕≡ζ]	‘husband’
	[νζ⊕]	‘to find’	↔	[νδ⊕ζ]	‘to sting’
ɖ / νδζ					
Word Initial	[⊕ρ]	‘to hide’	↔	[νζ⊕]	‘to find’
	[⊕≡Eκ]	‘truthfully’	↔	[νδZ⊕λE≡κ]	‘vegetable (type)’
Word Medial	[⊕≡Eκ]	‘truthfully’	↔	[δZ⊕νδZE#κ]	‘smoke’
	[ϕ⊕⊕ϕ]	‘to sweep’	↔	[μ⊕νζ⊕⊕ϕ]	‘bracelet’

d / φ					
Word Initial	[L⊕]	‘to wet’	↔	[φ⊕]	‘to be tired’
	[L⊕#κ]	‘vagina’	↔	[φ⊕≡κ]	‘grain (type)’
Word Medial	[L≡E≡κ]	‘truthfully’	↔	[ϑL≡φE≡κ]	‘sting’
	[φ⊕L⊕φ]	‘to sweep’	↔	[φ⊕φ⊕ω]	‘to shake’
Word Final	[κ⊕L]	‘to break’	↔	[κ⊕φ]	‘to show’
	[μ⊕≡L]	‘cold’	↔	[μ⊕≡φ]	‘mother’
ʁ / Λ					
Word Initial	[ʁ⊕]	‘to cut’	↔	[Λ⊕]	‘to go’
	[ʁ⊕≡φ]	‘egg’	↔	[Λ⊕≡φ]	‘leather’
Word Medial	[δ⊕≡ʁ⊕≡μ]	‘leaf’	↔	[δ⊕Λ⊕N]	‘to begin’
	[γ↔ʁE]	‘to play’	↔	[δ↔ΛE]	‘to arrive’
Word Final	[τσ⊕ʁ]	‘to sow’	↔	[δ⊕Λ]	‘to build’
	[μL#ρE≡ʁ]	‘tongue’	↔	[ϑ↔≡ρE≡Λ]	‘wrist’
ʁ / v					
Word Initial	[ʁ⊕]	‘to cut’	↔	[v⊕≡]	‘topic’
	[ʁ⊕≡φ]	‘egg’	↔	[v⊕φ]	‘to come’
Word Medial	[β⊕ʁ⊕φ]	‘to count’	↔	[β⊕v⊕φ]	‘to wash’
	[γΩ⊕#ʁ⊕≡φ]	‘child’	↔	[κΩ⊕≡v⊕#φ]	‘you (pl.)’
Word Final	[τσ⊕ʁ]	‘to sow’	↔	[δζ⊕N]	‘to climb’
	[μ⊕#μ⊕#ʁ]	‘middle’	↔	[τ↔#μ⊕#N]	‘sheep’
ʁ / vδ					
Word Initial	[ʁ⊕]	‘to cut’	↔	[vδ⊕]	‘to sting’
	[ʁ⊕≡λ]	‘ordinal’	↔	[vδ⊕Λ]	‘to burst’
Word Medial	[ʁ↔≡ʁEπ]	‘to make rope’	↔	[σ↔≡vδE≡ρ]	‘shin’
	[δ⊕≡ʁ⊕≡μ]	‘leaf’	↔	[μ⊕vδ⊕≡]	‘sticky’
ʁ / λ					
Word Initial	[ʁ⊕]	‘to cut’	↔	[λ⊕]	‘to dig’
	[ʁ⊕ρ]	‘to appear’	↔	[λ⊕ρ]	‘to throw’
Word Medial	[ρ↔#ʁ #μ]	‘stone (type)’	↔	[δ↔≡δ ≡μ]	‘wood’
	[ω⊕ʁ⊕φ]	‘to skin’	↔	[ω⊕λ⊕φ]	‘to choose’
Word Final	[τσ⊕ʁ]	‘to sow’	↔	[δζ⊕≡λ]	‘fence’
	[μL#ρE≡ʁ]	‘tongue’	↔	[μL#vδE#λ]	‘stupid’
ʁ / ρ					
Word Initial	[ʁ⊕]	‘to cut’	↔	[ρ⊕]	‘to take’
	[ʁ↔≡⊕]	‘to eat’	↔	[ρ↔#≡⊕#]	‘ashes’
Word Medial	[ω⊕ʁ⊕φ]	‘to skin’	↔	[ω⊕#ρ⊕≡φ]	‘shame’
	[β⊕ʁ⊕φ]	‘to count’	↔	[μβ⊕≡ρ⊕≡φ]	‘shield’
Word Final	[τσ⊕ʁ]	‘to sow’	↔	[τσ⊕ρ]	‘to cut’
	[μ⊕#μ⊕#ʁ]	‘middle’	↔	[μ⊕#ω⊕≡ρ]	‘Moloko mountain’

Contrastive Units - Consonants

ῥ / τσ

Word Initial	[ῥ⊕]	‘to cut’	⇔	[τσ⊕]	‘to see’
	[ῥ⊕ρ]	‘to appear’	⇔	[τσ⊕ρ]	‘to cut’
Word Medial	[τ⊕ῥ⊕φ]	‘to be happy’	⇔	[τ⊕τσ⊕φ]	‘to shut’
	[β⊕ῥ⊕φ]	‘to count’	↔	[μβ⊕τσ⊕φ]	‘to extinguish’
Word Final	[τσ⊕ῥ]	‘to sow’	↔	[δ⊕τσ]	‘to hit’
	[μ⊕#μ⊕#ῥ]	‘middle’	↔	[Ϟ⊕Ϟ⊕τσ]	‘eaves’

ῥ / δζ

Word Initial	[ῥ⊕]	‘to cut’	⇔	[δζ⊕]	‘to say’
	[ῥ⊕#N]	‘tooth’	⇔	[δζ⊕N]	‘to climb’
Word Medial	[γ↔ῥE]	‘to play’	↔	[ρ↔εδZEε]	‘scorpion’
			↔		

ῥ / σ

Word Initial	[ῥ⊕]	‘to cut’	⇔	[σ⊕]	‘to drink’
	[ῥ⊕#N]	‘tooth’	⇔	[σ⊕N]	‘to understand’
Word Medial	[π⊕ῥ⊕φ]	‘to pour’	⇔	[π⊕σ⊕φ]	‘to iron’
	[γΩ⊕#ῥ⊕≡φ]	‘child’	↔	[κΩ⊕σ⊕φ]	‘to ferment’
Word Final	[κ⊕≡γ⊕εῥ]	‘there’	↔	[κυκΩ⊕σ]	‘to weed’
	[μ⊕#ρEεῥ]	‘tongue’	↔	[μ⊕νEσ]	‘to warn’

ῥ / ζ

Word Initial	[ῥ⊕ρ]	‘to appear’	⇔	[ζ⊕≡ρ]	‘kidney’
	[ῥ⊕≡φ]	‘egg’	⇔	[ζ⊕≡φ]	‘peace’
Word Medial	[β⊕ῥ⊕φ]	‘to count’	⇔	[β⊕ζ⊕φ]	‘to feed someone by hand’
	[τ⊕ῥ⊕φ]	‘to be happy’	↔	[δ⊕ζ⊕φ]	‘to descend’
Word Final	[τσ⊕ῥ]	‘to sow’	↔	[νδ⊕ζ]	‘to sting’
	[μ⊕#μ⊕#ῥ]	‘middle’	↔	[μ⊕#≡⊕#ζ]	‘bilharzia’

ῥ / νδζ

Word Initial	[ῥ⊕#κ]	‘crack in rock’	⇔	[νζ⊕κ]	‘to gather’
	[ῥ↔κ⊕]	‘knife’	⇔	[νζ↔εκ⊕ερ]	‘chicken’
Word Medial	[β⊕ῥ⊕φ]	‘to count’	↔	[μ⊕ενζ⊕εφ]	‘bracelet’
	[δ⊕εῥ⊕≡μ]	‘leaf’	↔	[δζ⊕#νζ⊕#ρ]	‘chaff’

ῥ / φ

Word Initial	[ῥ⊕]	‘to cut’	⇔	[φ⊕]	‘to be tired’
	[ῥ⊕N]	‘to send’	↔	[φ⊕μ]	‘to cry’
Word Medial	[δ⊕εῥ⊕≡μ]	‘leaf’	↔	[η⊕#φ⊕≡μ]	‘grasshopper’
	[ω⊕ῥ⊕φ]	‘to skin’	↔	[ω⊕#φ⊕#ω]	‘who’
Word Final	[τσ⊕ῥ]	‘to sow’	⇔	[τσ⊕φ]	‘to look at’
	[μ⊕#μ⊕#ῥ]	‘middle’	⇔	[μ⊕#μ⊕≡φ]	‘mother’

Λ / ν

Word Initial	[Λ⊕]	‘to go’	↔	[ν⊕≡]	‘topic’
	[Λ⊕∃φ]	‘leather’	↔	[ν⊕φ]	‘to come’
Word Medial	[Λ↔ΛE]	‘to cough’	↔	[ϣ↔νE]	‘to hear’
	[γ↔Λ⊕ω]	‘in ones hands’	↔	[γ↔#ν⊕#ω]	‘animal’
Word Final	[β↔β⊕Λ]	‘to prepare a field for sowing’	↔	[β↔∃β⊕∃N]	‘father’
	[ϣ↔∃ρE∃Λ]	‘wrist’	↔	[δ↔∃ρE≡N]	‘far away’

Λ / νδ

Word Initial	[Λ⊕]	‘to go’	↔	[νδ⊕]	‘to sting’
	[Λ⊕η⊕φ]	‘to complain’	↔	[νδ⊕η⊕φ]	‘to pick’
Word Medial	[κ↔∃ΛE≡κ]	‘everyone’	↔	[γ↔∃νδE∃κ]	‘fat’
	[μ⊕Λ⊕≡]	‘glory’	↔	[μ⊕νδ⊕≡]	‘sticky’

Λ / λ

Word Initial	[Λ⊕]	‘to go’	↔	[λ⊕]	‘to dig’
	[Λ⊕≡]	‘to thresh’	↔	[λ⊕≡]	‘to mix’
Word Medial	[δ↔ΛE]	‘to arrive’	↔	[δ↔#λE#]	‘fiancée’
	[β⊕≡Λ⊕#]	‘upper arm’	↔	[β⊕∃λ⊕∃]	‘conversation’
Word Final	[δ⊕Λ]	‘to build’	↔	[δζ⊕∃λ]	‘fence’
	[μβ⊕Λ]	‘to damage’	↔	[≡⊕λ]	‘to hunt’

Λ / ρ

Word Initial	[ΛE∃]	‘well’	↔	[ρE≡]	‘also’
	[Λ⊕]	‘to go’	↔	[ρ⊕]	‘to take’
Word Medial	[γ↔Λ⊕]	‘to share’	↔	[κ↔ρ⊕]	‘to steal’
	[≡ν≡Λ #μ]	‘cheek’	↔	[μβν#ρ #μ]	‘sky’
Word Final	[μβ⊕Λ]	‘to damage’	↔	[μβ⊕ρ]	‘to heal’
	[δ⊕Λ]	‘to build’	↔	[L_Eρ]	‘to hide’

Λ / τσ

Word Initial	[Λ⊕]	‘to go’	↔	[τσ⊕]	‘to see’
	[Λ⊕≡]	‘to thresh’	↔	[τσ⊕≡]	‘to extend’
Word Medial	[γ↔Λ⊕ω]	‘in ones hands’	↔	[κ↔τσ⊕ω]	‘to catch’
	[μ⊕Λ⊕≡]	‘glory’	↔	[μ⊕∃τσ⊕∃ϣ]	‘secretary bird’
Word Final	[δ⊕Λ]	‘to build’	↔	[δ⊕τσ]	‘to hit’
	[μβ⊕Λ]	‘to damage’	↔	[μβ⊕≡τσ]	‘chest’

Λ / δζ

Word Initial	[Λ⊕]	‘to go’	↔	[δζ⊕]	‘to say’
	[Λ⊕μ]	‘to slink’	↔	[δζ #μ]	‘thirst’
Word Medial	[δ↔ΛE]	‘to arrive’	↔	[δZ↔∃δZE≡]	‘in-law’
	[L↔Λ⊕φ]	‘to build’	↔	[δζ↔δζ⊕φ]	‘to stroll’

Contrastive Units - Consonants

Λ / σ

Word Initial	[ΛEΞ]	‘well’	↔	[σE#]	‘tree’
	[Λ⊕]	‘to go’	↔	[σ⊕]	‘to drink’
Word Medial	[β⊕≡Λ⊕#]	‘upper arm’	↔	[μ⊕#σ⊕#]	‘price’
	[μ⊕Λ⊕≡]	‘glory’	↔	[μβ⊕σ⊕φ]	‘to laugh’
Word Final	[ω↔→ΞρEΞΛ]	‘wrist’	↔	[π↔→λEσ]	‘horse’
	[β↔→β⊕Λ]	‘to prepare a field for planting’	↔	[ρ↔→β⊕σ]	‘to smell’

Λ / ζ

Word Initial	[ΛEΞκ]	‘big’	↔	[ζEΞκ]	‘body’
	[Λ⊕Ξφ]	‘leather’	↔	[ζ⊕Ξφ]	‘peace’
Word Medial	[γ↔→Λ⊕]	‘to share’	↔	[Nγ↔→ζ⊕]	‘to drag’
	[≡υ≡Λ #μ]	‘cheek’	↔	[μβυ#ζ #μ]	‘Peul’
Word Final	[μβ⊕Λ]	‘to damage’	↔	[μβ⊕Ξζ]	‘husband’
	[νδ⊕Λ]	‘to burst’	↔	[νδ⊕ζ]	‘to sting’

Λ / νδζ

Word Initial	[Λ⊕≡]	‘to thresh’	↔	[νζ⊕]	‘to find’
	[Λ⊕μβ⊕λ]	‘to throw’	↔	[νζ⊕Ξω⊕ΞN]	‘guinea-fowl’
Word Medial	[ρ⊕Λ⊕]	‘to chase’	↔	[λ⊕Ξνζ⊕Ξ]	‘hail’
	[μ⊕Λ⊕≡]	‘glory’	↔	[μ⊕≡νζ⊕Ξω]	‘food paste’

Λ / φ

Word Initial	[Λ⊕]	‘to go’	↔	[φ⊕]	‘to be tired’
	[Λ⊕μ]	‘to slink’	↔	[φ⊕μ]	‘to cry’
Word Medial	[ρ⊕Λ⊕]	‘to chase’	↔	[λ⊕φ⊕]	‘fetish’
	[δ⊕Λ⊕N]	‘to begin’	↔	[ϝ⊕φ⊕N]	‘to whimper’
Word Final	[δ⊕Λ]	‘to build’	↔	[δ⊕#φ]	‘surroundings’
	[μβ⊕Λ]	‘to damage’	↔	[μβ⊕Ξφ]	‘manioc’

n / νδ

Word Initial	[ν⊕≡]	‘topic’	↔	[νδ⊕]	‘to sting’
	[ν⊕≡ω]	‘beans’	↔	[νδ⊕Ξω]	‘millet’
Word Medial	[τι#νEΞN]	‘they’	↔	[δτι≡νδE#ζ]	‘bee’
	[δ↔→Ξν⊕≡]	‘girl’	↔	[μ↔→Ξνδ⊕Ξ]	‘on the ground’

n / λ

Word Initial	[ν⊕≡]	‘topic’	↔	[λ⊕]	‘to dig’
	[ν⊕η⊕φ]	‘to incubate’	↔	[λ⊕γ⊕φ]	‘to accompany’
Word Medial	[βυΞν ≡]	‘towel’	↔	[μβυΞλ ≡]	‘bag’
	[ζ⊕≡ν⊕≡]	‘clothes’	↔	[ζ⊕λ⊕φ]	‘to exceed’
Word Final	[δζ⊕N]	‘to climb’	↔	[δζ⊕Ξλ]	‘fence’
	[ϝ⊕ΞN]	‘tooth’	↔	[ϝ⊕#λ]	‘ordinal’

n / ρ				
Word Initial	[v⊕≡]	'topic'	↔	[ρ⊕] 'to take'
	[v⊕φ]	'to come'	↔	[ρ⊕φ] 'to bring'
Word Medial	[⊕#v⊕#]	'of'	↔	[⊕#ρ⊕#] 'song'
	[γ↔#v⊕#ω]	'animal'	↔	[γ↔ρ⊕ω] 'to dance'
Word Final	[β⊕N]	'to catch'	↔	[β⊕ρ] 'to walk'
	[γ⊕N]	'to grind'	↔	[γ⊕ρ] 'to invite'
n / τσ				
Word Initial	[v⊕≡]	'topic'	↔	[τσ⊕] 'to see'
	[v⊕η⊕φ]	'to incubate'	↔	[τσ⊕#κ⊕≡φ]
Word Medial	[ωι#vE≡N]	'he'	↔	[ωιτΣE] 'to decorate'
	[γ↔#v⊕#ω]	'animal'	↔	[κ↔τσ⊕ω] 'to catch'
Word Final	[δζ⊕N]	'to climb'	↔	[δ⊕τσ] 'to hit'
	[β↔→β⊕≡N]	'father'	↔	[ω⊕ω⊕τσ] 'eaves'
n / δζ				
Word Initial	[v⊕≡]	'topic'	↔	[δζ⊕] 'to say'
	[vυ#κ ≡]	'we'	↔	[δZυ≡γ #] 'hat'
Word Medial	[ϣ↔→vE]	'to hear'	↔	[ρ↔→δδZE≡] 'scorpion'
	[δζ↔→v⊕φ]	'to climb out'	↔	[δζ↔→δζ⊕φ] 'to stroll'
n / σ				
Word Initial	[v⊕≡]	'topic'	↔	[σ⊕] 'to drink'
	[vυ#κ ≡]	'we'	↔	[συ≡κ ≡] 'evening'
Word Medial	[⊕#v⊕#]	'of'	↔	[⊕#σ⊕≡] 'again'
	[κΩ⊕≡v⊕#φ]	'you (pl.)'	↔	[κΩ⊕σ⊕φ] 'to ferment'
Word Final	[κ ≡N]	'viper'	↔	[γ ≡σ] 'thigh'
	[ωυ≡λE≡N]	'middle'	↔	[vδι≡λE≡σ] 'beans (type)'
n / ζ				
Word Initial	[v⊕φ]	'to come'	↔	[ζ⊕≡φ] 'peace'
	[vυ#κ ≡]	'we'	↔	[ζυ#Nγ #] 'donkey'
Word Medial	[τι#vE≡N]	'they'	↔	[τι≡ζE≡N] 'snake (type)'
	[η↔→v⊕≡]	'this'	↔	[Nγ↔→ζ⊕] 'to drag'
Word Final	[vE≡N]	'I'	↔	[μE≡ζ] 'blood'
	[β⊕N]	'to catch'	↔	[μβ⊕≡ζ] 'husband'
n / vδζ				
Word Initial	[v⊕η⊕φ]	'to incubate'	↔	[vζ⊕η⊕φ] 'to rest'
	[v⊕≡ω]	'beans'	↔	[vζ⊕κ] 'to gather'
Word Medial	[ζ⊕≡v⊕≡]	'clothes'	↔	[λ⊕≡vζ⊕≡] 'hail'
	[τι#vE≡N]	'they'	↔	[ζι≡vζE≡N] 'owl'

Contrastive Units - Consonants

n / φ

Word Initial	[v⊕≡]	'topic'	↔	[φ⊕]	'to be tired'
	[vυ#κ ≡]	'we'	↔	[φυ≡γ #]	'dust'
Word Medial	[⊕#v⊕#]	'of'	↔	[⊕≡φ⊕]	'plural'
	[τι#vE≡N]	'they'	↔	[τι⊕φE≡]	'food (type)'
Word Final	[μ⊕#N]	'place'	↔	[μ⊕#φ]	'hunger'
	[ω⊕≡N]	'child'	↔	[ω⊕≡φ]	'thing'

n / vγ

Word Initial	[v⊕≡]	'topic'	↔	[Nγ⊕#]	'head'
	[v⊕η⊕φ]	'to incubate'	↔	[Nγ⊕η⊕φ]	'to get water from well'
Word Medial	[⊕#v⊕#]	'of'	↔	[⊕≡Nγ⊕#]	'because'
	[μ⊕≡v⊕#φ]	'we'	↔	[μ⊕Nγ⊕ω]	'half full'

n / vγΩ

Word Initial			↔		
			↔		
Word Medial	[γυv⊕κ]	'to mix'	↔	[γυ≡NγΩ⊕≡Λ]	'cock'
	[μ⊕≡v⊕≡ω⊕≡]	'medium sized'	↔	[β⊕#NγΩ⊕#ρ⊕ #]	'machete'

nd / λ

Word Initial	[vδ⊕]	'to sting'	↔	[λ⊕]	'to dig'
	[vδ⊕κ⊕φ]	'to build'	↔	[λ⊕γ⊕φ]	'to accompany'
Word Medial	[ι≡vδE≡]	'inside'	↔	[ι#λE≡]	'vegetables'
	[δι≡vδE#ζ]	'bee'	↔	[vδι≡λEσ≡]	'beans (type)'

nd / ρ

Word Initial	[vδ⊕]	'to sting'	↔	[ρ⊕]	'to take'
	[vδ⊕Λ]	'to burst'	↔	[ρ⊕Λ]	'to chase'
Word Medial	[δι≡vδE#ζ]	'bee'	↔	[τι#ρE≡ζ]	'axe'
	[μι#vδE#λ]	'stupid'	↔	[μι#ρE≡ξ]	'tongue'

nd / τσ

Word Initial	[vδ⊕]	'to sting'	↔	[τσ⊕]	'to see'
	[vδ⊕Λ]	'to burst'	↔	[τσ⊕ξ]	'to sow'
Word Medial	[μι#vδE#λ]	'stupid'	↔	[μι≡τΣ.ι#≡]	'foundations'
	[μι↔≡vδ⊕≡κ]	'ground'	↔	[μι↔#τσ⊕≡ξ]	'porcupine'

nd / δζ

Word Initial	[vδ⊕]	'to sting'	↔	[δζ⊕]	'to say'
	[vδ⊕≡ρ⊕≡ω]	'intelligent'	↔	[δζ⊕#ρ⊕≡φ]	'cricket'
Word Medial	[μι↔≡vδ⊕≡κ]	'ground'	↔	[ηι↔δζ⊕κ]	'to bow down'
	[δι≡vδE≡]	'intestines'	↔	[βι≡δZE≡]	'grandfather'

nd / σ

Word Initial	[vδ⊕]	'to sting'	↔	[σ⊕]	'to drink'
	[vδ⊕≡ρ⊕≡ω]	'intelligent'	↔	[σ⊕#ρ⊕≡φ]	'leg'
Word Medial	[μι↔≡vδ⊕≡κ]	'ground'	↔	[μβι↔σ⊕κ]	'to leave'
	[μι↔#σι#vδE#]	'death'	↔	[δι≡σι≡σE≡]	'remedy'

nd / ζ

Word Initial	[vδ⊕ω]	'to finish'	↔	[ζ⊕ω]	'to plant'
	[vδυκΩE]	'to peck'	↔	[ζυκΩE]	'to point'
Word Medial	[γι↔≡vδE≡κ]	'fat'	↔	[ζι↔ζEκ]	'to rest'
	[δι≡vδE#ζ]	'bee'	↔	[τι≡ζE≡N]	'snake (type)'

nd / vδζ					
Word Initial	[vδ⊕η⊕φ]	‘to pick’	↔	[vζ⊕η⊕φ]	‘to rest’
	[vδiελE≅σ]	‘beans (type)’	↔	[vZiελE≅κ]	‘vegetable (type)’
Word Medial	[δiεvδEε]	‘intestines’	↔	[δZivδZE]	‘to quarrel’
	[μ↔εvδ⊕ελ⊕≅]	‘comrade’	↔	[μ↔εvζ⊕ερ⊕#]	‘termite mound’
nd / φ					
Word Initial	[vδ⊕]	‘to sting’	↔	[φ⊕]	‘to be tired’
	[vδ⊕εω]	‘millet’	↔	[φ⊕μ]	‘to cry’
Word Medial	[δiεvδEε]	‘intestines’	↔	[τιεφE≅]	‘food (type)’
	[μi#vδE#λ]	‘stupid’	↔	[ζiεφE≅λ]	‘lion’
nd / vγ					
Word Initial	[vδ⊕]	‘to sting’	↔	[Nγ⊕#]	‘head’
	[vδ⊕εω]	‘millet’	↔	[Nγ⊕μ]	‘to accept’
Word Medial	[δiεvδEε]	‘intestines’	↔	[ιNγE]	‘to reach (a height)’
	[μ⊕vδ⊕≅]	‘sticky’	↔	[μ⊕Nγ⊕ω]	‘half full’
nd / NγΩ					
Word Initial			↔		
			↔		
Word Medial	[μ⊕vδ⊕≅]	‘sticky’	↔	[δ⊕NγΩ⊕ζ]	‘to sleep’
			↔		
l / ρ					
Word Initial	[λ⊕]	‘to dig’	↔	[ρ⊕]	‘to take’
	[λ⊕ξ]	‘to be first’	↔	[ρ⊕ζ]	‘to satisfy’
Word Medial	[κ↔ελ⊕≅]	‘dog’	↔	[κ↔ρ⊕]	‘to steal’
	[δ⊕ελ⊕ε]	‘money’	↔	[δ⊕#ρ⊕≅]	‘East’
Word Final	[δζ⊕ελ]	‘fence’	↔	[τσ⊕ρ]	‘to cut’
	[≅⊕λ]	‘to hunt’	↔	[β⊕ρ]	‘to walk’
l / τσ					
Word Initial	[λ⊕]	‘to dig’	↔	[τσ⊕]	‘to see’
	[λ⊕ρ]	‘to throw’	↔	[τσ⊕ρ]	‘to cut’
Word Medial	[σιελ⊕εκ]	‘stirring stick’	↔	[τΣiετΣ⊕εκ]	‘musical instrument’
			↔		
Word Final	[δ⊕λ⊕φ]	‘young woman’	↔	[τ⊕τσ⊕φ]	‘to shut’
	[δζ⊕ελ]	‘fence’	↔	[δ⊕τσ]	‘to hit’
	[τ↔εμβ⊕ελ]	‘drum (type)’	↔	[Ϟ⊕Ϟ⊕τσ]	‘eaves’

Contrastive Units - Consonants

l / δζ

Word Initial	[λ⊕]	‘to dig’	↔	[δζ⊕]	‘to say’
	[λ⊕ω⊕φ]	‘to wash’	↔	[δζ⊕ω⊕φ]	‘to bind’
Word Medial	[≡ι#λE#]	‘slave’	↔	[βιΞδZEΞ]	‘grandfather’
	[γ⊕#λ⊕#κ]	‘hangar’	↔	[η↔δζ⊕κ]	‘to bow down’

l / σ

Word Initial	[λ⊕]	‘to dig’	↔	[σ⊕]	‘to drink’
	[λ↔#κ⊕#μ]	‘horn’	↔	[σ↔#κ⊕#τ]	‘hundred’
Word Medial	[β↔≡λEΞ]	‘weak’	↔	[β↔ΞσEΞ]	‘near’
	[vZιΞλEΞκ]	‘vegetable (type)’	↔	[vδιΞσEΞκ]	‘mouse (type)’
Word Final	[μι#vδE#λ]	‘stupid’	↔	[μιΞvEΞσ]	‘warn’
	[ζ⊕#μβ⊕#λ]	‘threshing stick’	↔	[ρ↔β⊕σ]	‘to smell’

l / ζ

Word Initial	[λ⊕ρ]	‘to throw’	↔	[ζ⊕Ξρ]	‘kidney’
	[λυΞNγ #]	‘leopard’	↔	[ζυ#Nγ #]	‘donkey’
Word Medial	[⊕#λ⊕Ξφ]	‘hand’	↔	[⊕Ξζ⊕Ξφ]	‘excrement’
	[δ⊕λ⊕φ]	‘young woman’	↔	[δ⊕ζ⊕φ]	‘to descend’
Word Final	[μι#vδE#λ]	‘stupid’	↔	[διΞvδE#ζ]	‘bee’
	[μιΞvδυΞωEΞλ]	‘only child’	↔	[μ↔ΞτυΞωEΞ ζ]	‘sorrel’

l / vδζ

Word Initial	[λ↔#κ⊕#μ]	‘horn’	↔	[vζ↔Ξκ⊕Ξρ]	‘chicken’
	[λ⊕ω⊕φ]	‘to wash’	↔	[vζ⊕η⊕φ]	‘to rest’
Word Medial	[λ⊕Ξλ⊕#]	‘bed’	↔	[λ⊕Ξvζ⊕Ξ]	‘hail’
	[ζι#λE#N]	‘pipe’	↔	[ζιΞvζEΞN]	‘owl’

l / φ

Word Initial	[λ⊕]	‘to dig’	↔	[φ⊕]	‘to tire’
	[λ⊕φ⊕]	‘fetish’	↔	[φ⊕Ξφ⊕Ξ]	‘rope’
Word Medial	[λ⊕Ξλ⊕#]	‘bed’	↔	[λ⊕φ⊕]	‘fetish’
	[μ⊕#λ⊕#μ]	‘window’	↔	[η⊕#φ⊕Ξμ]	‘grasshopper’
Word Final	[δζ⊕Ξλ]	‘fence’	↔	[ζ⊕Ξφ]	‘peace’
	[τ↔Ξμβ⊕Ξλ]	‘drum (type)’	↔	[τ⊕⊕⊕φ]	‘to finish’

l / /

Word Initial	[λ⊕Ξ]	‘to mix’	↔	[/⊕Ξμ]	‘mouth’
			↔		
Word Medial	[⊕#λ⊕Ξφ]	‘arm’	↔	[⊕Ξ/⊕Ξφ]	‘no’
	[κ⊕Ξλ⊕Ξμ]	‘antelope’	↔	[η⊕#/⊕Ξμ]	‘yawn’

r / τσ

Word Initial	[ρ⊕]	‘to take’	↔	[τσ⊕]	‘to see’
	[ρ↔#Ξ⊕#]	‘ashes’	↔	[τσ↔ΞΞ⊕Ξ]	‘sadness’
Word Medial	[μ↔Ξρ⊕#κ]	‘brother’	↔	[μ↔#τσ⊕Ξζ]	‘porcupine’
	[μβ⊕Ξρ⊕Ξφ]	‘shield’	↔	[μβ⊕τσ⊕φ]	‘to extinguish’
Word Final	[μβ⊕ρ]	‘to heal’	↔	[μβ⊕Ξτσ]	‘chest’
	[μ⊕#ω⊕Ξρ]	‘Moloko mountain’	↔	[⊕⊕⊕⊕ρ]	‘eaves’

r / δζ

Word Initial	[ρ⊕] [ρ<→∃δZE∃]	‘to take’ ‘scorpion’	↔	[δζ⊕] [δZ<→∃δZE ≡]	‘to say’ ‘in-law’
Word Medial	[γρ⊕τσ] [τ<→ρE]	‘to drink mayo water’ ‘to quarrel’	↔	[γρ#δζ⊕#ρ] [ρ<→∃δZE∃]	‘hole, ditch’ ‘scorpion’

r / σ

Word Initial	[ρE≡] [ρ⊕]	‘also’ ‘to take’	↔	[σE#] [σ⊕]	‘tree’ ‘to drink’
Word Medial	[⊕#ρ⊕#] [κν≡ρE∃]	‘song’ ‘before’	↔	[⊕#σ⊕≡] [κν∃σE≡]	‘again’ ‘fortunately’
Word Final	[γν∃τE≡ρ] [γνγΩ⊕ρ]	‘tail’ ‘to weed the second time’	↔	[κν≡δE≡σ] [κνκΩ⊕σ]	‘testicle’ ‘to weed the first time’

r / ζ

Word Initial	[ρ<→#≡⊕#] [ρ<→∃γ⊕∃φ]	‘ashes’ ‘abandoned house’	↔	[ζ<→≡⊕] [ζ<→∃γ⊕∃ φ]	‘to take’ ‘small genet’
Word Medial	[σ⊕#ρ⊕≡φ] [κ<→ρ⊕]	‘leg’ ‘to steal’	↔	[δ⊕ζ⊕φ] [Nγ<→ζ⊕]	‘to descend’ ‘to drag’
Word Final	[μE≡ρ] [μβ⊕ρ]	‘work’ ‘to heal’	↔	[μE≡ζ] [μβ⊕∃ζ]	‘blood’ ‘husband’

r / νδζ

Word Initial	[ρ<→∃γ⊕∃φ]	‘abandoned house’	↔	[νζ<→∃κ⊕∃ρ]	‘chicken’
Word Medial	[ρ⊕ξ] [⊕≡ρ⊕#] [μβ⊕≡ρ⊕≡φ]	‘to fill’ ‘five’ ‘shield’	↔	[νζ⊕κ] [λ⊕∃νζ⊕∃] [μ⊕∃νζ⊕∃φ]	‘to gather’ ‘hail’ ‘bracelet’

r / φ

Word Initial	[ρ⊕] [ρ⊕Λ⊕]	‘to bring’ ‘to chase’	↔	[φ⊕] [φ⊕∃φ⊕∃]	‘to be tired’ ‘rope’
Word Medial	[⊕#ρ⊕#] [⊕ρ⊕ξ]	‘song’ ‘wealth’	↔	[⊕≡φ⊕∃] [⊕#φ⊕≡ξ]	‘plural’ ‘squirrel’
Word Final	[β⊕ρ] [Ϟ⊕ρ]	‘to walk’ ‘to give’	↔	[β⊕#φ] [Ϟ⊕∃φ]	‘negative’ ‘sting’

r / /

Word Initial	[ρ⊕ξ]	‘to fill’	↔	[/⊕∃μ] ↔	‘mouth’
Word Medial	[μ⊕#ρ⊕≡μ] [⊕≡ρ⊕∃ω]	‘sorcerer’ ‘name for a twin’	↔	[η⊕#/⊕≡μ] [⊕#/⊕≡μ]	‘yawn’ ‘water’

ts / δζ

Word Initial	[τσ⊕] [τσ⊕π⊕φ]	‘to see’ ‘to plaster’	↔	[δζ⊕] [δζ⊕π⊕φ]	‘to say’ ‘to mix’
Word Medial	[ωτΣE] [τΣ<→τΣE]	‘to decorate’ ‘to ask’	↔	[βτ∃δZE≡] [δζ<→∃δZE≡]	‘grandfather’ ‘in-law’

ts / σ

Word Initial	[τσ⊕] [τΣ ≡φ]	‘to see’ ‘finished’	↔	[σ⊕] [σ ≡φ]	‘to drink’ ‘hot water’
Word Medial	[μ<→#τσ⊕≡η]	‘porcupine’	↔	[μβ<→σ⊕κ]	‘to leave’

Contrastive Units - Consonants

Word Final	[μβ⊕τσ⊕φ]	‘to extinguish’	↔	[μβ⊕σ⊕φ]	‘to laugh’
	[↵↔⊕⊕⊕τσ]	‘illness’	↔	[ρ↔⊕β⊕σ]	‘to smell’
	[ι#πE≡τΣ]	‘noon’	↔	[ι#νE#σ]	‘fault’
ts / ζ					
Word Initial	[τσ ≡φ]	‘finished’	↔	[ζ ⊕φ]	‘pubic hair’
	[τσ⊕ρ]	‘to cut’	↔	[ζ⊕≡ρ]	‘kidney’
Word Medial	[τ⊕τσ⊕φ]	‘to shut’	↔	[δ⊕ζ⊕φ]	‘to descend’
	[κΩE≡τΣEΞλEΞ]	‘show-off’	↔	[δEΞζEΞλEΞ]	‘Friday’
Word Final	[μβ⊕≡τσ]	‘chest’	↔	[μβ⊕Ξζ]	‘husband’
	[⊕⊕⊕τσ]	‘eaves’	↔	[μ⊕#≡⊕#ζ]	‘bilharzia’
ts / νδζ					
Word Initial	[τσ⊕ϱ]	‘to sow’	↔	[νζ⊕⊔]	‘to find’
	[τΣιτΣE⊔]	‘to pare’	↔	[νζιΞλEΞ⊔]	‘narrow’
Word Medial	[τΣιτΣE⊔]	‘to pare’	↔	[δζ↔⊕νζEΞN]	‘mortar’
	[μ⊕Ξτσ⊕Ξ⊕]	‘secretary bird’	↔	[μ⊕≡νζ⊕Ξ⊕]	‘food paste’
ts / φ					
Word Initial	[τσ⊕]	‘to see’	↔	[φ⊕]	‘to be tired’
	[τσ⊕≡]	‘to extend’	↔	[φ⊕μ]	‘to cry’
Word Medial	[μ⊕Ξτσ⊕Ξ⊕]	‘secretary bird’	↔	[⊕⊕#φ⊕#⊕]	‘who’
	[φιτΣE⊔]	‘to cut’	↔	[⊕ι≡φE≡κ]	‘sting’
Word Final	[π⊕#τσ]	‘sun’	↔	[π⊕≡φ]	‘milk’
	[μβ⊕≡τσ]	‘chest’	↔	[μβ⊕Ξφ]	‘manioc’
dz / σ					
Word Initial	[δζ⊕]	‘to say’	↔	[σ⊕]	‘to drink’
	[δζ⊕N]	‘to climb’	↔	[σ⊕N]	‘to know’
Word Medial	[βιΞδZEΞ]	‘grandfather’	↔	[βιΞσEΞ]	‘soon’
	[δZυδZ ≡]	‘to soak’	↔	[συ#σ ≡≡]	‘middle of millet stem’
dz / ζ					
Word Initial	[δζ⊕φ]	‘to pound’	↔	[ζ⊕⊕]	‘to plant’
	[δζ⊕#μ⊕≡]	‘rock’	↔	[ζ⊕≡ν⊕≡]	‘clothes’
Word Medial	[βιΞδZEΞ]	‘grandfather’	↔	[λιζE]	‘to lose’
	[δZυδZ ≡]	‘to soak’	↔	[μβυ#ζ #μ]	‘Peul’
dz / νδζ					
Word Initial	[δζ⊕Ξλ]	‘fence’	↔	[νζ⊕⊔]	‘to find’
	[δζ⊕Ξη⊕≡μ]	‘rib’	↔	[νζ⊕η⊕φ]	‘to rest’
Word Medial	[δζ↔⊕δζ⊕φ]	‘to stroll’	↔	[νζ↔⊕νζ⊕≡N]	‘solid’
	[βιΞδZEΞ]	‘grandfather’	↔	[δζινζE]	‘to quarrel’

dz / φ					
Word Initial	[δζ⊕]	‘to say’	↔	[φ⊕]	‘to be tired’
	[δζ⊕#μ]	‘thirst’	↔	[φ⊕μ]	‘to cry’
Word Medial	[βι⊕δζE≡]	‘grandfather’	↔	[τι⊕φE≡]	‘food’
	[δζι≡δζ⊕≡φ]	‘light’	↔	[μιφ⊕κ]	‘antelope’
s / ζ					
Word Initial	[σ ≡φ]	‘hot water’	↔	[ζ ⊕φ]	‘pubic hair’
	[σ⊕≡ρ]	‘way of throwing’	↔	[ζ⊕≡ρ]	‘kidney’
Word Medial	[υ#σ #σ]	‘hedgehog’	↔	[υ⊕ζ ⊕ζ]	‘marrow’
	[δι≡σι≡σE≡]	‘medicine’	↔	[τι#ζι#ρE≡]	‘name for a twin’
Word Final	[π↔→λEσ]	‘horse’	↔	[τι#ρE≡ζ]	‘axe’
	[ρ↔→β⊕σ]	‘to smell’	↔	[μ⊕#≡⊕#ζ]	‘bilharzia’
s / vδζ					
Word Initial	[σ↔→≡κ⊕≡ρ]	‘idol’	↔	[νζ↔→⊕κ⊕⊕ρ]	‘chicken’
	[σι⊕λ⊕⊕κ]	‘stirring stick’	↔	[νΖι⊕λE≡κ]	‘vegetable (type)’
Word Medial	[μ⊕⊕σ⊕≡φ]	‘name of twin’	↔	[μ⊕⊕νζ⊕⊕φ]	‘bracelet’
	[σ↔→⊕σ⊕≡λ⊕ #]	‘ladder’	↔	[μ↔→⊕νζ⊕≡ρ⊕#]	‘termite mound’
s / φ					
Word Initial	[σ⊕]	‘to drink’	↔	[φ⊕]	‘to be tired’
	[συ⊕κ ⊕]	‘evening’	↔	[φυ≡γ #]	‘dust’
Word Medial	[⊕#σ⊕≡]	‘again’	↔	[⊕≡φ⊕⊕]	‘plural’
	[σι#σE≡]	‘shade’	↔	[τι⊕φE≡]	‘food’
Word Final	[ρ↔→β⊕σ]	‘to smell’	↔	[β↔→⊕β⊕⊕φ]	‘father’
	[κυκΩ⊕σ]	‘to weed’	↔	[⊕κ⊕φ]	‘to explain’
z / vδζ					
Word Initial	[ζ⊕≡ρ]	‘kidney’	↔	[νζ⊕]	‘to find’
	[ζ↔→⊕γ⊕⊕φ]	‘small genet’	↔	[νζ↔→⊕κ⊕⊕ρ]	‘chicken’
Word Medial	[τι≡ζE≡N]	‘snake’	↔	[δΖ↔→⊕νδZE≡N]	‘mortar’
	[δ⊕ζ⊕φ]	‘to descend’	↔	[μ⊕⊕νζ⊕⊕φ]	‘bracelet’
z / φ					
Word Initial	[ζ⊕⊕]	‘to plant’	↔	[φ⊕μ]	‘to cry’
	[ζυ#Nγ #]	‘donkey’	↔	[φυ≡γ #]	‘hat’
Word Medial	[λιζE]	‘to lose’	↔	[τι⊕φE≡]	‘food’
	[μι≡ζ⊕⊕]	‘again’	↔	[μι≡φ⊕⊕]	‘together’
Word Final	[μβ⊕⊕ζ]	‘husband’	↔	[μβ⊕⊕φ]	‘manioc’
	[⊕#η⊕#ζ]	‘mole cricket’	↔	[⊕≡η⊕≡φ]	‘plural’
ndz / vγ					
Word Initial	[νζ⊕κ]	‘to gather’	↔	[Nγ⊕ξ]	‘to get water from well’
	[νζ⊕η⊕φ]	‘to rest’	↔	[Nγ⊕⊕η⊕≡κ]	‘crow’
Word Medial	[δΖινδZE]	‘to quarrel’	↔	[δΖιNγE]	‘to read’
	[μ⊕≡νζ⊕⊕ω]	‘food paste’	↔	[μ⊕Nγ⊕ω]	‘half full’

Contrastive Units - Consonants

ndz / vɣΩ

Word Initial			↔		
Word Medial	[δζ⊕#vζ⊕#ρ]	‘chaff’	↔	[δ⊕NγΩ⊕ζ]	‘to sleep’

j / /

Word Initial	[φ⊕μ]	‘to cry’	↔	[/⊕Ξμ]	‘mouth’
Word Medial	[⊕Ξφ⊕#ω]	‘yes’	↔	[⊕#/⊕Ξμ]	‘water’
	[η⊕#φ⊕Ξμ]	‘grasshopper’	↔	[η⊕Ξ/⊕Ξμ]	‘yawn’

k / γ

Word Initial	[κ⊕]	‘to show’	↔	[γ⊕]	‘to do’
	[κEΞμ]	‘sorry’	↔	[γE#μ]	‘hut for eldest son’
Word Medial	[⊕Ξκ⊕Ξ]	‘but’	↔	[⊕Ξγ⊕#]	‘at the home of’
	[⊕κ⊕φ]	‘to explain’	↔	[⊕γ⊕φ]	‘to gather’

k / /

Word Initial	[κ⊕⊔]	‘to break’	↔	[/⊕Ξμ]	‘mouth’
Word Medial	[τσ⊕κ⊕φ]	‘to lift up’	↔	[η⊕Ξ/⊕Ξμ]	‘yawn’

k / η

Word Initial	[κ⊕]	‘to show’	↔	[η⊕]	‘to grow’
	[κ↔Ξμ⊕Ξφ]	‘goat dung flavouring’	↔	[η↔Ξμ⊕Ξφ]	‘beard’
Word Medial	[υ#κ #]	‘fire’	↔	[υΞη Ξ]	‘outside’
	[συκ μ]	‘to buy’	↔	[ρυ#η #μ]	‘dirt’
Word Final	[ϱ⊕#κ]	‘crack in rock’	↔	[ρ⊕ξ]	‘to gather’
	[⊕Ξφ⊕#κ]	‘there’	↔	[⊕#φ⊕Ξξ]	‘squirrel’

k / vɣ

Word Initial	[κ⊕]	‘to show’	↔	[Nγ⊕#]	‘head’
	[κ↔Ξμ⊕Ξφ]	‘goat dung flavouring’	↔	[Nγ⊕μ⊕φ]	‘to call’
Word Medial	[⊕Ξκ⊕Ξ]	‘but’	↔	[⊕ΞNγ⊕#]	‘because’
	[vυ#κ Ξ]	‘we’	↔	[δυΞNγ #]	‘neck’

k / κΩ

Word Initial	[κ⊕]	‘to show’	↔	[κΩ⊕]	‘multiple’
	[κ↔Ξμ⊕Ξφ]	‘goat dung flavouring’	↔	[κΩ⊕Ξv⊕#φ]	‘you (pl.)’
Word Medial	[κ↔Ξρκ⊕Ξ⊔⊕#ω]	‘monkey (type)’	↔	[κυρκΩ⊕ζ⊕φ]	‘grasshopper’
	[vδ↔→#ρκE#ϱ]	‘cement’	↔	[κυ#ρκΩE#ρ]	‘meanwhile’

k / γΩ					
Word Initial	[κi#φ⊕#]	‘moon’	↔	[γΩiεφ⊕≡]	‘hockey’
	[κ⊕ελ⊕εμ]	‘antelope’	↔	[γΩ⊕#ᶯ⊕≡φ]	‘child’
Word Medial	[κ↔τiκEρ]	‘lizard’	↔	[μ↔ελiεγΩEελ]	‘flu’
	[⊕≡κ⊕#κ⊕≡]	‘out of play (hockey)’	↔	[⊕εγΩ⊕⊕εδ⊕ε]	‘cup’
k / ηΩ					
Word Initial	[κi#φ⊕#]	‘month’	↔	[ηΩiεφ⊕≡]	‘always’
			↔		
Word Medial	[τ↔εκ↔ετΣE≡]	‘louse’	↔	[τυεηΩEεηΩE≡]	‘aardvark’
			↔		
k / υγΩ					
Word Initial			↔		
			↔		
Word Medial	[σ↔#κ⊕#τ]	‘hundred’	↔	[δ⊕NγΩ⊕ζ]	‘to sleep’
	[μ↔#κ⊕#⊕⊕≡φ]	‘urine’	↔	[μυ#NγΩ⊕#λ⊕#φ]	‘liar’
			↔		
g / η					
Word Initial	[γ⊕]	‘to do’	↔	[η⊕]	‘to grow’
	[γ⊕ρ]	‘to invite’	↔	[η⊕ρ]	‘to grow’
Word Medial	[⊕#γ⊕≡φ]	‘home’	↔	[⊕εη⊕≡φ]	‘plural’
	[δZυεγ εμ]	‘shoulder’	↔	[ρυ#η #μ]	‘dirt’
g / υγ					
Word Initial	[γ⊕]	‘to do’	↔	[Nγ⊕#]	‘head’
	[γ↔Λ⊕]	‘to share’	↔	[Nγ↔ζ⊕]	‘to drag’
Word Medial	[⊕εγ⊕#]	‘at the house of’	↔	[⊕εNγ⊕#]	‘because’
	[δZυεγ #]	‘hat’	↔	[δυεNγ #]	‘neck’
g / /					
Word Initial	[γ⊕N]	‘to grind’	↔	[/⊕εμ]	‘mouth’
			↔		
Word Medial	[⊕#γ⊕≡φ]	‘home’	↔	[⊕ε/⊕εφ]	‘no’
	[κ⊕εγ⊕εᶯ]	‘then’	↔	[η⊕ε/⊕εμ]	‘yawn’
g / κΩ					
Word Initial	[γ⊕]	‘to do’	↔	[κΩ⊕≡]	‘multiple’
	[γ⊕#⊕#ζ]	‘biceps’	↔	[κΩ⊕_⊕ξ]	‘to boil’
Word Medial	[β↔εργ⊕εᶯ⊕≡φ]	‘feather’	↔	[κυρκΩ⊕ζ⊕φ]	‘grasshopper’
			↔		
g / γΩ					
Word Initial	[γiεφ⊕ε]	‘buffalo’	↔	[γΩiεφ⊕≡]	‘hockey’
	[γ⊕#λ⊕≡κ]	‘hangar’	↔	[γΩ⊕#ᶯ⊕≡φ]	‘child’
			↔		
Word Medial	[λiεγEερ]	‘bean’	↔	[μi#γΩE#ξ]	‘snake’
			↔		

Contrastive Units - Consonants

g / ηΩ

Word Initial	[γϵφϵ]	'buffalo'	↔	[ηΩϵφϵ]	'always'
			↔		
Word Medial	[μϵγϵγϵ]	'boundary'	↔	[τϵηΩϵηΩϵ]	'aardvark'
			↔		

g / vγΩ

Word Initial	γϵδϵγϵδϵ	'a lot'	↔	NγΩϵϵϵϵϵ	'crying'
			↔		
Word Medial	[κϵγϵϵ]	'then'	↔	[γϵNγΩϵϵ]	'cock'
	[ϵγϵ]	'to gather'	↔	[δϵNγΩϵζ]	'to sleep'

h / vγ

Word Initial	[ηϵ]	'to grow'	↔	[Nγϵ#]	'head'
	[ηϵμϵ]	'beard'	↔	[Nγϵμϵ]	'to call'
Word Medial	[ϵηϵ]	'to complain'	↔	[ϵNγϵ]	'to meet'
	[μϵηϵ]	'wine'	↔	[μϵNγϵ]	'half full'

h / /

Word Initial	[ηϵ]	'to run'	↔	[ϵμ]	'mouth'
			↔		
Word Medial	[ϵηϵ]	'plural'	↔	[ϵϵϵ]	'no'
	[ϵηϵ]	'where'	↔	[ϵ#/ϵμ]	'water'

h / κΩ

Word Initial	[ηϵ]	'to grow'	↔	[κΩϵ]	'multiple'
	[ηϵλϵ]	'to economise'	↔	[κΩϵvϵ#ϵ]	'you (pl.)'
Word Medial	[μϵ#ηϵ#ηϵ#ϵ]	'placenta'	↔	[μϵκΩϵκΩϵ]	'mosquito'
	[vδϵ]	'to pluck'	↔	[κΩϵκΩϵ]	'earlier'

h / γΩ

Word Initial	[ηϵvϵ#N]	'another'	↔	[γΩϵδϵ#N]	'toilet'
	[ηϵλϵ]	'to economise'	↔	[γΩϵ#ϵ#ϵ]	'child'
Word Medial	[μϵ#ηϵ#ηϵ#ϵ]	'placenta'	↔	[μϵγΩϵγΩϵϵ]	'present'
			↔		

h / ηΩ

Word Initial	[ηϵvϵ]	'this'	↔	[ηΩϵφϵ]	'always'
			↔		
Word Medial	[μϵvϵηϵϵϵ]	'skull'	↔	[τϵηΩϵηΩϵϵ]	'aardvark'
			↔		

h / vγΩ

Word Initial	[ηϵτϵκϵN]	'overcast'	↔	[NγΩϵϵϵϵϵ#]	'crying'
			↔		
Word Medial	[Nγϵηϵκ]	'crow'	↔	[γϵNγΩϵϵ]	'cock'
	[μϵ#ηϵ#ηϵ#ϵ]	'placenta'	↔	[μϵ#NγΩϵ#λϵ#ϵ]	'liar'

ng / /					
Word Initial	[Nγ⊕μ]	‘to accept’	↔	[/⊕Ξμ]	‘mouth’
			↔		
Word Medial	[⊕#Nγ⊕#Ξ]	‘okra’	↔	[⊕#/⊕Ξμ]	‘water’
	[μ⊕Nγ⊕ω]	‘half full’	↔	[η⊕Ξ/⊕Ξμ]	‘yawn’
ng / κΩ					
Word Initial	[Nγ⊕#]	‘head’	↔	[κΩ⊕Ξ]	‘multiple’
	[Nγ⊕Ξτ⊕Ξφ]	‘patience’	↔	[κΩ⊕Ξν⊕# φ]	‘you (pl.)’
Word Medial	[δνΞNγ #]	‘neck’	↔	[δνΞκΩEΞ]	‘to kneel’
	[γν#Nγ #ζ]	‘flute (type)’	↔	[κνκΩ⊕σ]	‘to weed’
ng / γΩ					
Word Initial	[Nγ⊕Ξτ⊕Ξφ]	‘patience’	↔	[γΩ⊕#Ξ⊕Ξφ]	‘child’
	[Nγ↔ζ⊕]	‘to drag’	↔	[γΩιΞφ⊕Ξ]	‘hockey’
Word Medial	[Λ⊕ΞNγ⊕Ξρ]	‘small box’	↔	[δζνγΩ⊕ρ]	‘to keep’
	[σ↔ΞNγ↔Ξλ EΞ]	‘pot’	↔	[ΛνΞγΩEΞμEΞ]	‘camel’
ng / ηΩ					
Word Initial	[Nγ↔ζ⊕]	‘to drag’	↔	[ηΩιΞφ⊕Ξ]	‘always’
			↔		
Word Medial	[σ↔ΞNγ↔Ξλ EΞ]	‘pot’	↔	[τνΞηΩEΞηΩE Ξ]	‘aardvark’
			↔		
ng / νγΩ					
Word Initial			↔		
			↔		
Word Medial	[γν#Nγ #ζ]	‘flute’	↔	[γνΞNγΩ⊕ΞΛ]	‘cock’
	[μ↔ΞNγ⊕Ξζ⊕Ξ ω]	‘giraffe’	↔	[μν#NγΩ⊕#λ⊕# φ]	‘liar’
// κΩ					
Word Initial	[/⊕Ξμ]	‘mouth’	↔	[κΩ⊕τσ]	‘a little’
			↔		
Word Medial	[⊕#/⊕Ξμ]	‘water’	↔	[ιΞκΩEΞN]	‘you (pl., IO)’
	[η⊕Ξ/⊕Ξμ]	‘yawn’	↔	[κνκΩ⊕σ]	‘to weed’
// γΩ					
Word Initial	[/⊕Ξμ]	‘mouth’	↔	[γΩ⊕#Ξ⊕Ξφ]	‘child’
			↔		
Word Medial	[η⊕Ξ/⊕Ξμ]	‘yawn’	↔	[γνγΩ⊕ρ]	‘to prune’
	[γ↔Ξσ⊕#Ξ⊕Ξ μ]	‘pot’	↔	[μ↔ΞιΞγΩEΞ]]	‘flu’
// ηΩ					
Word Initial	[/⊕Ξμ]	‘mouth’	↔	[ηΩιΞφ⊕Ξ]	‘always’
			↔		
Word Medial	[μ⊕Ξμ⊕Ξ/⊕Ξμ]	‘first’	↔	[τνΞηΩEΞηΩE Ξ]	‘aardvark’
			↔		

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// vγΩ

Word Initial			↔		
			↔		
Word Medial	[η⊕≡/⊕Ξμ]	‘yawn’	↔	[γ⊕ΞNγΩ⊕ΞΛ]	‘cock’
	[μ⊕≡μ⊕≡Ξ⊕Ξμ]	‘first’	↔	[μ⊕#NγΩ⊕#λ⊕#φ]	‘liar’

κΩ / γΩ

Word Initial	[κΩ⊕σ⊕φ]	‘to ferment’	↔	[γΩ⊕#ϱ⊕≡φ]	‘child’
			↔		
Word Medial	[κ⊕#κΩ⊕≡ρ]	‘chicken hut’	↔	[γ⊕γΩ⊕ρ]	‘to prune’
	[μ⊕#κΩ⊕#κΩ⊕#_]	‘mosquito’	↔	[μ⊕ΞγΩ⊕≡γΩ⊕Ξ φ]	‘present’

κΩ / ηΩ

Word Initial	[κΩ⊕≡κΩ⊕≡]	‘earlier’	↔	[ηΩ⊕≡φ⊕≡]	‘always’
			↔		
Word Medial	[δE≡κΩE#λE#]	‘short’	↔	[τ⊕ΞηΩE≡ηΩE ≡]	‘aardvark’
			↔		

κΩ / vγΩ

Word Initial	[δE≡κΩE#λE#]	‘short’	↔	[NγΩEΞ EΞ EΞ EΞ E #]	‘crying’
			↔		
Word Medial	[κ⊕κΩ⊕σ]	‘to weed’	↔	[γ⊕ΞNγΩ⊕ΞΛ]	‘cock’
	[μ⊕#κΩ⊕≡ζ⊕#]	‘first time’	↔	[β⊕#NγΩ⊕#ρ⊕#]	‘machete’

γΩ / ηΩ

Word Initial	[γΩ⊕Ξφ⊕≡]	‘hockey’	↔	[ηΩ⊕≡φ⊕≡]	‘always’
			↔		
Word Medial	[Λ⊕ΞγΩEΞμE Ξ]	‘camel’	↔	[τ⊕ΞηΩE≡ηΩE ≡]	‘aardvark’
			↔		

γΩ / vγΩ

Word Initial	[γΩE#δZE#γΩE# ρ]	‘chicken hut’	↔	[NγΩEΞ EΞ EΞ EΞ E#]	‘crying’
			↔		
Word Medial	[γ⊕γΩ⊕ρ]	‘to prune’	↔	[γ⊕ΞNγΩ⊕ΞΛ]	‘cock’
	[δζ⊕#γΩ⊕#ρE#]	‘pot (type)’	↔	[β⊕#NγΩ⊕#ρ⊕#]	‘machete’

ηΩ / vγΩ

Word Initial			↔		
			↔		
Word Medial	[τ⊕ΞηΩE≡ηΩE E≡]	‘aardvark’	↔	[β⊕#NγΩ⊕#ρ⊕#]	‘machete’
			↔		

3.2 Prosodies

In Mbuko there are two word-level prosodies, palatalisation and labialisation. These affect the vowels and, in the case of the labialisation prosody, the velar consonants of a word. Each mono-morphemic word either carries one of these prosodies or no prosody. The two prosodies cannot co-occur.

The effect of prosodies on the vowels and consonants of a word is discussed in the appropriate sections.

Prosodies are written at the end of the morphemes to which they apply. A raised upper case “W” is used to indicate the labialisation prosody. A raised lower case “w” is used to indicate labialisation of a consonant.

3.2.1 Evidence of Contrast

Zero prosody / Palatalisation

[δ⊕]	/da/	“to cook”	~	[δE]	/da ^Y /	“grain store”
[σ⊕]	/sa/	“to drink”	~	[σE]	/sa ^Y /	“tree”
[β⊕ρ]	/bar/	“to walk”	«	[μEρ]	/mar ^Y /	“work”
[δ↔v⊕]	/dəna/	“girl”	«	[ʒ↔vE]	/sləna ^Y /	“to hear”
[γ↔Λ⊕]	/gəzla/	“pot”	«	[γ↔ʒE]	/gəsla ^Y /	“to play (music)”

Palatalisation / Labialisation

[δE]	\da ^Y \	“grain store”	«	[ɫ]	\dɑ ^W \	“person”
[ɫɫEμ]	\dɑdɑm ^Y \	“truth”	«	[δυδ μ]	\dadɑm ^W \	“wood”
[γ↔ʒE]	\gəsla ^Y \	“to play (music)”	«	[κυρ]	\kəra ^W \	“ten”

Zero Prosody / Labialisation

[δ⊕]	\da \	“to cook”	«	[ɫ]	\dɑ ^W \	“person”
[Ϟ⊕κ]	\vak \	“to grill”	«	[φ κΩ]	\fak ^W \	“all”
[κ↔ρ⊕]	\kəra \	“to steal”	~	[κυρ]	\kəra ^W \	“ten”
[τ↔τ⊕κ]	\tətak \	“to learn”	~	[τ↔τ κΩ]	\tətak ^W \	“to clap”

has the Moloko cognate [ησω⊕ρ]. All other vowel-initial words begin with a variant of the underlying vowel /a/.

Morphophonemics.

The behaviour of the /a/ vowel can be seen in prepositions, perfective verb prefixes and subordinating verb prefixes. When these clitics are placed before a monosyllabic word the vowel is underlying /a/. However, if the following word has two or more syllables the vowel behaves as underlying /ə/. This is because the vowel of the clitic becomes part of the following word, and since it is no longer in the last two syllables of the word, it collapses to underlying /ə/.

/ta/ 'with'
 Second last syllable:
 /ta/ + /mbaz/ → [τ⊕μβ⊕ζ] 'with the husband'
 Third last syllable:
 /ta/ + /gadam/ → [τ↔γ⊕δ⊕μ] 'with the arrow'

/na/ '1Sperf'
 Second last syllable:
 /na/ + /sa/ → [v⊕σ⊕] 'I drank'
 Third last syllable:
 /na/ + /gəba/ → [v↔γ↔≡⊕] 'I took'

However when the underlying /a/ vowel is the first phoneme of the word, it does not collapse to /ə/:

/a/ 'of'
 /a/ + /mbaz/ → [⊕μβ⊕ζ] 'of the husband'
 /a/ + /gadam/ → [⊕γ⊕δ⊕μ] 'of the arrow'
 not * [↔γ⊕δ⊕μ]

/a/ '3Sperf'
 /a/ + /sa/ → [⊕σ⊕] 'he drank'
 /a/ + /gəba/ → [⊕γ↔≡⊕] 'he took'
 not * [↔γ↔≡⊕]

In addition, if underlying /a/ occurs in the last syllable of the word it becomes underlying /A/. This can be seen from the final vowels in words ending with an open syllable. In this position the variants /i/ and /u/ of underlying /a/ are not found.

[≡ιλEτ⊕] /bɪle tɑ/ "that slave"
 not * [≡ιλιτ⊕]

3.3.3 The Position of the Word in the Phrase

When a word comes before a pause in the phrase, the vowel in the final syllable becomes underlying /A/. This is true for both open and closed syllables.

/gəɸ/ 'cut'
 /na/ + /gəɸ/ + /ak/ → [v↔γ↔↘⊕κ] 'I have cut' (mid-phrase)
 /na/ + /gəɸ/ → [v⊕γ⊕] 'I cut' (pre-pausal)

3.3.4 Vowel Harmony - the Word-level Prosody

In almost all of the data collected there is a clear pattern of vowel harmony. Whilst the vowel [↔] may occur in any position, the other vowels in a mono-morphemic word must either all be front, all be central or all be back. In other words, front vowels cannot occur in the same monomorphemic word as central or back vowels, central vowels cannot co-occur with front or back vowels, and back vowels cannot co-occur with front or central vowels. Morphemes containing only front vowels are said to carry the palatalisation prosody, morphemes containing only back vowels are said to carry the labialisation prosody and morphemes containing only central vowels are said to carry no prosody.

Effect of prosodies

	Palatalised	No prosody	Labialised
/ə/	ə ~ I	ə	ə ~ Y
/a/	i	a	u
/A/	e	a	o

The forms of /a/ under palatalisation and labialisation are [ɪ] and [ʊ] respectively. The forms of /A/ are [E] and [ɔ]. /ə/ is only slightly modified by prosodies, moving in the direction of [I] or [Y]. The effects on /a/ can be seen from the following verb data:

Let us consider the verbs /kɑd/ “to break” and /gɑd/ “to cut”.

Since the vowels are neutralised to [κ⊕] and [γ⊕] before a phrase pause, and are also neutralised to [κ↔] and [γ↔] mid-phrase since they occur in closed syllables, we must first establish the phonemic form of the verb root by placing the vowel in a mid-phrase open syllable. This can be done by adding the suffix /-ak/ (“perfect tense”). Hence:

$v_1\# \kappa\oplus\#$ “I break” $v\leftrightarrow\# \kappa\oplus\# \oplus \kappa$ “I have broken”
 $v_1\# \gamma\oplus\#$ “I cut” $v\leftrightarrow\# \gamma\leftrightarrow\# \oplus \kappa$ “I have cut”

We can now examine the effect of the palatalisation prosody on the two vowel phonemes by adding the 2nd person plural suffix /-an^Y/ to the root. The palatalisation prosody of the suffix spreads onto the verb root (see below):

$\kappa_1\# \kappa\oplus\#$ “You (s) break” $\kappa_1\# \kappa_1\# E \cong N$ “You (pl.) break”
 $\kappa_1\# \gamma\oplus\#$ “You (s) cut” $\kappa_1\# \gamma\leftrightarrow\# E \cong N$ “You (pl.) cut”

Thus we can see that mid-phrase /a/ is realised as [ɪ] under palatalisation, whilst /ə/ is normally unaffected¹, and /A/ is realised as [E].

¹Schwa may take the palatalised form [I], or may also be reduced to Ø in fast speech.

Further data:

Phonemic /ə/

1Simpf	1Sperfect	2Pimpf	gloss
vι# β⊕#N	v↔# β↔≡v⊕≡κ	κι# β↔≡vE≡N	'catch'
vι# δ⊕#τσ	v↔# δ↔≡τσ⊕≡κ	κι# δ↔≡τσE≡N	'hit'
vι# π⊕#κ	v↔# π↔≡κ⊕≡κ	κι# π↔≡κE≡N	'pour'
vι# τ⊕#μ	v↔# τ↔≡μ⊕≡κ	κι# τ↔≡μE≡N	'sew'
vι# ʌ⊕#φ	v↔# ʌ↔≡φ⊕≡κ	κι# ʌ↔≡φE≡N	'put'

Phonemic /a/

1Simpf	1Sperfect	2Pimpf	gloss
vι# η⊕#N	v↔# η⊕#v⊕≡κ	κι# ηι#vE≡N	'make'
vι# τσ⊕#ʁ	v↔# τσ⊕#ʁ⊕≡κ	κι# τσι#ʁE≡N	'sow'
vι# ʋ⊕#κ	v↔# ʋ⊕#κ⊕≡κ	κι# ʋι#κE≡N	'grill'
vι# η⊕#ω	v↔# η⊕#ω⊕≡κ	κι# ηι#ωE≡N	'run'
vι# ʋ⊕#ρ	v↔# ʋ⊕#ρ⊕≡κ	κι# ʋι#ρE≡N	'give'

Under labialisation, mid-phrase /a/ is realised as [v], whilst /ə/ is unaffected, and /A/ is realised as [ɔ]. This can be seen from the following phonetic data:

ʌ⊕#κ⊕≡φ	'show!'	+ - ≡ 'me'	=	ʌv#κΩ ≡	'show me!'
π↔→λ⊕φ	'look for!'	+ - ≡ 'me'	=	π↔→λ	'look for (something) for me!'
⊕#π⊕≡	'on'	+ - ≡ 'me'	=	v#π ≡	'on me'
⊕#v⊕#	'of'	+ - ≡ 'me'	=	v#v ≡	'my'

Further evidence can be found in the behaviour of prefix clitics (see section 3.3.2). The vowel in these clitics is underlying /a/. When the following word is monosyllabic and carries a prosody, the prosody spreads onto the vowel of the clitic. Thus we can see the effect of the two vowel prosodies on underlying /a/ mid-phrase.

/ta/	"with"
/ta/ + [μβ⊕⊕ζ]	→ [τ⊕⊕μβ⊕⊕ζ] 'with the husband'
/ta/ + [δE≡μ]	→ [τι≡δE≡μ] 'with the sickle'
/ta/ + [δ #ξ]	→ [τv≡δ #ξ] 'with the house'

3.3.5 Strong and Weak Underlying /a/ Vowel

We have seen that the underlying /a/ vowel collapses to underlying /ə/ when it is more than two syllables from the end of a monomorphemic word. We have also seen that with words carrying a vowel prosody, the pre-pausal forms must end with a low vowel. Thus, for isolation forms of words (where the word is followed by a pause) there are a limited number of vowel patterns. For example, for a three syllable word beginning with a consonant, there are only six possible patterns at the segmental level:

vowels	word	gloss
↔↔↔⊕	π↔→#κ↔→#ρ⊕≡	'rock'
↔⊕⊕	β↔→⊕ργ⊕≡ʁ⊕≡φ	'wing'
↔↔→E	δZ↔→⊕γ↔→⊕λE≡N	'animal hut'
↔↔ιE	δ↔→⊕ρλι≡NγE#	'hyena'
↔↔↔	μ↔→#τ↔→#τ #κ	'cramp'
↔↔v	β↔→⊕βv⊕ζ ⊕μ	'root'

Thus we can see that there is a weakening of the underlying vowel /a/ with its distance from the end of a word. This is not the case with the other languages related closely to Mbuko (Merey, Mofu-nord, Mofusud, Gemzek, Moloko). In these other languages underlying /a/ does not collapse to /ə/ away from the end of the word, and vowel prosodies produce low rather than high surface forms.

There is a small but significant number of words in Mbuko which follow the pattern of these other neighbouring languages, rather than the rules of Mbuko cited above. These are characterised by the appearance of the surface vowels [E] or [ɔ] in mid-phrase syllables or underlying /a/ other than in the

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last two syllables. In the data, no words include both high and low vowels in non word-final position. In other words, words either follow the rules of Mbuko or the rules of the neighbouring languages. There is no mixing of rules. There are no verbs in Mbuko which follow the pattern of the neighbouring languages. We can presume that the words that don't follow the Mbuko pattern have been borrowed from the neighbouring languages². E.g. [δ⊕ω⊕φ⊕N] 'stream' comes from Mofu-nord, but is used in the closing formula of Mbuko folk tales, and so may well have been borrowed quite some time ago.

To describe these borrowed words in the phonology we shall divide the underlying /a/ vowel into two types, weak and strong. The weak /a/ is the standard Mbuko underlying /a/, which collapses to /ə/ and does not maintain its openness with distance from the end of the word. The strong /A/ is the underlying /a/ of neighbouring languages, which maintains its height with distance from the end of the word and does not collapse to /ə/.

Sample Mbuko data:

Phonetic	Underlying form	Gloss
δEδ↔δEμ	dAdədAm ^Y	"green"
δEκωEλE ³	dAkwaIA ^Y	"small"
└Eγ↔ριφEκ	dAgərəjAk ^Y	"smallness"
γωEδZ↔γωEρ	gWAdzəgwAr ^Y	"basket"
ηEρE≡	hArAδ ^Y	"heat"
ηEρτΣ↔τΣE	hArtsetsA ^Y	"ostrich"
ηEρE	hArA ^Y	"white"
ηEτEκEν	hAtAkAn ^Y	"overcast"
κ↔└EφE	kədAjA ^Y	"small bird (type)"
κωEτΣEλE	kwAtsAla ^Y	"show-off"
λEπ↔ρE	lApərA ^Y	"needle"
μEδZEπE	madzApA ^Y	"meat stew"
μEτEλEγωE	mAtAlAgwA ^Y	"hockey stick"
μ↔νδιφEφE	məndəjAjA ^Y	"moth"
τEμE	tAmA ^Y	"onion"
τEμσEω	tAmsAw ^Y	"snake (type)"
τEμβEω	tAmbAw ^Y	"toad (type)"
τ↔ργE└Eκ	tərgAdAk ^Y	"tickles"
ζEζE└Eκ	zAzAdAk ^Y	"tree swinging game"
ζEτEνE	zAtAnA ^Y	"salt"
ΛυγωEμE	ΛəgwAmA ^Y	"camel"

²It is not uncommon for Mbuko men to marry women from neighbouring groups. The wives come to their husbands' compounds and learn Mbuko. In many cases, therefore, children are brought up speaking Mbuko by mothers whose native tongue is not Mbuko. The adoption of words from neighbouring languages is therefore quite understandable.

³One informant was of the opinion that this word was not Mbuko but Meray. Another disagreed.

β ν γ ζ	bAngAz ^w	“papaya”
τσ ↔ τσ φ	tsətsAdAf ^w	“to bend down”
τσ τσ κ	tsAtsAdAk ^w	“game”
δ ν δ λ τ λ	dAndAltAl ^w	“calf (of leg)”
γΩ ρ	gArA ^w	“weaver bird”
λ λυηΩλ λ ηΩ	lAləhlAləh ^w	“luke warm”
μ τ τ φ	mAtAtAf ^w	“moisture”
τ ρ ρ	tArArA ^w	“leaf sledge for sliding down rocks”

Palatalised verbs sometimes contain [E] in a mid-phrasal syllable, even though they do not contain the strong /A/ phoneme. This [E] is in variation with [↔], and in contrast with [u] that comes from underlying /a/:

/fəted ^y /		
[vɪ# φ↔→τE≡] “I cut”	[κɪ# φ↔→#τE≡ E≡N]/[κɪ# φ↔→#τ↔→≡ E≡N]	“you (pl.) cut”
/bəbat ^y /		
[vɪ# β↔→βE≡τ] “I peel”	[κɪ# β↔→#βɪ#τE≡N]	“you (pl.) peel”

3.3.6 Conditioning of Vowels by Consonants

After the effects of position and prosody have been applied, the resulting vowel may still be conditioned by an adjacent consonant phoneme. The relevant consonants are /w/, /j/ and the labio-velar phonemes.

In the data, therefore, some words do not exhibit vowel harmony in their surface forms. In these words the non-harmonising vowel is always found adjacent to one of the consonants cited above.

The effect of this kind of conditioning on /ə/ can be shown from the changes that occur when a closed syllable is placed in mid-phrase or before a pause. Before a pause, the vowel will take the properties of underlying /a/, but mid-phrase the vowel in the syllable is reduced to /ə/. For example:

/zaj/ + /daw/ → [zɪ≡φ|⊕≡ω] ‘is there peace? (greeting)’

Here the underlying /a/ vowel in /zaj/ will collapse to /ə/ under rules already stated, since it lies in a closed syllable in mid-phrase. The above data shows the conditioning of /ə/ to [ɪ] adjacent to /j/.

Reduplicated words made up from a reduplicated closed syllable also show the effect of consonant conditioning. In their isolation form the first vowel will be underlying /ə/ and the second underlying /a/. The following also shows the conditioning of /ə/ to [ɪ] adjacent to /j/:

/dzajdzaj/ [δZɪ≡φδZ⊕≡φ] ‘light’

Labialised velars

There are four labialised velar consonants in Mbuko, /k^w/, /g^w/, /h^w/ and /ŋg^w/. (A raised lower-case “w” denotes labialisation of a consonant. A raised upper-case “W” denotes the word-level labialisation prosody.) These affect the surface forms of certain vowels as follows (Kw denotes any labialised velar):

a) /ə/ → [v] / _Kw

/dəkwa^y/ [δvkwə] “to kneel”

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b) /ə/ → [ʊ] / Kw_

/kwəsay/	[kʊ#σ⊕#φ]	‘harmattan’
/gwətar ^Y /	[γʊɜτE≡ρ]	‘tail’
/k ^w ark ^w ar ^Y /	[kʊρκΩEρ]	‘meanwhile’

c) /a/ → [] ~ [⊕] / Kw_

/makwakwad/ [μ⊕#κΩ⊕#κΩ⊕#_] ~ [μ⊕#κΩ #κΩ #_] ‘mosquito’

d) /e/ → [ɹ] / _Kw#

/sabakw ^Y /	[σɹβɹɹκΩ]	‘hair’
/azakw ^Y /	[ɹɹκΩ]	‘sorry’

Labialisation of velar consonants also results from a phrase-level prosody, distinct from the vowel labialisation prosody. There is one particle - the 2P indirect object agreement marker - which causes all velar consonants in the verb phrase to its left to become labialised. It does not labialize the vowels, as the vowel labialisation prosody does. Only vowels adjacent to a labialised velar consonant are affected as described by the rules just stated. This consonant labialisation prosody thus behaves quite differently from the word level labialisation prosody, which affects both velar consonants and vowels, and whose effect on vowels is different from the effect of a labialised velar on an adjacent vowel.

Phonetic	Segmental phonemic	Gloss
[ɹ γɹɹ_⊕Nυμ]	/i gəɖʌn umo/	“he breaks for us”
[ɹ γʊ_⊕κΩɹκΩEN]	/i g ^w əɖak ^w ik ^w ən/	“he breaks for you (pl.)”

If all labialised velar consonants were the result of this phrase-level prosody, or the word-level vowel-labialisation prosody, we would expect to find that words containing velars either have all of them labialised, or all of them unlabialised. However, in the data there are very few unreduplicated words containing two velars, and amongst these is one word in which one velar is labialised and the other is not. This argues in favour of the existence of labialised velar phonemes, alongside labialised velars resulting from one of the two labialising prosodies.

[τΣυκυλEk] /tsəkʷələk/ “elbow” (not *[τΣυκυλɹκΩ])

Thus there are three kinds of phonetic labialised velars: those which are phonemic labialised velars; those which are the result of the vowel labialisation prosody acting on an unlabialised velar phoneme; and those which are the result of the consonant labialisation prosody acting on unlabialised velar phonemes.

/w/ and /j/

The consonant phonemes /w/ and /j/ also affect the vowels /ə/ and /a/:

a) /ə/ → [ʊ] / _w

/fəwar/	[φʊω⊕ρ]	‘antelope’
/səwla ^Y /	[σʊωλɛ]	‘to fry’
/dəwdəw ^Y /	[δʊ≡ωδɛ≡ω]	‘morning’

b) /ə/ → [ʊ] / w_

/wədamay/	[wʊ#δ⊕#μ⊕≡φ]	‘wife’s brother-in-law’
/wərdak ^Y /	[wʊ≡ρδE#κ]	‘ring’

c) /ə/ → [ɪ] / ɹ_

/dzəjdzəj/ [δZɪ≡φδZ⊕≡φ] 'brown'

Since many words in Mbuko end with /...aj/ and the /a/ becomes /ə/ in a mid-phrasal closed syllable, this vowel change is extremely common. It is responsible for the change between [⊕φ] and [ɪφ]-[ɪ] that occurs many times in almost every sentence and is a noticeable feature of the language, as in the common exchange shown below:

/zaj daw/ [ζɪ≡⊕≡ω] 'Is there peace? (greeting)'
 /zaj/ [ζ⊕≡φ] 'Peace (response)'

d) /ə/ → [ɪ] / j_

/bajak aan/ [β⊕≡φɪ≡κ⊕#⊕≡N] "a lot"

e) /a/ → [] ~ [⊕] / w_#

/manawa/ [μ⊕≡v⊕≡ω] ~ [μ⊕≡v⊕≡ω⊕] 'half-full'

The vowel /a/ is not affected by /j/ or before /w/.

3.3.7 Compound Words

Vowel harmony only applies to single morphemes, i.e. prosodies are carried by morphemes, not entire words. Thus it is normal for compound words not to exhibit vowel harmony.

/mbalay-gadaza^w/ [μβ⊕λɪφγδυζ] "lizard (with a red head)"

3.3.8 Front Rounded Vowels

There are a number of words in Mbuko that contain the surface vowels [ɹ] and [ψ].

3.3.8.1 The surface vowel [ɹ]

The surface vowel [ɹ] occurs as the result of two separate processes: conditioning of segmental /e/ by /k^w/; and, contraction of segmental /əwe/.

The first process acts upon a group of words ending in /...ek^w/, and changes the vowel, resulting in the surface form [...ɹκΩ]. Here the [ɹ] is the result of the consonant /k^w/ conditioning /e/ (see above). E.g.:

[στɹλɹ≡κΩ] 'stirring stick'
 [φɹ≡κΩ] 'grain (type)'

The rest of the words with [ɹ] are the result of a contraction. The phonetic data consists of the following:

[δZɹ] 'hoe handle'
 [δZɹρ] 'fore-head'
 [τΣɹN] 'nose'
 [λɹ≡N] 'back'
 [τΣ↔≡ηɹ≡Λ] 'name for a twin'
 [μ↔≡τ↔≡#ρ↔≡#σɹ≡μ] 'coccyx'
 [τΣɹ≡] 'to position (wood, when building)'
 [τɹ] 'to wrap something in cloth for carrying'
 [σψσɹ≡] 'to suck'
 [vδɹvδɹ] 'sweet, sugary'

Here the vowel is analysed as a contraction of underlying /əwA^Y/. In other words the sequence /əwe/ is contracted to /ɹ/. This /ɹ/ functions as a single vowel at the segmental level.

This analysis is justified as follows:

Evidence from free variation

In certain words there is free variation between the contracted form and the uncontracted form:

[τυωE┘] ~ [τ┘┘] “to squeeze”
 [λυωEN] ~ [λ┘N] “back”

Some /əwe/ words always contract, some never do, and some exhibit free variation between the two. It seems that contraction is more likely if the sequence is preceded by /ts/ or /dz/, or followed by /n/ or an implosive.

Evidence from Nouns

When the preposition /ta/ ‘with’ is placed before a monosyllabic noun, the vowel /a/ is affected by the prosody on the noun, becoming /i/ under palatalisation or /u/ under labialisation. When /ta/ is placed before a polysyllabic noun, the /a/ vowel collapses to /ə/ and the prosody does not spread onto it.

Placing the preposition /ta/ (“with”) before the monosyllabic nouns in the above list, we notice that the surface form of the vowel /a/ is [ɪ]. From this we can see that the vowel [┘] is a single vowel and not a sequence. If it were a sequence, the word would be disyllabic and the vowel /a/ would be realised as [↔→]. Also we see that [┘] carries the palatalisation prosody, since this has spread onto the preposition (see also section 3.3.4). This is consistent with our analysis.

In the neighbouring language Mofu-nord, the [┘] vowel is analysed as carrying both palatalisation and labialisation prosodies, i.e. it is underlyingly /A^{yw}/. This analysis does not hold for Mbuko. If this were the case we might expect both prosodies to spread onto the vowel of /ta/, producing a surface form [τψ]. Since this is not the case for these nouns, we know that we have just one prosody.

/dzəwa ^y /	[δZ┘]	[τɪδZ┘]	“with the hoe handle”
/dzəwAr ^y /	[δZ┘ρ]	[τɪδZ┘ρ]	“with the fore-head”
/tsəwan ^y /	[τΣ┘N]	[τɪτΣ┘N]	“with the nose”
/ləwan ^y /	[λ┘N]	[τɪλ┘N]	“with the back”

Secondly, when placing the words in a mid-phrasal position we would expect the underlying sequence to behave as follows. If the word ends in a consonant, the vowel in the final syllable would collapse to /ə/, since it is in a mid-phrasal closed syllable (see 3.3.1). This would then be conditioned to [ʊ] by the /w/. E.g. /ləwən/ would be realised as [λʊəwəN]. This would then contract to [λʊəN]. This process would take place with underlying /ə/ and /a/, but not underlying /A/. If the final vowel were underlying /A/, it would not collapse to /ə/ and the sequence would remain as /əwe/ and contract to [┘]. The crucial data is as follows:

/dzəwAr ^y /	[δZ┘ρ]	[δZ┘ρ ⊕ η ⊕ φ]	“foreheads”
/tsəwan ^y /	[τΣ┘N]	[τΣʊN ⊕ η ⊕ φ]	“noses”
/ləwan ^y /	[λ┘N]	[λʊN ⊕ η ⊕ φ]	“backs”

Evidence from Verbs

We have three verbs in the current data that have the surface vowel [ɹ]: [τΣɹ≡], [τɹɹ] and [σψσɹ≡].

When the 2nd person plural agreement suffix /-en/ is added, we have the following forms:

/tsəwəɓ ^Y /	[τΣɹ≡]	[κɪ τΣυ≡EN]	'you (pl.) position (wood)'
/təwəd ^Y /	[τɹɹ]	[κɪ τυɹEN]	'you (pl.) squeeze'
/...səwəɓ ^Y /	[σψσɹ≡]	[κɪ σψσΩɹ≡EN]	'you (pl.) suck'

We have the two realisations [ωɹ] and [υ]. These are exactly the contractions we would expect from /əwə^Y/ and /əwə^Y/. E.g.:

/təwəd ^Y / + /an ^Y /	→ /təwədən ^Y /	→ /tɹən ^Y /	→ /tɹen/	→ [τυɹEN]
/...səwəɓ ^Y / + /an ^Y /	→ /...səwəɓən ^Y /	→ /...səwɹen/	→ [...σΩɹ≡EN]	

This data supports the analysis.

Conclusion

The vowel [ɹ] is analysed in the above cases as a contracted form of /↔ωɹ/ which in turn is the underlying form /əwə^Y/. However, it functions as a single vowel carrying the palatalisation prosody, which can spread leftwards in the normal way. It does not carry the labialisation prosody, its rounding coming from an underlying labio-velar consonant.

We shall see later (section 4.4.3) that morphophonemics can create situations where the vowel /æ/ is the result of two prosodies acting on one syllable. However, in the lexicon we do not find morphemes carrying two prosodies.

The question of how to represent this vowel phonemically will be examined in section 3.3.10 below.

3.3.8.2 The surface vowel [ψ]

The surface vowel /y/ is extremely rare. Only three examples have been found in the lexicon:

[σψσɹ≡]	/siwəsəwəɓ/	'to suck'
[σψσɹ]	/siwəse/	'thank you'
[τΣψυɹ]	/tsiwəne/	'tree (type)'

In addition /y/ is also found in verb forms such as [τ↔τψκΩEN] 'you (pl.) clap', where a palatalised suffix is added to a labialised verb. The palatalisation spreads onto what would have been [υ] and produces the surface form [ψ].

/tətak ^w / + /-an ^Y /	→ /tətyk ^w en/
---	---------------------------

Thus labialisation and palatalisation prosodies at the underlying level can occur in the same word, though never in the same morpheme. Because of spreading it is possible to have phonetic segments where both prosodies have overlapped.

The [ψ] vowel in [σψσɹ] and [τΣψυɹ] is analysed as a contraction of /iw/. It probably does not come from /əwi/ since this has been seen to contract to [ωɹ] (see verb data above). However the limited data available does not permit a conclusive analysis.

The verb [σψσɹ≡] is slightly unusual. It may be that the [σψ] was added historically to an original contracted form [σɹ≡] to make a two syllable verb in preference to a monosyllabic verb. Monosyllabic verbs carrying a prosody are extremely rare in Mbuko, whereas reduplicated disyllabic verbs carrying a prosody are very common. Thus the addition of a reduplicated syllable to a monosyllabic root in this way would be by no means unusual. Another possibility is that this verb does indeed carry both palatalisation and labialisation prosodies lexically, making it unique in the language. A third possibility is that it is simply adapted from the French word 'sucer'.

3.3.9 Definition of Features

The vowel system of a monomorphemic word is here analysed at two levels, the underlying level and the segmental level. At the underlying level the vowel system consists of three vowels (/ə/, /a/ and /A/) and two prosodies. At the segmental level we treat the language in terms of an eight vowel system, taking into account the following:

- a) the neutralisation of vowels in mid-phrase closed syllables
- b) the neutralisation of vowels before a pause
- c) the weakening of /a/ with distance from the end of the word.
- d) the realisations of the underlying vowel phonemes under the action of prosodies
- e) the neutralisation of word initial vowels
- f) the contractions which produce the vowels /œ/ and /y/
- g) the conditioning by vowels on consonants

Underlying Level

The following features apply at the Underlying Level of this phonology, where the vowels are analysed in terms of three phonemes /ə/, /a/ and /A/ and two prosodies, palatalisation and labialisation.

Mid

The feature “mid” is used to distinguish the vowel /ə/ from the other vowels. The phonemes /a/ and /A/ are [- mid] and the phoneme /ə/ is [+ mid].

Strong

The feature “strong” is used to distinguish the regular Mbuko /a/ vowel from the /A/ vowel in words borrowed from neighbouring languages. The [+ strong] variant will be written /A/ in phonemic transcriptions at the underlying level.

Palatal

The feature “palatal” applies to the word as a whole and has the effect of fronting the vowels of a word.

Labial

The feature “labial” also applies to the word as a whole, and has the effect of backing and rounding the vowels of a word.

The features for the underlying vowels are then as follows:

	ə	a	A
Mid	+	-	-
Strong	-	-	+

Segmental level

The following features apply to vowels at the segmental level.

Mid

The feature mid distinguishes the vowel /ə/ from the other vowels.

- [+ mid] ə
[- mid] a, i, e, u, o, y, œ

Strong

The feature “strong” is used to distinguish the phonemes /i/, /u/, /y/ from /e/, /o/, /œ/.

- [- strong] i, u, y
- [+ strong] e, o, œ

Front

The feature “front” is used to distinguish the front vowel phonemes /i/, /e/, /y/, /œ/ from the other vowels.

- [+ front] i, e, y, œ
- [- front] ə, a, u, o

Round

The feature “round” is used to distinguish the phonemes /u/, /o/, /y/, /œ/ from /ə/, /a/, /i/ and /e/.

- [+ round] œ, y, u, o
- [- round] e, i, a

Distinctive feature matrix.

We have therefore the following feature matrix for Mbuko vowels at the segmental level:

	/ə/	/a/	/i/	/e/	/y/	/œ/	/u/	/o/
Mid	+	-	-	-	-	-	-	-
Front	+/-	-	+	+	+	+	-	-
Strong	+/-	+/-	-	+	-	+	-	+
Round	+/-	-	-	-	+	+	+	+

The +/- denotes that either value for the feature produces the same phoneme at the segmental level. For example, when no prosody applies, both underlying /a/ (-strong) and underlying /A/ (+strong) realise the segmental phoneme /a/.

Alternatively, the vowels can be presented as follows:

		[- round]		[+ round]	
		[- front]	[+ front]	[- front]	[+ front]
[+ mid]		ə			
[- mid]	[- strong]	a	i	u	y
	[+ strong]		e	o	œ

This system of features is chosen to facilitate explanation of the processes that take place and reflects the natural features of the language. A more economic set of three rather than four features could be chosen to distinguish the eight vowels, but this would result in more complicated, and less natural, rules to describe the processes.

3.3.10 Can We Know all the Underlying Phonemes?

At the Underlying Level, in some circumstances it is impossible to deduce which of two phonemes is present. In most words ending with a CVC syllable this is the case, since pre-pausally the surface form of either vowel phoneme will always be open and mid-phrase the surface form will always be [↔].

Exceptions to this are verbs and a few nouns, where a morpheme can be added which changes the syllable pattern so that the vowel in question becomes the nucleus of an open syllable. E.g.:

Contrastive Units - Vowels

“I throw” [vɪ Λ⊕.μβ⊕λ]
 “I have thrown” [v↔ Λ⊕.μβ⊕.λ⊕κ] not *[v↔ Λ⊕.μβ↔.λ⊕κ]
 Hence the phonemic form at the Underlying Level is /zlambal/.

“brother” [μ↔ρ⊕κ]
 “my brother” [μυρκΩ] not *[μ↔ρυκΩ]
 Hence the phonemic form at the Underlying Level is /mərək/.

But there are many cases when the final vowel is ambiguous:

“arrow” pre-pausal: /gadam/ mid-phrasal: /gadəm/

In this case the final vowel cannot be deduced since in either case the quality of the final vowel is determined by the position of the closed syllable, and no noun suffixes exist which would change the closed syllable to an open syllable.

When writing the phonemic forms of words at the Underlying Level, if a vowel cannot be determined the symbol /V/ will be used.

At the Segmental Level there are two possible forms for each word, a pre-pausal and a mid-phrasal form. The pre-pausal form has an open vowel in the final syllable, but the mid-phrasal form will have a variant of /A/ or /ə/ in the final syllable. The pre-pausal (or isolation) form will be used as the standard form for words at this level, since the mid-phrasal form can often be deduced from the pre-pausal form, whereas the reverse is less true.

3.3.11 Presentation of Vowel Phonemes

Evidence of contrast is shown below for the vowel phonemes according to the two systems outlined above.

Underlying Level

ə / a

/gadam /	[γ↔δ⊕μ]	“caiman”	↔	/gadam/	[γ⊕δ⊕μ]	“arrow”
/dəna /	[δ↔v⊕]	“girl”	↔	/zana/	[ζ⊕v⊕]	“clothes”
/bəzlam ^w /	[≡YΛ μ]	“mountain”	↔	/bazlam ^w /	[≡υΛ μ]	“cheek”
/mbəram ^w /	[μβ↔ρ μ]	“God”	↔	/mbaram ^w /	[μβυρ μ]	“sky”
/vədza ^y /	[ϑ↔δZE]	“monkey”	↔	/badza ^y /	[βtδZE]	“grandfather”
/dədaw ^y /	[δ↔δEω]	“snake”	↔	/sadow ^y /	[σtδEω]	“tomorrow”

ə / A

/dəla ^y /	[δ↔λE	“fiancée”	«	/dAdA ^y /	[δEδE]	“child”
]					
/ʔəna ^y /	[ʔ↔vE	“to hear”	«	/tAmA ^y /	[τEμE]	“onion”
]					
/kəra ^w /	[κΩυρ	“ten”	«	/gArA ^w /	[γΩ ρ]	“weaver bird”
]					

a / A

/tine/	[tɪvE]	“they”	↔	/teme/	[τEμE]	“onion”
/dinde/	[δtνδE]	“intestines”	↔	/dede/	[δEδE]	“child”
/mungok/	[μυNγΩ κΩ]	“sin”	↔	/bongoz/	[β NγΩ ζ	“papaya”
]	
/dzudzob/	[δZυδZ ≡]	“to soak”	↔	/dodod/	[δ δ]	“to pluck”
/kuhom/	[κΩυηΩ μ]	“mouse”	↔	/hohos/	[ηΩ ηΩ	“to wipe”
					σ]	

Segmental Level**The phoneme /ə/**

The phoneme /ə/ can only be distinguished from the other phonemes in open syllables in the medial position, since this phoneme does not occur word initially or pre-pausally, and only this phoneme occurs in closed syllables in the medial position. As the phoneme /œ/ does not appear in this position, no contrast between /ə/ and /œ/ is possible.

ə / a

/gədam/	[ɣ↔δ⊕μ]	"caiman"	↔	/gadam/	[ɣ⊕δ⊕μ]	"arrow"
/dəna/	[δ↔v⊕]	"girl"	↔	/zana/	[ζ⊕v⊕]	"clothes"
/vəvaj/	[⊖↔⊖⊕⊖]	"to winnow"	↔	/vavar/	[⊖⊕⊖⊕⊖]	"roof"
/təman/	[τ↔μ⊕N]	"sheep"	↔	/tapak/	[τ⊕π⊕κ]	"palm (of hand)"
/bəbaj/	[β↔β⊕⊖]	"father"	↔	/mamaj/	[μ⊕μ⊕⊖]	"mother"

é / i

/vədze/	[⊖↔δZE]	"monkey"	↔	/bidze/	[βiδZE]	"grandfather"
/fəted/	[φ↔τE]	"to cut"	↔	/biten/	[βiτEN]	"today"
/vərəl/	[⊖↔pEΛ]	"wrist"	↔	/miresl/	[μiρEʁ]	"tongue"
/sənder/	[σ↔vδEρ]	"shin"	↔	/dindez/	[δivδEζ]	"bee (type)"
/dədew/	[δ↔δEω]	"snake"	↔	/sidew/	[σιδEω]	"tomorrow"

ə / e

/dəle/	[δ↔λE]	"fiancée"	↔	/dede/	[δEδE]	"child"
/ʁəne/	[ʁ↔vE]	"to hear"	↔	/teme/	[τEμE]	"onion"

é / u

/bəΛom/	[≡YΛ μ]	"mountain"	↔	/buΛom/	[≡υΛ μ]	"cheek"
/mbərom/	[μβ↔ρ μ]	"God"	↔	/mburom/	[μβυρ μ]	"sky"

ə / o

/kəro/	[κΩυρ]	"ten"	↔	/goro/	[ɣΩ ρ]	"weaver bird"
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ə / y

/sləne/	[ʁ↔vE]	"to hear"	↔	/tsyne/	[τΣψvE]	"tree (type)"
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ə / œ

/tsəhœΛ/	[τΣ↔Ξη↓ ≡Λ]	"name for a twin"	↔	/ndœndœ/	[vδ↓vδ↓]	"sweet"
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The phoneme /ə/ at the segmental level has the following phonetic realisations:

- [∅] in the medial position, between a consonant and /l/ or /r/.
- [ʊ] before or after a labialised velar or /w/.
- [ɪ] before or after /j/
- [I] alternating with [↔] in palatalised words in the medial position.
- [Y] alternating with [↔] in labialised words in the medial position.
- [↔] in other non-palatalised, non-labialised words in the medial position.

The phoneme /a/.

The identity of the phoneme /a/ is established by the following contrasts:

a / ə see above.

Contrastive Units - Vowels

a / i

/dala/	[δ⊕λ⊕]	“area”	↔	/tine/	[τινE]	“they”
/slala/	[ʒ⊕λ⊕]	“clan”	↔	/zlile/	[ΛιλE]	“wealth”

a / e

/da/	[δ⊕]	“to cook”	↔	/de/	[δE]	“grain store”
/sa/	[σ⊕]	“to drink”	↔	/se/	[σE]	“tree”
/san/	[σ⊕N]	“to know”	↔	/nen/	[νEN]	“I”
/gəΛa/	[γ↔Λ⊕]	“pot”	↔	/gəʒie/	[γ↔ʒE]	“to play”

a / u

/maka/	[μ⊕κ⊕]	“yoke”	↔	/nuko/	[νυκΩ]	“flour”
/ana/	[⊕ν⊕]	“of”	↔	/uno/	[υν]	“my”

a / o

/da/	[δ⊕]	“to cook”	↔	/dɔ/	[⊔]	“person”
/gan/	[γ⊕N]	“to grind”	↔	/kon/	[κΩ N]	“viper”
/gad/	[γ⊕⊔]	“to cut”	↔	/gos/	[γΩ σ]	“ten”
/tətak/	[τ↔τ⊕κ]	“to learn”	↔	/tətok/	[τ↔τ κΩ]	“to clap”

a / y

/dala/	[δ⊕λ⊕]	“money”	↔	/syse/	[σψσE]	“thank you”
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a / œ

/dza/	[δζ⊕]	“to speak”	↔	/dzœ/	[δZ↘]	“hoe handle”
/dzan/	[δζ⊕N]	“to climb”	↔	/tsœn/	[τΣ↘N]	“nose”
/tsar/	[τσ⊕ρ]	“friend”	↔	/dzœr/	[δZ↘ρ]	“forehead”
/ʒan/	[ʒ⊕N]	“tooth”	↔	/lœn/	[λ↘N]	“back”

/a/ may be realised as either [] or [⊕] adjacent to /w/ or a labialised velar.

E.g.	makwakwad	“mosquito”	[μ⊕κΩ⊕κΩ⊕⊔] ~ [μ κΩ κΩ ⊔]
	manawa	“half full”	[μ⊕ν⊕ω⊕] ~ [μ⊕ν ω]

The phoneme i

i / ə see above

i / a see above

i / e

/tine/	[τινE]	“they”	↔	/teme/	[τEμE]	“onion”
/dinde/	[δινδE]	“intestines”	↔	/dede/	[δEδE]	“child”

i / u

/tine/	[τινE]	“they”	↔	/sule/	[συλE]	“to fry”
/dinde/	[δινδE]	“intestines”	↔	/dʊk ^w e/	[⊔υκΩE]	“to kneel”

i / o

/disise/	[δισισE]	“medicine”	↔	/sololo/	[σ λ λ]	“deep”
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i / y

/dzike/	[δZικE]	“proverb”	↔	/tsyne/	[τΣψνE]	“tree (type)”
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i / œ

/dinde/	[δινδE]	“intestines”	↔	/ndœndœ/	[νδ↘νδ↘]	“sweet”
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"

The phoneme e

e / ə, e / a, e / i see above.

e / u

/lele/ [λEλE] "good" ↔ /sule/ [συλE] "to fry"

e / o

/kəlef/ [κ↔λEφ] "fish" ↔ /dəlon/ [δ↔λ N] "below"

/gədek/ [γ↔δEκ] "begun" ↔ /tətok/ [τ↔τ κΩ] "to clap"

/gəʔe/ [γ↔ʔE] "to play" ↔ /kəro/ [κΩυρ] "ten"

e / y

/lele/ [λEλE] "good" ↔ /syse/ [σψσE] "thank you"

e / ə

/de/ "grain store" ↔ /dzə/ [δZ↔] "hoe handle"

/nen/ "I" ↔ /tsən/ [τΣ↔N] "nose"

/nen/ "I" ↔ /lən/ [λ↔N] "back"

/mer/ "work" ↔ /dzər/ [δZ↔ρ] "forehead"

The phoneme u

u / ə, u / a, u / i, u / e see above

u / o

/mungok/ [μυNγΩ κΩ] "sin" ↔ /bongoz/ [β NγΩ ζ] "papaya"

/dzudzob/ [δZυδZ ≡] "to soak" ↔ /dodod/ [δ δ] "to pluck"

/kuhom/ [κΩυηΩ μ] "mouse" ↔ /hohos/ [ηΩ ηΩ σ] "to wipe"

u / y

/sule/ [συλE] "to fry" ↔ /syse/ [σψσE] "thank you"

u / ə

/dudə/ [δυ] "clay" ↔ /ndəndə/ [νδ↔νδ↔] "sweet"

The phoneme o

o / ə, o / a, o / i, o / e, o / u see above

o / y

/tororo/ [τ ρ ρ] "leaf sledge" ↔ /tsyne/ [τΣψνE] "tree (type)"

o / ə

/dɔ/ [] "person" ↔ /dzə/ [δZ↔] "hoe handle"

/kon/ [κΩ N] "viper" ↔ /tsən/ [τΣ↔N] "nose"

4 The Phonology of the Word

4.1 The Rules for a Monomorphemic Word

The rules for a monomorphemic word are as follows (with sample derivations at the end):

4.1.1 Input

The input consists of the consonant and vowel phonemes at the underlying level, along with the two prosodies of palatalisation and labialisation. At this level there are three vowel phonemes: /ə/ and the two variants of /a/.

4.1.2 Vowel Position Rules

These rules specify that a [- strong] vowel in a syllable other than the last two of a word must be [+ mid], unless it is the initial vowel when it must be [- mid, - strong]. Also the vowel in the final syllable of the word must be [- mid, + strong]

Vowel Decay Rule: $V[-\text{strong}] \rightarrow [+ \text{mid}] / C_ \sigma . \sigma \dots$

Initial Vowel Rule: $V[+ \text{mid}] \rightarrow [- \text{mid}, - \text{strong}] / \# _$

Final Vowel Rule: $V[- \text{mid}] \rightarrow [+ \text{strong}] / _ (C) \#$

4.1.3 Closed Syllable Rule

This rule specifies that a vowel in a closed syllable must be [+ mid], i.e. /ə/.

Closed Syllable Rule: $V \rightarrow [+ \text{mid}] / \sigma [+ \text{closed}]$

4.1.4 Schwa Deletion

The phoneme /ə/ is deleted in medial syllables after /r/, /l/, /y/, /w/ and before another consonant. E.g.:

/kəɾətək^Y/ → /kəɾtak^Y/ [κ↔≅πτE#κ] “one”

This gives us:

Schwa Deletion Rule: $/ə/ \rightarrow \emptyset / V \left[\begin{array}{c} C \\ \left\{ \begin{array}{l} - \text{obstruent} \\ + \text{trill} \end{array} \right\} \right] _ C . \sigma$

Some linguists (e.g. Barreteau, Bow, Smith) have analysed related languages as having one underlying vowel /a/, with a rule to insert /ə/ between consonants. In the case of Mbuko this analysis is also feasible, but more difficult to express. The Mbuko data alone does not lead to this analysis, so schwa deletion, being simpler to describe than schwa insertion, is chosen.

4.1.5 Pause Vowel Rule

This rule specifies that the vowel in the final syllable before a pause must be [- mid, + strong].

Pause vowel Rule: $V \rightarrow [- \text{mid}, + \text{strong}] / _ (C) \# \#$

In this section where we are dealing with single words, we shall normally be concerned with their isolation forms, where the word stands before a pause.

4.1.6 Optional Vowel Contraction

This rule describes the optional process that produces the contracted vowels /œ/, /y/, /wi/ and /u/. Since these contractions are not generally predictable we cannot give precise rules for their occurrence.

Optional Vowel Contraction Rules: $\text{ə wə} \rightarrow \text{u}$
 $\text{ə wa} \rightarrow \text{wi}$
 $\text{ə wA} \rightarrow \text{œ}$
 $\text{iwə} \rightarrow \text{y}$

4.1.7 Application of Prosodies

To move from the underlying level to the segmental level we need to consider the effect of the prosodies on the underlying vowels. The palatalisation prosody has the effect of fronting underlying /a/ and /A/. The labialisation prosody has the effect of rounding and backing underlying /a/ and /A/, and of labialising the velar phonemes in the word. The two prosodies of palatalisation and labialisation do not co-occur on the same syllable. Hence we have:

Palatalisation: $\text{V}[-\text{mid}] \rightarrow [+ \text{front}] / \textit{palatalisation}$

Vowel Labialisation: $\text{V}[-\text{mid}] \rightarrow [+ \text{round}] / \textit{labialisation}$

Velar Labialisation Rule: $\left[\begin{array}{c} \text{C} \\ - \text{anterior} \\ - \text{coronal} \\ - \text{glottal} \end{array} \right] \rightarrow [+ \text{rounded}] / \textit{labialisation}$

For the rules for determining the where the prosodies apply, see 4.4.3.

This gives us the form of the word at the segmental level. Note that, where no prosody applies, the underlying vowel /A/ is mapped onto the segmental phoneme /a/. This is in accordance with the definitions of features given in section .

Sample derivations:

	“to position”	“debt”	“baboon”	“nose”	“salt”
Underlying form	gələw	g ^w Vdara ^Y	hVrægVv ^w	cəwVn ^Y	zAtAnA ^Y
Vowel position	gəlAw	g ^w ədara ^Y	hərægVv ^w	cəwVn ^Y	-
Closed syllable	gələw	-	hərægəv ^w	cəwən ^Y	-
Pause vowel	gəlAw	-	hərægAv ^w	cəwAn ^Y	-
Vowel contraction	-	-	-	cœn ^Y	-
Schwa deletion	-	-	hərgAv ^w	-	-
Palatalisation	-	g ^w ədire	-	cœn	zetene
Vowel labialisation	-	-	hərgov ^w	-	-
Velar labialisation	-	-	h ^w ərg ^w ov	-	-
Segmental level	gəlaw	g ^w ədire	h ^w ərg ^w ov	cœn	zetene
Surface form	γ<-→λ⊕ω	γυἔδιδιἔρἔἔ	ηυἔργυ ἔῶ	τΣ.⊥N	ζἔἔτἔἔνἔἔ

4.2 Words Formed by Reduplication

Many of the words in the lexicon have been formed by reduplication, though no common meaning can be assigned to this feature. Reduplication has taken two forms, Complete Reduplication, and Partial Reduplication.

4.2.1 Complete Reduplication

In words formed historically by complete reduplication the complete morpheme is repeated. Once the phonological rules operate, the final vowel of each part takes on its appropriate form. E.g.:

Underlying level	Segmental level	Surface Form	Gloss
/caw ^Y caw ^Y /	/cəwcew/	[τΣυωτΣἔω]	“twice”

/dAk ^Y dAk ^Y /	/dɛkɛk/	[lɛɛk lɛɛk]	“only”
/k ^w Adɛk ^Y k ^w Adɛk ^Y /	/k ^w ɛdɛkk ^w ɛdɛk/	[kɔE#dIɛkkɔE#dE ɛk]	“white”

4.2.2 Partial Reduplication

In words formed historically by partial reduplication, only the first consonant and vowel have been reduplicated. This is common with verbs, whereas complete reduplication has not taken place with verbs. No meaning has been found for reduplication, though with words carrying a prosody it may be due to a tendency in the language to avoid monosyllables which carry prosodies.

Underlying Level	Segmental level	Surface form	Gloss
/fəfət ^Y /	/fəfet/	[fɛ→fɛt]	“to whistle”
/kəkək ^Y /	/kíkèz/	[kɪkɛz]	“bat”
/tətək/	/tətək/	[tɛ→tɛk]	“to learn”
/tətək ^w /	/tətək ^w /	[tɛ→tɛ kɔ]	“to clap”
/dádáz/	/dádáz/	[lɔ lɔz]	“red”
/k ^w ək ^w əs ^Y /	/k ^w ək ^w es/	[kɪkɔEσ]	“to rain a little”

4.3 Compound Words

Some words are compounds of two or more different morphemes. This may be combined with reduplication.

Underlying Level	Segmental level	Surface form	Gloss
/ma-dAwə ^Y dAwə ^Y /	/mədewdewe/	[mɛ→dEωdEωE]	“type of bird”
/mbalaj-gadaza ^w /	/mbaləj ^w əduzo/	[mβɔlɪɣδυz]	“type of lizard”

4.4 Morphophonemics

4.4.1 Basic Morphology

Mbuko has a fairly simple morphology. Verbs have only one slot for a suffix, and there are only a handful of suffixes that can fill this slot. However when two suffixes are required by the grammar, only one can be represented segmentally. The other is either completely replaced, leaves only its tone (as with the low tone /-əj/ suffix below), or takes the form of a separate particle. Details are in a forthcoming description of Mbuko grammar.

A verb root may also be inflected by one of a small number of prefix clitics. Affixes without a tone mark are toneless.

Prefixes		Suffixes	
na-	1S subject, imperfective	-àj	destination valency changer
ka-	2S and 2P subject, imperfective	-ák	perfect tense
a-	3S subject, imperfective	-ũmó	1P inclusive dual imperative
ɖà-	1P inclusive subject, imperfective	-ũkó	1P inclusive multiple imperative
ma-	1P exclusive subject, imperfective	-én	2P subject agreement
ta-	3P subject, imperfective	-ó	1S indirect object agreement
ká-	3S subject, perfect tense	-ák	2S indirect object agreement
à-	infinitive/nominaliser	-án	3S indirect object agreement
ma-	participle/adjectiviser		
sa-	subordinator		

Nouns can be prefixed by a prepositional clitic. Only one example has been found of a noun with a suffix (*murko* ‘my brother’).

Prefixes		Suffixes	
ā-	of	-ó	my
á-	to		
tá-	with		
pá-	on		
sā-	of		

4.4.2 Elision

Vowel sequences are not permitted in Mbuko, except for a few exceptional examples within a word. When a vowel sequence is created by the addition of a suffix to a verb, the first vowel of the sequence is deleted. Note that only three final vowels are possible (a, e, o). E.g.:

/zla/	/zla/	“go (2s)”
/zla/ + /-en/	/zlen/	“go (2p)”
/zla/ + /-ak/	/zlak/	“has gone”
/zla/ + /-uko/	/zluko/	“let’s go!”

No example has yet been found of a verb ending with “e” that can take the indirect object pronoun /-o/.

This gives us the following rule:

Vowel Elision Rule: $V \rightarrow \emptyset / _ - V$

4.4.3 Scope of Prosodies

The palatalisation and labialisation prosodies can be regarded as lying at the end of the morpheme to which they belong. The prosody affects the preceding two syllables, and may cross morpheme boundaries, unless blocked by the presence of another prosody. A prosody may also spread from a verb root onto a suffix when the suffix does not carry a prosody.

Spread from a suffix to a verb root:

$[\text{ɔ} \oplus \rho] + [-\text{EN}] \rightarrow [\text{ɔ} \rho \text{EN}]$
 ‘give’ ‘2P’ ‘you (pl.) give’
 $/\text{var}/ + /-\text{an}^Y/ \rightarrow /-\text{var-an}^Y/$

$[\Lambda \oplus \mu \beta \oplus \lambda] + [-\text{EN}] \rightarrow [\Lambda \oplus \mu \beta \iota \lambda \text{EN}]$
 ‘throw’ ‘2P’ ‘you (pl.) throw’
 $/\text{zlambal}/ + /-\text{an}^Y/ \rightarrow /-\text{zla.mbal-an}^Y/$

[$\text{[}\oplus\kappa\oplus\phi\text{]}$] + [-] → [$\text{[}\upsilon\kappa\Omega\text{]}$]
 ‘show’ ‘to me’ ‘show me’
 / $\text{d}\kappa\text{aj/}$ + / -a^{W} / → / $\text{d}\kappa\text{a}^{\text{W}}$ /

[$\text{[}\oplus\text{p}\text{]}$] + [$\text{-}\upsilon\kappa\Omega\text{]}$ → [$\text{[}\oplus\text{p}\upsilon\kappa\Omega\text{]}$] not * $\text{[}\oplus\text{p}\upsilon\kappa\Omega\text{]}$ since the scope of the
 prosody is limited to two syllables

‘give’ ‘1Pinc’ ‘let’s give!’
 / var/ + / -aka^{W} / → / $\text{var-aka}^{\text{W}}$ /

Where there is already a prosody leftward spreading still occurs:

[$\text{[}\tau\Sigma\leftrightarrow\tau\Sigma\ \pi\text{]}$] + [-EN] → [$\text{[}\tau\Sigma\leftrightarrow\tau\Sigma\psi\pi\text{EN}$]
 ‘attach’ ‘2P’ ‘you (pl.) attach’
 / $\text{ts}\epsilon\text{tsap}^{\text{W}}/$ + / -an^{Y} / → / $\text{ts}\epsilon\text{tsa}^{\text{W}}\text{pan}^{\text{Y}}$ /

Rightward spread from a verb root onto a suffix:

[$\text{[}\phi\iota\tau\Sigma\text{E}\text{[}\text{]}$] + [$\text{-}\oplus\kappa\text{]}$] → [$\text{[}\phi\iota\tau\Sigma\leftrightarrow\text{[}\text{E}\kappa\text{]}$]
 ‘cut’ ‘PERF’ ‘have cut’
 / $\text{fats}\epsilon\text{d}^{\text{Y}}/$ + / -ak/ → / $\text{fats}\epsilon\text{d}^{\text{Y}}\text{ak/}$ /

Leftward spread from a root onto a prefix:

/ ta/ “with”

/ ta/ + / mbaz/ → / ta-mbaz/	[$\text{[}\tau\oplus\mu\beta\oplus\zeta\text{]}$]	“with the husband”
/ ta/ + / $\text{zak}^{\text{Y}}/$ → / $\text{ta-zak}^{\text{Y}}/$	[$\text{[}\tau\zeta\text{E}\kappa\text{]}$]	“with the body”
/ ta/ + / $\text{dah}^{\text{W}}/$ → / $\text{ta-dah}^{\text{W}}/$	[$\text{[}\tau\upsilon\delta\ \xi\text{]}$]	“with the house”

/ ka/ “2nd person singular perfective prefix”

/ ka/ + / zla/ → / ka-zla/	[$\text{[}\kappa\oplus\Lambda\oplus\text{]}$]	“you went”
/ ka/ + / zla/ + / $\text{-an}^{\text{Y}}/$ → / $\text{ka-zl-an}^{\text{Y}}/$	[$\text{[}\kappa\iota\Lambda\text{EN}$]	“you (pl.) went”
/ ka/ + / var/ → / ka-var/	[$\text{[}\kappa\oplus\text{p}\oplus\text{p}\text{]}$]	“you gave”
/ ka/ + / var/ + / $\text{-an}^{\text{Y}}/$ → / $\text{ka-var-an}^{\text{Y}}/$	[$\text{[}\kappa\leftrightarrow\text{p}\iota\text{p}\text{EN}$]	“you (pl.) gave”
/ ka/ + / ja/ + / $\text{-a}^{\text{W}}/$ → / $\text{ka-ja-a}^{\text{W}}/$	[$\text{[}\kappa\upsilon\delta\text{Z}\text{]}$]	“you said to me”

We have therefore the following rules:

Labialisation: $\text{V} \rightarrow \text{[+ round] / } _ (\text{C})(\sigma)^{\text{W}}$

Palatalisation: $\text{V} \rightarrow \text{[+ front] / } _ (\text{C})(\sigma)^{\text{Y}}$

4.5 The Rules for a Polymorphemic Word

The above rules, combined with the rules for single morphemes, give us the necessary rules for polymorphemic words.

The vowel decay rule must be applied to the root first, and then again after affixation. This is because the vowels of a root decay with distance from the end of the root, whereas the vowel of a prefix decays according to its distance from the end of the word.

The Phonology of the Word

The order is therefore as follows:

ROOT

1. Vowel Position (Vowel decay and initial vowel rules, but not the final vowel rule)

MORPHOLOGY

2. Elision
3. Syllabification
4. Vowel Position
5. Closed Syllable
6. Pause Vowel
7. Vowel Contraction
8. Schwa Deletion
9. Palatalisation
10. Vowel Labialisation
11. Velar Labialisation
12. Syllabification

Derivations:

	“my brother”	“you (pl.) vomit”	“let us do”	“has positioned (wood)”	“you have put up”	“you (pl.) give”
UF	mərək -a ^w	vənah ^Y -an ^Y	ga-aka ^w	cəwəb ^Y -ak	ka-gələw-ak	var-an ^Y
Vowel Position (root)	-	-	-	-	-	-
Elision	-	-	g-aka ^w	-	-	-
Syllabification	mə.rə.ka ^w	və.na ^Y .han ^Y	ga.ka ^w	cə.wə ^Y .bək	ka.gə.lə.wək	va.ran ^Y
Vowel Position (affixes)	mə.rə.kA ^w	və.na ^Y .hAn ^Y	ga.kA ^w	cə.wə ^Y .bAk	kə.gə.lə.wAk	-
Closed Syllable	-	və.na ^Y .hən ^Y	-	cə.wə ^Y .bək	kə.gə.lə.wək	va.rən ^Y
Pause Vowel	-	və.na ^Y .hAn ^Y	-	cə.wə ^Y .bAk	kə.gə.lə.wAk	va.rAn ^Y
Vowel Contraction	-	-	-	cu ^Y .bAk	-	-
/ə/ Deletion	mə.r.kA ^w	-	-	-	-	-
Syllabification	mər.kA ^w	-	-	-	-	-
Palatalisation	-	və.ni.hən	-	cu.bək	-	vi.ren
Vowel Labialisation	mər.ko ^w	-	guko ^w	-	-	-
Velar Labialisation	mər.k ^w o	-	g ^w uk ^w o	-	-	-
Segmental Level	mər ^w o	vənihen	g ^w uk ^w o	cu b ək	kəgələwək	viren
Surface Form	[μɔpκΩ]	[θ↔vɪɛN]	[γ ^w υκΩ]	[τΣυ≡Eκ]	[κ↔γ↔λυω⊕κ]	[θɪpEN]

4.6 The Basic Phonological Word

The basic phonological word is two or three syllables long, and made up essentially of CV syllables.

The spread of prosodies from single syllable morphemes seems to indicate that one syllable is not sufficient for a phonological word. Most, if not all words of more than three syllables are either derived, reduplicated or compounded forms, so three syllables appears to be the upper limit for the phonological word. Also, inflected verbs (verb words) only rarely exceed four syllables. We shall also see later that stress units are also made up of two or three syllables.

The most usual syllable pattern is CV. V syllables occur either word initially or when a consonant has been historically deleted. In the word initial position the vowel is always underlying /a/. This prefix is used in the language to create nominalised and infinitive forms of verbs. However, this does not explain the occurrence of all lexical items beginning with a vowel, since for many nouns, for example, the corresponding verb does not exist. It seems that for some lexical items there was an historical /a/ prefix

that has become fossilised and is now part of the lexical morpheme.

Underlying CVC syllables are only found as the final syllable of a word, internal CVC syllables being formed by schwa deletion. It is also possible that word final CVC syllables are the result of deletion of a word final /ə/. This could be justified by the range of consonants that can occur word finally. Voiced plosives, pre-nasalised plosives and fricatives may not occur word finally, though all other consonants can. We could conjecture that with these word final consonants an historic final /ə/ has been deleted and is no longer part of the word. If this is the case, we would expect not to find a word final /ə/ after a consonant that can occur word finally. This has yet to be shown. If this were the case it might justify the status of /ə/ as a full phoneme, rather than an epenthetic vowel inserted to break up consonant clusters.

5Tone

5.1 Overview

Mbuko is a tone language, with a surface system of three level tones. Tone is a lexical feature of all lexical categories except verbs. Verb roots themselves do not normally carry lexical tone, but instead carry a tone pattern which has grammatical significance.

For verb forms it can be shown that there are two underlying tones, H, M, with depressor consonants acting to produce the third surface tone L.

There is no downstep or downdrift in Mbuko.

5.2 Verbs

5.2.1 Verb Tone Patterns

There are two underlying tone patterns used on Mbuko verb roots, MH and MM. Other surface patterns are the result of the action of depressor consonants.

The pattern MH is used for the perfective aspect. E.g.:

nā tām	I sewed
nē wītsé	I drew
nē tóták	I learned
nē kérá	I stole

The pattern MM is used for the imperfective aspect. E.g.:

nī tām	I am sewing
nī tēták	I am learning
nī kōrā	I am stealing

5.2.2 High Tone Spread

High tone can spread leftwards onto a neighbouring /ə/ phoneme. It does not spread onto underlying /a/. In the following examples the tone on the underlying /ə/ is H rather than M:

/bən/	kī bān	“you (s) catch”	kī bónén	“you (pl.) catch”
/gər/	kī gār	“you (s) invite”	kī górén	“you (pl.) invite”

But with underlying /a/ it remains M:

/tsasl/	kī tsāsl	“you (s) sow”	kī tsīslén	“you (pl.) sow”
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5.2.3 Depressor Consonants

There is a set of depressor consonants in Mbuko that cause tone lowering in words in which they occur. They consist of voiced plosives and fricatives, and pre-nasalised consonants. Of these, only the three voiced fricatives can occur word finally. I.e.:

b, d, dz, g, g^w, v, ʌ, z, mb, nd, ndz, ng, ng^w.

With verbs in the perfective aspect, which normally have a MH tone pattern, a depressor consonant anywhere in the word causes a low tone to spread across the word from the left, until it reaches an inhibitor consonant. The inhibitor consonants appear to consist of all non-depressor consonants, except // which we shall call “neutral”. The verb-word consists of the verb prefix (but only in the perfective), verb root and suffix.

In the imperfective aspect, which normally carries a MM one pattern, if the verb contains no inhibitor consonants the tone on the verb becomes L.

Examples (here D denotes a depressor consonant, C a non-depressor consonant, N neutral):

Perfective	Imperfective	Gloss
CVC		
nā tsár	nī tsār	sow
nā-sán	nī sán	know
DVC		
nà bàr	nī bār	walk
nà-ndzàǀ	nī ndzāǀ	find
CVD		
nà ráΛ	nī ráΛ	chase
nà-dáΛ	nī dāΛ	build
DVD		
nà dàv	nī dàv	shine
nà-ndàΛ	nī ndàΛ	explode
CVCV		
nē-kérá	nī kērā	steal
DVCV		
nè-zùkwé	nī zùkwē	point
NVDV		
nè-lizè	nī lizè	lose
DVDV		
nè-dèΛè	nī dèΛè	meet
CVCVC		
nē-tēták	nī tēták	learn
DVCVC		
nè-ngèráw	nī ngērāw	tear
DVDVC		
nè-bèbét	nī bèbét	shell

In this last example, as in all others of its type (DVDVC), the final tone of the imperfective is high where we might expect low. An analysis has not yet been found that can be applied to all verb root types.

5.3 Total Tone Lowering

Two affixes cause the tone of the entire verb-word to be low, irrespective of other factors. These are the destination suffix /-àj/, which allows a verb to carry a directional complement, and the nominalising prefix /à-/, which forms a noun from a verb.

kē slēháj “you fall”
kè slèhàj “you fall towards somewhere”

nā cār “I harvest”
àcār “the harvest”

5.4 Nouns and Other Lexical Categories

Tone

For nouns and other grammatical categories there seems to be a strong, but by no means complete, correlation between the existence of depressor consonants in a word and low tones. For this reason it seems better to regard the surface tones as the underlying tones, and treat all grammatical categories other than verbs as having lexical tone, represented by three tonemes. The tones on all non-verbal categories except preposition prefixes are stable, so the lack of variation allows us to deal with their lexical tones in a straightforward manner.

5.5 Evidence of Contrast

The current data provides only one example of a minimal triplet for tones:

máj “mother (human)” māj “hunger” màj “to return”

Here the verb màj is the directional form of *ma* ‘to go back’, i.e. *ma* + àj.

The contrast between tones is also shown by the following:

High versus Mid:

mán	“penis”	mān	“mother (animal)”
á	“to”	ā	“of”
nūkó	“us”	nūkō	“flour”
sā	“of”	sá	“future marker”

High versus Low:

kón	“village”	kòn	“viper”
áháj	“plural”	àhàj	“to here”

Mid-High versus Low-Low:

āwán	“state marker”	àwàn	“thing”
slāháj	“to fall”	slàhàj	“to fall down (directional)”

There are very few minimal pairs where tone is the only contrastive feature.

5.6 Distribution

For two-syllable nouns, all possible combinations of tone pattern have been found, though LM, ML and HL are extremely rare. For three syllable nouns, tone patterns when M and L occur in adjacent syllables are also rare. The following patterns have been found for three syllable nouns:

HHH	Yes	MHH		LHH	Yes
HHM	Yes	MHM		LHM	Yes
HHL		MHL	Yes	LHL	Yes
HMH	Yes	MMH	Yes	LMH	Yes
HMM	Yes	MMM	Yes	LMM	Yes
HML		MML		LML	
HLH	Yes	MLH		LLH	Yes
HLM		MLM		LLM	
HLL	Yes	MLL		LLL	Yes

6 Phrase-level Phonology

The phrase-level phonological features of Mbuko play a great role in shaping the surface forms of sentences. The mid-phrase and phrase-final forms of words sometimes differ quite substantially.

The phrase-level phenomena are as follows:

1. Opening of the final vowel in a phrase.
2. Elision of vowels between words.
3. Deletion of word final /n/ mid-phrase.

In addition, the meter of a phrase must be considered. There are a number of words that have either short or long forms, the choice being made to best fit the meter of the sentence.

6.1 The Pause Phrase

In Mbuko the phonological phrase is defined as a unit terminated by a pause and not containing a pause. Mid-sentence pauses occur normally at the end of noun, verb or prepositional phrases.

6.2 Final Vowel Lowering

The final vowel in a phrase is lowered, (see 4.1.5).

E.g.

Final:	/təman/	“sheep (sg.)”
Medial:	/təmən ahaj/	“sheep (pl.)”

The pause vowel rule precedes allophonic changes, thus permitting quite major changes to occur:

Final:	/bahaj/	[β⊕η⊕⊕]	“chief”
Medial:	/bahəj ahaj/	[β⊕η⊕⊕⊕⊕⊕]	“chiefs”
Final:	/mədəwer/	[μ↔δυωEρ]	“old”
Medial:	/mədəwər aan/	[μ↔δυρ⊕⊕N]	“old (state)”

6.3 Elision

When two vowels occur in sequence across a word boundary, the first of the two is normally deleted. The only exception is when a word final /e/ is followed by /a/, when there can be a short glide from one to the other.

E.g.:

/dəna ahaj/	[δ↔v⊕η⊕⊕]	“women”
/dɔ ahaj/	[l⊕η⊕⊕]	“men”
/zungo uno/	[ʒʊNɣʊv]	“my donkey”
/vədze anak/	[w↔δZ ^E ⊕v⊕κ]	“your monkey”

6.4 /n/ Deletion

Word final /n/ may be deleted when it occurs mid-phrase.

E.g.

/anga winen/	[⊕Nɣ⊕ωɪvEN]	“because of him”
/winen dʊk ^w en/	[ωɪvE_lʊκΩEN]	“he too”
/awan/	[⊕ω⊕N]	“thing”
/awan maw/	[⊕ω⊕μ⊕ω]	“what thing?”

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/man/	[μ⊕N]	“place”
/a man ata awan/	[⊕μ⊕τ⊕ω⊕ν]	“at that place”

In this last example we also see that the /n/ deletion precedes elision between *man* and *ata*. This can also be seen in the following example with *winen* ‘he’ and the progressive marker *apan* (see also chart in chapter 8).

/winen apan i naj/	[ωιν⊕πιναφ]	“he is coming (actually on his way)”
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7 Metrical Phonology

7.1 The Metrical System

Mbukko is a metrical language. Rhythmic stress is right-headed, and runs right to left. In other words, within a phrase the final syllable is stressed, and then every second or third syllable, counting from right to left, is stressed.

Feet are made up of two or three syllables, though three is preferred. Heavy (i.e. closed) syllables may count for two rhythmic pulses. It is the final syllable in a foot that is stressed.

Metrical stress is difficult to determine phonetically. It seems to be a rhythmic feature, with amplitude helping to distinguish the stressed syllable. Native speakers react to stress primarily on the basis of rhythm, though when asked to pick “stronger” syllables, they may also pick those containing an underlying /a/ vowel. Stress is not a feature of a word, and may occur on any syllable in different contexts.

In the following examples bold type denotes a stressed syllable. A hyphen denotes an open syllable extended to last for two rhythmic pulses.

Trisyllabic feet (preferred):

ʔám sē gùvùgò tá **ʔám** sē mbūkó

Disyllabic feet:

ʔám sē gùvùgò tá **ʔám** sē mbū-kó

“mouth of honest-man with mouth of Mbuko”

“A folk story in Mbuko”

Trisyllabic feet:

tēmān ā **kərtək** ā ná, à ngè**màj** àgàj **bāj**

“sheep certain one - this he returned home NEG”

“One particular sheep didn’t return home.”

Tā wá tā **wá**.

“They say, they say.” (opening of a folk tale)

In this example the same two words are repeated, but the stress is different in each case.

ā**ʔám** sē bā**náj** ā**láj**.

“water for wash hand”

Here the syllable ʔám lasts for two rhythmic pulses.

7.2 Epenthetic /a/

An epenthetic /a/ is sometimes inserted between words in order to keep the rhythm or give rhythm to a sentence:

kā ná**k** **dáw** or kā ná**k** a **dáw**

“Have you come?”

7.3 Schwa Replacement

Schwa deletion may not take place where this helps the rhythm:

mépè**r**èkè**v**èkè**v**è or mépè**r**èkè**v**èkè**v**è

“damsel fly”

7.4 Variable Length Morphemes

A number of grammatical markers have two forms of different lengths. The speaker chooses between the

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two in order to give a phrase the optimum rhythmic structure. The variable markers are as follows:

Short form	Long form	Gloss
ā	ānā	of
á	ānā	to
pá	āpá	on
ūpó	púnó	on me
āpák	pánák	on you
āpán	pánán	on him
-ó	ūnó	to me
-ák	ānák	to you
-án	ānán	to him
àhàj	ānāhāj	to here
àjāk	ānājāk	to there
sā, sāá	sāsá	in order to
ā	ānā	infinitive
āán	āwán	state marker

The variation between the two forms for ‘of’ can be seen in the following sentences:

á ?àm ānā bábà wà

“out of the mouth of the vulture”

á ?àm ā bábà (ā)tà ná (parentheses denote an elided vowel)

“out of the mouth of that vulture”

In order to preserve the trisyllabic meter of the sentences, the disyllabic form was used in the first example and the monosyllabic form in the second.

7.5 Verb Reduplication

One circumstance has also been noted where the meter causes partial reduplication of a verb root:

verb	sentence	gloss
/ʒəba/	kī ʒəbén ā ʒəbā	You (pl.) eat (potato) while eating (i.e. in a strange way).
/rəts/	kī rətsén ā rārāts	You (pl.) chew while chewing.
/pa/	kī pén ā pāpā	You eat while eating.
/tsa/	kī tsén ā tsātsā	You look while looking.

In the first example the disyllabic verb is not reduplicated, whereas in the other examples the monosyllabic verb undergoes reduplication. The result is that the meter of each sentence when spoken is very clear, with trisyllabic feet.

7.6 Predicting Metrical Changes

It is very difficult to describe the rules that govern these metrical changes. The above examples are ones with very clear meter, comparable perhaps to the meter of children’s nursery rhymes in English. In normal speech the meter is less clear, and the rules determining the variation of words must necessarily be complex. We shall just say that of all the different combinations of word variant and placement of metrical stress, the speaker chooses the one which is optimal for metrical rhythm.

8The Phonological Structure of Mbuko

From the features described in this and earlier sections we can now describe the complete structure of the phonology of Mbuko. The following description is based on the model of lexical phonology.

UNDERLYING FORM

1. Vowel Decay

MORPHOLOGY - application of morphemes to the root

2. Elision
3. Syllabification
4. Vowel Decay
5. Closed Syllable

SYNTAX - grouping of words into phrases

6. Division into pause phrases and feet
7. Pause Vowel
8. Contraction
9. Schwa Deletion
10. Syllabification
11. Prosodies
12. /n/ Deletion
13. Elision

14. Metrical Changes

SEGMENTAL LEVEL

15. Structure Preserving Rules
16. Non-structure Preserving Rules

SURFACE FORM

It will be noted that a number of processes take place after the application of phrase-level features. Because of this there are normally significant differences between the mid-phrase and phrase-final forms of a word. In particular the effect of prosodies cannot be determined until the position of the phrase pauses is known.

The allophonic realisations at the segmental level are divided into two groups, structure preserving and non-structure preserving. For example, in the first category, the phoneme /ə/ is realised as [ɪ] before /j/, and [ʊ] before /w/. /i/ and /u/ are also full phonemes, and Mbuko speakers react to the surface vowels as if they were these phonemes. These changes are significant for the design of the orthography. However, in the second category, the phoneme /h/ is realised as [χ] word finally. There is no phoneme /x/ and Mbuko speakers are not aware of the change in surface form.

Word List

Derivations:

	You (pl.) chew while chewing	Thing to eat (food)	I ate (thing)	He is eating peanuts	At this place
UF	ka ^Y rɛts-an ^Y a rɛts	waj sa pə	na pə waj	wanan ^Y apan a ^Y rɛts mbana	a man ana awan/aan
Vowel position	-	-	-	wanan ^Y apan a ^Y rɛts mbana	-
MORPHOLOGY	ka ^Y rɛtsan ^Y a rɛc	-	-	-	-
Elision	-	-	-	-	-
Syllabification	ka ^Y rɛ.tsan ^Y a rɛc	-	-	wa.nan ^Y a.pan a ^Y rats mba.na	a man a.na a.wan/a.an
Vowel position	ka ^Y rɛ.tsAn ^Y a rAc	wAj sa pə	na pə wAj	wanAn ^Y apAn a ^Y rAts mbanA	a mAn a.na a.wAn/aAn
Closed syllable	ka ^Y rɛ.tsən ^Y a rɛc	wəj sa pə	na pa wəj	wa.nən ^Y a.pən a ^Y rɛts mbanA	a mən a.na a.wən/a.An
SYNTAX					
Pause vowel	ka ^Y rɛ.tsAn ^Y , a rAc.	wəj sa pA	na pa wAj	-	a mən a.na a.wAn/a.An
Contraction	-	-	-	-	-
Schwa deletion	-	-	-	-	-
Syllabification	-	-	-	-	-
Prosodies	ki rɛ.tsɛn, a rac.	wəj sa pa	na pa waj	wi.nən a.pən i rɛts mba.na	a mən a.na a.wan/a.an
/n/ deletion	-	-	-	wi.nə a.pə i rɛts mbana	a mə a.na a.wan/a.an
Elision	-	-	-	wi.na.pi rɛts mba.na	a ma.na.wan/ma.n a.an
Metrical changes	ki rɛ.tsɛn, a ra.rac.	-	-	-	a ma.na.an (aan “beats” awan)
Segmental Level	ki rɛtsɛn a rarac	wəj sa pa	na pa waj	wina pi rɛts mbana	a man aan
WORD FEATURES					
Phoneme allophones	-	wij sa pa	na pa waj	-	-
Other allophones: SF	κi ρ↔τΣEN ⊕ ρ⊕ρ⊕τσ.	ωiφ σ⊕ π⊕	v⊕ πY ω⊕φ	ωiv⊕πi ρ↔τσ μβ ⊕v⊕	⊕μ⊕v⊕N