# 'Bëlï Phonology, Tone and Orthography
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## 0. Introduction

'Bëlï (Beli, Jur Beli, ethnologue code [blm]) is a Western, Central Sudanic, Nilo-Saharan language in the Bongo-Baka subgroup.   'Bëlï is related to Jur Modo, Bongo, Morokodo, Mo'da, Baka, and Nyamusa.   There are 65,000 speakers of 'Bëlï who mainly live in an area southeast of Rumbek in South Sudan (Lewis et al. 2013).   There are three dialects of 'Bëlï:   Wulu, Bahri Girinti, and Sopi (Persson 1997:31-32).   This paper describes phonological features of the Wulu dialect[1], with special emphasis on tone and how meaning distinguished by tone is marked in the orthography. The analysis is based on about 1100 words collected in grammar awareness workshops for 'Bëlï speakers in Juba, South Sudan in April 2012 and February 2013.   For a complete list of words, see the *'Bëlï Dictionary* (Gideon and Majok 2013).

Tone is of particular importance in 'Bëlï for distinguishing meaning.   Nearly 10% of words are in a tone minimal pair of the same word category, and nearly 20% of words are in a tone minimal pair regardless of word category.   Grammatical tone also has a high functional load in that common prepositions are in tone minimal pairs with body part nouns, and common relative clause connectors are in tone minimal pairs with demonstratives.   Rather than write surface tone in the orthography, the 'Bëlï community have chosen to represent the meaning distinguished by tone using four spelling rules involving doubled vowels, underlined vowels, hyphens and commas.   In this way, they are primarily marking grammatical category, rather than marking surface or underlying tone.

We first discuss consonant and vowel phonemes, showing contrastive pairs and their distribution in words.   We also discuss syllable structure and interpretation of ambiguous segments.   Then we discuss tone, showing the evidence for three underlying level tones from the number of tone melodies in the same syllable structures.   Then, we discuss the morphological alternations of [ATR] and tone in surrounding words and bound morphemes.   Finally, we list the orthography symbols chosen for each phoneme, and discuss the spelling rules for representing meaning distinguished by tone.

## 1. Consonants

The 28 consonant phonemes of table 1 are found in 'Bëlï.   Unlike the related language Jur Mödö (Persson and Persson 1991), Jur 'Bëlï has no fricatives phones [f], [v], [s], [z].

Table 1:   Consonant phonemes

|  | Labial | Dental | Palatal | Velar | Labiovelar | Glottal |
|---|---|---|---|---|---|---|
| Voiceless plosives | p | t̪ | c | k | k͡p |  |
| Voiced plosives | b | d̪ | ɟ | g | g͡b |  |
| Implosives | ɓ | ɗ | ʄ |  |  |  |
| Prenasalised plosives | ᵐb | ⁿd̪ | ⁿɟ | ᵑg | ᵑ͡ᵐg͡b |  |
| Nasals | m | n | ɲ | ŋ | ŋ͡m |  |
| Fricative |  |  |  |  |  | h |
| Approximants |  | ɾ, l | y |  | w |  |

The symbol /y/ is used for the palatal approximant instead of the IPA /j/ so as to be more easily seen in the data in contrast with /ɟ/.

### 1.1 Consonant distribution

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The data of (1) show that all 'Bëlï consonants can occur word-initially and intervocalically.   All words except *mùŋ͡màŋ͡gū* 'wrestling' are analyzed to be monomorphemic in that the words cannot be divided into two or more attested roots found in the data.   The phoneme *ŋg* is not yet found word-medially in roots.   There is one word found with word-final *ŋ*, that is *kìlēŋ* 'tree type'.

(1)

|  | Word-initial | | Intervocalic | |
|---|---|---|---|---|
| b | **b**íɲà | 'goat' | kà**b**í | 'rope' |
| ɓ | **ɓ**ìrù | 'bat' | hū**ɓ**ú | 'oil' |
| c | **c**ērē | 'star' | wɔ̄**c**ɔ́ | 'wolf' |
| ḍ | **ḍ**àlá | 'stone' | kà**ḍ**à | 'day' |
| ɗ | **ɗ**ú | 'food' | kì**ɗ**ì | 'elephant' |
| g | **g**ɔ̀mʊ́ | 'man' | mé**g**í | 'work' |
| g͡b | **g͡b**áⁿḍà | 'cassava' | hé**g͡b**ɛ́ | 'rat' |
| h | **h**íɲà | 'gun' | ⁿg**íh**í | 'fish' |
| ɉ | **ɉ**ètèyì | 'hyena' | cè**ɉ**è | 'honey' |
| ʄ | **ʄ**à | 'wife' | kù**ʄ**ù | 'water well' |
| k | **k**àbí | 'rope' | ɓɔ́**k**ɔ̀ | 'bush rat' |
| k͡p | **k͡p**à | 'mouth' | ŋ͡mg͡bɛ̄**k͡p**ɛ́ | 'heart' |
| l | **l**ɛ́ⁿḍʊ̀ | 'brother' | bì**l**à | 'horn' |
| m | **m**ɜ̀kù | 'owl' | gɔ̀**m**ʊ́ | 'man' |
| ᵐb | **ᵐb**ágà | 'basket' | mɔ̀**ᵐb**ù | 'corpse' |
| n | **n**ɔ̀kɔ̀ | 'uncle' | ɓɔ̄**n**í | 'owner' |
| ⁿḍ | **ⁿḍ**ūmá | 'grass' | lɛ́**ⁿḍ**ʊ̀ | 'brother' |
| ⁿg | **ⁿg**ɔ̀lɔ̀ | 'hill' | kà**ⁿg**à | 'ostrich' |
| ᶮɉ | **ᶮɉ**ɔlɔ | 'frog' | kɔ́**ᶮɉ**ò | 'drum' |
| ɲ | **ɲ**áká | 'field' | bí**ɲ**à | 'goat' |
| ŋ | **ŋ**érɛ̀ | 'chief' | gʊ́**ŋ**à | 'axe' |
| ŋ͡mg͡b | **ŋ͡mg͡b**àlá | 'arm' | kɔ́**ŋ͡mg͡b**ó | 'canoe' |
| ŋ͡m | **ŋ͡m**à | 'termite' | mù**ŋ͡m**àŋ͡gū | 'fighting (vn)' |
| p | **p**àdʊ̀ | 'fire' | ɲīp**ɔ**́ɗɔ́ | 'frog' |
| r | **r**ɛ̀mɛ̀ | 'squirrel' | cē**r**ē | 'star' |
| ṭ | **ṭ**ʊ́g͡bɛ́ | 'gourd' | kí**ṭ**ɔ̀ | 'nut tree' |
| w | **w**ɔ̄cɔ́ | 'wolf' | lù**w**ā | 'woman' |
| y | **y**īṭí | 'young man' | kɔ́**y**ɔ̀ | 'bean' |

## 1.2 Consonant contrasts

The contrastive pairs of consonants in (2) show that each of the consonants are phonemes.

(2)

| | | | | | |
|---|---|---|---|---|---|
| p - b | **p**î | 'send' | **b**î | 'smoke (meat)' |
| b - ɓ | **b**ɔ̂ | 'get engaged' | **ɓ**ɔ̂ | 'beat (rug)' |
| b - ᵐb | **b**àlà | 'bull' | **ᵐb**àlà | 'song' |
| b - m | **b**íɲà | 'goat' | **m**ìɲà | 'complaint' |
| ᵐb - m | **ᵐb**à | 'wine' | **m**à | 'mother' |
| b - w | **b**álì | 'friend' | **w**àlì | 'crime' |
| m - w | **m**ɔ̂ | 'be alive' | **w**ɔ̂ | 'be far, long' |
| ṭ - ḍ | **ṭ**á | 'meet' | **ḍ**á | 'tie' |
| ḍ - ɗ | **ḍ**ī | 'sink' | **ɗ**ĭ | 'arrive' |
| ḍ - ⁿḍ | **ḍ**â | 'hide' | **ⁿḍ**â | 'beat' |
| ḍ - n | **ḍ**á | 'tie' | **n**á | 'produce (fruit)' |
| ⁿḍ - n | **ⁿḍ**ā | 'that' | **n**ā | 'this' |
| ḍ - r | **ḍ**ú | 'cry' | **r**ú | 'sew (clothes)' |
| ḍ - l | **ḍ**ʊ́ | 'chase' | **l**ū | 'narrate' |
| n - r | **n**á | 'stretch' | **r**á | 'smear' |

| | | | | |
|---|---|---|---|---|
| **n - l** | n ̂ | 'make, do' | l ̂ | 'wear' |
| **ɾ - l** | ɾ ̂ | 'mix' | l ̂ | 'call, name' |
| **c - ɟ** | cá | 'peck, grab' | ɟá | 'tear (v)' |
| **ɟ - ʄ** | ɟɔ̀lɔ̀ | 'dress (n)' | ʄɔ́lɔ́ | 'gazelle type' |
| **ɟ - ⁿɟ** | ɟɔ̀lɔ̀ | 'dress (n)' | ⁿɟɔ̀lɔ̀ | 'frog' |
| **ɟ - ɲ** | ɟɔ̄kɔ̀ | 'baby carrier' | ɲɔ́k͡pɔ́ | 'tree type' |
| **ⁿɟ - ɲ** | ⁿɟārà | 'ant' | ɲáká | 'farm (n)' |
| **ɟ - y** | ɟɛ̀ | 'we' | yɛ̀ | 'you (pl)' |
| **ɲ - y** | ɲē | 'be bad' | yê | 'awake' |
| **k - g** | kùtù | 'comb handle' | gútú | 'tree' |
| **g - ⁿg** | gʋ̀ | 'hole' | ⁿgʋ́ | 'body' |
| **g - ŋ** | gâ | 'bite' | ŋâ | 'take' |
| **ⁿg - ŋ** | ⁿgíhí | 'fish' | ŋíhí | 'moon' |
| **k͡p - g͡b** | k͡pâ | 'throw' | g͡bâ | 'pay' |
| **g͡b - ŋ͡mg͡b** | g͡báⁿḍà | 'cassava' | ŋ͡mg͡bāⁿḍà | 'whip' |
| **g͡b - ŋ͡m** | g͡bâ | 'pay' | ŋ͡má | 'roast' |
| **ŋ͡mg͡b – ŋ͡m** | ŋ͡mg͡bà | 'guest' | ŋ͡mà | 'termite' |
| **g͡b - w** | g͡bâ | 'scratch' | wâ | 'know' |
| **ŋ͡m - w** | ŋ͡má | 'roast' | wâ | 'know' |
| **p - k͡p** | pà | 'open area' | k͡pà | 'mouth' |
| **k - k͡p** | kî | 'watch, guard' | k͡pí | 'help (v)' |
| **b - g͡b** | bɛ́ | 'want' | g͡bɛ̂ | 'marry' |
| **g - g͡b** | gâ | 'bite' | g͡bâ | 'pay' |
| **ŋ - ŋ͡mg͡b** | ŋíṭì | 'cat' | ŋ͡mg͡bìlí | 'ankle braclet' |
| **ŋ - ŋ͡m** | ŋá | 'praise' | ŋ͡má | 'roast' |
| **m - ŋ͡m** | mà | 'mother' | ŋ͡mà | 'termite' |
| **m - n** | mɛ̄ | 'wrap' | nɛ́ | 'finish' |
| **n - ɲ** | mīní | 'water' | ṭíɲì | 'curse' |
| **n - ŋ** | ná | 'stretch' | ŋá | 'praise' |
| **ɲ - ŋ** | kɔ̀ɲɔ̀ | 'foot' | kɔ́ŋɔ́ | 'fly (n)' |

In 'Bëlï, there are no consonant sequences and there is no contrastive consonant length.

## 2. Vowels

There are nine 'Bëlï vowel phonemes that can be divided into [+/- ATR] sets. The [-ATR] phoneme /a/ becomes [ə] in words with [+ ATR] vowels. The allophone [ə] does not occur in roots without other [+ ATR] vowels.

Table 2:    Vowel phonemes

| | [-ATR] | | [+ ATR] | |
|---|---|---|---|---|
| High | ɪ | ʋ | i | u |
| Non-high | ɛ | ɔ | e | o |
| | | a | | (ə) |

### 2.1 Vowel distribution in word positions

All vowels can occur in word-medial and word-final position.

(3)    **i**   | ḍílì    'shadow'
       **ɪ**   | mīní    'water'
       **e**   | cēɾē    'star'
       **ɛ**   | bɛ́lɛ́    'stick'
       **a**   | bàlà    'bull'
       **u**   | búṭú    'hill'
       **ʋ**   | ṭʋ́ɾʋ́    'water hog'

| o | ɓō̄ŋó | 'wound' |
| ɔ | ɓɔ́kɔ̀ | 'bush rat' |

In addition, there are several words that begin with /a/, some of which are monomorphemic, such as **àkācā** 'donkey'.   There is one word that consists only of the vowel /ʊ/, that is **ʊ̂** 'no'; and one word that consists only of the vowel /ɔ/, that is **ɔ̂** 'yes'.   Otherwise, vowels only occur word-initially in borrowed words such as **ugə** 'container (from Arabic)'.

2.2 Vowel contrasts

The contrastive pairs of vowels in (4) show that each of the vowels are phonemes.

| (4) | **i - ɪ** | kî | 'beat' | kî̤ | 'guard, watch' |
| | **i - e** | pí | 'push' | pé | 'penetrate' |
| | **ɪ - e** | lí | 'lock' | lé | 'soar' |
| | **ɪ - ɛ** | gì | 'your (sg)' | gɛ̀ | 'your (pl)' |
| | **e - ɛ** | hé | 'return, open' | hɛ́ | 'break' |
| | **e - a** | né | 'throw' | ná | 'stretch' |
| | **ɛ - a** | nɛ́ | 'finish' | ná | 'produce fruit' |
| | **u - ʊ** | d̪ú | 'cry, want' | d̪ṳ́ | 'chase' |
| | **u - o** | d̪ú | 'cry, want' | d̪ó | 'kill, beat' |
| | **ʊ - o** | t̪ṳ̂ | 'smell' | t̪ô | 'press' |
| | **ʊ - ɔ** | d̪ṳ́ | 'chase' | d̪ɔ́ | 'lay down' |
| | **o - ɔ** | ɓò | 'egg' | ɓɔ̀ | 'foot print' |
| | **o - a** | ɡ͡bô | 'wash' | ɡ͡bâ | 'pay' |
| | **ɔ - a** | hɔ̀ | 'nose' | hà | 'cow' |

2.3 Vowel distribution in two adjacent syllables

Vowels in two adjacent syllables of roots are only ever of the same vowel quality—either both [-ATR] or both [+ATR].   In addition, it is rare for non-high vowels to co-occur with other non-high vowels in the same word, unless they are the same vowel.   The few words attested with two different adjacent non-high vowels are analyzed to be bimorphemic.   High vowels in both [-ATR] and [+ATR] sets co-occur with all vowels of the same [ATR] set, in either order of the vowel pair.   In (5), an x indicates an attested root with the vowel pair.   An (x) in parentheses indicates the vowel pair is only found in words with more than one morpheme.   And a dash indicates the vowel pair has not yet been attested in adjacent syllables of any word.

(5)

[-ATR] vowel pairs

| | a | ɔ | ɛ | ʊ | ɪ |
|---|---|---|---|---|---|
| a | x | (x) | (x) | x | x |
| ɔ | (x) | x | (x) | x | x |
| ɛ | - | (x) | x | x | x |
| ʊ | x | x | x | x | x |
| ɪ | x | x | x | x | x |

[+ATR] vowel pairs

| | a | o | e | u | i |
|---|---|---|---|---|---|
| a | - | (x) | (x) | x | x |
| o | - | x | (x) | x | x |
| e | (x) | - | x | x | x |
| u | x | x | x | x | x |
| i | x | x | x | x | x |

(6)

| [-ATR] | | | | [+ATR] | | |
|---|---|---|---|---|---|---|
| **a, a** | bàlà | 'bull' | | **ə, ə** | ----- | |
| **a, ɔ** | (cád̪ɔ̀) | 'care for (lit. put on)' | | **a, o** | (mə̀ŋó) | 'woman (lit. mother of girl)' |
| **a, ɛ** | (nát̪ɛ́) | 'when (lit. that which)' | | **a, e** | (mə̀k͡péɾī) | 'instrument (lit. mother of tree)' |
| **a, ʊ** | pàd̪ʊ̀ | 'fire' | | **a, u** | mə̀kù | 'owl' |
| **a, ɪ** | bálì | 'friend' | | **a, i** | kə́t̪ì | 'suddenly (adv)' |
| **ɔ, a** | (gɔ̄d̪á) | 'wait (lit. continue to tie)' | | **o, a** | ----- | |
| **ɔ, ɔ** | ɓɔ́kɔ̀ | 'bush rat' | | **o, o** | ɓō̄ŋó | 'wound' |
| **ɔ, ɛ** | (d̪ɔ̀ɓɛ̄) | 'village (lit. head house)' | | **o, e** | (bó̤ŋē) | 'bad (lit. that is bad)' |
| **ɔ, ʊ** | gɔ̀mʊ́ | 'man' | | **o, u** | rò̤ɟū | 'flour' |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ɔ, ɪ | pɔ́lɪ́ | 'skin (n)' | | o, i | ɓórí | 'bush' | |
| ɛ, a | ----- | | | e, a | (fɛ́nɔ̄) | 'today (lit. this is burned)' | |
| ɛ, ɔ | (lɛ́dɔ̀) | 'start (lit. dig head)' | | e, o | ----- | | |
| ɛ, ɛ | bɛ́lɛ́ | 'stick' | | e, e | cɛ̄rɛ̄ | 'star' | |
| ɛ, ʊ | ŋɛ́lū | 'flash (v)' | | e, u | cémū | 'think' | |
| ɛ, ɪ | t̪ɛ̀rɪ́ | 'argue' | | e, i | mɛ́rì | 'hippo' | |
| ʊ, a | gʊ́ŋà | 'axe' | | u, a | múnɔ̀ | 'old wine' | |
| ʊ, ɔ | kʊ̀wɔ̀ | 'long thing' | | u, o | gūmó | 'blood' | |
| ʊ, ɛ | gʊ́bɛ̀ | 'be strong' | | u, e | t̪ùrè | 'dust' | |
| ʊ, ʊ | t̪ʊ́rʊ́ | 'water hog' | | u, u | bút̪ú | 'hill' | |
| ʊ, ɪ | mʊ́nɪ́ | 'duck (n)' | | u, i | púlí | 'cooking stone' | |
| ɪ, a | bɪ̀là | 'horn' | | i, a | d̪ìɲɔ̄ | 'among (prep)' | |
| ɪ, ɔ | kɪ́t̪ɔ̀ | 'shea nut tree' | | i, o | líɓò | 'beehive' | |
| ɪ, ɛ | d̪ɪ́kɛ̀ | 'cup' | | i, e | hìɲè | 'scorpion' | |
| ɪ, ʊ | d̪ɪ̀lʊ̀ | 'dikdik' | | i, u | ɓìrù | 'bat' | |
| ɪ, ɪ | mɪ̄nɪ́ | 'water' | | i, i | d̪ílì | 'shadow' | |

So, there is the vowel height constraint of (7) that disallows the following pairs in roots (monomorphemic words): (a,ɔ), (a,ɛ), (ɔ,a), (ɔ,ɛ), (ɛ,a), (ɛ,ɔ), (a,o), (a,e), (o,a), (o,e), (e,a), (e,o).

(7)    Vowel height constraint
       Two non-equivalent non-high vowels are not allowed in adjacent syllables of roots.

In 'Bëlï, there are no vowel sequences and there is no contrastive vowel length.

## 3. Syllable structure

Nearly every syllable of every 'Bëlï word is CV.   The majority of monomorphemic nouns are disyllabic (CVCV), whereas the majority of verbs are monosyllabic (CV).   Although not nearly as numerous, there are also monosyllabic (CV) nouns and disyllabic (CVCV) verbs.   As previously noted, there are several words beginning with /a/, and two words with a single vowel.   These have the rare syllable V.   There is one word found with word-final CVC syllable, **kìlēŋ** 'tree type'.

(8)    Syllable types
       **V (rare)**      ɔ̂      'yes'
       **CV**            d̪ɔ̀     'head'

The rare syllable V is only possible word-initially.   The CV syllable is common in any position of two and three-syllable words.   Three-syllable words are not as common as one and two-syllable words.   Four-syllable words are rare.   Many three-syllable words and all four-syllable words are analyzed as poly-morphemic.

(9)    Syllable structures in words
       **V.CV (rare)**           álà          'who (qu)'
       **CV.CV**                 bàlà         'bull'
       **V.CVCV (rare)**         àkācā        'donkey'
       **CV.CV.CV**              t̪ìmàrà       'crocodile'
       **V.CV.CV.CV (rare)**     àpàràgá      'youth'

Ambiguous consonants are all analyzed as single units rather than as consonant sequences for the following reasons.   The labial-velars /k͡p/, /g͡b/, /ŋ͡m/ and prenasalized plosives /ᵐb/, /ⁿd̪/, /ᶮɟ/, /ⁿg/, /ⁿgb/ all occur word-initially, as well as intervocalically, as do all unambiguous consonants.   There are no unambiguous complex consonant onsets (*CCV) nor unambiguous word-medial consonant sequences (*VC.CV).   When analyzed as single units, ambiguous consonants fill the C slot in the CV syllable type, and there is no need for an analysis with additional syllable types.

(10)

|  | CVCV |  | CVCV |  |
|---|---|---|---|---|
| g͡b | g͡báⁿdà | 'cassava' | hég͡bé | 'rat' |
| ⁿd̥ | ⁿd̥ūmá | 'grass' | léⁿd̥ù | 'brother' |

Ambiguous high vowels /i/, /ɪ/, /u/, /ʊ/ are analyzed as vowels, rather than as glides or in a vowel sequence.   There are no unambiguous vowel sequences (CVV), and no unambiguous non-word-initial V syllables (CV.V).   High vowels are never adjacent to another vowel, but only adjacent to consonants.   So, they always fill the V slot in the CV syllable type.

(11)

| CVCV /ʊ/, /ɪ/ |  | CVCV /u/, /i/ |  |
|---|---|---|---|
| mʊ́nɪ́ | 'duck (n)' | púlí | 'cooking stone' |
| d̥ɪ̀lʊ̀ | 'dikdik' | ɓìɾù | 'bat' |

Ambiguous approximants /y/, /w/ are analyzed as consonants, rather than as vowel glides, labialization, or palatalization.   Approximants are never adjacent to consonants and never occur word-finally, but are always word-initial or intervocalic.   So, they always fill the C slot in the CV syllable type.

(12)

|  | CVCV |  | CVCV |  |
|---|---|---|---|---|
| w | wɔ́cɔ́ | 'wolf' | wɔ̀wɔ̀ | 'shelter' |
| y | yàŋà | 'removed foreskin' | kɔ́yɔ̀ | 'bean' |

## 4. Tone

The related language of Jur Modo is analyzed to have 2 underlying level tones (Persson and Persson 1991).   In contrast, 'Bëlï has three underlying level tones, evidenced by the number of tone melodies with the same syllable structure.   Contour tone consists of more than one level tone on the same syllable.   The syllable is the tone bearing unit.

### 4.1 Tone melodies

Noun tone melodies are represented by the nouns in isolation of (13).   The number of monomorphemic nouns with the tone melody in each syllable structure is given[2].   The number of melodies in CV and CVCV syllable structure is evidence of a system with three underlying level tones.   If there were only two underlying level tones, there would be no more than four contrastive tone melodies in any one word syllable structure.   Although not all tone melodies of noun syllable structures have a significant number of nouns, there are at least 12 nouns in five different melodies of CVCV nouns.   Since there is no reason to analyze any of these nouns as having more than one morpheme, it would be difficult to analyze them as having only two underlying level tones.

(13)   Noun Tone Melodies (in isolation)

|  | CV |  |  | CVCV[3] |  |  | (C)VCVCV |  |  |
|---|---|---|---|---|---|---|---|---|---|
| H | 17 | d̥á | 'meat' | 46 | ɲɔ́ɾɔ́ | 'poison' | 3 | kúɾúɓú | 'dove' |
| M |  |  |  | 5 | cērē | 'star' |  |  |  |
| L | 25 | ɦà | 'cow' | 63 | ᵐbàlà | 'song' | 12 | càmàⁿɟà | 'comb' |
| HL | 3 | bî | 'dog' | 39 | g͡báⁿdà | 'cassava' | 2 | kílíyà | 'stick' |
| MH | 4 | pǐ | 'bamboo' | 30 | ᵐbāyá | 'wing' |  |  |  |
| LM | 2 | dǎ | 'grandparent' | 5 | ròɟū | 'flour' | 5 | g͡bòⁿd̥ōŋī | 'cockroach' |
| LH |  |  |  | 12 | kàbí | 'rope' |  |  |  |

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[2]   There are CVCV and CVCVCV nouns with various tone melodies that are not monomorphemic, and which are not included in the number of nouns indicated by the table.
[3]   In addition to the data listed in the table, there is one CVCV noun with HM tone **máɲā** 'sorghum type'.

In (14), verb tone melodies are represented by the verbs in command form, which can be said in isolation.    The number of monomorphemic verbs with the tone melody in each syllable structure is given.    Verbs with HL tone in isolation are analyzed to have Low underlying tone.    As discussed in the section on tone morphophonology, the verb-initial High tone is not present when a Low tone prefix is attached (*à-cà* 'he put', *à-ṱ̀ə̀mì* 'he disturbed').    The number of melodies in CVCV syllable structure is evidence of a system with three underlying level tones.

(14)    Verb Tone Melodies; command form (in isolation)

|        | CV |     |           | CVCV |      |                       |
|--------|----|-----|-----------|------|------|-----------------------|
| **H**     | 82 | ḍá  | 'tie'     |      |      |                       |
| **M**     | 17 | cū  | 'build'   | 3    | ṱēgē | 'hear, listen'        |
| **L [HL]** | 73 | câ  | 'put'     | 10   | ṱə́mî | 'disturb'            |
| **HM**    |    |     |           | 4    | kélē | 'choose'              |
| **ML**    |    |     |           | 3    | lūḍɔ̀ | 'surround'           |
| **MH**    |    |     |           | 17   | cīkí | 'accuse'              |
| **LH**    |    |     |           | 2    | ṱèrí | 'be against, argue'   |

It seems odds that there are no attested monomorphemic disyllabic verbs with High tone, and the reader may wonder if one of the other tone melodies of disyllabic verbs has underlying High tone. However, as seen from section 6 on tone morphophonology, the disyllabic verbs listed in (14) do not alternate substantially according to the tone of surrounding words or prefixes, with the exception of verbs with HL tone melody in isolation.    Thus, verbs are analyzed to have the same underlying tone as the surface tone in isolation, with the exception of HL verbs which have underlying Low tone.

4.2 Tone minimal pairs of same word category

We now list the tone minimal pairs of words–first the pairs of the same word category and then the pairs in different word categories.    Surprisingly, there are no minimal triplets such as H, M, L or L, LM, LH that support the claim of three underlying level tones.    This may indicate that the language is still in the process of changing from a 2-tone system to a 3-tone system or vice versa.

9.7% of words (109 of 1120) are in a tone minimal pair of the same word category.    3.5% of nouns (17 of 486) are in a tone minimal pair with another noun.    All attested noun minimal pairs are listed in (15) according to tone contrasts.    Half are pairs consisting of a noun with level tone and a noun with contour tone.

(15)    Tone minimal pairs in nouns

|           |       |                |       |                |
|-----------|-------|----------------|-------|----------------|
| **H-L**   | g͡bé   | 'marriage'     | g͡bè   | 'child, son'   |
|           | ᵐbá   | 'breast'       | ᵐbà   | 'wine'         |
| **M-L**   | hūrū  | 'flower'       | hùrù  | 'liver'        |
| **L-HL**  | bì    | 'hair'         | bî    | 'dog'          |
|           | pɔ̀lì  | 'cloud'        | pólì  | 'skin'         |
| **H-LM**  | ḍá    | 'meat'         | ḍǎ    | 'grandparent'  |
| **L-HM**  | màɲà  | 'gazelle'      | máɲā  | 'sorghum type' |
| **L-LM**  | bì    | 'hair'         | bǐ    | 'place'        |
| **HL-MH** | kɔ́kɔ̀ | 'circling wind'| kɔ̄kɔ́ | 'maize stock'  |
| **LM-HL** | bǐ    | 'place'        | bî    | 'dog'          |

21.3% of verbs (82 of 384) are in a tone minimal pair with another verb.    All attested verb minimal pairs are listed in (16) according to tone contrasts.    The vast majority consist of a verb with level tone and a verb with contour tone.

(16)    Tone minimal pairs in verbs

|          |     |                      |     |                  |
|----------|-----|----------------------|-----|------------------|
| **H-M**  | cú  | 'drop, fall, attack' | cū  | 'build'          |
|          | ḍí  | 'be cold'            | ḍī  | 'sink, drown'    |
|          | hí  | 'red'                | hī  | 'narrow, advise' |

|        |       |                            |        |       |                            |
|--------|-------|----------------------------|--------|-------|----------------------------|
|        | ɟá    | 'tear'                     |        | ɟā    | 'light'                    |
|        | lí    | 'lock, untie, mix'         |        | lī    | 'supervise'                |
|        | lɔ́    | 'say'                      |        | lɔ̄    | 'collect'                  |
|        | pé    | 'penetrate'                |        | pē    | 'read, count'              |
|        | yɛ́    | 'drink'                    |        | yɛ̄    | 'stretch'                  |
| **H-[HL]** | ɓá | 'loose, make pot'          |        | ɓâ    | 'turn'                     |
|        | ɓí    | 'be quiet'                 |        | ɓî    | 'sing'                     |
|        | ɓɛ́    | 'follow, walk'             |        | ɓɛ̂    | 'shoot'                    |
|        | cá    | 'peck'                     |        | câ    | 'put'                      |
|        | cú    | 'drop, fall, attack'       |        | cû    | 'be full'                  |
|        | ḍá    | 'tie'                      |        | ḍâ    | 'hide'                     |
|        | ḍú    | 'chase'                    |        | ḍû    | 'arrive'                   |
|        | ɗú    | 'sleep, lie'               |        | ɗũ̂    | 'like, be'                 |
|        | ɗú    | 'pound'                    |        | ɗû    | 'throw, follow, plant'     |
|        | g͡bó   | 'laugh'                    |        | g͡bô   | 'wash'                     |
|        | há    | 'build, sift, penetrate'   |        | hâ    | 'push'                     |
|        | hɔ́    | 'enter'                    |        | hɔ̂    | 'fish, catch'              |
|        | ɟí    | 'wipe, plane'              |        | ɟî    | 'milk, pull up'            |
|        | ɟɔ́    | 'say, tell'                |        | ɟɔ̂    | 'compare'                  |
|        | ʄá    | 'run'                      |        | ʄâ    | 'see, find'                |
|        | k͡pá   | 'swim'                     |        | k͡pâ   | 'throw, scatter, be sick'  |
|        | lá    | 'hold, arrest'             |        | lâ    | 'crawl (like vine)'        |
|        | lɛ́    | 'dig'                      |        | lɛ̂    | 'be good'                  |
|        | lí    | 'lock, untie, mix'         |        | lî    | 'swallow'                  |
|        | lɔ́    | 'say'                      |        | lɔ̂    | 'wear, release'            |
|        | mɔ́    | 'be pregnant'              |        | mɔ̂    | 'be alive, save'           |
|        | ⁿḍá   | 'is not'                   |        | ⁿḍâ   | 'beat'                     |
|        | ŋá    | 'praise'                   |        | ŋâ    | 'take, marry'              |
|        | ŋ͡mí   | 'be white'                 |        | ŋ͡mî   | 'be sweet'                 |
|        | pí    | 'push'                     |        | pî    | 'send'                     |
|        | pɔ́    | 'light'                    |        | pɔ̂    | 'go another direction'     |
|        | rá    | 'smear, amaze'             |        | râ    | 'make ladder'              |
|        | rú    | 'sew, roar, burn'          |        | rû    | 'delay'                    |
|        | ṭó    | 'follow, escort'           |        | ṭô    | 'press'                    |
|        | wɔ́    | 'remove'                   |        | wɔ̂    | 'be far, long'             |
|        | yá    | 'harvest, hate'            |        | yâ    | 'skin'                     |
|        | yɛ́    | 'drink'                    |        | yɛ̂    | 'play'                     |
| **M-[HL]** | cū | 'build'                    |        | cû    | 'be full'                  |
|        | kū    | 'cover'                    |        | kû    | 'climb'                    |
|        | lī    | 'supervise'                |        | lî    | 'swallow'                  |
|        | lɔ̄    | 'collect'                  |        | lɔ̂    | 'wear, release'            |
|        | ᵐbā   | 'leave'                    |        | ᵐbâ   | 'squeeze'                  |
|        | yɛ̄    | 'stretch'                  |        | yɛ̂    | 'play'                     |
| **[HL]-MH** | kɔ́kɔ̀ | 'hatch'                 |        | kɔ̄kɔ́ | 'lead'                     |

Pronoun and adverb tone minimal pairs are listed in (17-18).

(17)  <u>Tone minimal pairs in pronouns</u>

| **H-L** | má | 'I (subj)'       | mà | 'me (obj), my'   |
|---------|----|------------------|----|------------------|
|         | yí | 'you (subj sg)'  | yì | 'you (obj sg)'   |
| **H-HL**| mú | 'I (perf.)'      | mû | 'his, her'       |

(18)  <u>Tone minimal pairs in adverbs</u>

| **H-L**  | ní   | 'be, have' | nì   | 'there is'      |
|----------|------|------------|------|-----------------|
| **L-ML** | k͡pɛ̀ | 'really'   | k͡pɛ̀ | 'long, forever' |

72.5% (45/62) of minimal pairs in the same word category involve a contrast of level tone with contour tone.   Because this percentage is so high, an orthographic spelling rule using doubled vowels to represent contour tone is an effective way to distinguish many of these minimal pairs in writing.   This and other spelling rules are discussed in section 8.

4.3 <u>Tone minimal pairs of different word categories</u>

19.7% of words (221/1120) are in a tone minimal pair regardless of word category[4].   All attested tone minimal pairs of different word categories are listed in (19) according to tone contrasts.   The vast majority involved a verb.

(19)   <u>Tone minimal pairs of different word category</u>

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **H-L** | ɓɛ́ | 'follow, walk'' | v | ɓɛ̀ | 'house' | n | |
| | ɓɔ́ | 'beat' | v | ɓɔ̀ | 'footprint' | n | |
| | ɖɔ́ | 'lay down, buy' | v | ɖɔ̀ | 'head' | n | |
| | há | 'build, sift, penetrate' | v | hà | 'cow' | n | |
| | hɔ́ | 'enter' | v | hɔ̀ | 'nose, chaff' | n | |
| | ɟá | 'run' | v | ɟà | 'wife' | n | |
| | k͡pá | 'swim' | v | k͡pà | 'mouth, language' | n | |
| | ⁿɟá | 'leave' | v | ⁿɟà | 'junction' | n | |
| | ŋmá | 'roast, burn' | v | ŋmà | 'termite' | n | |
| | rú | 'cover, hide, respect' | v | rù | 'back' | n | |
| | ɟɛ́ | 'arrange' | v | ɟɛ̀ | 'we, us' | pron | |
| | nɛ́ | 'finish' | v | nɛ̀ | 'he, she, her, him | pron | |
| | yɛ́ | 'drink' | v | yɛ̀ | 'you (pl)' | pron | |
| | ɓɔ́ | 'beat' | v | ɓɔ̀ | 'because' | con | |
| | ká | 'be, continue' | v | kà | 'and, then' | con | |
| | k͡pɛ́ | 'dance' | v | k͡pɛ̀ | 'really' | adv | |
| | ṭɛ́ | 'sacrifice, remain' | v | ṭɛ̀ | 'that' | dem | |
| | hɔ́ | 'enter' | v | hɔ̀ | 'four' | num | |
| | yá | 'harvest, hate' | v | yà | plural marker | particle | |
| | má | 'I (imperf.)' | pron | mà | 'mother' | n | |
| | ɓó | 'hungry' | adj | ɓò | 'egg, father' | n | |
| | ɖó | 'there is, exists' | adv | ɖò | 'thigh' | n | |
| | ŋ͡mgbá | 'then' | con | ŋ͡mgbà | 'guest, visitor' | n | |
| | kú | 'seed' | n | kù | 'and' | con | |
| | bú | 'who, which' | rel con | bù | 'big, important' | adj | |
| | bú | 'who, which' | rel con | bù | 'that' | dem | |
| | ṭɛ́ | 'who, which' | rel con | ṭɛ̀ | 'that' | dem | |
| | ní | 'be, have' | adv | nì | 'they' | pron | |
| | ní | 'with' | prep | nì | 'they' | pron | |
| | ní | 'with' | prep | nì | 'there is' | adv | |
| **H-M** | ᵐbá | 'breast' | n | ᵐbā | 'leave' | v | |
| | ɓɔ́ | 'beat' | v | ɓɔ̄ | 'for' | prep | |
| | ɖɔ́ | 'lay down, buy' | v | ɖɔ̄ | 'on, at' | prep | |
| | rú | 'cover, hide, respect' | v | rū | 'towards' | prep | |
| | ná | 'stretch, bare' | v | nā | 'before' | prep | |
| | ná | 'stretch, bare' | v | nā | 'this' | dem | |
| | ⁿɖá | 'is not' | v | ⁿɖā | 'that' | dem | |
| | ṭɔ́ | 'leave' | v | ṭɔ̄ | 'certain' | indef | |
| | ná | 'who, which' | rel con | nā | 'this' | dem | |
| | ná | 'who, which' | rel con | nā | 'before' | prep | |

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[4]  The percentage 19.3% includes words in a tone minimal pair of the same word category and words in a tone minimal pair of different word categories, but only counts each word once regardless of how many minimal pairs (triplets/quadrulplets) it is found in.   The percentage does not include words that are homonyms of words in a tone minimal pair, of which there is an additional significant number.

| | | | | | | |
|---|---|---|---|---|---|---|
| **H-[HL]** | ɓí | 'day' | n | ɓî | 'sing' | v |
| | ɗá | 'meat' | n | ɗâ | 'hide' | v |
| | ɗɔ́ | 'thing' | n | ɗɔ̂ | 'dig' | v |
| | ɗú | 'food, bread' | n | ɗû | 'throw, follow, plant' | v |
| | gú | 'arrow' | n | gû | 'write' | v |
| | g͡bɛ́ | 'marriage' | n | g͡bɛ̂ | 'marry' | v |
| | g͡bɔ́ | 'fence' | n | g͡bɔ̂ | 'gather' | v |
| | hú | 'buttock' | n | hû | 'grind' | v |
| | ɟí | 'people' | n | ɟî | 'milk, pull up' | v |
| | lɛ́ | 'big pot' | n | lɛ̂ | 'be good' | v |
| | mɔ́ | 'pregnant woman' | n | mɔ̂ | 'be alive, save' | v |
| | ᵐbá | 'breast' | n | ᵐbâ | 'squeeze' | v |
| | ᵑgú | 'body' | n | ᵑgû | 'pull down' | v |
| | rú | 'house, hut' | n | rû | 'delay' | v |
| | t̪ɔ́t̪ɔ́ | 'wood insect' | n | t̪ɔ́t̪ɔ̂ | 'be around' | v |
| | lí | 'lock, untie, mix' | v | lî | 'father's sister' | n |
| | ɓɔ́ | 'beat' | v | ɓɔ̂ | 'ready' | adv |
| | ɟá | 'run' | v | ɟâ | 'later' | adv |
| | ɗó | 'there is, exists' | adv | ɗô | 'lay down' | v |
| | má | 'I (imperf.)' | pron | mâ | 'go, visit' | v |
| | rá | 'it' | pron | râ | 'make ladder' | v |
| | lɛ́ | 'dig' | v | lɛ̂ | 'our' | pron |
| | ᵑgú | 'at' | prep | ᵑgû | 'pull down' | v |
| | lɛ́ | 'big pot' | n | lɛ̂ | 'our' | pron |
| | búnɔ́ | 'fat' | adj | búnɔ̂ | 'so that, in order to' | con |
| **H-ML** | k͡pɛ́ | 'dance' | v | k͡pɛ̀ | 'long, forever' | adv |
| **H-MH** | yí | 'come' | v | yǐ | 'snake' | n |
| | t̪á | 'meet' | v | t̪ǎ | 'there' | adv |
| **H-LM** | ɗ̪á | 'tie' | v | ɗ̪ǎ | 'grandparent' | n |
| **M-L** | ᵐbā | 'leave' | v | ᵐbà | 'wine' | n |
| | yē | 'stretch' | v | yè | 'you (pl)' | pron |
| | ɓɔ̄ | 'for' | prep | ɓɔ̀ | 'footprint' | n |
| | ɗ̪ɔ̄ | 'on, at' | prep | ɗ̪ɔ̀ | 'head' | n |
| | kɔ̄ | 'into' | prep | kɔ̀ | 'eye' | n |
| | rū | 'towards' | prep | rù | 'back' | n |
| | ɓɔ̄ | 'for' | prep | ɓɔ̀ | 'because' | con |
| **M-[HL]** | lī | 'supervise' | v | lî | 'father's sister' | n |
| | mē | 'wrap' | v | mê | 'their' | pron |
| | gā | 'to' | prep | gâ | 'bite, cut' | v |
| | kɔ̄ | 'into' | prep | kɔ̂ | 'break, search, weave' | v |
| | ɓɔ̄ | 'for' | prep | ɓɔ̂ | 'ready' | adv |
| **M-[HL]** | ⁿɗ̪ā | 'that' | dem | ⁿɗ̪â | 'beat' | v |
| **M-MH** | mē | 'wrap' | v | mɛ̌ | 'spear' | n |
| **L-[HL]** | bì | 'hair' | n | bî | 'smoke' | v |
| | ɓè | 'home' | n | ɓê | 'shoots' | v |
| | ɗò | 'thigh' | n | ɗô | 'lay down' | v |
| | g͡bè | 'child, son' | n | g͡bê | 'marry' | v |
| | hà | 'cow' | n | hâ | 'push' | v |
| | hɔ̀ | 'nose, chaff' | n | hɔ̂ | 'fish, catch' | v |
| **L-[HL]** | ɟà | 'wife' | n | ɟâ | 'see, find' | v |
| | kɔ̀ | 'eye' | n | kɔ̂ | 'break, search, weave' | v |
| | k͡pà | 'mouth, language' | n | k͡pâ | 'throw, scatter, be sick' | v |
| | ᵐbà | 'wine' | n | ᵐbâ | 'squeeze' | v |
| | yò | 'death' | n | yô | 'die' | v |
| | mà | 'me, my' | pron | mâ | 'go, visit' | v |
| | yè | 'you (pl)' | pron | yê | 'play' | v |
| | bɔ̀ | 'almost' | adv | bɔ̂ | 'be able' | v |

| | | | | | | |
|---|---|---|---|---|---|---|
| | hɔ̂ | 'four' | num | hɔ̂ | 'fish, catch' | v |
| | yà | plural marker | particle | yâ | 'skin' | v |
| | ɓɔ̂ | 'footprint' | n | ɓɔ̂ | 'ready' | adv |
| | ɟà | 'wife' | n | ɟâ | 'later' | adv |
| | ɓɔ̂ | 'because' | con | ɓɔ̂ | 'ready' | adv |
| L-HMH | ɟɔ̀lɔ̄ | 'dress' | n | ɟɔ́lɔ́ | 'say' | v |
| [HL]-ML | lɛ̂ | 'be good' | v | lɛ̂ | 'slowly' | adv |
| | lɛ̂ | 'our' | pron | lɛ̂ | 'slowly' | adv |
| [HL]-MH | kî | 'beat' | v | kǐ | 'stool' | n |
| | kɔ́kɔ̀ | 'hatch' | v | kɔ̄kɔ́ | 'maize stock' | n |
| | pî | 'be tall' | v | pǐ | 'bamboo' | n |
| | kɔ́kɔ̀ | 'circling wind' | n | kɔ̄kɔ́ | 'lead' | v |
| | mê | 'their' | pron | mɛ̌ | 'spear' | n |
| [HL]-LM | d̪â | 'hide' | v | d̪ǎ | 'grandparent' | n |
| HM-MH | ᵐbílā | 'possibly' | adv | ᵐbīlá | 'elastic' | n |
| MH-LHL | kūd̪í | 'if, when' | con | kʊd̪î | 'be like' | adv |
| LM-[HL] | bǐ | 'place' | n | bî | 'smoke' | v |

75.4% (86/114) of minimal pairs in different word categories involve a verb.   Because this percentage is so high, an orthographic spelling rule of underlining the first root vowel of verbs is an effective way to distinguish many of these minimal pairs in writing, as discussed in section 8.

4.4 Tone distribution

Tone distribution in monomorphemic CV nouns is given in (20).   There are no attested CV nouns with HM, M, ML, or LH tone.   There are however, adverbs with ML tone such as *k͡pɛ̂* 'forever' that contrast with the adverbs *k͡pɛ̀* (L)'again' and *ɟâ* (HL) 'later'.

(20)    Tone distribution in CV nouns

| | H | | M | | L | |
|---|---|---|---|---|---|---|
| H | d̪á | 'meat' | --- | | bî | 'dog' |
| M | pí | 'bamboo' | --- | | --- | |
| L | --- | | d̪ǎ | 'grandparent' | hà | 'cow' |

Tone distribution in monomorphemic CVCV nouns is given in (21).   There are no CVCV nouns with M,L tone[5].   There are however, CVCV verbs with M,L tone such as *cā ⁿd̪ì* 'be poor' that contrast with the verbs *t̪ēgē* (M,M) 'hear' and *t̪āɲá* (M,H) 'be malnourished'.

(21)    Tone distribution in CVCV nouns

| | H | | M | | L | |
|---|---|---|---|---|---|---|
| H | ɲɔ́rɔ́ | 'poison' | máɲā | 'sorghum type' | g͡báⁿdà | 'cassava' |
| M | ᵐbāyá | 'wing' | cērē | 'star' | --- | |
| L | kàbí | 'rope' | ròɟū | 'flour' | ᵐbàlà | 'song' |

Although High tone follows Low in CVCV nouns such as in *kàbí* (L,H)'rope', High is not allowed following Low tone on the same syllable.   Rather, the High and Mid tone contrast is neutralized in this environment, such as in *d̪ǎ* (LM) 'grandparent'.

So, there is the High tone constraint of (22).

(22)    High tone constraint
        High tone does not surface following Low on the same syllable.

---

[5]   M,L tone was elicited in *huka* 'skin of cow', *ɟɔkɔ* 'baby carrier', *ⁿjara* 'ant', *ᵑᵐg͡baⁿda* 'whip'.   However, the tone of these words was not yet compared and contrasted with CVCV nouns of other tone melodies.

We now discuss morphophonology of 'Bëlï.    All sound alternations across morpheme boundaries involve either [+ATR] spreading or tone changes.    We first look at [ATR] changes and then tone changes.    For further explanation of 'Bëlï morphology and syntax, see the *'Bëlï Grammar Book* (Gideon et al. 2013).

## 5. [ATR] morphophonology

As stated by the rule of (23), [+ATR] spreading is to the left in words to prefixes.    There are no attested suffixes in 'Bëlï.

(23)    [+ATR] leftward spreading rule
         [+ATR] quality spreads to the left from roots to prefixes in words,
         to vowels unspecified for [ATR].

As shown in (24), there are 3 inflectional verb prefixes, 3 derivational noun preffixes, and 1 derivational adjective prefix where this rule applies.

When the perfective pronoun prefix **à-** 'he, they' attaches to verbs with [+ATR] vowels, it becomes the [+ATR] vowel **ə̀-**.

(24)    |      | [-ATR] Vowels |        |             |      | [+ATR] Vowels |        |             |
|---|---|---|---|---|---|---|---|
| bɛ́ | 'want, love' | à-bɛ́ | 'he wanted' | hé | 'open' | ə̀-hé | 'he opened' |
| ɟɔ́ | 'say, tell' | à-ɟɔ́ | 'he said' | g͡bó | 'laugh' | ə̀-g͡bó | 'he laughed' |
| lí | 'lock' | à-lí | 'he locked' | ɲí | 'dream' | ə̀-ɲí | 'he dreamt' |
| cú | 'fall, drop' | à-cú | 'he fell' | ɖú | 'cry, want' | ə̀-ɖú | 'he cried' |

When the verbal noun prefix **mʊ̀-** attaches to verbs with [+ATR] vowels, it becomes the [+ATR] prefix **mù-**.

(25)    |      | [-ATR] Vowels |        |             |      | [+ATR] Vowels |        |             |
|---|---|---|---|---|---|---|---|
| bɛ́ | 'want, love' | mʊ̀-bɛ́ | 'wanting' | hé | 'open' | mù-hé | 'opening' |
| ɟɔ́ | 'say, tell' | mʊ̀-jɔ́ | 'saying' | g͡bó | 'laugh' | mù-g͡bó | 'laughing' |
| lí | 'lock' | mʊ̀-lí | 'locking' | ɲí | 'dream' | mù-ɲí | 'dreaming' |
| cú | 'fall, drop' | mʊ̀-cú | 'falling' | ɖú | 'cry, want' | mù-ɖṳ́ | 'crying' |

When the subordinate prefix **kʊ̀-** attaches to verbs with [+ATR] vowels, it becomes the [+ATR] prefix **kù-**.

(26)    |      | [-ATR] Vowels |        |             |      | [+ATR] Vowels |        |             |
|---|---|---|---|---|---|---|---|
| bɛ́ | 'want, love' | kʊ̀-bɛ́ | 'wanting' | hé | 'open' | kù-hé | 'opening' |
| ɟɔ́ | 'say, tell' | kʊ̀-jɔ́ | 'saying' | g͡bó | 'laugh' | kù-g͡bó | 'laughing' |
| lí | 'lock' | kʊ̀-lí | 'locking' | ɲí | 'dream' | kù-ɲí | 'dreaming' |
| cú | 'fall, drop' | kʊ̀-cú | 'falling' | ɖú | 'cry, want' | kù-ɖú | 'crying' |

The noun derivational prefix **ɖɔ̀-** is from the noun **ɖɔ̀** 'head' and the derivational prefix **ɖɔ̄** is from the noun **ɖɔ̄** 'on, at'.    When either of these prefixes attach to words with [+ATR] vowels, they becomes [+ATR] **ɖò-** or **ɖō**.

(28)    |      | Root |        | Derived Word |        |
|---|---|---|---|---|
| [-ATR] | háyí | 'sand' | ɖɔ̀-háyí | 'land, region' |
|        | ɓè | 'house' | ɖɔ̀-ɓɛ̄ | 'village' |
|        | kɔ̀ | 'eye' | ɖɔ́-kɔ̄ | 'in presence (adv)' |
| [+ATR] | dílì | 'shadow' | ɖò-dílī | 'spirit' |
|        | ɾú | 'house, hut' | ɖò-ɾū | 'roof' |
|        | bōɾō | 'down (adv)' | ɖō-bōɾō | 'world' |

When the noun derivational prefix **mà**- from **mà** 'mother' attaches to words with [+ATR] vowels, it becomes [+ATR] **mə̀**-.

(29)

|  | Root | | Derived Noun | |
|---|---|---|---|---|
| [-ATR] | d̪ǎ | 'grandparent' | **mà**-d̪ǎ | 'descendent' |
|  | híɲà | 'gun' | **mà**-híɲà | 'trap' |
|  | t̪ũ̀ | 'in-law' | **mà**-t̪ũ̀ | 'mother-in-law' |
| [+ATR] | k͡pérī̃ | 'mulberry tree' | **mə̀**-k͡pérī̃ | 'horn instrument' |
|  | ŋó | 'girl, daughter' | **mə̀**-ŋó | 'woman' |
|  | kuⁿgu | 'surrounding (adv)' | **mā**-kúⁿgù | 'manager' |

When the noun derivational prefix **yɪ̵**- attaches to words with [+ATR] vowels, it becomes [+ATR] **yí**-.

(30)

|  | Root | | Derived Noun | |
|---|---|---|---|---|
| [-ATR] | ɲáká | 'field' | **yí**-ɲákā | 'farmer' |
|  | kɪ̄ɟá | 'foreigner' | **yɪ̵**-kɪ̄ɟá | 'foreigner, gentile' |
|  | ɓélé | 'news' | **yɪ̵**-ɓélé | 'messenger' |
|  | d̪ɔ̄mūgá | 'border' | **yɪ̵**-d̪ɔ̄mūgá | 'neighbour' |
|  | bùbù | 'old (adj)' | **yɪ̵**-būbū | 'elder' |
| [+ATR] | bèt̪í | 'cheating (adv)' | **yí**-bēt̪í | 'cheater, hypocrite' |
|  | t̪úɾù | 'rub (v)' | **yí**-t̪ūrū | 'government official' |

When the adjective derivational prefix **bʊ̵**- from **bʊ̵** 'who, which' attaches to words with [+ATR] vowels, it becomes [+ATR] **bú**-.

(31)

|  | Root | | Derived Adjective | |
|---|---|---|---|---|
| [-ATR] | rá | 'smear, amaze' | **bʊ̵**-ɾà | 'amazing' |
|  | lɛ̂ | 'be good' | **bʊ**-lɛ | 'good' |
|  | ŋ͡mî | 'be sweet' | **bʊ̵**-ŋ͡mí | 'healthy' |
|  | wɔ̂ | 'be far, long' | **bʊ̵**-wɔ̀ | 'distant' |
|  | d̪ũ̀ | 'like, be' | **bʊ̵**-d̪ũ̀ | 'having' |
| [+ATR] | d̪í | 'be cold' | **bú**-d̪í | 'peaceful' |
|  | ŋ͡mg͡bèɲì | 'very (adv)' | **bù**-ŋ͡mg͡bèŋí | 'very big' |

Passive/reflexive verbs are verb phrases consisting of the verb root followed by the noun **ŋgʊ̵** 'body, self'.   When this noun follows verbs with [+ATR] vowels, it remains [-ATR] -**ŋgʊ̵** and the [+ATR] spreading rule does not apply. [check vowels and tone of all data of (27)].[6]

(27)

|  | [-ATR] Vowels | | | | [+ATR] Vowels | | |
|---|---|---|---|---|---|---|---|
| bɛ́ | 'want, love' | bɛ́ **ŋgʊ̵** | 'is wanted' | hé | 'open' | hé **ŋgʊ̵** | 'is opened' |
| ɟɔ́ | 'say, tell' | ɟɔ́ **ŋgʊ̵** | 'is said' | g͡bó | 'laugh' | g͡bó **ŋgʊ̵** | 'is laughed' |
| lí | 'lock' | lí **ŋgʊ̵** | 'is locked' | ŋí | 'dream' | ŋí **ŋgʊ̵** | 'is dreamed' |
| cʊ́ | 'fall, drop' | cʊ́ **ŋgʊ̵** | 'is dropped' | d̪ú | 'cry, want' | d̪ú **ŋgʊ̵** | 'is wanted' |

## 6. Tone morphophonology

We now look at tone changes across word and morpheme boundaries.   First we discuss changes in tone for nouns, verbs, and pronouns in relation to other words (6.1-6.3).   Then we look at the tone of derived prepositions in relation to the tone of corresponding nouns they were derived from, and the tone of relative connectors in relation to the tone of corresponding demonstratives (6.4-6.5).   After looking at the unique tone of the continuous particle **ka** (6.6), we then discuss tone changes

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[6]  The noun **ŋgʊ̵** 'body, self' is not analyzed as a bound morpheme to the verb because prepositions can occur between the passive/reflexive verb and the noun **ŋgʊ̵** 'body, self' (**yɛ ɟɔ ga ŋgʊ̵** 'you (pl) say to yourself') [check if the same reflexive verb can be used with the same pronoun both with and without a preposition]

in verbs with inflectional prefixes (6.7). Then tone changes in derived verbs, nouns, and adjectives (6.8). Finally, we mention the attested grammatical tone (6.9).

6.1 Tone alternations of nouns

There are few changes in word tone as a result of the tone of surrounding words. However, the tone of nouns, verbs, and pronouns is sometimes altered in word-initial or word-final position of a clause or phrase. [Inconclusive evidence in the rest of the paper. Need more data]

Each tone melody of disyllabic nouns is listed under various frames in (32-33). The nouns were elicited in the frames preceding initial Low, Mid, and High tone of numbers and following Low tone of verbs. No change in tone on nouns has been found depending on the tone of the numbers or verbs.

(32) Tone of nouns preceding Low, Mid, and High tone

| Root tone | Noun in isolation | ____ mùʈà 'three X' | ____ kɔ̄ʈɔ́ 'one X' | ____ yú 'two X' | |
|---|---|---|---|---|---|
| H | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | 'poison' |
| M | cērē | cērē | cērē | cērē | 'star' |
| L | ᵐbàlà | ᵐbàlà | ᵐbàlà | ᵐbàlà | 'song' |
| HL | g͡báⁿdà | g͡báⁿdà | g͡báⁿdà | g͡báⁿdà | 'cassava' |
| MH | ᵐbāyá | ᵐbāyá | ᵐbāyá | ᵐbāyá | 'wing' |
| LM | ròɟū | ròɟū | ròɟū | ròɟū | 'flour' |
| LH | kàbí | kàbí | kàbí | kàbí | 'rope' |

(33) Tone of nouns following Low, Mid, and High tone

| Root tone | Noun in isolation | àɟà ____ 'he saw X' | ɘɓē ____ 'he gave X' [check all] | yɔ́ ____ 'he showed X' [check all] | |
|---|---|---|---|---|---|
| H | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | ɲɔ́ɾɔ́ | 'poison' |
| M | cērē | cērē | cērē | cērē | 'star' |
| L | ᵐbàlà | ᵐbàlà | ᵐbàlà | ᵐbàlà | 'song' |
| HL | g͡báⁿdà | g͡báⁿdà | g͡báⁿdà | g͡báⁿdà | 'cassava' |
| MH | ᵐbāyá | ᵐbāyá | ᵐbāyá | ᵐbāyá | 'wing' |
| LM | ròɟū | ròɟū | ròɟū | ròɟū | 'flour' |
| LH | kàbí | kàbí | kàbí | kàbí | 'rope' |

However, Low tone of nouns at the end of a clause are raised to Mid as shown in **bold**. [or this could be an effect of the preceding pronoun; check with more data]

(34) Tone of nouns following prepositions

| Root tone | Noun in isolation | | àɟá ɓɔ̄ ____ 'he ran for X' | | àɟá ᵑgú ____ 'he ran to X' | |
|---|---|---|---|---|---|---|
| H | ɲɔ́ɾɔ́ | 'poison' | ɲɔ́ɾɔ́ | 'poison' | ɲɔ́ɾɔ́ | 'poison' |
| M | cērē | 'star' | cērē | 'star' | cērē | 'star' |
| L | ᵐbàlà | 'song' | ᵐbàl**ā** | 'song' | ᵐbàl**ā** | 'song' |
| HL | g͡báⁿdà | 'cassava' | g͡bá**ⁿd̠ā** | 'cassava' | g͡bá**ⁿd̠ā** | 'cassava' |
| MH | ᵐbāyá | 'wing' | ᵐbāyá | 'wing' | ᵐbāyá | 'wing' |
| LM | ròɟū | 'flour' | r**ō**ɟū | 'flour' | r**ō**ɟū | 'flour' |
| LH | kàbí | 'rope' | kà**bī** (error?) | 'rope' | k**ā**bí | 'rope' |

6.2 Tone alternations of verbs

Little change in tone on verbs has been found regardless of the tone of preceding or following words. However, verbs with HL tone melody (either CV or CVCV) in isolation have Low tone when in a phrase or clause, regardless of the tone of surrounding words. For this reason, they are

analyzed as having underlying Low tone, and have an added initial High tone in imperative (imp.) form, which can be said in isolation.   Other verbs are analyzed to have the same underlying tone as the surface tone in isolation.   The examples of verbs in frames of (35-36) support the claim of the underlying tone melodies listed, in that there is little change of tone.

(35)  Tone of verbs following Low, Mid, High tone

| | Root tone | Imp. (root) | Imperf. in *ɓùgù* ____ *hùdù* 'thief X husband' | Imperf. in *cērē* ____ *hùdù* 'star X husband' | Imperf. in *mácá* ____ *hùdù* 'rhino X husband' | |
|---|---|---|---|---|---|---|
| CV | H | ḓá | ḓá | ḓá | ḓá | 'tie' |
| | M | cū | cū | cū | cū | 'build' |
| | L [HL] | câ | cà | cà | cà | 'put' |
| CVCV | M | ṱēgē | ṱēgē | ṱēgē | ṱēgē | 'hear' |
| | L [HL] | ṱə́mì | ṱə̀mì | ṱə̀mì | ṱə̀mì | 'disturb' |
| | HM | kélē | kélē (?) | kélē (?) | kélē (?) | 'choose' |
| | ML | lūḓɔ̀ | lūḓɔ̀ (?) | lūḓɔ̀ (?) | lūḓɔ̀ (?) | 'surround' |
| | MH | cīkí | cīkí | cīkí | cīkí | 'accuse' |
| | LH | ṱèrí | ṱḗrí (error ?) | ṱḗrí (error ?) | ṱḗrí (error ?) | 'be against' |

[Not sure why **cà** 'put' and **ṱə̀mì** 'disturb' in (36), both with underlying L tone melody, surface with initial Mid tone.]

(36)  Tone of verbs preceding Low, Mid, High tone.

| | Root tone | Imp. (root) | Imperf. in *mácá* ____ *hùdù* 'rhino X husband' | Imperf. in *mácá* ____ *cērē* 'rhino X star' | Imperf. in *mácá* ____ *hég͡bé* 'rhino X rat' | |
|---|---|---|---|---|---|---|
| CV | H | ḓá | ḓá | ḓá | ḓá | 'tie' |
| | M | cū | cū | cū | cū | 'build' |
| | L [HL] | câ | cà | c**à** | cà | 'put' |
| CVCV | M | ṱēgē | ṱēgē | ṱēgē | ṱēgē | 'hear' |
| | L [HL] | ṱə́mì | ṱə̀mì | **ṱə̄**mì | ṱə̀mì | 'disturb' |
| | HM | kélē | kélē (?) | kélē (?) | kélē (?) | 'choose' |
| | ML | lūḓɔ̀ | lūḓɔ̀ (?) | lūḓɔ̀ (?) | lūḓɔ̀ (?) | 'surround' |
| | MH | cīkí | cīkí | cīkí | cīkí | 'accuse' |
| | LH | ṱèrí | ṱḗrí (error ?) | ṱḗrí (error ?) | ṱḗrí (error ?) | 'be against' |

There may be a Low tone raising rule that has the following or a different application.

(37)  Morphological Low raising
    Low tone is raised to Mid tone at a morpheme boundary when
      following Low tone and preceding High tone.

Verbs with Low tone are raised to Mid in the frame of (38) following Low and preceding High.

(38)  Tone of verbs following Low and preceding High

| | Root tone | Imp. (root) | Imperf. in *ɓùgù* ____ *hég͡bé* 'thief X rat' | |
|---|---|---|---|---|
| CV | H | ḓá | ḓá | 'tie' |
| | M | cū | cū | 'build' |
| | L [HL] | câ | **cā** | 'put' |
| CVCV | M | ṱēgē | ṱēgē | 'hear' |
| | L [HL] | ṱə́mì | **ṱə̄mī** | 'disturb' |
| | HM | kélē | kélē (?) | 'choose' |
| | ML | lūḓɔ̀ | lūḓɔ̄ (?) | 'surround' |
| | MH | cīkí | cīkí | 'accuse' |

| LH | t̪èrí | t̪ērí (error ?) | 'be against' |

Tone of verbs is mostly not affected by the tone of preceding particles--continuous **ka**, relative connector **bú** 'who, which, that', and **t̪í** 'will surely'.   Examples (39-41) further support the claim of the underlying tone melodies listed.   The tone of the continuous particle **ka** (with no underlying tone) changes according to the tone of surrounding words.   See further examples with **ka** in (50).

(39)      Tone of verbs following continuous particle **ka**
          in the frame *yìkòlù _____ dɔ́* 'person continues to X something'

| | Root tone | Command (root) | | Continuous | |
|---|---|---|---|---|---|
| CV | H | d̪á | 'tie' | kǎ d̪á | 'tying' |
| | M | cū | 'build' | kà cū | 'building' |
| | L [HL] | câ | 'put' | kà cà | 'putting' |
| CVCV | M | t̪ēgē | 'hear' | kà t̪ēgē | 'hearing' |
| | L [HL] | t̪ɔ́mì | 'disturb' | kà t̪ə̀mì | 'disturbing' |
| | HM | kélē | 'choose' | kǎ kélē   (?) | 'choosing' |
| | ML | lūd̪ɔ̀ | 'surround' | kà lūd̪ɔ̀   (?) | 'surrounding' |
| | MH | cīkí | 'accuse' | kǎ cīkí | 'accusing' |
| | LH | t̪èrí | 'be against' | kǎ t̪èrí | 'being against' |

The relative clause connector **bú** (H) 'who, which, that' becomes Mid following Low.   However, if the initial tone of the word following **bú** is underlyingly Mid, the High tone of **bú** is downstepped (**b⁺ú**) to be between High and Mid, and the register of all other words in the phrase is shifted down by a similar half step. [check this with more data]

(40)      Tone of verbs in relative clause following **bú** 'who, which, that'
          in the frame *mɔ́rɔ̀ _____ ɓɔ̀ⁿd̪ā* 'lion that X there'

| | Root tone | Command (root) | | Subordinate | |
|---|---|---|---|---|---|
| CV | H | d̪á | 'tie' | bū d̪á | 'ties' |
| | M | cū | 'build' | b⁺ú cū | 'builds' |
| | L [HL] | câ | 'put' | bū cà | 'puts' |
| CVCV | M | t̪ēgē | 'hear' | b⁺ú t̪ēgē | 'hears' |
| | L [HL] | t̪ɔ́mì | 'disturb' | bú t̪ə̀mì | 'disturbs' |
| | HM | kélē | 'choose' | bū kélē   (?) | 'chooses' |
| | ML | lūd̪ɔ̀ | 'surround' | b⁺ú lūd̪ɔ̀   (?) | 'surrounds' |
| | MH | cīkí | 'accuse' | bú cīkí | 'accuses' |
| | LH | t̪èrí | 'be against' | bū t̪èrí | 'is against' |

In the phrase of (41), Low tone on verbs is raised to Mid, probably because the verbs are at the end of the clause [check with more data].

(41)      Tone of verbs following future certainty particle **t̪í** (HM) 'will surely'
          in the frame *yí _____* 'you (sg) will surely X'

| | Root tone | Command (root) | | Subordinate | |
|---|---|---|---|---|---|
| CV | H | d̪á | 'tie' | t̪í d̪á | 'tie' |
| | M | cū | 'build' | t̪í cū | 'build' |
| | L [HL] | câ | 'put' | t̪í **cā** | 'put' |
| CVCV | M | t̪ēgē | 'hear' | t̪í t̪ēgē | 'hear' |
| | L [HL] | t̪ɔ́mì | 'disturb' | t̪í **t̪ɔ̄mī** | 'disturb' |
| | HM | kélē | 'choose' | t̪í kélē   (?) | 'choose' |
| | ML | lūd̪ɔ̀ | 'surround' | t̪í lūd̪ɔ̄   (?) | 'surround' |
| | MH | cīkí | 'accuse' | t̪í cīkí | 'accuse' |
| | LH | t̪èrí | 'be against' | t̪í t̪ērí | 'be against' |

6.3 Tone of pronouns

In 'Bëlï, there four sets of pronouns that differ in some person or number forms by either their segments or tone.

(42)    Pronouns

| Subject Perfective | | Subject Imperfective | | Object | | Possessor | | |
|---|---|---|---|---|---|---|---|---|
| mú | H | má | H | mà | L | mà | L | 1s |
| yí | H | yí | H | yì | L | gì | L | 2s |
| à- | L | nè | L | nè | L | mõ̂ | HL | 3s |
| ɟὲ | L | ɟὲ | L | ɟὲ | L | lê | HL | 1p |
| yè | L | yè | L | yè | L | gὲ | L | 2p |
| à- . . nì | L . . L | mènὲ | L | mènὲ | L | mê | HL | 3p |

There are two sets of subject pronouns according to whether the verb is imperfective or perfective. Both sets are shown in (43-44) in clause-initial and non-clause-initial positions.   As shown in **bold**, Low tone of some subject pronouns in clause-initial position of some clauses is raised to Mid tone.

(43)    Subject imperfective pronouns

| _kìɗí àɟà dɔ́,_ ____ _kâ ᵐbέ_ 'if he saw something, X continues to fight' | ____ _ká mɔ̀rì_ 'X am rich' | ____ _ka wà dɔ́_ 'X continues to know something' | |
|---|---|---|---|
| má | má | má kã́ wà | 1s |
| yí | yí | yí kã́ wà | 2s |
| nè | nè | **nē̄** kà wà | 3s |
| ɟὲ | ɟὲ | **ɟē̄** kà wà | 1p |
| yè | yè | **yē̄** kà wà | 2p |
| mènὲ | mènὲ | mènὲ kà wà | 3p |

(44)    Subject perfective pronouns

| _kìɗí_ ____ _dɔ́,_ _nè kâ ᵐbέ_ 'if X saw something, he continues to fight' | _____ɗó dɔ́_ 'X beat something' | _____ɓē̄ dɔ́_ 'X gave something' | _____wà dɔ́_ 'X knew something' | |
|---|---|---|---|---|
| mú ɟà | **mū̄** ɗó (error?) | mú ɓē̄ | mú wà | 1s |
| yí ɟa | yí ɗó | yí ɓē̄ | yí wā̄ | 2s |
| à-ɟà | **ɔ̄**-dó | ə̀-ɓē̄ | ə̀-wà | 3s |
| ɟὲ ɟà | **ɟē̄** ɗó | ɟὲ ɓē̄ | ɟὲ wā̄ | 1p |
| yè ɟà | **yē̄** ɗó | yè ɓὲ | **yē̄** wā̄ | 2p |
| à-ɟà dɔ̀ nǐ | ə̀-ɗó ní | ə̀-ɓē̄ ní | ə̀-wà | 3p |

Similarly, object pronouns are shown in (45) in clause-final and non-clause final positions.   Low tone of some object pronouns in clause-final position is raised to Mid tone.   In the passive clause (last frame of (45)), the tone rises from Low to Mid on the final syllable of all pronouns.   The preposition **ní** 'with' introduces the noun phrase consisting of these object pronouns.

(45)    Object pronouns

| _ā-bé yìkòlù ṭị̄ṭī_ ____ _ṭí_ 'he doesn't want person continue to ask X' | _yìkòlù kã̌ ɗó_ ____ 'person continues to beat X' | _mɔ̀rì ká_ ____ 'rich am X' | _ànέⁿgú ní_ ____ 'it is finished with me' | |
|---|---|---|---|---|
| mà | mā̄ | mā̄ | ní **mǎ** | 1s |
| yì | yī̄ | yī̄ | ní = **yǐ** | 2s |
| nè | nē̄ | nē̄ | ní = **nè̌** | 3s |
| ɟὲ | ɟē̄ | ɟē̄ | ní = **ɟὲ̌** | 1p |
| yè | yē̄ | yē̄ | ní = **yè̌** | 2p |
| mènὲ | mènὲ | mènὲ | ní mè**nè̌** | 3p |

Possessor pronouns are shown in (46) in clause-final and non-clause final positions.   Low tone of some possessor pronouns in clause-final position of the reflexive clause (last frame of (46)) is raised to Mid tone.   The preposition *rū* 'on, towards' in the third frame of (46) is derived from the body-part noun *rʋ̀* 'back'.   This is further discussed in the following section on prepositions. Whereas the non-derived preposition *nf* 'with' in (45) introduces object pronouns, the derived preposition *rū* 'on, towards' of (46) introduces possessor pronouns.   This derived preposition retains the noun-like quality of being possessed.

(46)    Possessor pronouns

| *ā-bɛ́ mʋ̄ʳɟí kɔ̀ __ ɟí* 'he doesn't want (anyone) seeing X's eyes' | *naɟe à-mà ɖʋ̀ ɖɔ̀ __* 'when they go arrive to X' (lit. X's head) | *ā-bɛ́ yìkòlù bū ʈú rū __ ɟí* 'he doesn't want person that steps on X' | 'I said to _ body (lit. X's self)' | |
|---|---|---|---|---|
| mà | mà | mà | mú ɟó gà = ⁿgū **mā** | 1s |
| gì | gì | gì | yí ɟó gà = ⁿgū **gī** | 2s |
| mʋ̂ | mʋ̂ | mʋ̂ | à-ɟó gà = ⁿgū mʋ̂ | 3s |
| lê | lê | lê | ɟè ɟó gà = ⁿgū lê | 1p |
| gè | gè | gè | yè ɟó gà = ⁿgū **gē** | 2p |
| mê | mê | mê | à-ɟó gà = ⁿgū mê nî | 3p |

Another comparison of object and possessive pronouns following the two types of prepositions is shown in (47).

(47)    Object pronouns following            Possessor pronouns following
        non-derived preposition *gà* 'to'       derived preposition *rū* 'on, towards'

| *ŋérè mà 6ē 6ǐ gà ____* 'chief went to give place to X' | *ā-bɛ́ yìkòlù bū ʈú rū ____ ɟí* 'he doesn't want person that steps on X' |
|---|---|
| gà **mà** | rū **mà** |
| gè = **yì** | rū **gì** |
| gè = **nè** | rū **mʋ̂** |
| gè = **ɟè** | rū **lê** |
| gè = **yè** | rū **gè** |
| gà **mènè** | rū **mê** |

6.4 Tone of prepositions

The prepositions of (48) can be analyzed to have derived from nouns, mostly from body-part nouns.   Most have a change in tone from the corresponding noun.   All such prepositions are grammatically distinct from their corresponding noun in that they are required to introduce a noun phrase, whereas nouns have no such requirement.   However, as seen in the previous section, prepositions derived from nouns introduce possessive pronouns, whereas non-derived prepositions introduce object pronouns.   In this way, derived prepositions retain the noun-like quality of being possessed.

(48)    Tone of derived prepositions and corresponding nouns

| Root tone | Noun in isolation | | *àfa ____ 6ɔ̀ⁿɖā* 'he saw X there' | | *àmà ____ yìkòlù* 'he went X person' | |
|---|---|---|---|---|---|---|
| H | ⁿgú | 'body' | ⁿgú | 'body' | ⁿgú | 'at' |
| L | k͡pà | 'mouth' | k͡pà | 'mouth' | **k͡pā** | 'to' |
| | 6ɔ̀ | 'footprint' | 6ɔ̀ | 'footprint' | **6ɔ̄** | 'for' |
| | ɖɔ̀ | 'head' | ɖɔ̀ | 'head' | **ɖɔ̄** | 'on' |
| | kɔ̀ | 'eye' | kɔ̀ | 'eye' | **kɔ̄** | 'into' |
| | rʋ̀ | 'back' | rʋ̀ | 'back' | **rū** | 'towards' |

|    | mì | 'stomach' | mì | 'stomach' | **mī̄**[7] | 'in' |
|----|----|-----------|----|-----------|-------|------|
|    | nà (?) | 'center of hand' | nà (?) | 'center of hand' | **nā** | 'before' |
| HL | hɔ́lɔ̀ | 'buttock, tail' | hɔ́lɔ̀ | 'buttock, tail' | hɔ́lɔ̄ | 'under' |
|    | hɔ́gɔ̀ | 'back' | hɔ́gɔ̀ | 'back' | hɔ́gɔ̄ (?) | 'behind' |

As seen in (48), prepositions derived from nouns often have different tone than that of the original noun.    An orthographic spelling rule of using hyphens to mark prepositions is an effective way to distinguish these tone minimal pairs in writing, as discussed in section 8.

6.5 Tone of relative connectors and demonstratives

The relative clause connectors of (49) can be analyzed to have derived from demonstratives, or vice versa.    They differ in tone and in grammatical function.    The relative connectors have High tone whereas the corresponding demonstratives have Low tone.    Relative connectors introduce a clause or phrase that describes or identifies the head noun, whereas demonstratives alone identify the head noun without introducing a clause or phrase.

(49)    Relative clause connector tone and demonstrative tone

| Dem. | nà | bí **nà** búlé ɗò. | 'There is **this** good place.' |
|------|-----|--------------------|---------------------------------|
| Rel. | ná | bí **ná** dɔ̀háyí nà ka ruᵐbɛkɪ ţɛnɛ ga=ɟoŋo nʊ nɛ ⁿɖawa | 'Place **that** is this region called Rumbek remains to Dinkas.' |
| Dem. | bʊ̀ | yìkòlù **bʊ̀** kǎ yì | '**That** person is coming.' |
| Rel. | bʊ́ | yìkòlù **bʊ́** ᵐbɛ́ ka yì | 'A person **who** is brave is coming.' |
| Dem. | ţè | ɗɔ́ **ţè** kǎ yì | '**That** thing is coming.' |
| Rel. | ţɛ́ | ɗɔ́ **ţɛ́** mʊ̀ gɔ́ ŋɪɾɪ ţe ⁿɖawa | 'The thing **that** I hate this is it.' |

As discussed in section 8, an orthographic spelling rule of using commas to mark connectors is an effective way to distinguish these tone minimal pairs in writing.

6.6 Tone of the continuous particle *ka*

The continuous particle **ka** seems to take the tone or be affected by the tone of both the previous and following word.    [More data is needed for a more specific prediction of the tone alternations on **ka**.]

(50)    Tone of continuous particle *ka* (no underlying tone) before High, Mid, and Low tone

| ___ *ka ɗó ɗɔ́* | ___ *ka ɓē ɗɔ́* | ___ *ka wà ɗɔ́* | |
|-----------------|-----------------|-----------------|----|
| 'X continues to beat something' | 'X continues to give something' | 'X continues to know something' | |
| má **kā̂** ɗó | má **kâ** ɓē | má **kā̂** wà | 1s |
| yí **kā̂** ɗó | yí **kâ** ɓē | yí **kā̂** wà | 2s |
| nē **kā̂** ɗó | nē **kà** ɓē | nē **kà** wà | 3s |
| ɟē **kā̂** ɗó | ɟē **kà** ɓē | ɟē **kà** wà | 1p |
| yē **kā̂** ɗó | yē **kà** ɓē | yē **kà** wà | 2p |
| mènè **kā̂** ɗó | mènè **kà** ɓē | mènè **kà** wà | 3p |

6.7 Tone of inflected verbs

As shown in (51), tone of verbs is mostly not affected by the tone of prefixes—the perfective **à-** 'he, they', verbal noun **mʊ̀-**, and subordinate **kʊ̀-**.    Examples in frames of (51) further support the claims of the underlying tone melodies listed.

(51)    Tone of verbs with perfective pronoun prefix **à-** (L) 'he, they'

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[7] The preposition **mī̄** 'in' differs from other prepositions derived from nouns in that the vowel changes ([i] in **mì** 'stomach'; [ɪ] in **mī̄** 'in'), as well as the tone.

in the frame _____ *dɔ́ nɨ́* 'they Xed something'

|      | Root tone | Command (root) |          | Perfective |            |
|------|-----------|----------------|----------|------------|------------|
| CV   | H         | ḍá             | 'tie'    | à-ḍá       | 'tied'     |
|      | M         | cū             | 'build'  | à-cū       | 'built'    |
|      | L [HL]    | câ             | 'put'    | à-cà       | 'put'      |
| CVCV | M         | ṭēgē           | 'hear'   | à-ṭēgē     | 'heard'    |
|      | L [HL]    | ṭə́mì          | 'disturb'| à-ṭə̀mì    | 'disturbed'|
|      | HM        | kélē           | 'choose' | à-kélē  (?)| 'chose'    |
|      | ML        | lūḍɔ̀          | 'surround'| à-lūḍɔ̀ (?)| 'surrounded'|
|      | MH        | cīkí           | 'accuse' | à-cīkí     | 'accused'  |
|      | LH        | ṭèrí           | 'be against'| à-ṭērí (error?)| 'was against'|

The verbal noun prefix **mù-** may have underlying Low tone that is raised to Mid following High tone except when followed by verb-initial Low tone.

(52)   Tone of verbs with verbal noun prefix **mù-** (L)
       in the frame **ká** _____ **mɔ̂** 'he Xed (lit. is his Xing)'

|      | Root tone | Command (root) |          | Verbal noun |            |
|------|-----------|----------------|----------|-------------|------------|
| CV   | H         | ḍá             | 'tie'    | mū-ḍá       | 'tying'    |
|      | M         | cū             | 'build'  | mū-cū       | 'building' |
|      | L         | câ             | 'put'    | mù-cà       | 'putting'  |
| CVCV | M         | ṭēgē           | 'hear'   | mū-ṭēgē     | 'hearing'  |
|      | L [HL]    | ṭə́mì          | 'disturb'| mù-ṭə̀mì    | 'disturbing'|
|      | HM        | kélē           | 'choose' | mū-kélē  (?)| 'choosing' |
|      | ML        | lūḍɔ̀          | 'surround'| mū-lūḍɔ̀ (?)| 'surrounding'|
|      | MH        | cīkí           | 'accuse' | mū-cīkí     | 'accusing' |
|      | LH        | ṭèrí           | 'be against'| mù-ṭèrí   | 'being against'|

The subordinate prefix **kù-** may have underlying Low tone that is raised to Mid following High tone except when followed by verb-initial Low tone.

(53)   Tone of verbs with subordinate prefix **kù-** (L)
       in the frame **yìkòlù mū pɨ́yá** _____ **ɓɔ̀ⁿḍā** 'person went out Xing there'

|      | Root tone | Command (root) |          | Subordinate |            |
|------|-----------|----------------|----------|-------------|------------|
| CV   | H         | ḍá             | 'tie'    | kù-ḍá       | 'tying'    |
|      | M         | cū             | 'build'  | kū-cū       | 'building' |
|      | L [HL]    | câ             | 'put'    | kù-cà       | 'putting'  |
| CVCV | M         | ṭēgē           | 'hear'   | kū-ṭēgē     | 'hearing'  |
|      | L [HL]    | ṭə́mì          | 'disturb'| kù-ṭə̀mì    | 'disturbing'|
|      | HM        | kélē           | 'choose' | kū-kélē  (?)| 'choosing' |
|      | ML        | lūḍɔ̀          | 'surround'| kū-lūḍɔ̀ (?)| 'surrounding'|
|      | MH        | cīkí           | 'accuse' | kù-cīkí     | 'accusing' |
|      | LH        | ṭèrí           | 'be against'| kù-ṭèrí   | 'being against'|

### 6.8 Tone of derived words

Tone in derived words is much less predictable than in roots with attached inflectional morphemes or in roots surrounded by words of various tones.   The tone in derived verbs appears to be mostly tone replacement.   The tone in derived nouns and adjectives sometimes follows tone rules, but often not.

Repetitive verbs indicate the action is done more than once, done to more than one object, or have some other similar meaning as the verb root they are derived from.   Repetitive verbs copy the first consonant and vowel of the root verb they are derived from, and so have the prefix *CV-*.   As shown in (54), the tone of such verbs is not predictable except by several surface tone choices from certain underlying root tones.   There can be MH repetitive tone from root L, H, or M tone.

There can be HL repetitive tone from root H or L root tone.   H root tone can result in M or HM repetitive tone.

(54)    Tone of verbs with repetitive prefix **CV-** in command form (isolation)

| Root tone | Repetitive tone | Command (root) | | Repetitive command | |
|-----------|----------------|----------------|---|--------------------|---|
| L [HL] | MH | ᶮɟû | 'carry' | ᶮɟū-ᶮɟú | 'gather' |
|  |  | ᵑgô | 'pull down' | ᵑgō-ᵑgú | 'pick with stick' |
|  |  | ɟô | 'compare' | ɟō-ɟó | 'try, test, teach' |
|  |  | kô | 'search' | kō-kó | 'lead' |
|  |  | dɛ̂ | 'pull, lead' | dɛ̄-dɛ́ | 'recede, reduce' |
|  |  | kî | 'watch, guard' | kī-kí | 'keep' |
| H | MH | ɟέ | 'arrange' | ɟɛ̄-ɟέ | 'prepare, create' |
|  |  | dǐ | 'reach, arrive' | dī-dí | 'pick' |
|  |  | ⁿdí | 'be ripe' | ⁿdī-ⁿdí | 'be wise' |
|  |  | ṭú | 'step' | ṭū-ṭú | 'stand on' |
| M | MH | yē | 'stretch' | yē-yé | 'stretch repetitively' |
|  |  | gɔ̄ | 'sit, remain' | gɔ̄-gɔ́ | 'sweep' |
| H | L [HL] | yá | 'be angry, hate' | yá-yà | 'shake, wave' |
|  |  | né | 'finish' | né-nè | 'test' |
|  |  | ṭɔ́ | 'leave' | ṭɔ́-ṭɔ̀ | 'be around, turn' |
| L [HL] | L [HL] | kô | 'break' | kɔ́-kɔ̀ | 'hatch' |
| H | M | lé | 'soar, fly' | lē-lē | 'slope' |
| H | H,M | lí | 'peel, love' | lí-lī | 'scatter' |

Passive/reflexive verbs add the word **ᵑgʊ́** 'body, self' to form derived verb phrases with similar meaning as the verb root by itself.   Roots with H tone can form passive/reflexive verb phrases with H or MH tone.   Roots with L tone can form passive/reflexive verb phrases with MH or HM,H tone.

(55)    Tone of verbs with passive/reflexive word **ᵑgʊ́** 'body, self' in command form (isolation)

| Root tone | Passive tone | Command (root) | | Passive/reflexive command | |
|-----------|-------------|----------------|---|---------------------------|---|
| H | H | ɟá | 'tear' | ɟá ᵑgʊ́ | 'be burst, broken' |
|  |  | né | 'finish' | né ᵑgʊ́ | 'be finished' |
| H | MH | ḍá | 'tie' | ḍā ᵑgʊ́ | 'be tied, tie self' |
|  |  | k͡pέ | 'dance' | k͡pɛ̄ ᵑgʊ́ | 'be untied' |
| L [HL] | MH | nô | 'make, do' | nɔ̄ ᵑgʊ́ | 'happen' |
| L [HL] | HM,H | rô | 'mix' | rô ᵑgʊ́ | 'be anxious' |

In some derived nouns, the lowering rule of (56) applies.   [It is not known when it applies and when it doesn't as it seems unpredictable with the current data.]

(56)    Morphological High lowering
        High tone lowers to Mid following a Low tone prefix in some derived nouns.

Nouns can be derived from various prefixes--**ḍɔ̀-** (L) from **ḍɔ̀** 'head', **ḍɔ̄-** (M) from **ḍɔ̄** 'on, at', **mà-** (L) from **mà** 'mother', and **yí-** (H) similar to **yìkòlù** 'person'.   The tone changes in derived nouns are shown in (57-60) in **bold**.   Most of the tonal changes are Low tone raised to Mid, or High tone lowered to Mid following Low.   However, there are other changes that cannot be explained.

(57)    Tone of derived nouns with prefix **ḍɔ̀-**

|  | Root tone | Root | | Derived Noun | |
|--|-----------|------|---|--------------|---|
| **ḍɔ̀-** (L) from **ḍɔ̀** 'head' | H | rú | 'house, hut' | ḍɔ̀-**rū** | 'roof' |
|  |  | háyí | 'sand' | ḍɔ̀-háyí | 'land, region' |
|  | L | ɓɛ̀ | 'house' | ḍɔ̀-**ɓɛ̄** | 'village' |

| | HL | dílì | 'shadow' | dò-dílī̠ | 'spirit' |
|---|---|---|---|---|---|
| **d̠ɔ̄-** (M)from **d̠ɔ̄** 'on, at' | H | kú | 'seed' | d̠ɔ̄-kú | 'descendent' |
| | | gútú | 'tree' | d̠ɔ̄-gút̠ū | 'back' |
| | M | bōrō | 'down (adv)' | d̠ō-bōrō | 'world' |
| | L | kɔ̀ | 'eye' | d̠ɔ̄-kɔ̀ | 'in presence (adv)' |

(58)    Tone of derived nouns with prefix **mà-**(L) from **mà** 'mother'

| Root tone | Root | | Derived Noun | |
|---|---|---|---|---|
| H | ŋó | 'girl, daughter' | mə̀-ŋó | 'woman' |
| H | k͡pérí | 'mulberry tree' | mə̀-k͡pérī̠ | 'horn instrument' |
| HL | t̠û | 'in-law' | mà-t̠ū̠ | 'mother-in-law' |
| | hínà | 'gun' | mà-**hī̠**ɲà | 'trap' |
| HM | t̠íd̠ɔ̄ | 'ahead (adv)' | mà-t̠ìd̠ɔ̀ | 'leader' |
| LM | d̠ǎ | 'grandparent' | mà-d̠ǎ | 'descendent' |

(59)    Tone of derived nouns with prefix **yí-**(H) similar to **yìkòlù** 'person'

| Root tone | Root | | Derived Noun | |
|---|---|---|---|---|
| H | ɓélé | 'news' | yí-ɓélé | 'messenger' |
| | ɲáká | 'field' | yí-ɲá**kā** | 'farmer' |
| L | bù | 'important (adj)' | yí-**bū** | 'elder' |
| | ɓùgù | 'thief' | yí-ɓù**gū** | 'thief' |
| | bùbù | 'old (adj)' | yí-**būbū** | 'elder' |
| HL | t̠úrù | 'rub (v)' | yí-**t̠ūrū** | 'government official' |
| MH | t̠ābá | 'leprosy' | yí-**t̠àbā** | 'leper' |
| | d̠ōmūgá | 'border' | yí-d̠ōmūgá | 'neighbour' |
| | kī̠á | 'foreigner' | yí-kī̠á | 'foreigner, gentile' |
| ML | bāt̠à | 'proud (adj)' | yí-**bàt̠ā** | 'proud' |
| LH | bèt̠í | 'cheating (adv)' | yí-**bē̠**t̠í | 'cheater, hypocrite' |
| | t̠èrí | 'argue (v)' | yí-**t̠ē̠**rí | 'enemy' |

Adjectives can be derived with the prefix **bú-**(H) from the relative connector **bú** 'who, which'. There are several tone changes in **bold** that are not predictable.

(60)    Tone of derived adjectives with prefix **bú-**(H) from **bú** 'who, which'

| Root tone | Root | | Derived Adjective | |
|---|---|---|---|---|
| H | d̠í | 'be cold' | búd̠í | 'peaceful' |
| | rá | 'smear, amaze' | bú**rà** | 'amazing' |
| | lá | 'arrest' | **bùlā** | 'naked' |
| HL | d̠û | 'like, be' | bú**d̠ū** | 'having' |
| | wɔ̂ | 'be far, long' | bú**wɔ̀** | 'distant' |
| | nɔ̂ | 'do, make' | bú**nɔ́** | 'fat' |
| | ŋ͡mî | 'be sweet' | bú**ŋ͡mí** | 'healthy' |
| | gúbè | 'be strong' | bú**gùbè** | 'strong' |
| L | bù | 'big (adj)' | bùbù | 'old' |
| | ŋ͡mg͡bèŋì | 'very (adv)' | bù**ŋ͡mg͡bèŋí** | 'very big' |
| | ŋ͡mg͡bèŋì | 'many (adv)' | bù**ŋ͡mg͡bē̠ŋī** | 'kingdom (n)' |

6.9 Grammatical tone

In 'Bëlï, grammatical distinctions made only by tone consist of semantically related minimal pairs in two different word categories.   There are at least six noun-preposition minimal pairs, three demonstrative-relative connector minimal pairs, and two noun-verb minimal pairs.   There is a high functional load for the grammatical tone involving these words.   Specifically, in 144 lines of narrative text with an average of 10 words per line, there were 39 occurances of one of the nouns or prepostions of (61), that is 27.1% of lines, or 1 in 36 words.   There were 84 occurances of one of the demonstratives or relative clause connectors of (62), that is 58.3% of lines, or 1 in 17 words.

(61)    Noun-prepositions pairs

| Noun Tone | Preposition Tone | Nouns | | Prepositions | |
|---|---|---|---|---|---|
| L | M | k͡pà | 'mouth' | k͡pā | 'to' |
| | | ɓɔ̀ | 'footprint' | ɓɔ̄ | 'for' |
| | | d̪ɔ̀ | 'head' | d̪ɔ̄ | 'on' |
| | | kɔ̀ | 'eye' | kɔ̄ | 'into' |
| | | ɾʊ̀ | 'back' | ɾʊ̄ | 'towards' |
| | | nà (?) | 'center of hand' | nā | 'before' |
| HL | HM | hɔ́lɔ̀ | 'buttock, tail' | hɔ́lɔ̄ | 'under' |
| | | hɔ́gɔ̀ | 'back' | hɔ́gɔ̄ (?) | 'behind' |

(62)    Demonstrative-relative connector pairs

| Demonstrative tone | Relative connector tone | Demonstratives | | Relative connectors | |
|---|---|---|---|---|---|
| L | H | nà | 'this' | ná | 'who, which, that' |
| | | bʊ̀ | 'that' | bʊ́ | 'who, which, that' |
| | | t̪è | 'that (mentioned before)' | t̪é | 'who, which, that' |

(63)    Noun-verb pairs

| Noun Tone | Verb Tone | Nouns | | Verbs | |
|---|---|---|---|---|---|
| H | HL | g͡bé | 'marriage' | g͡bê | 'marry' |
| L | HL | yò | 'death' | yô | 'die' |

## 7. Orthographic symbols

In this section, we list orthography symbols for each phoneme.    In the following section, we list spelling rules in the orthography which deal with distinctions made by tone.

The consonants and vowels of (64) are included in the 'Bëlï orthography.    The symbol for each phoneme that the 'Bëlï community has chosen is listed and illustrated in an example word.

| (64) | IPA symbol | Orthography symbol | IPA Example Word | Orthography Example Word | English Gloss |
|---|---|---|---|---|---|
| | a | **A a** | àkʊ̀ɾā | **a**kora | 'chicken' |
| | a | **Ä ä** | màɲà | **m**äny**ä** | 'antelope' |
| | b | **B b** | bíɲà | **b**inya | 'goat' |
| | ɓ | **'B 'b** | ɓɔ̄tí | **'b**oti | 'monkey' |
| | c | **C c** | càmà$^n$ɟà | **c**amanja | 'comb' |
| | d̪ | **D d** | d̪ɔ̀ | **d**ɔ | 'head' |
| | ɗ | **'D 'd** | ɗú | **'d**u | 'food' |
| | ɛ | **E e** | hɛ́g͡bɛ́ | **h**egbe | 'rat' |
| | e | **Ë ë** | cēɾē | **c**ërë | 'star' |
| | g | **G g** | gúŋà | **g**oŋa | 'axe' |
| | g͡b | **Gb gb** | g͡bá$^n$d̪à | **gb**anda | 'cassava' |
| | h | **H h** | hà | **h**a | 'cow' |
| | ɪ | **I i** | kìɗî | k**i**'di | 'elephant' |
| | i | **Ï ï** | kíɗì | k**ï**'d**ï** | 'spoon' |
| | ɟ | **J j** | ɟí | **j**i | 'hand' |
| | ʃ | **'J 'j** | ʃɔ́lɔ́ | **'j**ɔlɔ | 'redbud gazelle' |
| | k | **K k** | kìlìɾù | **k**ïliru | 'giraffe' |
| | k͡p | **Kp kp** | k͡pà | **kp**a | 'mouth' |
| | l | **L l** | líɓò | **l**i'bö | 'beehive' |

| | | | | |
|---|---|---|---|---|
| m | **M m** | mɔ́rɔ̀ | **m**ɔrɔ | 'lion' |
| ᵐb | **Mb mb** | ᵐbágà | **mb**aga | 'basket' |
| n | **N n** | nɔ̀kɔ̀ | **n**ɔko | 'uncle' |
| ⁿd̪ | **Nd nd** | ⁿd̪ì | **nd**ï | 'pot' |
| ⁿg | **Ng ng** | ⁿgíhí | **ng**ihi | 'fish' |
| ᶮɟ | **Nj nj** | ᶮɟɔ̀lɔ̀ | **nj**ɔlɔ | 'frog' |
| ɲ | **Ny ny** | ɲīpɔ́ɗɔ́ | **ny**ipɔ'dɔ | 'frog' |
| ŋ | **Ŋ ŋ** | ŋíhí | **ŋ**ihi | 'moon' |
| ᵑᵐg͡b | **Ŋb ŋb** | ᵑᵐg͡bàlá | **ŋb**ala | 'arm' |
| ᵑm | **Ŋm ŋm** | ᵑm̀à | **ŋm**a | 'termite' |
| ʊ | **O o** | kúmú | k**o**mo | 'hare' |
| o | **Ö ö** | kóᵑᵐg͡bó | kö**ŋb**ö | 'canoe' |
| ɔ | **Ɔ ɔ** | kɔ̀ | kɔ | 'eye' |
| p | **P p** | pàɗʊ̀ | **p**a'do | 'fire' |
| ɾ | **R r** | ɾú | **r**u | 'house, hut' |
| t̪ | **T t** | t̪ìmàɾà | **t**imara | 'crocodile' |
| u | **U u** | hūɓú | hu'bu | 'oil' |
| w | **W w** | wāɾí | **w**ari | 'shoe' |
| y | **Y y** | yɪ́ | **y**ii | 'snake' |

There are four tone minimal pairs with the vowel /**a**/. In the words of (65), the vowel symbol {**ä**} marks Low tone in order to distinguish the pairs of words.

(65)

| | **A a** | | | | | **Ä ä** | | | |
|---|---|---|---|---|---|---|---|---|---|
| IPA | Orthography | Tone | | | IPA | Orthography | Tone | | |
| ᵐbá | mba | **H** | 'breast' | | ᵐbà | mbä | **L** | 'wine' | |
| má | ma | **H** | 'I' | | mà | mä | **L** | 'mother' | |
| máɲā | manya | **H,M** | 'sorghum' | | màɲà | mänyä | **L,L** | 'gazelle' | |
| ᵑᵐg͡bá | ŋba | **H** | 'then (con)' | | ᵑᵐg͡bà | ŋbä | **L** | 'guest, visitor' | |

Only the vowel symbol {**ä**} can be used to show Low tone. The vowel symbols {**ë**}, {**ï**}, {**ö**}, {**u**} are not used to show Low tone, but are instead used to show [+ATR] vowel quality. The symbol {**ä**} only marks Low tone in the four words of (65). Otherwise it marks [+ATR] vowel quality as the other symbols with dots and /**u**/[8].

## 8. Orthographic spelling rules

Although tone has a high functional load, both lexically and grammatically, four spelling rules disambiguate all of the grammatical load of tone, and about 75% of the lexical load of tone. The spelling rules in no way mark surface tone or underlying tone melodies. Rather, three rules mark a grammatical category, and the other rule marks contour tone of words in isolation.[9]

In section 2.3, we stated that 'Bëlï has no contrastive vowel length. Because of this, doubled vowels can be used to distinguish contour tone from level tone in the orthography. As discussed in 4.2, 72.5% of minimal pairs of the same word category involve a contrast of level tone with

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[8]  This system of using umlauts to mark both Low tone and [+ATR] is not a recommended orthographic strategy. The only reason it works at all for the 'Bëlï is because the language developers are so consistent in spelling. They consistently spell the fours nouns of (65) with the symbol {ä} for /a/ with Low tone. However, it could be they are using the symbol {ö} for /o/ with Low tone in a few other words, thus confusing the role of the umlauts on this second vowel where it should only be used for [+ATR]. Nevertheless, with further checking and minimal training this inconsistency should be easily corrected.

[9]  The first suggestion of how to handle tone distinctions in the orthography was to mark all surface High tone, either with an acute accent or underline of the vowel. In retrospect, this rule would have been quite challenging for writers to consistently follow, and thankfully, the 'Bëlï rejected this rule. Special thanks to Christine Waag who attended the first 'Bëlï grammar awareness workshop and thought up the four current spelling rules to handle distinctions made by tone.

contour tone.    Thus, the rule of (66) from the *Reading and Writing 'Bëli Book 2* (Gideon et al. 2013: 21) makes effective use of this percentage.

(66)  **Long Vowel Rule[10]**:    When the tone of a syllable in a word said by itself is rising or falling, always write the vowel long (doubled) in that syllable.

The Long Vowel Rule applies regardless if the word having contour tone is in a tone minimal pair with another word.    For the sack of consistency, all syllables with contour tone have doubled vowels.

In (67), words written in orthographic symbols illustrate the Long Vowel Rule.

(67)  | Level tone |  |  | Rising or Falling tone |  |  |
      | --- | --- | --- | --- | --- | --- |
      | **bï** | L | *hair* | **bïï** | *LM* | *place* |
      | **ru̱** | H | *sew clothes (v)* | **ru̱u** | *HL* | *delay (v)* |

As discussed in 4.3, 75.4% of minimal pairs of different word categories involve a verb.    An underlined vowel in verbs can distinguish such pairs.    The rule of (68) from the *Reading and Writing 'Bëli Book 2* (Gideon et al. 2013: 28) makes effective use of the high percentage of verbs in minimal pairs of different word categories.

(68)  **Underlined Vowel Rule**:    Underline the first root vowel of each verb.

(69)  | Noun |  |  | Verb |  |  |
      | --- | --- | --- | --- | --- | --- |
      | **'be** | L | *home* | **'be̱** | H | *follow (v)* |
      |  |  |  | **ale̱** | M,H | *he dug (v)* |

The Underlined Vowel Rule applies regardless if the verb is in a tone minimal pair with another word; the first root vowel of all verbs is underlined.

As discussed in 6.9 on grammatical tone, 1 in every 36 words of narrative texts is either a noun or preposition from a noun-preposition tone minimal pair.    Such words can be distinguished in writing by the rule of (70) from the *Reading and Writing 'Bëli Book 2* (Gideon et al. 2013: 32).

(70)  **Hyphen Rule** (page 32):    Put a hyphen (-) between all prepositions and following words.

(71)  | *Noun* |  | *Preposition* |  |
      | --- | --- | --- | --- |
      | **dɔ** yïkölu | *head of person* | **dɔ**-yïkölu | *on person* |

The Hyphen Rule applies regardless if the preposition is in a tone minimal pair with a noun; all prepositions are attached to following words with a hyphen.

As discussed in 6.9, 1 in every 17 words of narrative texts is either a demonstrative or relative connector from a demonstrative-relative connector minimal pair.    Such words can be distinguished in writing by the rule of (72) from the *Reading and Writing 'Bëli Book 2* (Gideon et al. 2013: 34).

(72)  **Comma Rule** (page 34):    Put a comma (,) or period (.) before every connector and at the end of each relative clause.    In addition, if there is more than one connector together, put a comma after them.

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[10] Of the four rules, the Long Vowel Rule is by far the most challenging for 'Bëlï writers to consistently follow, primarily because it involves hearing the difference between tones.    'Bëlï speakers are generally not able to correctly label tones of individual syllables as H, L, HL, etc.    However, they are quite accurate at choosing which words have the same tone. So, by comparing and constrasting the tone of a new word with known tone of common words, or by looking up the new word in the dictionary, writers have become about 90% accurate in using this rule.

(73)  | Demonstrative | Connector |
|---|---|
| Yïkölu **bo** ka̠ yi̠. | Yïkölu, **bo** mbe̠, ka̠ yi̠. |
| ***That*** person is coming. | *A person,* ***who*** *is brave, is coming.* |
|  | **Di-'bɔnda naka**, jëtëyï bo yi̠, . . . |
|  | *Then from there, that hyena came, . . .* |

The Comma Rule applies regardless if the connector is in a tone minimal pair with a demonstrative; all connectors (not just relative clause connectors) are preceded with a comma or period.

## 8. Summary

'Bëlï has 28 consonant phonemes that occur in both word-initial and intervocalic environments. There are 9 vowel phonemes, where [ə] is an allophone of /a/, only occurring along with other [+ATR] vowels in words.   Two non-equivalent non-high vowels do not occur in adjacent syllables of roots, but high vowels occur with all vowels in adjacent syllables of roots.   Nearly every syllable of every word is CV.   [+ATR] quality spreads to prefixes from roots in words.

The functional load of tone is very high, both lexically and grammatically.   Although 9.7% of words are in a tone minimal pair of the same word category, and 19.7% of words are in a tone minimal pair of a different word category, there are no tone minimal triplets giving evidence of three underlying level tones.   Nevertheless, there are seven contrastive tone melodies in CVCV nouns (five of these melodies have at least 12 monomorphemic nouns), and six contrastive tone melodies in CVCV verbs.   This is more than enough melodies for sufficient evidence of three underlying level tones.   Further, the tonal alternations, although not always predictable with the current data, also support the claim of three underlying level tones.

The 'Bëlï community has chosen four spelling rules which mark grammatical category and contour tone rather than mark surface tone or underlying tone.   These rules efficiently disambiguate 75% of lexical tone distinctions and all grammatical tone distinctions.

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