



Lexical and grammatical tone in Wiru (Southern Highlands Province, PNG)

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Abstract

This paper presents the first description of the tonal system in Wiru, a Trans New Guinea language spoken in the Southern Highlands Province of Papua New Guinea. Wiru has a mixed prosodic system, with both word-initial stress as well as lexical and grammatical tone based off of two tonal primitives: H and L. Both tones are phonologically active, as evidenced by the presence of contour tones and the preservation of floating L tones in cases of H tone spread. The domain of the tone contrast is a left-aligned trochaic foot, which can be specified as /H/, /HL/, or /LH/. Grammatical tone is found at the phrase level, particularly within noun phrases. In particular, certain noun phrase modifiers, including demonstratives and relative clauses, trigger replacive grammatical tone melodies on the modified noun. Phonological processes affecting tone include dramatic phrase-final lowering as well as bidirectional H-tone spread.

Index Terms: tone, Papua New Guinea, stress, prosody

1. Introduction

This paper presents the first description of the tonal system in Wiru, a Trans New Guinea language spoken in the Southern Highlands Province of Papua New Guinea. Also known as Witu, the language was first described by Kerr [1], who noted the existence of “word tone” (a common designation in the Papuan literature) but never fully analyzed the system. The analysis presented here draws on over 100 hours of primary data collected predominantly with a single female speaker of Wiru. Given that data from Papuan languages are still drastically underrepresented in the literature on tone, and given the diversity of tone systems they exhibit [2], this paper represents an important contribution to our understanding of how tone operates both within PNG and cross-linguistically.

Wiru has a mixed prosodic system, with both word-initial stress as well as lexical and grammatical tone. We show below that a left-aligned trochee can be understood as the domain of tone contrast in the language, but that this is the limit of tone-stress interactions in the language.

The paper is laid out as follows: In Section 2, we provide background on Wiru and our data sources. Section 3 presents details of the ingredients in the prosodic system: stress and the tonal primitives, H and L. Section 4 lays out the lexical tone contrasts, Section 5 addresses grammatical tone, and Section 6 discusses postlexical processes that affect the realization of tone in the language. Section 7 concludes.

2. Background on Wiru

Wiru, also known as Witu, is spoken in the Ialibu-Pangia District, a mountainous area of Southern Highlands Province of Papua New Guinea. As of 1981, the population of speakers was 15,300 [3], a figure still cited in the Ethnologue [4], though the current population of speakers is thought to be much higher [5]. It is a member of the Trans New Guinea Family, within which it is currently regarded as a family-level isolate [6], though there is some evidence that it groups with the Engan languages [5][7]. It is a head-final language with minimal nominal morphology and agglutinative verbal morphology.

The data in this paper were collected mainly with one female speaker, Susan Yakip, during the course of a year-long Fields Methods class at the Australian National University in 2017 and continued subsequent work. Additional data were collected with her husband, Thompson Mange. In total, over 100 hours of elicited and text data have been recorded. Future work should seek to confirm the analyses presented here with other speakers of the language.

3. Wiru prosody

As stated in the introduction, Wiru has a mixed prosodic system, with both stress and tone. In this section, we lay out the distribution and surface realization of stress, as well as the building blocks (the tonal primitives) of the tone system.

3.1. Stress

Wiru content words are characterized by initial stress. On the surface, the stressed syllable is longer, with fully articulated onset consonants, while unstressed syllables are subject to vowel reduction (or elision) and lenition of onset consonants (voicing and/or spirantization). For example, consider the word /káka/ ‘banana’, realized on the surface as [kʰá:ɣə]. In the onset of the stressed syllable, /k/ is realized as an aspirated plosive, while it lenites to the voiced fricative [ɣ] in the onset of the unstressed syllable. The stressed vowel /a/ is long and peripheral, while the unstressed /ə/ is realized as [ə].

Because tone is an independent phonological contrast, stress is not marked with pitch in Wiru. For a discussion of tone-stress interactions, see Section 4.

3.2. Tone

We analyze the Wiru tone system as comprising two tonal primitives, L and H; in addition, some syllables may be underlyingly toneless and receive their tones via spreading.

Both H and L are phonologically active: H tone participates in bidirectional spreading (see Section 6), which can leave a delinked L tone as a floating trigger of downstep. Further, we find both LH and HL contour tones, suggesting that both of these tones must be specified.

The tone-bearing unit (TBU) is the mora, with each mora able to host a single tone. While there is no phonemic vowel length distinction in Wiru, moras are implicated at the foot level, which we take to be the domain of lexical tone melody assignment.

4. Lexical tone

The tonal primitives L and H combine to create three contrastive lexical melodies: /H/, /LH/, and /HL/. While the presence of melodies such as these has led authors in the past, particularly in the Papuan arena, to the designation of “word tone” (see [1] for Wiru, also [2][8]), McPherson (2022) argues that such a designation is epiphenomenal, the result of constraints on tone assignment which vary in strictness language-to-language [9]. In the case of Wiru, the lexical melodies are easily derived from a combination of a ban on all-L melodies and a ban on HLH sequences (see also [10][11]). In other words, like many other languages, Wiru words must contain exactly one H tone span.

An interesting feature of Wiru is that the domain of tone melody assignment is not the whole word or stem but rather a left-aligned trochaic foot. For mono- and disyllabic stems, this foot encompasses the entire stem, but on trisyllabic stems, we are left with a toneless syllable after the initial foot, which receives either L or H depending on the context. Table 1 illustrates the three-way lexical tone contrast on mono-, di-, and trisyllabic stems. The initial foot is enclosed in parentheses.

Table 1: *Lexical tone contrasts on Wiru stems*

Melody	Example	Gloss
/HL/	(‘tóè)	‘fire’
	(‘jómò)	‘tree’
	(‘ákò)ma	‘girl’
/LH/	(‘tǎ:)	‘rain’
	(‘jònó)	‘arm, hand’
	(‘òkó)ro	‘gourd’
/H/	(‘ká:)	‘bag’
	(‘káǰá)	‘kunai grass’
	(‘éré)ne	‘father’

Note that to date, we have been unable to confirm a truly monosyllabic (monophthongal) /HL/ stem. For the /LH/ and /H/ monosyllabic stems, we note a vowel lengthening, which we take to fulfill a bimoraic minimum for the trochaic foot.

As evidence for the foot as the domain of tone assignment vs. simple left-to-right association, we look to the /H/ tone melody. Notably, H is always associated to the first two syllables, leaving the final syllable to receive either a L tone by default or a H tone via spreading in some contexts. The fact that disyllabic stems can have a H tone at the right edge shows that there is not a restriction against final H (at least at the lexical level, though see Section 6 for phrase-level tone restrictions). We also know that there is not an obligatory rule of H tone doubling, as in certain Bantu languages [12], since trisyllabic

/LH/ stems surface as L.H.L rather than L.H.H. Thus, coupled with independent evidence for an initial stressed syllable, we posit the initial foot as the domain of melody assignment.

5. Grammatical tone

In addition to lexical tone, Wiru also displays grammatical uses of tone. Specifically, phrasal grammatical tone is attested in noun phrases, wherein modifiers trigger replacive tonal overlays on the modified noun. This is akin to what is seen in other Highlands languages like Awa [13] and Gadsup [14], or further afield in the Dogon languages [15] and Kalabari Ijo [16]. The replacive overlays resemble the lexical tone melodies, in that they can be broadly conceived of as {H}, {HL}, and {LH}, but unlike the lexical melodies, they apply to whole stems rather than just the initial trochee. Further, as we will see below, {LH} is realized as {L...H} rather than {LH...}.

5.1. Determiners

Wiru uses a variety of prenominal determiners, indicating deixis, definiteness, and discourse reference. Interestingly, different determiners impose different replacive tonal overlays. The distal demonstrative /júkú/ ‘that (distal)’ and the anaphoric demonstrative /è-nǎ/ ‘that (aforementioned)’ both impose {HL} on the modified noun. This is shown in (1), with the nouns /tégé/ ‘frog’ and /kákà/ ‘banana’, the latter remaining unchanged:

- (1) a. júkú ^{HL}tégé
 that.DIST frog
- b. júkú ^{HL}kákà
 that.DIST banana
- c. è-nǎ ^{HL}tégé
 that-ANAPH frog
- d. è-nǎ ^{HL}kákà
 that-ANAPH banana

In contrast, the definite determiner /è-ní/ ‘the’ as well as the indefinite plural determiner /pàdé/ ‘some’ both impose {H} on the modified noun, as shown in (2):

- (2) a. è-ní ^Htégé
 the frog
- b. è-ní ^Hkákà
 the banana
- c. pàdé ^Htégé (^Hkíri)
 some frog (plural)
- d. pàdé ^Hkákà (^Hkíri)
 some banana (plural)

We find an interesting interaction between metathesis and grammatical tone assignment with the demonstrative /è-ní/. In Wiru, sequences of coronal consonants + /i/ optionally undergo metathesis before the vowel /a/. When /è-ní/ metathesizes, it is realized as L-toned [èin] and imposes a {L...H} overlay on the

following noun. Contrast (3a) and (3b) below with the noun /áròà/ ‘woman’:

- (3) a. è-ní ^Háróá
the woman
- b. èin ^{LH}àròá
the woman

Unlike the lexical /LH/ melody, whose H would be realized on the second syllable, the H in the {LH} grammatical overlay is realized only on the final vowel. Such an interaction between metathesis and grammatical tone has not, to the best of our knowledge, been reported before in the literature.

5.2. Relative clauses

Relative clauses in Wiru are typically head-final, with the modifying clause preceding the head. Like the discourse definite and distal demonstrative, the head of the relative clause also takes a {HL} melody [5]. This is demonstrated in (4) with the nouns /mòdó/ ‘sweet potato’ and /kářá/ ‘kunai grass’:

- (4) a. píri mòró-ká ^{HL}módò
fear get-PST.3SG sweet.potato
‘the sweet potato s/he is afraid of’
- b. píri mòró-ká ^{HL}kářà
‘the kunai grass s/he is afraid of’

5.3. Compounds

There are two compound tonal patterns attested in our corpus, both of which involve the deletion of one stem’s lexical tone. If we hypothesize that this tone deletion in compounds is to satisfy the lexical requirement that words contain one and only one H tone span.

When the right-hand stem retains its tone, we refer to this as “right-dominant”, and when the left-hand stem retains its tone, we refer to this as “left-dominant”. The initial stem whose tones are deleted in a right-dominant compound receives L tone by default:

- (5) /jómò + téké/ → [jòmò téké]
tree root ‘tree root’

Here, the /HL/ of /jómò/ is deleted, with a default L filling in, while /téké/ ‘root’ retains its lexical /H/.

When the second stem’s tone is deleted, as in left-dominant compounds, the second stem receives its surface tone via spreading from the final tone of the initial stem. Compare (6a) and (6b):

- (6) a. /líwì + mú/ → [líwì mù]
ant egg ‘rice (lit. ant egg)’
- b. /tègè + mú/ → [tègé mù]
frog egg ‘frog egg’

In (6a), after /HL/ tone of /líwì/ ‘ant’, ‘egg’ receives L tone, whereas in (6b) after the /LH/ tone of /tègè/ ‘frog’, ‘egg’ receives H tone.

There appears to be some free variation between left- and right-dominant compounds. Take, for instance, ‘bird egg’,

which has surfaced in our data corpus as both left-dominant [ínì mù] as well as right-dominant [ínì mú], though the latter is the preferred form.

A final variation we find on the right-dominant compound is one in which the right-hand stem receives a {H} overlay (in addition to tone deletion on the initial stem), as shown in (7):

- (7) /jómò + képènè/ → [jòmò ^Hképéné]
tree skin ‘tree bark’

It is possible that the form [ínì mú] ‘bird egg’ or [jòmò téké] ‘tree root’ could likewise involve a vacuous {H} overlay, but more examples are needed to determine whether all right-dominant compounds take {H} on the right-hand stem. Further data are also required to determine whether there are any factors that predict whether a combination of stems will be right- or left-dominant.

5.4. Complex noun phrases

Our data corpus contains a few examples of complex noun phrases, in which a compound noun co-occurs with a determiner. We find variation in whether the determiner’s overlay applies to one or both stems in the compound. In the example in (8), /è-nǎ/ imposes its {HL} overlay only on the initial stem of the right-dominant compound:

- (8) /è-nǎ + ^Ljòmò ^Hképénè/ → [è-nǎ ^{HL}jòmò ^Hképéné]
that-ANAPH tree skin ‘that tree bark’

Here, the right-hand stem retains the {H} overlay found in the unmodified compound form.

In contrast, the form in (9) shows the {H} overlay of /è-ní/ imposed across both stems of a left-dominant compound:

- (9) /è-ní + jònó ^Lògò/ → [è-ní ^Hjónó ^Hógó]
the hand nail ‘the fingernail’

At this stage, we do not have enough examples of complex noun phrases to disentangle the factors affecting overlay application. For instance, if we replace the distal determiner /è-nǎ/ in (8) with the definite /è-ní/, we would not be able to tell if an all H-toned form [jómó képéné] were the result of local or global application of {H}, since the second stem is H-toned in the compound already. The same situation holds if we replaced /è-ní/ by /è-nǎ/ in (9); whether {HL} is applied globally or locally, the second stem of the compound would be L-toned either way.

We leave these questions to future work.

6. Phonological tone processes

The final topic we address here are (postlexical) phonological processes that affect the realization of tone. In particular, we discuss Wiru’s rather dramatic final lowering in Section 6.1 and bidirectional H tone spread in Section 6.2.

6.1. Final lowering

All of the tone melodies, lexical and grammatical, that we have discussed thus far are only fully realized in non-final position. The ends of phrases in Wiru are marked with a L% boundary tone, which results in dramatic register lowering across the entire word in addition to providing a final L target. This register lowering is particularly pronounced for /LH/ vocabulary, with the H tone barely higher than the surrounding L tones. See Figure 1 for a pitch trace of /LH/ noun /mòdó/ ‘sweet potato’ phrase-medially, and Figure 2 for the same word phrase-finally.

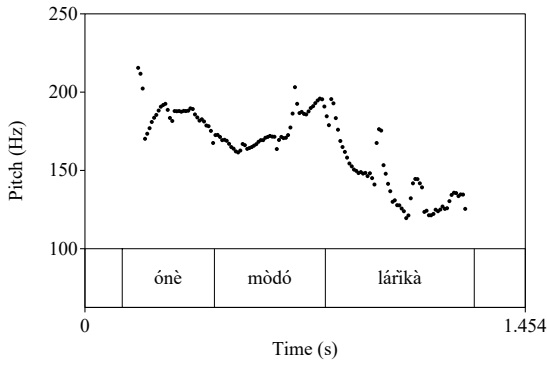


Figure 1: Pitch trace of /LH/ noun /mòdó/ 'sweet potato' phrase-medially.

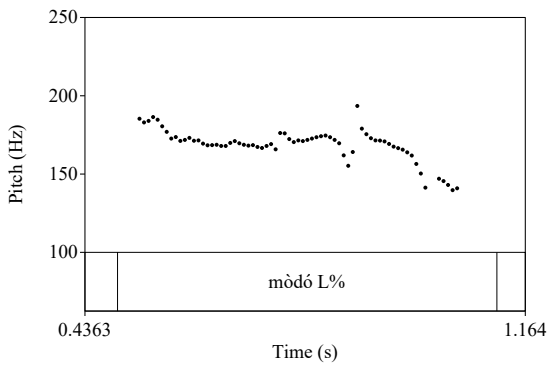


Figure 2: Pitch trace of /LH/ noun /mòdó/ 'sweet potato' phrase-finally.

Because Wiru is a verb-final language, this means that tone contrasts on the main verb are greatly reduced. To date, we have not found any evidence of grammatical tone in verb inflection, which could be due to this register compression, which would reduce the salience of this information.

6.2. H tone spread

In connected speech, /HL/ words are subject to H-toned spread. This can either be rightward spread of the word's H tone onto its own L-toned syllable, or leftward spread from a following H-initial word. In either case, the L tone is left as a floating trigger of downstep on the following H tone.

The examples in (10) show that the directionality of H-tone spread is subject to free variation. The underlying form is given first in (10a), along with a gloss; (10b) shows rightwards spread, and (10c) leftwards spread. In each case, the L tone left floating is enclosed in a circle.

- (10) a. óné téké=me tukaka
3SG root=AGT die
'S/he died because of the root.'

- b. óné 'téké=me 'túkàkà (rightwards spread)
| ✱ | ✱ | ✱
H(L) H H L

- c. ó'né téké=me 'túkàkà (leftwards spread)
| ✱ | ✱ | ✱
H(L) H H L

While such H-tone spread and subsequent L tone delinking appears more common with pronouns such as /ónè/, it is attested on lexical morphemes as well. Note that in the examples above, final register lowering is indicated on *túkàkà* as downstep.

7. Conclusion

In this paper, we have sketched out the basics of the Wiru prosodic system, with a focus on tone. This two-tone language uses tone both lexically and grammatically, with grammatical tone patterns consistent with those found in other Highlands languages. However, tone systems in Papua New Guinea remain underdescribed, making it difficult to generalize or make predictions about what we might expect to see. This highlights the importance of studies, such as the current one, which aim to fill this gap.

In future work, we hope to expand this study to include more speakers. More work is also needed on the verbal tone system, particularly looking at non-final verbs, to determine both lexical tone contrasts and whether tone plays a role morphologically. In the domain of noun phrase grammatical tone, future work will target more complex noun phrases combining modifiers with different tonal requirements to understand how these conflicts are resolved. Finally, cases of {L...H} tone patterns, such as those seen in (3b) or found on adverbialized nouns such as *irónó* 'on the ground' should be explored further, as they present counterexamples to the relationship between tone and stress otherwise present in the language.

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