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The tone system of Poko-Rawo (Skou)

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This paper describes the tone system of Poko-Rawo, a Skou language spoken in northwestern Papua New Guinea. The system displays a number of points of interest to tonal typology, including: a distinction between underlying specified Mid tones and M tones filled in by default; a dispreference for single-toned melodies; a preference for rising tones rather than falling tones; and strict alignment of Low and High tones, with L always initial and H always final in a melody. These alignment principles extend to floating tones, as floating L is always to the left of a stem and floating H always to the right. We provide a detailed description of underlying melodies, postlexical processes, and phonetic realization of tone in Poko in an effort to bring more Papuan data to bear on questions of tonal typology.

Keywords: tone; Papuan; Skou; typology

1 Introduction

This paper provides the first description of the tone system of Poko-Rawo (henceforth: Poko), a Skou language spoken in northwestern Papua New Guinea (PNG). The tone system is of interest to tonal typology for a number of reasons: First, while many languages with a Mid tone can be analyzed with this M as default (e.g. Fasu, May and Lowecke 1964; Yorùbá, Akinlabi 1985, Pulleyblank 1986; Buli, Akanlig-Pare and Kenstowicz 2002; Peñoles Mixtec, Daly and Hyman 2007 etc.), Poko displays a distinction between underlyingly specified M tones and underlyingly toneless syllables that receive a default M. Further, while most languages with level-toned syllables also display full level-toned words, the only such melody in Poko is /M/ – the melodies /L/ and /H/ are conspicuously absent. Related to this point, L and H tones show strict alignment in the language, with L gravitating to the left and H to the right; these alignments even extend to floating tones, with floating L always on the left of a stem and floating H always on the right. These alignments result in a preference in Poko for rising tones over falling tones, despite the fact that rising tones are crosslinguistically more marked than falling tones (Yip 2002, 2004; Zhang 2004; Morén and Zsiga 2006, etc.). Finally, Poko's inventory of tone melodies, including contrasts such as /MH.Ø/ vs. /M.H/ vs. /M.M^{H}/, provides evidence against automatic association of tones as envisaged in the Universal Association Conventions (Goldsmith 1976; see also Hyman and Ngunga 1994).

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Beyond these typological points of interest, detailed descriptions of Papuan tone systems remain relatively rare as compared to tone systems of African, Asian, or Meso-American languages. Thus, another goal of this work is to help fill this gap.

The aim of the paper is careful description: We attempt to present the tone system as theory-neutrally as possible, leaving formal modeling for future work. Section 2 begins with background information on Poko, the Skou languages, and our data collection methods. Section 3 gives a brief overview of the segmental morphophonology of the language and its ramifications for the tone system. Section 4 presents the underlying tonal melodies, which are shown to be largely the same for mono- and disyllabic stems. Section 5 illustrates the surface realization of tone, both in terms of sandhi processes and phonetic implementation. Section 6 considers the tone patterns of complex words. Section 7 sketches out a possible abstract analysis, while Section 8 concludes.

2 Poko-Rawo

The Skou languages are found mostly in the coastal region of Sandaun Province of Papua New Guinea, in the far northwest, and across the border into West Papua. Other members of the family include I'saka (Donohue and San Roque 2004), Wutung (Marmion 2010), Skou (Donohue 2003), Barapu/Warapu (Corris 2006), Puare, Vanimo/Dumo (Ross 1980), Womo/Onei, and Sumararu.[1] To the best of our knowledge (though many Skou languages remain underdocumented), all members of the family are tonal. Unlike Poko, which we show below to contrast three tonal primitives – L, M, and H – all other Skou languages for which tonal description is available are analyzed in terms of only two tonal primitives, H and L (with HL and LH sometimes treated as separate tonemes, F[all] and R[ise], respectively). Ross (1980) provides a brief sketch of Dumo, which he describes as having three tones, but the phonetic description of these categories is unclear; he classifies the three using binary features [high] and [long], though he says himself that he is unsure of what the feature [long] means phonetically. We will return to comparison with these other Skou languages in Section 7.

Poko belongs to a different branch of the Skou family than any of the tone systems described; the other languages in its branch are virtually undocumented. We have gathered very preliminary data for its closer relative spoken in Sumararu, and the surface pitch patterns are reminiscent of Poko. It could be that the switch to a three-tone system occurred at the time this branch split from the others, but more data are required to evaluate this hypothesis.

The Poko people historically lived inland but moved to the coast in the 1950s after an epidemic wiped out a large part of the population. In the 1990s, they returned inland due to quarrels with the village of Leitre. Like many languages in PNG, Poko is endangered as younger speakers shift to Tok Pisin. It is no longer spoken at all in the village of Rawo and is largely moribund in Onip, with most remaining speakers living in the village of Poko. Even in Poko, the primary language of communication is now Tok Pisin. However, we have learned that in the village of Sumararu, the home of another eponymously named Skou language, younger speakers are likely to speak Poko instead, as it is deemed "simpler".[2] It is difficult to estimate the total number of speakers of Poko, but we suspect it is no more than 100.

The analyses presented here are based on primary data gathered in the town of Vanimo, PNG with Didicus Mari, a male speaker of Poko, primarily through elicitation. These elicitations have resulted in

[1] Many languages are known by different names, at least one of which is typically a village where it is spoken (e.g. Vanimo, Onei, Rawo, Sumararu, etc.).

[2] There is no in-depth work on the Sumararu language to determine why Poko would be seen as simpler. However, a preliminary word list we recorded showed that Sumararu has a far more complicated segmental phonology, with a larger vowel inventory and exuberant final consonant clusters like *ndrk* in words like *yindrk* 'two'.

dozens of hours of audio recordings dating back to 2001. While most data were gathered with this single individual, the same tone patterns hold for other speakers for whom data are available.[3]

Statements of frequency in this paper are based on a tone-marked wordlist compiled in the course of tonal analysis consisting of 63 monosyllabic stems, 192 disyllabic stems, and 5 verb stems that vary between being monosyllabic or disyllabic, depending upon subject agreement (see Section 3 below). In addition, the list contains 77 longer words (3-4 syllables) and disyllabic compounds. The vocabulary in the list are drawn from all syntactic categories. Though by no means exhaustive, we take this sample of vocabulary as representative. Since a formal analysis of the tone system has only recently been developed, the considerably more substantial lexicon and text corpus has yet to receive tone marking.

3 Segmental phonology and morphology

Before turning to the tone system, we first lay out the segmental facts for Poko. The consonant phoneme inventory is provided in Table 1.

Table 1: Consonant phoneme inventory of Poko

	Bilabial	Alveolar	Palatal	Velar
Plosive	p b	(t) d		k
Nasal	m	n		ŋ <ng>
Fricative		s		
Trill	ʙ 	r		
Lateral		l		
Glide	w		j <y>	

There are a few notable aspects of the Poko consonant inventory. First is the presence of the typologically rare bilabial trill, spelled
 below, which is always prenasalized word-medially. The second is the near-total absence of the typologically common voiceless alveolar plosive /t/, found in just four words. Finally, there is no phonemic voiced velar plosive /ɡ/, an unsurprising gap in the plosive inventory; however, phonetically, the velar nasal /ŋ/ is realized as a prenasalized velar plosive in onset position (e.g. [ꜜŋɡā] 'grasshopper') and as [ŋ] in coda position. In other words, velar nasals and prenasalized voiced velar plosives are in complementary distribution. The alternative analysis would be to posit an underlying /ɡ/, with a nasal allophone in coda position, but phonotactic patterns support the former analysis. In particular, voiced plosives are never found in the onset of non-initial syllables morpheme-internally, but [ŋɡ] is found in this position (e.g. [sìŋɡī] 'rat'). Therefore, we will analyze the phoneme as an underlying nasal here, though both allophones will be represented <ng> in the transcriptions below. Other nasal phonemes do not display these alternations (i.e. /n/ and /m/ remain [n] and [m] regardless of position).

Poko has a simple five vowel inventory: /i, e, a, o, u/, three rising sonority diphthongs, /ia, ua, ue/, and one back-to-front diphthong /ui/.

Most stems are either mono- or disyllabic, though trisyllabic stems may also exist. Trisyllabic *words* are not uncommon, but many of them appear to be compounds, consisting of a monosyllabic stem followed by a disyllabic stem or vice versa. Given the difficulty of determining whether a trisyllabic word is morphologically simplex or complex, the bulk of this paper will focus on mono- and disyllabic stems. Longer words will be addressed in Section 6, showing how the same tonal principles from simplex words extend to these complex forms.

While all stems are underlyingly vowel-final, Poko displays systematic deletion of the final vowel of polysyllabic stems in all but phrase-final position; monosyllabic stems remain unchanged, as do a small

[3] The second author has been documenting the language since 2001 to produce a grammatical description and dictionary, while the first author has worked with Poko data in the United States and in Vanimo, PNG since 2018, focusing exclusively on the tone system.

number of longer invariant stems, which could indicate erstwhile morphological complexity. Table 2 gives examples of mono-, di-, and potentially trisyllabic stems (though see Section 6) in both their full (phrase-final) and reduced forms, where applicable.

Poko displays tonal stability (Goldsmith 1976, Pulleyblank 1986), meaning that when a final vowel is lost via reduction, its tone reassociates to the preceding syllable; for a suggestion that it may associate to the derived coda consonant rather than the preceding vowel, see Section 5.5. The [ML] patterns above constitute a different case, which will be addressed in Section 5.4.

Table 2: Full and reduced forms of mono-, di-, and trisyllabic stems.

Length	Full form	Reduced form	Gloss
Monosyllabic	rī	---	‘pig’
	kǎ	---	‘friend’
	dâ	---	‘dog’
Disyllabic	bīnì	bīn	‘fish’
	brlānè	brlān	‘chicken’
	ālí	ā́l	‘small-leaf ginger’
Trisyllabic	brīsīsì	brīsīs	‘worm’
	dūkū́lû	dūkū́l	‘chest’
	màlīkí	màlík	‘red and green parakeet’

There is limited vowel harmony in stems: non-low vowels tend to be followed by identical vowels, while /a/ can be followed by any vowel but /o/. For stems with initial diphthongs, the final element of the diphthong determines the vowel harmony pattern.

Poko allows a small number of word-initial consonant clusters, shown in Table 3 with example vocabulary. As the table shows, for all but /s/-initial clusters, the second consonant is a liquid. There are cases that sound like clusters with /w/ in second position, but this does not appear to be contrastive with a /u/-initial diphthong.

Table 3: Onset clusters

Cluster	Example	Gloss
sn	snḗnê	‘laulau tree’
sk	skā́brâ	‘tree wallaby’
spo	spō	‘bubbles’
ml	mlṓpī	‘good’
kl	klàkánā	‘three’
brl	brlāká	‘spider’
wl	wlǒ	‘stick’

Consonant clusters are found word-internally, but most of these straddle suspected morpheme boundaries and hence are the result of final vowel deletion discussed above.

Morphologically, Poko displays interesting consonant alternations marking subject agreement on verbs, which can appear either initially (as a prefix) or medially (as an infix). An example of initial subject marking can be seen with /<>īlí/ ‘break (intr.)’, where angle brackets mark the position of the alternating consonant (following Leipzig Glossing Conventions for infixation):

(1) <n>īlí ‘I break’
<m>īlí ‘you break’
<d>īlí ‘he breaks’
etc.

An example of stem-internal alternation can be seen with the verb /dū<>ú/ ‘cut’:

(2) dū<n>ú ‘I cut’
dū<m>ú ‘you cut’
dū<l>ú ‘he cuts’
etc.

While most person/number combinations are fairly stable in their consonantal reflex, the 3sg shows a lot of lexicalized variation, including /d/, /l/, /k/, and ∅. In the last case, this can result in monosyllabic 3sg forms (e.g. *nī́* ‘he sleeps’) but disyllabic forms for other subjects (e.g. *nī<n>í* ‘I sleep’).

There is no morphological marking for TAM; instead, tense or aspect interpretation is encoded through context and/or the use of temporal adverbs. As in (1)-(2) above, we will gloss examples in this paper in present tense, but they could be equally well glossed as past, future, etc.

4 Tone melodies

Poko has three contrastive tonal primitives, L, M, and H. In addition, some syllables are underlyingly unspecified for tone. The three tonal primitives do not combine freely. Instead, they form the building blocks of a set of *tone melodies*, which are generally mirrored on mono- and disyllabic stems. In this way, Poko could be seen as an example of a word-tone system, commonly described for Papuan languages (e.g. Donohue 1997, 2003; James 1994; Fedden 2011) as well as in other parts of the world (e.g. Mende, Zhang 2004; Copala Trique, Hollenbach 1984; or the Chatino languages, Campbell 2013), wherein a fixed set of melodies map automatically to words of various lengths. However, as argued elsewhere (McPherson forthcoming), classifications like “word tone” or even the notion of tone melodies are likely epiphenomenal rather than a distinct phonological classification. For convenience here, we will discuss Poko tonology in terms of tone melodies. With the exception of /^{L}M^{H}/, melodies typically consist of zero to two tones, meaning that no syllable (which we could take as the tone-bearing unit/TBU) ever hosts more than two tones.

The basic tone melodies are given in Table 4, with examples of mono- and disyllabic stems. Surface realizations of these melodies will be discussed in Section 5. Here and elsewhere, floating tones are indicated in superscript.

Table 4: Poko tone melodies

Tone melody	Monosyllabic stem	Gloss	Disyllabic stem	Gloss
/MH/	kā́	‘tulip’	kūwú	‘picture’
/MH.∅/	---		bū́lu	‘mother’
/M^{H}/	rī^{H}	‘pig’	wāpī^{H}	‘breadfruit’
/M/	nā	‘eat (1sg)’	nānē	‘1sg’
/∅/	da	‘dog’	bini	‘fish’
/LM/	rà̄	‘pot’	ùnū	‘mango’
/LH/	wlǒ	‘stick’	ìlí	‘bamboo’
/^{L}M^{H}/	---		^{L}būlū^{H}	‘jungle’

In the melody /MH.∅/, the syllable break is explicitly marked with a period, as it only occurs on disyllabic stems and is characterized by both tones, M and H, associating to the first syllable; in all other cases, syllable boundaries are not marked, and association can be assumed to occur from left to right. For instance, for the melody /MH/, this will yield a [MH] rising tone on a monosyllable and [M.H] on disyllabic stems. Note that the last melody, /^{L}M^{H}/ could also be analyzed as /^{L}∅^{H}/, since underlying non-final toneless syllables generally receive M by default on the surface (see Section 5.4). If we analyze it as underlyingly unspecified on the root, then the melodies would be consistent in never consisting of more than two tones, but as we will discuss in Section 5.7, there are reasons to suspect the M is underlying.

From the table, we can observe two curious facts. First, there are no level /L/ or /H/ melodies – the only single-tone melody is /M/. This analysis will be defended in the next section with evidence from phonetic realization and sandhi behavior. Second, L and H tones pattern differently, with L always at the left edge (whether associated or floating), and H always at the right. These combinatorics are summarized in Table 5, with the initial tone in the left-hand column and the second tone across the top row.

Table 5: Permitted two-tone combinations in Poko

	H	M	L
H	---	X	X
M	✓	---	X
L	✓	✓	---

We make the assumption that Poko would obey the OCP within a stem or melody, and thus that H-H or M-M would be ruled out a priori (marked here with ---). Possible but unattested combinations are indicated with X.

The same set of melodies is found on all syntactic categories, with minor exceptions, such as all pronouns belonging to either the /M/ or /M^H/ classes. While lexical tone carries a high functional load in Poko, there is no evidence for productive grammatical or morphological tone of the sort found in many African or Meso-American languages (see e.g. Rolle 2018, Palancar and Leonard 2016). The closest contender we find is optional number marking of the object on the verb: Some Poko verbs encode object number (singular or plural) segmentally (e.g. *wīán* 'look for (sg. object)' vs. *wīn* 'look for (pl. object)'), but two or three verbs mark this pattern tonally instead (e.g. *nīkī* 'give to them (sg. object)' vs. *nìkí* 'give to them (pl. object)'). However, given the limited number of words behaving in this way, the pattern is likely to be lexicalized and hence not a productive morphological process in the language.

The distribution of tone melodies on mono- and disyllabic stems is summarized in Table 6, including both token count and percentage of the wordlist.

Table 6: Distribution of tone melodies across mono- and disyllabic stems

	Monosyllabic	Disyllabic
/MH/	11% (7)	14% (27)
/MH.Ø/	---	6% (12)
/M^H/	13% (8)	15% (29)
/M/	3% (2)	5% (10)
/Ø/	40% (25)	17% (33)
/LM/	22% (14)	21% (41)
/LH/	11% (7)	20% (39)
/$^LM^H$/	---	1% (2)

A couple of comments can be made here about the distribution of tone melodies. First, level /M/ is quite rare, accounting for just 3% and 5% of mono- and disyllabic stems, respectively. The only tone melody that is rarer is the complex melody /$^LM^H$/, found on just two disyllabic stems. A large portion of monosyllabic stems are toneless, whereas the other melodies (i.e. not /M/ or /$^LM^H$/) are very evenly distributed across disyllabic stems.

Table 7 provides a series of minimal sets for monosyllabic stems.

Table 7: Tonal minimal sets for monosyllabic stems

Tone melody	Set 1	Set 2	Set 3	Set 4	Set 5
/MH/			nī́ 'dragonfly'		nā́ 'song'
/M^{H}/		dō^{H} 'get'		ō^{H} 'breadfruit'	
/M/	dā 'he eats'				nā 'I eat'
/Ø/	da 'dog'	do 'cry'	ni 'light'	o 'thing'	
/LM/	dă 'story'		nĭ 'water'	ŏ 'sago'	nă 'I go'
/LH/		dǒ 'half'			nǎ 'white'

We are not aware of any minimal pairs for /MH/ vs. /M^{H}/, or for /M^{H}/ vs. /M/, among monosyllabic stems. However, we do find such minimal pairs for disyllabic stems, as shown in Table 8:

Table 8: Tonal minimal sets for disyllabic stems

Tone melody	Set 1	Set 2	Set 3	Set 4	Set 5
/MH/			kūwú 'picture/shadow'		īlí 'dirt'
/MH.Ø/	bū́lu 'mother'	ṓlo 'father'		ū́lu 'maternal uncle'	
/M^{H}/			kūwū^{H} 'fog/cloud'	ūlū^{H} 'moon'	īlī^{H} 'she/her'
/M/			kūwū 'whistle'		
/Ø/				ulu 'egg/bone'	ili 'skin'
/LM/		òlō 'grandfather'		ùlū 'grandmother'	ìlī 'hide (intr)'
/LH/		òló 'ashes'			ìlí 'bamboo'
/^{L}M^{H}/	^{L}būlū^{H} 'jungle'				

Minimal set 2 demonstrates that the three rising melodies (/MH.Ø/, /LM/, /LH/) are all contrastive. Minimal set 3 is especially informative, since it shows that a) /MH/ is contrastive with /M^{H}/, despite consisting of the same tonal primitives, and b) that /M^{H}/ is contrastive with /M/ despite the fact that they are pronounced the same in isolation (see Sections 5.2-5.3 below). There are no attested minimal pairs for /MH/ vs. /MH.Ø/, possibly due in part to the fact that the two melodies neutralize in their reduced form. See Section 5.1 below.

5 Phonetic and phonological behavior of Poko tone melodies

In this section, we expand on each of the tone melodies presented above. The phonological behavior of each melody is summarized in isolation and in context, including questions of phonetic implementation, which are at times difficult to distinguish from truly phonological processes. We show that while Poko likely had simple L- and H-toned words at some point in its past, such an analysis would be difficult to defend synchronically.

5.1 /MH/ and /MH.∅/: Contrastive association

We begin with the /MH/ melody, as it is the most stable tone melody in terms of its realization. On monosyllabic stems in isolation or in phrase-final position, M and H are both associated to the single syllable of monosyllabic stems, creating a rising tone:

(3) a. ka [ka᷄] 'friend'
   /\
   M H

b. ni [ni᷄] 'sleep (1sg)'
   /\
   M H

On disyllabic stems, we find two patterns of association for MH tones. The majority associate M tone to the first syllable and H to the second, creating a disyllabic form with level tones on each syllable (4a-b), while a smaller number of stems associate both tones to the first syllable, leaving the second syllable unspecified for tone (4c-d); these two patterns of association are distinguished as /MH/ and /MH.∅/ in Tables 4, 6, and 8 above.

(4) a. kuwu [kūwú] 'picture, shadow'
   | |
   M H

b. dili [dīlí] 'he breaks'
   | |
   M H

c. bulu [bu᷄lû] 'mother'
   /\
   M H

d. skabra [ska᷄mʙâ] 'tree wallaby'
   /\
   M H

We will address the phonetic realization of underlyingly unspecified syllables in Section 5.4 below, which deals with /∅/ stems. This lexically-specified tone association is reminiscent of a much more widespread system of phonological accent proposed for the Skou language by Donohue (2003), wherein accented syllables determine where the tones are associated. It is possible that this system was also once more widespread for Poko, but with its extensive segmental reduction, stems often lose a syllable that may have once carried contrastive accent. The /MH.∅/ pattern has only been seen on nouns, and it is overrepresented on kinship terms (*a᷄lu* 'older brother', *no᷄po* 'brother-in-law', *o᷄lo* 'father-in-law', *so᷄lo* 'younger brother', *u᷄lu* 'maternal uncle', *u᷄ru* 'younger sister').[4]

Non-finally, the contrast between these two disyllabic association patterns is neutralized, as the disyllabic stems undergo loss of the final vowel, forcing both M and H to associate to the remaining syllable. Thus, in this position, both mono- (5a) and disyllabic (5b-c) stems are realized with a MH rising tone:

[4] The rest of the kinship terms belong to the /LM/ class, e.g. *nàrū* 'elder sister', *mùlū* 'wife', *sùlū* 'sister-in-law', *òlō* 'grandfather', *ùlū* 'grandmother'. We treat these semi-predictable distributions as a kind of comparative phonotactics (e.g. Hayes 2014, Gouskova 2018), rather than as a case of grammatical tone, as suggested by a reviewer.

(5) a. UR: /nānē kǎ nìasí/ SR: [nān kǎ nìasí] 'I hide the friend'
nan ka niasi
| /\ | |
M M H L H

b. UR: /nānē kūwú nìasí/ SR: [nān kǔw nìasí] 'I hide the shadow'
nan kuw niasi
| /\ | |
M M H L H

c. UR: /nānē bǔlu nìasí/ SR: [nān bǔl nìasí] 'I hide mother'
nan bul niasi
| /\ | |
M M H L H

While we have yet to find any minimal pairs contrasting /MH/ vs. /MH.Ø/, the two patterns are entirely consistent for core vocabulary (that is, there is no confusion between [M.H] and [MH.Ø] in isolation), showing that these are two distinct phonological representations despite frequent neutralization.[5] Since we have not seen any minimal pairs, /MH/ and /MH.Ø/ may be a case of marginal contrast (Currie Hall 2013).

Given the unusual absence of the more basic tone patterns /L/ and /H/ in Poko, it is tempting to ask whether the MH rise could simply be a phonetic implementation of /H/. In the examples given thus far, for instance, it could simply be the case that there is peak delay of H (e.g. Myers 1999, Akinlabi and Liberman 2000, Xu 2001, etc.), with f0 beginning at a neutral M pitch in isolation or interpolating from the preceding M in the phrasal examples in (5). In fact, Poko does have peak delay of H tone, leading to the neutralization of MH and H in some contexts (see 9 below), but we cannot explain the /MH/ melody in this way for a few reasons. First, in a sequence of /MH/ tones, each word shows the MH rise, rather than reaching a H peak and maintaining it. For example:

(6) ko ka [kǒ kǎ] 'that is tulip (an edible green)'
/\ /\
M H M H

Peak delay as a phonetic principle alone could not account for these facts.

Second, /MH/ is distinct from what we analyze to be a level H tone resulting from tone sandhi when a floating H docks to a following toneless syllable. This docked H tone reaches its peak considerably earlier in the syllable than the underlying MH, which shows a rise in the same environment; see Figure 3 below for illustration.

Finally, more theoretical analysis of the system as a whole shows that strict Obligatory Contour Principle (OCP) for L and H tones may have led speakers to reanalyze allophonic tone patterns like /H/ → [MH] as being in fact the underlying representation. We will return to these more theoretical questions in Section 7.

Taken together, these facts point to a synchronic /MH/ melody in Poko.

Returning to peak delay, this phenomenon can result in the f0 peak of the /MH/ melody being realized at the beginning of the following syllable. For instance:

(7) UR: /kākā^{H} kǎ dō^{H}/ SR: [kāk kǎ dǒ] 'he gets tulip'
kak ka do
| /\ |
M ~~H~~ M H M ~~H~~

[5] For some less common words, we have heard the consultant vary between [M.H] and [MH.Ø] on non-reduced forms, which we take to represent uncertainty about class membership.

In this example, the floating H tone of the /M^H/ melody is shown struck through (~~H~~) on the autosegmental tier as it goes unrealized. Since peak delay and this "H carryover" are gradient, subject to factors like speech rate, we treat them as phonetic rather than phonological effects, and hence do not show autosegmental spreading of the H-tone of *ka᷄* 'tulip'. The behavior of floating H tones will be addressed in the next subsection.

A following L tone blocks peak delay and H carryover (e.g. /nānē bū́lu nìasí/ → [nān bū́l nìasí] 'I hide mother' and not *[nān bū́l nîasí]). As such, the whole MH rise must be realized during the duration of the syllable that hosts it, meaning there is often less time to realize the full rise. This is especially true when a reduced disyllabic stem has an obstruent coda that cannot carry f0 information. In these cases, the MH rise is compressed and realized almost like a H tone, a result in line with crosslinguistic findings of the effects of duration and sonority on contour tone realization (e.g. Zhang 2004). However, as Figure 3 in Section 7 shows, the two do remain distinct; thus, we take this MH compression to also be a phonetic effect rather than an allophonic rule of /MH/ → [H].

5.2 /M^H/: M with a floating H

The second tone melody consists of the same autosegments, M and H, but in a different configuration. For this melody, the H floats at the right edge of the stem. In isolation, the floating H goes unrealized, leading to level [M] pronunciations of both mono- and disyllabic stems, as shown in (8):

```
(8)   a.   ri          [rī]        'pig'
           |
           M H

      b.   do          [dō]        'get'
             |
            M H

      c.   wapi        [wāpī]      'breadfruit'
             |/
            M  H

      d.   ulu         [ūlū]       'moon'
           |/
           M  H
```

In disyllabic stems, the second syllable is often produced slightly lower than the first. It is unclear whether this should be viewed as a phonological process of downstep, which could indicate that each syllable carries its own M tone, or whether it is a phonetic effect due to the phrase-final position or to a possible stress distinction, as described in other Skou languages (e.g. Donohue 2003).[6]

With the floating H unrealized in isolation or phrase-final position, the /M^H/ melody neutralizes with the /M/ melody in these positions; see Section 5.3 below. The two are differentiated by their behavior in non-final context, where the floating H of /M^H/ has the chance to dock. When followed by either /M/ or /Ø/ words, the floating H docks to the right (overwriting the M tone). In (9), a /M + M/ sequence (a) is contrasted with a /M^H + M/ sequence (b):

```
(9)   a.   UR:    /nānē   nā/        SR: [nān nā]    'I eat'
                  nan     na
                   |       |
                  M       M
```

[6] We thank an anonymous reviewer for this suggestion. While there is no independent evidence for stress, the process of phrase-final reduction could corroborate the prosodic weakness of the final syllable.

```
   b.   UR:   /kākā^H  dā/          SR: [kāk dǎ]   'he eats'
              kak      da
               |       ╪
              M H      M
```

Plain M-toned words like *nānē* '1sg' (reduced form *nān*) trigger no alternations on following words, whereas the 3sg pronoun *kākā^H^* introduces a H tone that replaces the following M tone. Though phonologically a H tone, it is realized in final position with peak delay, neutralizing the contrast between /MH/ and derived surface H. In medial positions, this distinction is maintained, with the docked H reaching the H target early in the syllable and MH continuing to show a rise (see Figure 3). For examples of floating H docking onto toneless stems, see Section 5.4.

Interestingly, while the floating H tone can displace /M/, it cannot dock onto either /MH/ or /M^H^/. Followed by words with these melodies, the floating H goes unrealized:

```
(10) a. UR:   /kākā^H  kǎ    dō^H/      SR: [kāk kǎ dō] 'he gets tulip'
              kak      ka    do
               |       /\     |
              M ~~H~~  M H   M ~~H~~
     b. UR:   /kākā^H ūlū^H/            SR: [kāk ūlū]       'his moon'
              kak     ulu
               |      |/
              M ~~H~~ M ~~H~~
```

One possible explanation for this behavior lies in the OCP: If the floating H docked to the following M, displacing it (as it does for /M/ words), then it would create an illicit sequence of two H tones. In the case of the disyllabic form in (10b), this wouldn't fully explain the situation, since the floating H could displace the M from just the first syllable of *ūlū^H^*, leaving a M-toned barrier between the two H tones. In fact, in rare instances, we do find this realization, but more often, the floating H is blocked altogether.

When followed by a L tone of any sort (/LM/, /LH/, or /^L^M^H^/), the H tone docks leftwards onto the stem's own M tone. In this case, it does not overwrite the M, but instead creates a MH rise (neutralizing /MH/ and /M^H^/ in this context):

```
(11) UR:  /nānē  dō^H    yě/        SR: [nān dǒ ꜜyē]    'I already got (it)'
           nan   do      ye
            |    | \     ≠|
            M    M  H    L M
```

The unlinking of L in /LM/ will be discussed in Section 5.5 below.

In summary, the /M^H^/ class is distinguishable from the /MH/ class both in its own alternating realizations ([M] ~ [MH], as opposed to /MH/'s invariant realization [MH]), but also in the alternations it triggers on following /M/ and /∅/ words.

5.3 /M/: Plain M

The only single-toned melody in Poko is /M/. In isolation, words with this melody are indistinguishable from /M^H^/. Examples include:

```
(12) a.  nane        [nānē]       '1sg'
          |/
          M
```

b. kuwu [kūwū] 'whistle'
  |⁄
  M

See also 'eat' in (9) above.

The only alternation /M/ stems undergo is the docking of a preceding floating H, as shown in (9) above (or the shifting of a H from a preceding /LH/; see Section 5.6). On disyllabic stems, this only affects the initial syllable:

(13) UR: /kākā^H kuwu/ SR: [kāk kúwū] 'he whistles'
kak kuwu
|
M H M

In autosegmental terms, the M is delinked from the first syllable of /kūwū/ by the association of the floating H, but it remains linked to the second syllable. In non-final position, however, when the disyllabic stem is reduced, the M tone is completely replaced:

(14) UR: /kākā^H kuwu yě/ SR: [kāk kúw ꜜyē] 'he already whistled'
kak kuw ye
|
M H M L M

The H in this context remains distinct from underlying /MH/ – the f0 peak is reached earlier in the syllable, lending further support to the analysis in Section 5.1 that /MH/ is a phonological and not just phonetic representation.

In summary, the /M/ melody has two surface realizations: [M] and [H(M)] ([H] on monosyllabic stems and [H.M] on disyllabic stems), with the H-initial variant due to the docking of a floating H from a preceding word, as in (13) and (14). This melody represents a relatively small proportion of the lexicon but includes common items like non-third person pronouns and the verb 'eat'.

5.4 /∅/: Toneless stems

An interesting facet of the Poko tone system is the presence of both specified /M/ and unspecified (toneless) stems, which receive M by default in many configurations. This is a relatively rare state of affairs, argued to be found in a small number of languages, including Nochixtlán Mixtec (McKendry 2013) and Sierra Juárez Zapotec (Bickmore and Broadwell 1998). In isolation, Poko toneless stems are realized as [ML]. We understand this realization to be due to the presence of a final L% boundary tone, which is only able to surface when there is no lexical tone. On monosyllabic stems, [ML] is a falling contour tone; we assume that the boundary tone provides the final point for pitch interpolation, and that the syllable begins on M by default in the absence of any other starting point for interpolation.

(15) a. da [dā̀] 'dog'
  L%

b. ne [nḕ] 'I make'
  L%

On disyllabic stems, the initial syllable is realized as M and the second syllable begins on a M pitch and falls to L. This could be due to the same interpolation from a default M starting pitch, as in (15) above, or could be due to the phonological insertion of a default M tone on the first syllable. Here and elsewhere, default M tones will be shown in parentheses.

(16) a. bini [bīnȉ] 'fish'
(M) L%

b. kulu [kūlȕ] 'dig up'
(M) L%

Either a default starting pitch or the epenthetic M tone could provide the starting point of interpolation for the final syllable. The reason we cannot posit the insertion of a M tone for monosyllabic stems is that the presence of any phonological tone on a phrase-final syllable blocks the realization of the L% boundary tone (as can be seen in Section 5.3 for /M/ stems).

Like the specified melody /M/, toneless stems are subject to floating H tone docking. Monosyllabic stems thus see the neutralization of /M/ and /∅/ in these contexts, as do reduced (non-final) disyllabic stems, which have just a single tone-bearing syllable.

(17) a. UR: /kākā^H de/ SR: [kāk dȅ] 'he makes'
kak de
M H L%

b. UR: /kākā^H umu de/ SR: [kāk úm dê] 'he makes a hole'
kak um de
M H L%

The example in (17a) can be compared to example (9b), showing the neutralization of /M/ and /∅/. As this example shows, the boundary tone goes unrealized since /de/ has taken the floating H from the preceding pronoun. Recall that on the surface, phrase-final H is realized as [MH] due to peak delay. Example (17b) can be compared to (14) showing the neutralization of the two tonal melodies in question on reduced disyllables. Toneless /umu/ becomes [úm] in its reduced form; peak delay of the docked H does not occur on non-final syllables, presumably due to their shorter duration. This H tone provides the initial point of interpolation for the final toneless monosyllable /de/, with the final point being the L% boundary tone, thus producing a HL contour tone.

Disyllabic /M/ and /∅/ remain distinct in phrase-final position after a floating H, with the former realized as [H.M] (see example 12) and the latter as [H.HL], as shown in (18):

(18) UR: /kākā^H kulu/ SR: [kāk kúlû] 'he digs up'
kak kulu
M H L%

The association of the floating H to the first syllable blocks default M insertion, but the final syllable remains toneless and hence able to realize the final boundary tone.

In other positions, toneless stems receive M by default. Examples are shown in (19). Following IPA conventions, [ꜜ] on [ꜜŋgā] indicates downstep.

(19) a. UR: /nānē bini dō^H/ SR : [nān bīn dō] 'I get a fish'
nan bin do
M (M) M ~~H~~

b. UR: /da ngǎ dō^H/ SR: [dā ꜜngā dō] 'the dog gets a grasshopper'
da nga do ~ [dâ ꜜngā dō]
⋮ ≠| |
(M) L M M ~~H~~

In phrase-medial position in (19a), the toneless noun /bini/ 'fish', reduced to [bin], receives a default M tone. This is likewise the case in (19b), where the toneless noun /da/ 'dog' is in phrase-initial position. However, in this same configuration, the subject is occasionally pronounced with [ML] tone due presumably to the leftward docking of the L tone left floating by delinking from /ŋgǎ/; the behavior of the /LM/ melody will be discussed further in the next subsection.

5.5 /LM/: Deriving floating L

The /LM/ melody manifests itself differently on monosyllabic and disyllabic stems. We begin with the disyllabic stems, where the pattern is the most transparent, with L associated to the first syllable and M to the second:

(20) a. unu [ùnū] 'mango'
| |
L M

b. duku [dùkū] '(rope) snap'
| |
L M

The second syllable in each case is audibly higher than the first.

Unlike other melodies, like /MH/, where monosyllabic stems display a contour tone, monosyllabic stems with /LM/ instead surface as [ꜜM], i.e. downstepped M, suggesting that the L tone is left floating. We take this to be the result of a phonotactic ban on [LM] rising tones. For instance:

(21) a. nga [ꜜngā] 'grasshopper'
≠|
L M

b. na [ꜜnā] 'I go'
≠|
L M

We represent this here with a derived floating L, that is, a delinking of the L of the /LM/ melody. This allows us to unify the behavior of monosyllabic stems, which uniformly surface as [ꜜM], with the behavior of disyllabic stems, where L is associated to the first syllable.

Typically, downstep is defined as a register drop, meaning that subsequent tones of the same height (e.g. H tones after a downstepped H) will be pronounced at the same level – in other words, the pitch ceiling for that category has been lowered (see e.g. Stewart 1965, Snider and van der Hulst 1993). This is almost the case in Poko. The language consultant's pronunciation for the sequence [ꜜM M] varies between the second M being at the same level as the preceding one and the second M being slightly higher (though not as high as other M tones earlier in the phrase). An alternative analysis, suggested by a reviewer, is that /LM/ simplifies to an intermediate tone level – in terms of tone numbers, /13/ → [2]. This would allow us to account for the local pitch drop without making any predictions about lowering of subsequent M tones. Further phonetic analysis will be required to decide between these analyses.

A further alternative would be to view these monosyllabic stems as L-toned, filling in the gap in the inventory where we might expect a level /L/ melody. However, support for the downstepped M analysis comes from the behavior of reduced disyllabic /LM/ stems. Reducing the disyllabic stem produces a single tone-bearing syllable, but due to the ban on [LM] contour tones, adjustments must be made. We find two surface allomorphs depending upon context and speech style. Before M tones (i.e. /MH/, /M^{H}/, /M/, and /∅/) in more rapid speech, we find a lax falling realization of the stem which we take to be a L-toned allomorph, since it resembles the initial syllable of /LM/ and /LH/ disyllabic stems. This realization can be seen as the result of tonal absorption (Hyman and Schuh 1974), the process in which the second half of a contour tone can be absorbed into a following identical tone resulting in contour simplification (e.g. /LH-H/ → [L-H], or in this case /LM-M/ → [L-M]).

(22) a. UR: /nānē bòlō ne/ SR: [nān bòl nē] 'I make a comb'
nan bol ne
M L M L%

b. UR: /nānē ìyī dō^{H}/ SR: [nān ìy dō] 'I got a string bag'
nan iy do
M L M M ~~H~~

Note that the realization of the boundary L% in (22a) is slightly puzzling; final /M/ words do not allow the realization of the boundary tone, and phonological docking of a H tone onto a final toneless syllable likewise blocks L%, as shown in (17a) above and (25) below, yet here we see both the docking of the M of /LM/ and the realization of the boundary tone. There are at least two possible explanations for the facts, neither without complication. First, we could posit a timing difference between M and H shift, namely that H shifts before the docking of L% (hence blocking it), whereas M shifts after. Second, we could attribute the realization in (22a) not to a phonological shift but rather to peak delay, which we also variably see with LH rises before ∅, illustrated in (26) below. The issue with this second explanation is that unlike LH rising tones, which do surface as a contour tone in Poko, LM rising tones never do, as shown above for monosyllabic stems. Forms like those in (22) may give us evidence that reduced disyllabic stems, with their derived coda consonant, have greater tone bearing capability than underlying monosyllabic stems; in other words, reduction may leave something like |ìȳ|, with the M tone on the coda consonant, and peak delay causes it to be realized on the following syllable, as in (22a), or absorbed by it, as in (22b). For other examples of the distinction between mono- and disyllabic /LM/ stems in this tonal context, see the discussion of compounds following Table 10 below.

Before a L tone, the reduced /LM/ is realized like monosyllabic /LM/ stems, i.e. [ꜜM]. This realization is also found before M tone in more careful speech.

(23) UR: /nānē ùnū nìasí/ SR: [nān ꜜūn nìasí] 'I hide a mango'
nan un niasi
M L M L H

The ꜜM of [ꜜūn] 'mango' is considerably higher than the following L tone, with the same flat pronunciation we always see on monosyllabic /LM/ stems. This pattern of realization can also be understood in terms of the OCP: delinking the L and leaving the M associated prevents two L tones from being adjacent.

To summarize this section, the /LM/ melody has three realizations depending upon the number of syllables and the context. On disyllabic stems, each tone associates to one syllable; with only a single tone bearing syllable, the LM contour tone is banned, and so one or the other tone must delink and either remain floating (L) or get absorbed into the following tone (M). Underlyingly monosyllabic stems have the invariant realization [ꜜM], perhaps due to the fact that speakers have the floating L as part of the lexical representation (or a preference for maintaining the underlying association of M). Reduced disyllabic stems vary between this same pronunciation of [ꜜM] and [L], perhaps due to the fact that it is the M tone in this case that loses its underlying tone-bearing syllable through the reduction process.

5.6 /LH/: A tolerated but dispreferred rise

The last melody found on both mono- and disyllabic stems is /LH/. On monosyllabic stems in phrase-final position, it is realized as a rising tone, and on disyllabic stems, each tone associates to one syllable:

(24) a. na [nǎ] 'white'
L H

b. kulu [kùlú] 'garden'
L H

Typologically, rising tones tend to be marked or dispreferred compared to level or falling tones (see Yip 2002, 2004; Zhang 2004; Morén and Zsiga 2006, etc.). As in many other languages, LH rising tones in Poko are realized most clearly in phrase-final position, which is the least marked position for them (thanks in part to phrase-final lengthening, Zhang 2004). In non-final position, disyllabic stems have just a single tone-bearing syllable due to reduction (i.e. [kǔl] rather than [kùlú]), yielding LH contour tones on what would otherwise have been a sequence of level L and H; monosyllabic stems, of course, invariably carry this LH contour tone. These rising tones are subject to different kinds of simplification. Two alternations we classify as phonological, with a third being a phonetic effect.

First, if the rising tone is followed by a toneless stem, the H tone usually shifts to the toneless syllable:

(25) a. UR: /nānē wlǒ ne/ SR: [nān wlò nē̂] 'I make a stick'
nan wlo ne
M L H L%

b. UR: /nānē so kunu/ SR: [nān sò kúnû] 'I want to dig it up'
nan so kunu
M L H L%

In (25a), the reassociation of the H onto the monosyllabic toneless stem blocks the realization of the boundary tone. In (25b), with a disyllabic toneless stem, the reassociated H docks to just the first syllable, leaving the second toneless syllable to realize the boundary tone. In both cases, the /LH/ stem surfaces as [L].

Note, however, that while the pronunciations in (25) appear to be the most frequent, we also find cases where the H does not shift, but rather we see peak delay, yielding a HL falling tone on the toneless stem:

(26) UR: /kākā^{H} wlǒ de/ SR: [kāk wlǒ dê] 'he makes a stick'
kak wlo de
M H L H L%

In this example, we also see the leftward docking of floating H on the first word, due to the following L tone of the /LH/ rise. We take this variation between a shifted H tone vs. simple peak delay/H carryover to be phonological in nature, since the two realizations are categorically distinct in the behavior of the L% boundary tone.

The same shifting of the H tone seen in (25) can occur with a following /M/ stem, in which case the M is overwritten (analogously to the docking of a floating H tone, discussed in Section 5.2):

(27) UR: /nānē sǒ nā/ SR: [nān sò nǎ] 'I want to eat'

```
nan   so    na
 |   /\=   ‡
 M  L  H   M
```

The second phonological alternation is the deletion of H tone before /MH/. This occurs regardless of whether the following stem is mono- or disyllabic.

(28) a. UR: /kākā^H sǒ nǐ/ SR: [kāǩ sò nǐ] 'he wants to sleep'

```
kak    so     ni
 |\   /\=    /\
 M H  L  H  M  H
```

b. UR: /nānē sǒ nīní/ SR: [nān sò nīní] 'I want to sleep'

```
nan   so     nini
 |   /\=     | |
 M  L  H     M H
```

As with the association of floating H tone, discussed in Section 5.2, the M of /MH/ cannot be overwritten by a shifted H tone without producing an OCP violation.

Before L tones, L and H appear to remain associated to the stem, but the rise is not fully realized. Instead, it surfaces as something close to a phonetic [LM] rise, which we take to be a matter of phonetic implementation (given the phonological ban on LM rising tones). For example:

(29) UR: /nānē sǒ nìasí/ SR: [nān sǒ nìasí] 'I want to hide it'

```
nan   so    niasi
 |   /\      | |
 M  L  H     L H
```

While this sounds very similar in some cases to a ꜜM, phonetic analysis shows that retains a more rising trajectory.

Finally, before /M^H/ we find both gradient phonetic and categorical phonological behavior depending upon whether the following stem is mono- or disyllabic. Before a disyllabic /M^H/, the H tone can shift onto the initial syllable:

(30) UR: /nānē nìní kīpī^H/ SR: [nān nìn kípī] 'I am afraid of them'

```
nan   nin    kipi
 |   /\=     ‡/
 M  L  H    M  H̶
```

Here, the H of /LH/ delinks from its stem and reassociates to the first syllable of /kīpī^H/ 'them'; this causes the M tone to delink from this syllable, but it remains associated to the second syllable, yielding the realization [kípī] (HM).

Before monosyllabic /M^H/, however, the LH rise remains on its original stem (i.e. the H is unable to shift); H carryover from this rising tone yields a [HM] tone phonetically on the following /M^H/ stem.

(31) UR: /nānē rī^H nǎ dō^H/ SR: [nān rī nǎ dȭ] 'I got a white pig'

```
nan   ri     na     do
 |    |\    /\      |
 M    M H  L  H     M H̶
```

Sometimes the rising tone can be severely truncated, to the extent that the /LH/ stem sounds L-toned, which raises the question of whether its H tone should be seen as phonologically associating to the following syllable. Since the same HM contour can be created phonetically from peak delay with /MH/, which still remains audibly rising on its own stem, we will assume that it is likewise a phonetic effect here.[7]

5.7 /^{L}M^{H}/: Floating tones at both edges

The last lexical melody is the rarest and is only found on disyllabic stems. It is characterized by two floating tones, an initial floating L and a final floating H. The stem itself typically carries M tone, which we analyze here as being underlyingly specified, but it could also be inserted by default. In isolation, these stems are pronounced as [ꜜM], in contrast to disyllabic /LM/ which sees both of its tones associated to the stem (see Section 5.5 above).

```
(32)  a.  bulu        [ꜜbūlū]      'jungle'
           \/
        L  M H

      b.   bluwu      [ꜜblūwū]     'ground'
            \/
          L M  H
```

The floating L is evidenced both by this realization as downstepped M and also by the fact that these stems trigger leftward docking of floating H tones:

```
(33)  UR:   /kākāᴴ  ᴸbūlūᴴ/      SR: [kā́k ꜜbūlū] 'his jungle'
             kak     bulu
             |\       \/
             M H  L   M  H
```

The floating H is evidenced by the fact that these stems trigger the same alternations on following words as /M^{H}/ (cf. Section 5.2 above):

```
(34)  UR:   /nānē   ᴸbūlūᴴ  ne/    SR: [nān ꜜbūl nḗ]     'I make a jungle'
             nan     bul    ne
             |        |    /
             M    L  M  H            L%
```

Like /M^{H}/ stems, a following L tone causes the floating H of /^{L}M^{H}/ to dock leftwards. Because of the floating L, this creates a [ꜜMH]:

```
(35)  UR:   /ᴸbluwuᴴ  nǎ/         SR: [ꜜblū́w nǎ]  'white ground'
             bluw      na
               |\      /\
             L M  H   L  H
```

The fact that a [MH] contour is created is one piece of evidence that the M should be treated as underlying. Otherwise, the docking of the floating H should block the insertion of default M.

The current dataset includes just two examples of this melody (the two examples in 31). There is, in addition, one stem that appears to be /^{L}MH.∅/, namely *ᴸswā́bra* 'cassowary', which appears to be the equivalent of the rare /MH.∅/ melody with a floating L tone. It is unclear whether the lack of monosyllabic stems with these tone patterns should be seen as an accidental gap or whether disyllabic stems, by virtue of having two syllables, license more complex tone patterns. We leave such questions to future work.

[7] We could analyze it as phonological shift, but this would raise the question of why the H of a LH can shift onto /M^{H}/ but a floating H is unable to dock there. We leave such analytical questions to future work.

5.8 Summary and pitch traces

Summing up, this section described the surface realization of each tone melody in both phonological and phonetic terms. The most common processes and phenomena are summarized below:

a) Floating H docking

A large number of stems which surface as [M] in isolation carry a floating H tone. This always docks to a following toneless syllable, yielding a MH rise in final position (on monosyllabic stems) and a level H tone in non-final position (either on the first syllable of disyllabic stem or on any phrase-medial toneless stem); it can also dock to a plain /M/-toned word, and variably to the first syllable of disyllabic /M^H/-toned word, leaving a M-toned buffer between the two H tones. If the following word begins with a L tone (whether floating or associated), the floating H docks leftward to the M-toned stem itself, yielding a MH rise (and neutralizing the contrast between /MH/ and /M^H/). In all other cases, it goes unrealized.

b) Peak delay/H carryover

The final H of /LH/ rising tones is often realized at the beginning of a M-toned or toneless syllable. This H carryover can be distinguished from phonological H tone shift (point (c) below) with toneless syllables, since H carryover still allows for the realization of the boundary L% in final position while H shift does not; further, f0 still rises on the /LH/-toned syllable with H carryover, but not with H shift, which yields a surface L tone. There appears to be free variation in whether a LH tone will be realized with peak delay or H shift before a toneless syllable, though H shift is more frequent; further investigation of natural speech may reveal pragmatic or other factors conditioning the choice of one realization over the other. The H of a /MH/ contour never shifts, though it can experience peak delay (to a lesser extent than LH). Peak delay is also responsible for the phrase-final [MH] realization of a floating H that has docked to a toneless syllable.

c) H shift

As stated above, /LH/ contour tones, whether on a monosyllabic stem or derived from the reduction of a disyllabic stem, will variably shift the H tone onto a following toneless syllable or M-toned syllable. This appears to be the preferred realization, accounting for most cases in the data corpus, but pronunciations with only H carryover are also attested.

d) Boundary L% docking

Poko shows evidence of a phrase-final L% boundary tone. It can only be realized on final toneless syllables, where it creates either a ML or HL fall, depending on what tone precedes the toneless syllable (i.e. H.∅ → [H.HL], M.∅ → [M.ML]). Phonological docking of a H tone onto a toneless syllable, whether from a floating tone or H shift, blocks the realization of the boundary tone.

e) Leftward floating L docking

In some instances, a floating L (whether from an underlying floating tone, like /$^LM^H$/, or from a L tone delinked from its underlying host, as in [ꜜM] from /LM/) will dock leftwards onto a toneless stem, yielding a ML fall phrase-medially. This appears to produce an equivalent realization to the final boundary L% docking just discussed. In other instances, the floating L is left floating, producing a downstepped M.

We carried out phonetic analysis of each of the tone melodies in different contexts (phrase-finally as well as phrase-medially followed by different tones). Space does not permit including all of those pitch traces here, but readers are referred to the supplementary materials for the complete set and the recordings on which they are based. Here, we provide a small set that illustrate important points in the description.

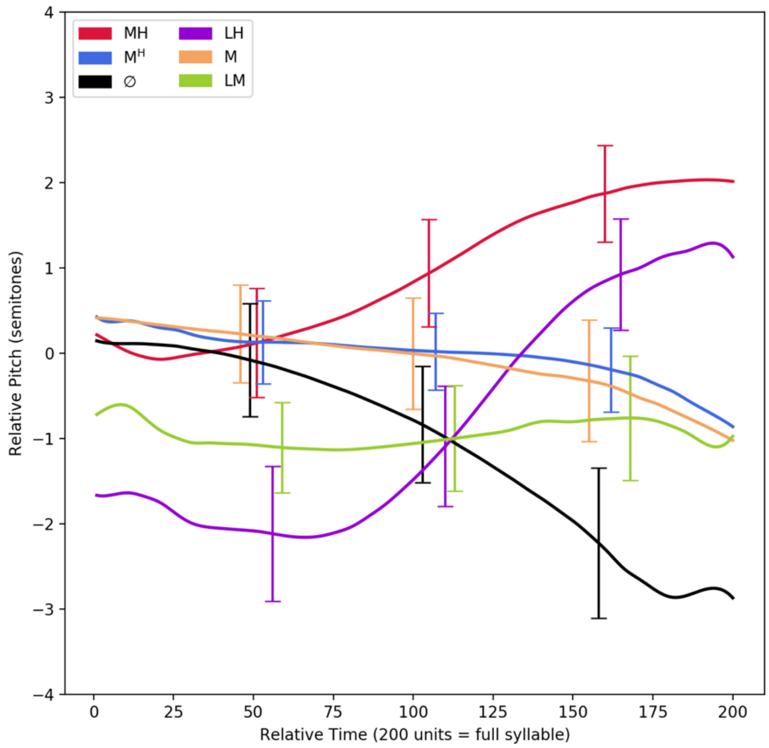

Figure 1: Normalized pitch traces of the six monosyllabic tone categories in phrase-final position

First, Figure 1 shows normalized f0 traces for monosyllabic stems in phrase-final position. Target words were placed in a short frame sentence, preceded by either the 1sg pronoun /nānē/ (*nān* in non-final position) or the noun /brlane/ ‘chicken’ (*brlān* in this position). For each tonal category, five lexemes were included in the elicitation, except for the rare /M/ category, where only two lexemes could be identified. Each short phrase was repeated three times. The syllable rime of the target lexeme was segmented in a Praat TextGrid (Boersma and Weenink 2017), and f0 was extracted from these domains and normalized using James Stanford’s sociotonetic scripts in R (Stanford 2013). The pitch traces were smoothed by taking one out of every five extracted points and using the Spline interpolation function in Scipy (Virtanen et al. 2020), then plotted using the package matplotlib (Hunter 2007). Confidence intervals, which reflect one standard deviation, are staggered for legibility.

These pitch traces illustrate the neutralization of /M/ and /M^H/ stems in this context (orange vs. blue, respectively), the [ꜜM] realization of /LM/ (light green), and the realization of the L% boundary tone on toneless stems (black).

For comparison, Figure 2 shows disyllabic stems in the same context. In this case, the TextGrid boundaries were placed after the onset of the lexeme through the end of the word (e.g. around [ùwū] in the lexeme /nùwū/ ‘bee’); all medial consonants were sonorants. Here, we have more tone categories due to the presence of the /$^L M^H$/ melody (gray) and due to the distinction between /MH/ (red) and /MH.Ø/ (fuchsia).

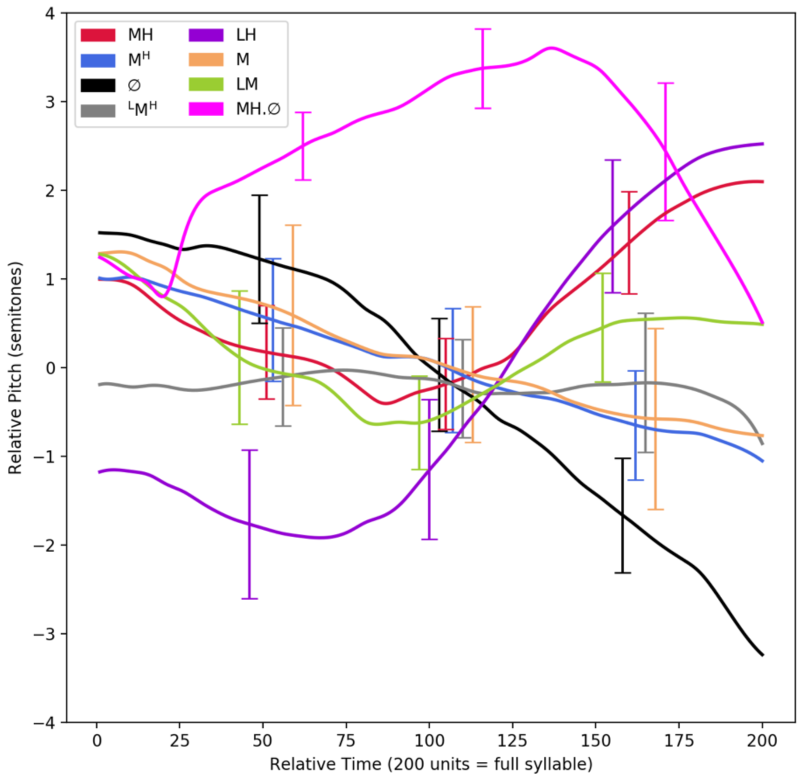

Figure 2: Normalized pitch traces of the eight disyllabic tone categories in phrase-final position

The other crucial environment we show here is the phrase-medial context followed by L tone. To elicit this tone sequence, target words were placed in either the frame sentence *nān* ___ *nìasí* 'I hid ___' or *nān* ___ *wàmá* 'I ____ in the ceremonial house', for nouns and verbs, respectively. Recall from Section 5.2 that in this context, the floating H of /M^H/ docks leftwards onto the M tone. The pitch trace in Figure 3 illustrates reduced disyllabic stems, i.e. disyllabic stems that have lost their final vowel in phrase-medial position. In this case, f0 was extracted from the whole rime, e.g. [ùw̄] from reduced [nùw̄] (UR /nùwū/). Figure 3 shows the neutralization of /MH/ and /M^H/ in this context (blue and red), both of which show parallel slopes up from a M starting point to a higher peak later in the syllable, as opposed to the earlier high peak of a H tone that has docked rightwards onto a toneless syllable (blue-green). The y-axis of Figure 3 has been set the same as Figures 1 and 2 for direct comparison of tonal realizations; note the more compressed pitch range phrase-medially as opposed to phrase-finally.

For a complete set of pitch traces, see the supplementary materials.

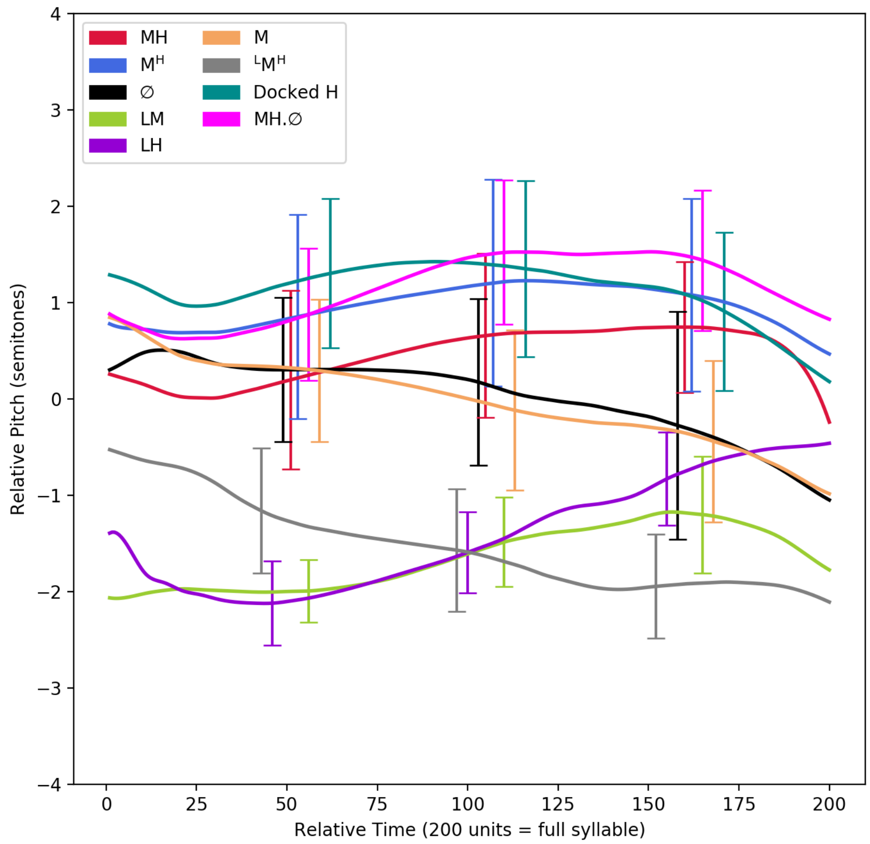

Figure 3: Normalized pitch traces of reduced disyllables before a L tone

6 Complex words

The preceding sections have described the tone patterns found on stems, which account for the entirety of monosyllabic words and the vast majority of disyllabic words. However, Poko also displays a large number of compound words made up of two (or sometimes three) stems. Compound tone patterns are entirely predictable from the concatenation of their component melodies; that is, the sandhi rules laid out in §5 apply equally to complex words as they do to sequences of words.[8] However, there are cases where more than one combination of melodies could lead to the same surface form. For the sake of completeness in illustrating the tone system, we will address these more complex words here.

The best evidence that a word is complex is, of course, being able to semantically identify one or more of the component morphemes. In other cases, we must rely on phonological cues if all morphemes are bound and there are no morphologically related words. First, the word may have sequences of vowels that are uncommon or unattested on simple stems (e.g. *dē-ꜜnā* ‘climb up (1sg)’, where *ꜜnā* is likely ‘go (1sg)’). Second, the word may have intervocalic consonant clusters, suggesting the concatenation of a (reduced) disyllabic stem with a monosyllabic stem (e.g *bruk᷄-ꜜnā* ‘throw down (1sg)’, also with ‘go’). Third, the word may have a medial voiced plosive, which is otherwise unattested in stems (e.g. *wā-bo᷄* ‘itch-inducing substance’, whose constituent stems are unidentifiable). Fourth, the word may not undergo reduction non-finally, which suggests that the final component is a monosyllabic stem, since these do not undergo reduction (e.g. *nān wā-bo᷄ do᷄* ‘I get an itch-inducing substance’, *wab᷄). Of course, tone pattern is also an indicator of complexity, but to avoid circularity in our argumentation, we avoid such evidence here.

[8] As a result, it is often difficult to distinguish whether a two-stem construction should be treated as one word or two.

In Section 6.1, we briefly illustrate some combinations of simple melodies on disyllabic complex words. This will set the stage for a discussion of trisyllabic forms in Section 6.2, where we show that it is unclear whether *any* trisyllabic words should be treated as morphologically simplex (i.e. whether Poko has any unequivocal trisyllabic stems).

6.1 Disyllabic complex words

To look at how tone melodies combine in complex words, it helps to compare related forms. For instance, consider the following three compounds, each with the final stem *-de*, meaning 'ache' or 'affliction':

(36) a. nī́ng-dê (cf. *nīngí* 'eye')
'eye sore'

b. sēp-dḕ (cf. *sepe* 'ear')
'ear ache'

c. nūw-dḗ (cf. *nūwū*^{H} 'tooth')
'toothache'

The alternations on *-de* indicate that it is a toneless monosyllable; after the /MH/ noun 'eye' in (36a), it is realized as [HL]. After the toneless noun 'ear' in (36b), it is realized as [ML]. After the /M^{H}/ noun 'tooth' in (36c), it is realized as [H] ([MH] in final position). All of these realizations are consistent with regular tonal allophony from the concatenation of words described in §5.

Other disyllabic tone patterns on less transparently complex stems can be deduced by comparison with decomposable cases. The three examples in (37) provide a case in point:

(37) a. sā́-ꜜkō (cf. /sā^{H}/ 'sea'; /kō̆/ 'snail')
'sea snail'

b. brū́k-ꜜdā (cf. *brūk-dālá* 'throw down'; /dā̆/ 'go')
'throw down'

c. brī́-ꜜyō
'no/not'

This set of examples illustrates three complex words with the same tone pattern in decreasing order of transparency. In (37a), both stems that make up 'sea snail' are attested independently, providing clear evidence that the surface [MHꜜM] pattern arises from the concatenation of /M^{H} + LM/. In (37b), *brūk* never appears as an independent word; its H tone before the [ꜜM] of 'go' could be either because it is underlying /MH/ or it could be the result of M^{H} taking its own floating tone, both regular sandhi processes before a L tone. However, comparison with a synonymous form *brūk-dālá* reveals that /M^{H}/ is likely the origin of this tone pattern as well, since the H of /M^{H}/ but not of /MH/ is blocked before a following /MH/ stem. Finally, in (37c), we see the common negative word *brī́-ꜜyō,* which shares the tone pattern of the other two. In this case, neither constituent morpheme appears independently. The H tone on the first syllable could also be due to either /M^{H}/ or /MH/, but by analogy with the other forms in (37) (and others like them in the lexicon), it seems likely that speakers would analyze them in the same way. In contrast, clear cases of /MH + LM/ are comparatively rare.

In looking at the melodies above, we can see that some of them (MH.HL of *nī́ng-dê,* M.H of *nūw-dḗ*) are confusable with simple stem melodies (here, /MH.Ø/ and /MH/) – but most of them are distinct, only arising from the combination of simple melodies. In the next subsection, dealing with trisyllabic words, we will show that nearly every pairwise combination of tones is attested in Poko complex words.

6.2 Trisyllabic words

With the tone classes and realizations of shorter stems in place, we will now briefly address trisyllabic forms. There are a number of complications with trisyllabic words, including determining whether they are mono- or bimorphemic (or even trimorphemic), which has ramifications for expected tone patterns. Some cases are clearly complex, with identifiable non-derived forms for at least one of the constituent morphemes. In other cases, we have to rely on phonological cues for complexity, as outlined above. Given the challenge of identifying trisyllabic *stems*, we instead provide here examples of tone patterns attested on trisyllabic words, pointing out morphological complexity where possible.

These issues could form the basis of a paper in their own right, and so in the interest of space, we provide only a brief overview here, showing how thus far all attested trisyllabic words follow the same tonal principles seen above and leaving more in-depth treatment of longer words to future work.

In Table 8, we begin by presenting cases of trisyllabic words whose internal structure is opaque and whose tone melodies are consistent with a single melody. Nevertheless, these same melodies could be derived from two-melody combinations, which we provide for comparison in parentheses below.

Table 8: Plausibly simple tone melodies on trisyllabic words

Underlying tone	Isolation tone	Reduced form	Other realizations	Example	Gloss
/MH/ (/M-MH/, /M^{H}-MH/, /Ø-MH/)	M.M.H	M.MH	---	dāpūlú	‘collapse’
/MH.Ø/ (/M^{H}-MH.Ø/, /M-MH.Ø/, /Ø-MH.Ø/)	M.MH.HL	M.MH	---	rāmū́su	‘sanguma (sorcerer)’
/M^{H}/ (/M^{H}-M^{H}/)	M.M.M	M.M	---	dīngīlī^{H}	‘testicles’
/Ø/ (/Ø-Ø/)	M.M.L	M.M	H.M.L, H.M (reduced)	brisisi	‘worm’
/LM/ (/LM-Ø/)	L.M.M	L.M	ꜜM.M.M	dàlēlē	‘he singes’ (maybe: go-??, cf. *īlēlē/ūlēlē* ‘shiver’)
/LH/ (/LM-MH/, /LH-MH/)	L.M.H	L.H	---	màlīkí	‘parakeet sp.’

The only simple melody missing here is /^{L}M^{H}/, which we see in Table 10 below, ostensibly from a combination of /LM-M^{H}/.

In a few cases, the tone pattern on a trisyllabic word could only be derived from a concatenation of two melodies, but the morphological structure remains opaque. We illustrate two such cases in Table 9.

Table 9: Complex tone melodies on non-decomposable trisyllabic words

Underlying tone	Isolation tone	Reduced form	Other realizations	Example	Gloss
/M^{H}-LM/?	MH.L.M	MH.ꜜM	MH.L (reduced)	wǟlùkū	'die'
/LH-M/?	L.H.M	L.H	---	ìbánī	'rotten' (cf. *nàpánī* 'heavy')

In the case of 'die', Poko offers no disyllabic /LM/-toned stem *ùkū*. There is a /M^{H}/ disyllabic stem *wālī*^{H} 'light a fire', with a reduced form *wal̄* before L, but this would require quite an idiomatic expression indeed. Likewise, *wal̄â* 'bring', part of the /MH.∅/ class, would also simplify to [MH] *wal̄* in this context, but it is similarly unclear how this meaning would factor into death. In the case of *ìbánī* 'rotten', the internal structure is not clear (though given the lack of stem-internal voiced plosives, it would have to be *ǐ-bānī*), but another modificational word *nàpánī* 'heavy' shares a very similar form, suggesting some kind of morphological complexity.

In most cases, one or both constituent morphemes can be identified. Table 10 (next page) shows a form from each attested two-melody combination, with morpheme boundaries showing how the tones are distributed across the constituent morphemes. As above, in the "Other allomorphs" column, reduced allomorphs are explicitly indicated and non-reduced allomorphs (also identifiable by their three syllable pattern) are unmarked. One point to note in this table is the difference in realization between 'goanna lizard' and 'night', both of which have the underlying melodies /LM-M^{H}/. In 'night', the first syllable always emerges as [ꜜM], whereas in 'goanna lizard', it surfaces as [L]. This comes down to the fact that the first stem in 'night' is monosyllabic, and hence /LM/ will always surface as [ꜜM], whereas in 'goanna lizard', it is disyllabic /brèsē/; recall from Section 5.5 that reduced /LM/ disyllables show a L-toned allomorph that we never see with underlying monosyllabic stems.

Table 11 shows which of the logically possible two-melody combinations are attested in the data corpus, excluding /^{L}M^{H}/ since it is so rare. Plain /M/ is also omitted, as it is relatively rare and in many combinations would be indistinguishable from ∅, and the distinction between /MH/ and /MH.∅/ is collapsed, since it would only be discernible on disyllabic stems in second position. Combinations that are only possible analyses for otherwise simple surface melodies are indicated with a question mark:

Table 11: Attested combinations of two melodies on trisyllabic words

Melody 1↓ Melody 2→	MH	M^{H}	∅	LM	LH
MH	✓		✓	✓	✓
M^{H}	?	?	✓	✓?	✓
∅	✓	✓	✓		✓
LM	✓	✓	✓	✓	✓
LH	?		✓	✓	

First, there is a conspicuous absence of clear evidence for combinations that would yield a HMH sequence (whether floating or linked); these cells are highlighted in gray. The only confirmed case we have been able to identify that likely has this tone pattern is *wū-pēlé* 'broom', made up of *wuˉ* 'wild betelnut tree' and possibly the term *pēlé* 'sprout, branch'. In some instances, the language consultant pronounces this word with an initial MH tone, but mostly the initial MH is simplified to M. This same tone pattern is found on the word *nīngāná* 'different', which is less morphologically transparent, but may contain *nīngí* 'eye' as its initial morpheme.

There are question marks under /M^{H}-MH/, /M^{H}-M^{H}/, and /LH-MH/ as they are possible analyses for surface M.M.H, M.M.M, and L.M.H sequences, respectively, but in every case, the first H would never be realized. It may be that Poko disprefers sequences of two H tones separated only by M, or this may simply

Table 10: Two-melody combinations on complex trisyllabic words.

Underlying tone	Isolation tone	Reduced form	Other realizations	Example	Gloss
/MH-MH/	M.M.H ~ H.M.H	M.MH	M.H (reduced)	wʉ̃-pēlé	'broom' (wild.betelnut-branch)
/MH-Ø/	MH.H.L	MH.H	MH.M (reduced)	ngʉ̃w-ulu	'chest bone' (??-bone)
/MH-LM/	M.H.ꜜM	---	---	bēbé-dǎ	'run away' (??-go)
/MH-LH/	MH.L.H	MH.LH	MH.L (reduced) MH.ꜜM (reduced)	nǐng-sàpé	'eye crust' (eye-??)
/M^{H}-LH/	MH.L.H	MH.LH	MH.L (reduced) MH.ꜜM (reduced)	dō^{H}-kàsá	'steal' (get-??)
/M^{H}-Ø/	M.H.L	M.H	---	sōk^{H}-ala	'come close' (??-come)
/Ø-MH.Ø/	M.MH.HL	M.MH	M.H (reduced)	bo-dʉ̃lu	'group hunt' (ground-??)
/Ø-M^{H}/	M.M.M	M.M	H.M.M M.MH (reduced) H.M (reduced)	sep-swāngā^{H}	'deaf' (ear-??)
/Ø-Ø/	M.M.L	M.M	H.M.L H.M (reduced)	so-singi	'stone' (stone-??)
/Ø-LH/	M.L.H	M.LH	H.L.H H.LH (reduced) M.L (reduced) H.L (reduced) H.ꜜM (reduced) M.ꜜM (reduced)	bu-kùlú	'bush' (place-garden)
/LM-Ø/	ꜜM.M.L	ꜜM.M	---	nǐ-umu	'pond' (water-hole)
/LM-MH/	L.M.H	L.MH	L.H (reduced)	nǐ-bāká	'flood' (water-??)
/LM-MH-Ø/	L.MH.H	---	L.M.HL	nǐ-sʉ̃l-bo	'spring' (water-??-ground)
/LM-M^{H}/	ꜜM.M.M	ꜜM.M	L.M.M L.M (reduced) ꜜM.MH (reduced)	bǔ-sūngū^{H}	'night' (??-dark)
/LM-M^{H}/	L.M.M	L.M ~ ꜜM.M	L.MH (reduced)	brěs-ūwū^{H}	'goanna lizard' (taro-??)
/LM-LM/	ꜜM.LM	ꜜM.LM	ꜜM.ꜜM (reduced) ꜜM.L (reduced)	ǒ-kòlō	'wild sago' (sago-??)
/LM-LH/	ꜜM.L.H	ꜜM.LH	ꜜM.L (reduced)	nǐ-dàlé	'paint' (water-??)
/LH-Ø/	L.H.L	L.H	---	bǔk-dapa	'jawbone' (chin-bone)
/LH-LM/	LH.L.M	L.HꜜM	L.HL (reduced) L.H.ꜜM	nǔp-ùlū	'blue fly' (fly-grandma)

be an accidental gap. For a possible diachronic analysis based on the OCP, see Section 7.

The absence of /LH-LH/ is either an accidental gap or it is due to the difficulty of realizing two marked rising tones in a row. Since /LH/ can simplify to a lower [M] tone before another L, it may be that words originating with this melody are reanalyzed by learners as /M-LH/.

Finally, there is what appears to be an accidental gap for the /∅-LM/ melody. We identified a word that should have exemplified /M-LM/, the term for 'placenta' made up of *pēsē* 'child' and *ìyī* 'bilum (string bag)'. However, the compound is pronounced with an entirely level M melody, suggesting that either the lexicalized compound has drifted phonologically from its origins or that there may be small pockets of tonal modifications specific to compound words. We will treat cases like this as lexicalized exceptions here, but it is an area that would benefit from further investigation.

Trisyllabic words in context follow the same tone rules as mono- and disyllabic stems and will not be illustrated further here.

7 Discussion

In the paper thus far, we have shown that Poko's tone system can be understood as drawing upon melodies made up of three tonal primitives, L, M and H. Melodies consist of zero to two tones, with the possible exception of /^{L}M^{H}/ (itself a rare melody).

However, under this analysis, Poko's tone system is puzzling from a typological perspective. Specifically, it is generally taken as an implicational universal that a language with contour tones will also have level tones (Yip 2002). On the one hand, this is true for Poko: disyllabic stems show level tones in melodies such as /L.H/ or /L.M/, and isolation M-toned words (mostly consisting of /M^{H}/) are pronounced with a level M tone. But given that Poko shows clear evidence of a three-tone system, built off of L, M, and H, there is a curious lack of level L- or H-toned vocabulary. In other words, the Poko tone system is a sort of hybrid system between the prototypical East Asian system with predominantly contour tones and the prototypical African register tone system. Further, with the exception of rare M-toned words without a floating tone (*dā* 'eat', *kūwū* 'whistle, the non-third person pronouns, and a small handful of other stems), all lexical melodies consist of either zero or two tones, of which one tone may be floating; in a couple of cases (e.g. ^{L}*būlū*^{H} 'jungle') there are two floating tones and M on the stem. Finally, not all logically possible combinations of two tones are attested, as laid out again in (38):

(38)	/LM/	Attested	
	/LH/	Attested	
	/ML/	Unattested	
	/MH/	Attested	(/M^{H}/, /MH/, /MH.∅/)
	/HL/	Unattested	
	/HM/	Unattested	

All three rising combinations are lexically attested, but none of the falling tones are. This is also unusual from a typological perspective, where falling tones are considered less marked than rising tones (Zhang 2000, Yip 2002). Unattested combinations are found on the surface through phonetic and phonological processes but are never lexical melodies. These gaps do not appear to be accidental. Rather, we find that in Poko, L is always initial and H is always final, which holds true both of associated tones and floating tones (floating L always appears at the left edge and floating H always at the right). M can appear in either position.

A possible reanalysis of the system, then, would be to treat /MH/ as /H/, /LM/ as /L/, with /LH/ unchanged. /H/ aligns to the right edge of the stem and /L/ to the left, with M tones filled in by default; this reanalysis is shown in (39):

(39) a. wunú ‘sign’
        |
        H

b. ùnu ‘mango’
   |
   L

c. ùnú ‘sand’
   | |
   L H

For longer stems, this default M assignment is understandable, as otherwise there would be toneless syllables; it follows from the same principles laid out above for default M insertion. What is more unusual about Poko is that M tones are still inserted for monosyllabic stems, yielding contours (simplified to [ꜜM] in the case of LM). It would seem that in Poko, L and H can only be half of a melody, at least at the lexical level. Later sandhi processes can yield level L and H (by contour tone simplification or floating H docking), but no word “starts out” this way.

The fact that Poko shows the same tone melodies on monosyllabic and disyllabic stems is thus not necessarily evidence for the word as TBU (“word tone”) but rather the result of these alignment constraints. A melody like L.LH or LH.L on a disyllabic stem would be impossible, since in the former, the second L tone is not left-aligned, and in the latter, the H tone is not right-aligned. For further discussion of this point, see McPherson (forthcoming).

The data patterns necessitate both an unspecified default M (for the varied realizations of toneless stems like *da* ‘dog’) as well as a specified M (for the fixed M-final words like *dā* ‘he eats’). It is indeterminate whether M-toned words with a floating H are M by default or specified for M; as we’ve seen from disyllabic M-toned words like *kūwū* ‘whistle’, or even monosyllabic M-toned words like *dā* ‘he eats’, a specified M can be overwritten by a floating H.

We propose that the lack of floating H docking on monosyllabic stems like *rī*^{H} is not due to the M tone but rather due to the presence of its own floating H – in other words, Poko shows clear evidence of the OCP for H (and L) tones. Under this analysis, the M of what we analyze above as /M^{H}/ may also be filled in by default, as shown in (40), to provide a buffer between two H tones. The actual surface form and ungrammatical floating H docking are shown in (40a) and (40b) below:

(40) a. kāk rī ‘his pig’
   (M) H (M) H

b. *kāk rí
   (M) H H

Docking the floating H onto *rī*^{H}*,* thus blocking the insertion of default M, would render the two H tones adjacent. This would be the case even if the M were underlyingly specified but deleted by floating H tone. Either way, the language prevents this configuration by not allowing a floating H tone to dock on monosyllabic syllables carrying their own floating H tones, instead opting to retain or insert M tone.

Similarly, while /LM/ on a reduced disyllable can simplify to [L] before a M or H tone, it always simplifies to [ꜜM] before a L tone; to do otherwise would be to create a sequence of two L tones:

(41) a. nān ꜜūn nìasí ‘I hide the mango’
   | ≠\ | |
   M L M L H

```
b.   *nān ùn      nìasí          'I hide the mango'
       |  /=\       |  |
      M  L (M)     L   H
```

By having a M as part of every melody, and having each of L and H tones restricted to one edge, Poko ensures that there will never be two adjacent L tones or H tones; the only level stretches of tones in the language are M. This is, to our knowledge, a novel strategy for satisfying the OCP – most documented strategies involve deletion (e.g. Meeussen's Rule in Bantu, Goldsmith 1984, Myers 1997, etc.) or blocking of H tone spreading or insertion.

Further formal modeling will be required to determine whether default insertion of M tones into /L/ and /H/ melodies simplifies or complicates the analysis; as the primary aim of this paper is descriptive, we remain agnostic here. However, such a reanalysis (whether synchronic or diachronic) puts Poko more in line with the other Skou languages whose tone systems have been described as having two tonal primitives. In fact, we even see parallels in the phonetic realization of some of these tone categories in other languages that could help explain the development of Poko tone. Most notably, in the Skou language, Donohue (2003) describes a dissimilatory process for adjacent H tones whereby the first H is realized as a high rise ([34] rather than [44]), a realization also found after some low tones. It could be that in the development of Poko, learners reinterpreted a similar rise as representative of the underlying form rather than a surface allophone, thus leading to the current /MH/ melody. Further comparative work, especially looking at more closely related languages such as Sumararu, will be needed to flesh out a diachronic account of Poko tone.

8 Conclusion

In sum, this paper has provided a description of the underlying and surface tone patterns in Poko. We have shown that a system with three tonal primitives, L, M, and H, is able to account for the tone melodies and tonal alternations found in the language. Poko displays floating tones (L to the left and H to the right), but there is no evidence for grammatical tone. The surface system may be reducible, synchronically or diachronically, to a largely two-tone system underlyingly, with strict left-alignment of L and right-alignment of H. The OCP prevents sequences of two identical tones, so M forms a part of nearly every lexical melody as a "buffer" between the phonologically active tones.

We have argued that Poko's tone system is of interest to tonal typology for a number of reasons: 1. The language shows a contrast between underlyingly specified M tones and underlyingly toneless syllables that receive M by default; 2. Contrary to crosslinguistic patterns of markedness, Poko prefers rising tones to falling tones; 3. Despite showing many characteristics of a level-toned system, including tonal stability, tone shift, etc., Poko lacks the single-toned melodies /L/ and /H/; this last point is a consequence of L and H tones aligning to left and right edges of the stem, respectively (or perhaps, more accurately, avoiding final L and initial H).

Future work is required on three fronts. First, phonetic work will seek to determine whether complete neutralization occurs for MH and H tones (to MH in final position or H before L tones), and we will explore whether there are differences in realization of sequences of specified or default M tones (such as downstep). Second, documentation efforts for other languages in Poko's sub-family will enable better comparative work that could bolster the argument for an evolution from a two-tone to a three-tone system. Finally, further theoretical work will formalize the abstract analysis sketched out in §7 and situate Poko typologically in the literature on the OCP and level- vs. contour-systems.

Abbreviations

Abbreviations in the body text include OCP Obligatory Contour Principle; PNG Papua New Guinea; SR Surface Representation; UR Underlying Representation.

Supplementary materials

A complete set of pitch traces and the recordings on which they are based, as well as Praat output data and all other data informing the analysis, are available for download HERE.

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