Tonogenesis of a fourth contrastive tone height via phonologized tonal depression in Cua (Kalahari Khoe)

Cua is a highly endangered and underdocumented Kalahari Khoe language of the Tshwa subgroup spoken in southeastern Botswana. Recent work on the phonetic realization of lexical tone has shown that Cua has at least 8 distinct tonal categories which are realized as complex f_0 curves (Figure 1). A major question is whether these categories are represented phonologically as 'true contours' (Hyman 2011) or are decomposed into discrete tonemic heights. The tonal systems of the related languages G|ui (Nakagawa 2006), Kua (Collins 2023), and Tsua (Mathes 2015) have been analyzed decompositionally with three tonemic heights: /H, M, L/. By contrast, I present several arguments for a decompositional analysis of Cua's lexical tonal system with four contrastive tone heights: /H, M, ᵀL, L/. I argue that the notable contrast between two low tones, /ᵀL, L/ in Cua is a result of the phonologization of tonal depression as root-initial insertion of /L/, which triggered 'counter-depressant raising' of *L-initial tone contours to a novel fourth tone height, /ᵀL/. This is the first research to bring Cua data to bear on issues at the phonetics-phonology interface, particularly consonant-tone interactions, tonogenesis, and tone change.

CLAIM 1: TONAL CONTOURS ARE DECOMPOSITIONAL (i) tonal melodies associate uniformly across different rootshapes: CVV, CVCV, CVN; (ii) monomoraic functional items show reduced contrasts between /M, L/; (iii) monomoraic reduplicants copy the individual tone height of the corresponding mora in the bimoraic base.

CLAIM 2: TONAL DEPRESSION PHONOLOGIZED AS ROOT-INITIAL /L/-INSERTION Tonal depression has phonologized in Cua (1) as the insertion of a root-initial /L/ f(1)ollowing a cross-linguistically unusual class of depressor consonants: voiced obstruents, voiceless aspirated obstruents, nasal aspirated clicks, and /h/. Evidence: (i) /L/-initial phonetic profile of depressed ‹dHM, dHL› melodies relative to their non-depressed counterparts (Figure 2); (ii) synchronic depression exceptions show that the process has phonologized.

(1) Tonal depression conditioned by tentative [+slack] feature

$$*\emptyset \rightarrow L \;/\; \#\left[_{\rho} C_{[\text{-son, +slack}]} \_\_\right.$$

CLAIM 3: /L, ᵀL/ ARE DISTINCT TONE HEIGHTS: (i) near-minimal pairs show 4-way root-initial tonal contrast between /H, M, ᵀL, L/, e.g. /gáé/ 'pass' /gāò/ 'bury' / ᵀgàm̀/ 'korhaan' /gǎī/ 'adder'; (ii) /L, ᵀL/ cannot be derived as allotones as an effect of onset consonant due to depression exceptions; (iii) /L, ᵀL/ alternate morphophonologically with each other in the juncture morpheme paradigm (cf. Table 1, /LML/ → [ᵀLM], *Figure 3*). I show that /ᵀL/ corresponds to *L in proposed Proto-Kalahari Khoe, and attribute its raised pitch to (2), which supports the typology of cyclic tone change via low-tone-raising (Pittayaporn 2018).

(2) Counter-depressant raising of *L to /ᵀL/:

$$*L \rightarrow {}^{\intercal}L \;/\; \#\left[_{\rho} \_\right.$$

CLAIM 4: TONE IS POSITIONALLY CONSTRAINED: A four-tone-height analysis falsely predicts up to 16 contrastive tonal categories, but I show that Cua's 4 contrastive tone heights are positionally constrained to the initial mora of bimoraic roots; elsewhere a reduced binary tone contrast between /M, L/ is observed. I derive this observed effect via */ᵀL/-final, */H/-final, and Tonal Adjacency Constraints and relate these to de Lacy (2002)'s Tonal Prominence Scale & associated constraints.

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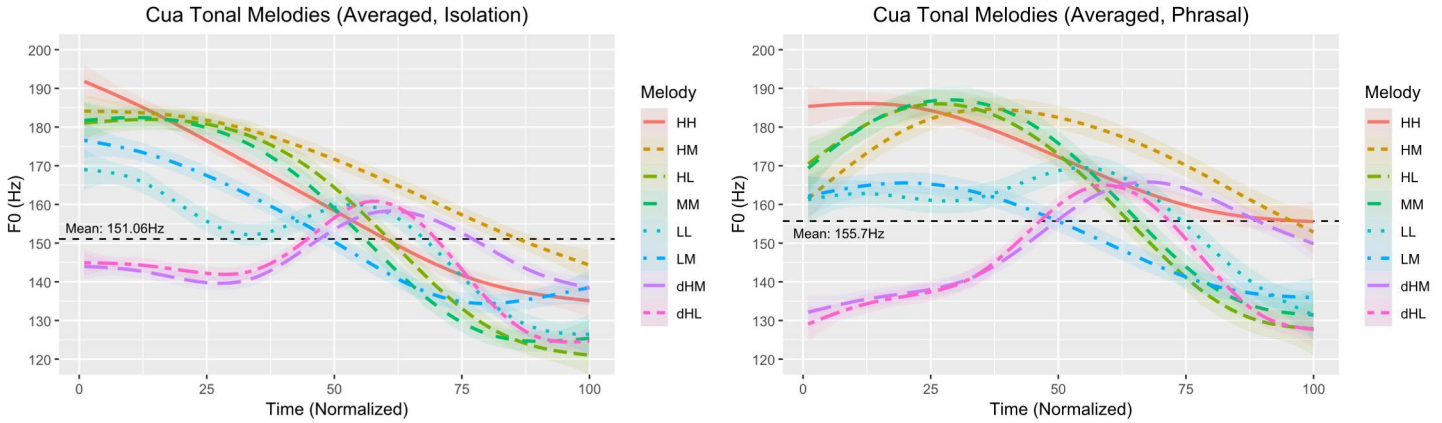

Figure 1. Phonetic realization of lexical tone in Cua in isolation (left) and phrase-internally (right), averaged across 6 speakers.

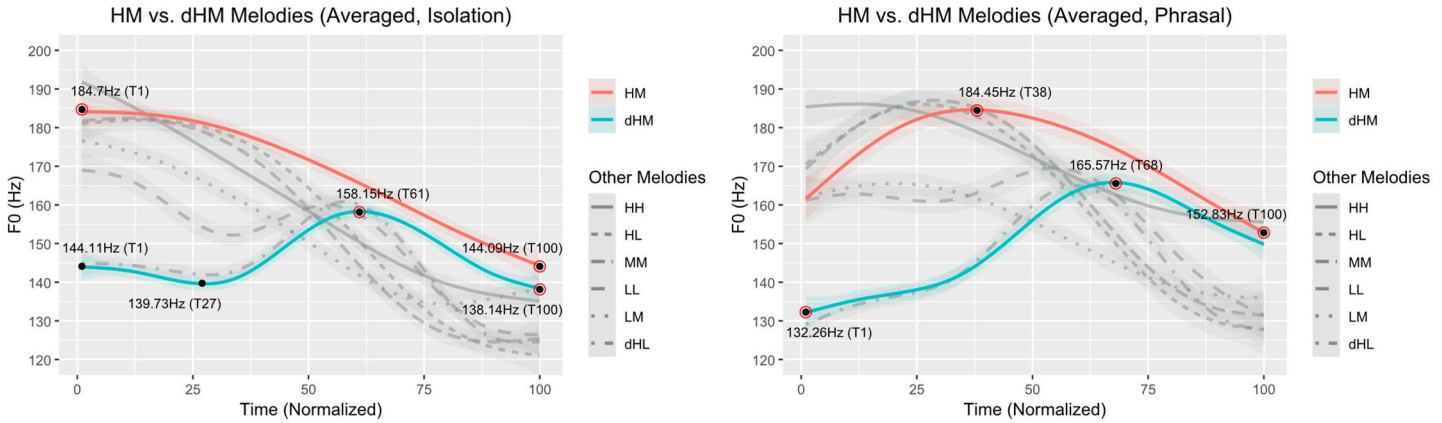

Figure 2. Depressed ‹dHM› tone category vs. non-depressed ‹HM›; note the /L/ onset of ‹dHM› (and ‹dHL›) compared to baseline.

Table 1. Juncture morpheme allomorphs and tonal alternations in Cua by root tone category and rootshape (/LH/ category is marginal)

						DEPRESSED CATEGORIES				
	Root Tone	/H/	/HM/	/ML/	/MM/	/ˀLL/	/ˀLM/	/LML/	/LH/	/LHM/	*JCT Morph*
ROOTSHAPES	$CVV_{[+hi]}$	ǂʔúū̱-ā	ʔáu̱-ā	kūū̱-ā	kāu̱-ā	ǂùū̱-ā	kʰài̱-ā	cʰǔi̱-ā	gǁǎū̱-ā	kʰǔi̱-ā	-ā
	$CVCV_{[+hi]}$	t͡sʼídi̱-ā	kánu̱-ā	?	tʼūni̱-ā	kàbi̱-ā	d͡zàdu̱-ā	gǁàbu̱-ā	?	gǂǔni̱-ā	-ā
	CVN	cúm-ā	q͡χán-ā	cʼōm-ā	tʼūm-ā	?	gǁàm-ā	gàm-ā	?	gǒn-ā	-ā
	$CVV_{[-hi]}$	káē	ʔá<n>ā̃	ǁʔāē	ǁʔā<l>ē	‖q͡ò̄	|ò<r>ō	d͡zèē	ǁʰǎā	ǁʰǎ<l>ā	M, <C>
	$CVCV_{[-hi]}$	cʼórō	sárā-nā	ʔābā	kʼārē-nā	kàrō	kàrē-nā	gǁàlā	?	dǒrō-nā	M, -nā
	JCT Tone	[HM]		[MM]		[ˀLM]			[LHM]		

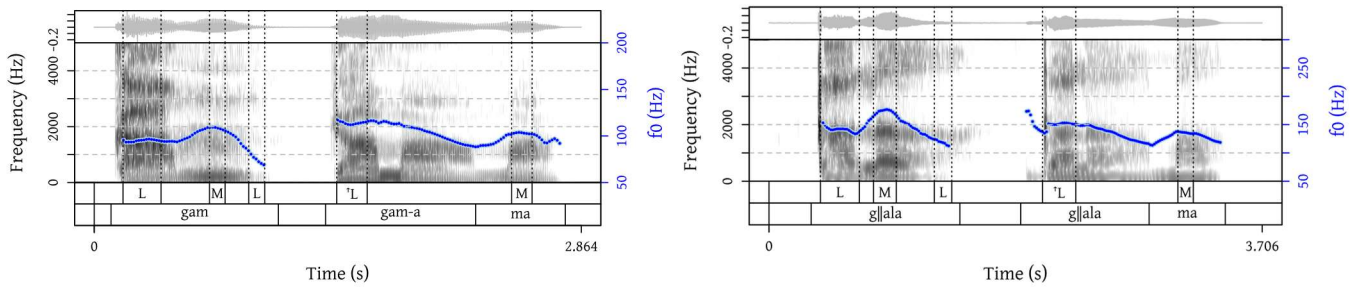

Figure 3. Morphophonological alternation between /L/ onset in citation forms of verbs vs. /ˀL/ onset in juncture form of same verbs