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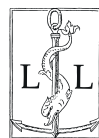décembre 2021

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_ Floating tone noun class prefixes in Mada (Nigeria)

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1

Floating tone noun class prefixes in Mada (Nigeria)

Keith L. Snider
SIL International

Abstract

Mada [mda], a Plateau language spoken in central Nigeria, has many seemingly inexplicable tone alternations that occur between the singular and plural forms of nouns. These alternations find straightforward and reasonable explanations if one assumes the existence of underlying representations that include floating tone prefixes and certain nouns with toneless stems. Another fascinating aspect of Mada addressed in this paper is that despite there being no other evidence of consonant-tone interaction in the language, there is a direct correlation between the proposed floating tone singular prefixes and the surface realizations of the singular diminutive prefix: diminutive nouns with floating (L)- prefixes take only *və̄-*, and those with floating (H)- prefixes take only *fə́-*.

Keywords

consonant-tone interaction, floating tones, grammatical tone, Mada, Ninzic

Résumé

Le mada [mda], langue plateau de la famille Niger-Congo parlée au centre du Nigéria, voit ses noms présenter de nombreuses alternances tonales, apparemment inexplicables, lorsque l'on passe du singulier au pluriel. Toutefois, ces alternances s'expliquent de façon simple et raisonnable si l'on fait l'hypothèse qu'il existe au niveau sous-jacent des préfixes constitués uniquement d'un ton flottant, et que certaines bases nominales ne possèdent pas de ton. Un autre aspect fascinant de la langue mada est que, bien qu'il n'y existe aucun indice indépendant en faveur d'une interaction entre tons et consonnes, il y a une corrélation directe entre les tons flottants

sous-jacents proposés et la réalisation de surface du préfixe du diminutif au singulier, qui sera *və-* pour les noms associés à un préfixe flottant bas (B), et *fə́-* pour les noms qui ont un préfixe flottant haut (H).

Mots clés

interaction ton-consonne, langues ninziques, mada, ton grammatical, tons flottants

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1. Introduction

One of the most fascinating aspects of Mada [mda], spoken in Nigeria and not to be confused with Mada [mxu], a Chadic language spoken in Cameroon, is the large number of seemingly inexplicable tone alternations that occur between the singular and plural forms of many nouns (cf. *kì/kī* 'thing SG/PL', *wò/wú* 'mosquito SG/PL').[1] Mada [mda], whose tone system is only minimally described,[2] is a Ninzic language (Blench 2018), spoken in the Akwanga and Keffi Districts of Plateau State and the Jema'a District of Kaduna State, Nigeria (Price 1989: 1). Ninzic (Greenberg's 1963 Plateau IV) is part of the Plateau subgroup of Benue-Congo languages. The aforementioned tone alternations find straightforward and reasonable explanations if one assumes the existence of underlying representations that include floating tone noun class prefixes and (for certain nouns) toneless roots.[3] Floating tone prefixes are prefixes that underlyingly consist solely of tones not associated with any segments. These floating tones, however, can still interact phonologically with other tones, and it is only by analyzing the surface results of those interactions that one is able to determine the presence and identity of floating tones. Toneless roots are roots that have

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1. The data that form the basis for the present paper were provided by Rekiya Audu, a middle-aged, female, native Mada speaker from Nasarawa State, Nigeria, in September 2012. I am most grateful to Rekiya for her help and for graciously giving me permission to associate her name with these data. I am also grateful to the following people (alphabetized by last name) for helpful comments on previous versions of this paper: Virginia Beavon-Ham, Roger Blench, Larry Hyman, Will Leben, Kevin Penner, Brian Plimley, Dave Roberts, and Jim Roberts. Finally, I wish to acknowledge the helpful suggestions of two anonymous LLA reviewers. Thank you, everyone, and I assume full responsibility for any remaining errors.

2. To the best of my knowledge, the only publications to date that describe Mada tone are two pages in Price (1989: 15-16), two pages in Samuel (2012: 32-34), and one paragraph in Blench (2015: 2-3). Blench (2015) appears to be subsumed (verbatim) into Blench & Kato (2019). While Samuel describes five tonemes — H, M, L, Rising, and Falling —, and gives some examples of lexical and grammatical tone, Price and Blench & Kato document three phonemic levels of tone: H, M, and L. Blench & Kato's work also includes an extensive list of singular/plural minimal tone pairs in their detailed treatment of Mada segmental noun morphology (Blench & Kato 2019: 6-18), and they describe the tone differences between these minimal pairs. I discuss their findings in Section 4.

3. Floating tone prefixes and clitics are also proposed for Eton [etn], a Bantu language spoken in Cameroon (Van de Velde 2009). My thanks to an anonymous reviewer for drawing this reference to my attention.

no tones associated to them underlyingly, but which are realized phonetically with the pitches of adjacent tones, or with a default tone when no other eligible tone is available. The conventions for representing tone in this paper appear in (1).

(1) Conventions for representing tone

Description	Pitch	Tone	Floating
High	bá	H	(H)
Mid	bā	M	
Low	bà	L	(L)
Mid-rising	bǎ	MH	

Based solely on noun class prefixes, I propose that Mada has three distinct singular/plural noun pairings: Pairing A, Pairing B, and Pairing C. Although other pairing strategies exist in the language (see below), these three pairings are the focus of this paper and together account for over 75% of the nouns in the language.

(2) Pairing strategies for count nouns with monosyllabic simple stems

Pairing	SG	PL	Percentage
A	(H)-	mà-	41.4%
B	(L)-	(H)-	30.3%
C	(H)-	(L)-	4.0%
Others	(H)- or (L)-	Reduplication, etc.	24.3%
			100.0%

I analyze Pairing A singular nouns as beginning with a floating (H)- prefix and their corresponding plurals as beginning with the L-toned segmental prefix mà-. Pairing B singular nouns begin with a floating (L)- prefix and their corresponding plurals with a floating (H)- prefix, and Pairing C singular nouns begin with a floating (H)- prefix and their corresponding plurals with a floating (L)- prefix. This means that all singular nouns and almost half of all plural nouns begin with floating tone prefixes. Tonally, Pairing A singular forms, Pairing C singular forms, and Pairing B plural forms all behave identically because all begin with floating (H)- prefixes.

Another fascinating aspect of Mada addressed in this paper is that despite there being no other evidence of consonant-tone interaction in the language, there is a direct correlation between the proposed floating tone singular prefixes and the surface realizations of the singular diminutive

prefix that follows the floating tone prefixes on diminutive nouns: the diminutive prefix /Və̄-/ is realized as [və̄-] when preceded by a floating (L)-prefix, and as [fə́-] when preceded by a floating (H)- prefix.[4] I conclude in Section 5 that underlyingly, the tone of the prefix is mid, and the consonant of this prefix is unspecified for voicing (i.e., the prefix is /Və̄-/).

This paper is organized as follows. Section 2 presents data representative of the greater corpus upon which the analysis is based. Section 3 sets forth an analysis of these data that reduces the seeming irregularity of the singular/plural alternations to just three patterns based on whether the prefixes are (H)-, (L)-, or *mə̀-*. Section 4 demonstrates the superiority of the proposed analysis by comparing it with a phonemic analysis. Section 5 discusses the diminutive prefix /Və̄-/. Section 6 justifies the proposed floating tone prefixes in Mada from an historical perspective. Section 7 argues against claims that Mada no longer has a noun class system, and the conclusion, in Section 8, reiterates the main points of the paper.

2. Mada tone data

All count nouns in my database,[5] including those with complex and compound stems, consist of a noun class prefix (NC) followed by a stem, and minimally have the structure [NC[[ROOT] STEM] NOUN]. As demonstrated in Section 3, the singular noun class prefix is a floating tone, either (H)- or (L)-, and the plural prefix either floating (H)-, floating (L)-, or segmental *mə̀-*. With no evidence to the contrary, I assume all monosyllabic nouns to have simple stems. Although many polysyllabic stems in my database appear to be either complex or compound, I leave open whether all polysyllabic stems are in fact non-simple. Examples of the different stem types appear in (3).

(3) Stem types in Mada

Simple	/ [´ [[tàr]]] /	→	[tār]	'room'
	[NC[[room$_{ROOT}$]$_{STEM}$]$_{NOUN}$]			
Complex	/ [´ [Və̄[tàr]]] /	→	[fə́tàr]	'little room'
	[NC[DIM[room$_{ROOT}$]$_{STEM}$]$_{NOUN}$]			
Compound	/ [´ [[tàr][kòr]]] /	→	[tārkòr]	'bedroom'
	[NC[[room$_{ROOT}$][bed$_{ROOT}$]$_{STEM}$]$_{NOUN}$]			

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4. I first documented this correlation in Snider (2007). The data for that conference presentation were elicited by Norman Price during a phonology workshop I conducted in Jos, Nigeria (Nov. 21 - Dec. 13, 1994) under the auspices of the Nigeria Bible Translation Trust.

5. All Mada data are from my personal field notes, which include a database corpus of 236 nouns.

As shown in (4), the roots of Mada nouns have the syllable shapes CV, CN, CCV, CVC, and CCVC.

(4) Noun root syllable shapes

CV	dó	'market'
CN	ĝbḿ̩	'canoe'
CCV	brɛ́	'grave'
CVC	gùr	'granary'
CCVC	kwār	'voice'

Those nouns with syllable shape CN are rare (only seven known words according to Price 1989: 13), and in each case, the onset is labial-velar ($\widehat{kp}$ or $\widehat{gb}$), and the nucleus is syllabic m̩. The second consonant of CC onsets is restricted to liquids (r, l) and semivowels (j, w), and the coda of CVC syllables is restricted to sonorant consonants, usually r, but occasionally n. As shown in (5), monosyllabic nouns have four surface tone patterns: H, M, L and MH (mid-rising-to-high), although, as demonstrated in Section 3, these are not underlying contrasts but surface contrasts only.

(5a) Surface contrastive tone patterns on light syllables

Light	CV		CCV	
[H]	tʃĭ	'forehead'	brɛ́	'grave'
[M]	nē	'human being'	ĝblā	'facial incision'
[L]	t͡sè	'guinea fowl'	gjɔ̌	'hare'
[MH]	tɛ̃	'father'	gʷã́	'snake'

(5b) Surface contrastive tone patterns on heavy syllables

Heavy	CVC		CCVC	
[H]	tír	'neck'	jwúr	'pus'
[M]	tʃār	'stranger'	kwār	'voice'
[L]	gàr	'ant'		
[MH]	gə̃n	'slave'	gjə̄r	'mother'

Comparing (5a) with (5b), one can also see that all four surface patterns are found with both syllable weights, which suggests that the presence or absence of a coda has no effect on the realization of a noun's surface tone pattern. As in many tone languages with a significant number of monosyl-

labic words, surface minimal pairs are not uncommon, and a number of these appear in (6).

(6) Minimal pairs

sã᷉	'name'	sã̀	'basket'
t͡ʃàr	'monkey'	t͡ʃār	'stranger'
gár	'axe'	gàr	'ant'
bēr	'hut'	bə̀r	'hat'

As mentioned above, Mada employs several strategies for distinguishing singular and plural nouns. Without expressing awareness of floating tone prefixes, Blench & Kato (2019) describe plural nouns as differing from their singular counterparts in any one of the following ways: a) tone alternation, b) initial syllable reduplication, c) prefix addition, d) suppletion, and e) zero marking (i.e., both singular and plural forms are identical). Examples of each of these are shown in (7), together with the percentage each represents in my database.

(7) Pluralization strategies

Strategy	Count	Percentage	Singular	Plural	Gloss
Prefix addition	88	42.7%	lá	mə̀-lá	'debt'
Tone alternation	83	40.3%	kì	kī	'thing'
Zero marking	22	10.7%	ŋgā	ŋgā	'ladder'
Reduplication	12	5.8%	tē	té-té	'father'
Suppletion	1	0.5%	vɛ̃᷉	ɲʷɛ̃́	'child'
Total	206	100.0%			

In the following section, I demonstrate that the strategy of "prefix addition" is due to singular nouns having floating tone prefixes and their corresponding plural forms having segmental prefixes. Likewise, the strategy of "tone alternation" is due to singular and plural forms having different floating tone prefixes. It is also the case that the singular forms of reduplicated plurals begin with floating tone prefixes, which explains why singular and reduplicated plural nouns always have different surface tone patterns (cf. *tē/té-té* 'father/fathers').

As the title and introduction to this paper suggest, the present study focusses on convincing the reader that floating tone noun class prefixes are mainly responsible for the seemingly inexplicable tone alternations that occur between the singular and plural forms of many nouns. The data for

this study are therefore restricted to count nouns to better ensure the presence of singular and plural prefixes. In addition, the stems of these nouns are limited to monosyllabic forms to better ensure that all surface tones are due solely to interactions between floating tone prefixes and the tones of single roots, and not additionally due to interactions between the tones of multiple roots in compound stems. Together, these restrictions reduce the corpus of this study (monosyllabic count nouns) to 42% of the nouns in my database, a figure not far removed from Price's (1989: 13) claim that 55% of all Mada words (nouns, verbs, etc.) are monosyllabic.

I conclude this section by presenting the different surface tone alternations found in the singular plural pairings of my corpus data.

(8) Singular/plural tone alternations

Singular	Plural	Gloss	Singular	Plural	Gloss
m͡bú	m͡bū	'mat'	lá	mə̀-lá	'debt'
d͡ʒí	d͡ʒì	'mortar'	fú	mə̀-fū	'lung'
pō	pə́	'shoulder'	ŋɔ́	mə̀-ŋɔ̂	'hand'
n͡zār	n͡zàr	'hoe (n)'	kō	mə̀-kə̀	'compound'
rɛ̀	rɛ̂	'pot'			
kì	kī	'thing'			
kɔ̄	kɔ́	'bushfowl'			

As one can see in (8), there are many alternations which, at first glance, appear to be quite arbitrary. As noted by an anonymous reviewer however, despite how arbitrary the singular/plural tone pairings might first appear to be, it is important to realize that from a morpho-phonological perspective, there are only three patterns for which to account, each based on whether the prefixes are (H)-, (L)-, or *mə̀-*.

3. Analysis

The present work proposes underlying tone patterns of /H/, /M/, /L/, and /Ø/ (toneless) for simple monosyllabic noun stems. Toneless stems in Mada are realized with the pitch normal for whichever floating tone prefix is affixed to the stem: [H] in the case of floating (H)- prefixes, and [L] in the case of floating (L)- prefixes. Elsewhere (e.g., following the diminutive prefix), toneless stems are realized with L tones, which I conclude are default (see below). Here are examples of toneless stems from Pairings B ('mosquito') and C ('mortar').

(9) Phonetic realizations of toneless stems

Singular		Plural		Diminutive (Singular)[6]		Gloss
/ˋ-wʊ/→	[wʊ̀]	/´-wʊ/ →	[wʊ́]	/ˋ Və̄-wʊ/ →	[və̄-wʊ̀]	'mosquito'
/´-d͡ʒi/→	[d͡ʒí]	/ˋ-d͡ʒi/ →	[d͡ʒì]	/´ Və̄-d͡ʒi/ →	[fə́-d͡ʒì]	'mortar'

To help readers more easily follow the discussion below, which justifies the underlying stem tone patterns, I first present how the floating tone prefixes interact with the underlying tones of the stems to which they are affixed. These are summarized in (10) and discussed in detail below.

(10) Interactions between floating tone prefixes and underlying stem tones

(10a)	Prefix	Stem	Surface		(10b)	Prefix	Stem	Surface
	(H)-	/H/	[H]			(L)-	/H/	[MH]
	(H)-	/M/	[H]			(L)-	/M/	[M]
	(H)-	/L/	[M]			(L)-	/L/	[L]
	(H)-	/Ø/	[H]			(L)-	/Ø/	[L]

In (10a), when a floating (H)- prefix interacts with a stem /H/, there is no change to the stem tone; when a floating (H)- interacts with a stem /M/, the resultant tone is [H]; and when a floating (H)- interacts with a stem /L/, the resultant surface tone is [M].[7] Finally, when a floating (H)- interacts with a toneless stem, the resultant surface tone is [H]. Each of these interactions is illustrated in (11) and explained in the discussion that follows.

In (10b), when a floating (L)- prefix interacts with a stem /H/, the resultant surface tone is [MH]. When a floating (L)- interacts with a stem /M/ or with a stem /L/, there is no change to the stem tone. Finally, when a floating L interacts with a toneless stem, the resultant surface tone is again [L]. Toneless stems are therefore unlike stems with any of the other three patterns in that their surface pitches are always identical to the quality of whatever floating tone prefix precedes them: When the prefix is a floating (H)-, they are [H], and when the prefix is a floating (L)-, they are [L]. As such, when toneless stems follow floating (L)- prefixes, they are phonet-

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6. As noted at the beginning of Section 2, the (complex) stems of diminutive nouns are preceded by whichever noun class prefixes are appropriate for their classes.

7. Given this interaction, some might wonder if the /M/ tone might be better analyzed as the underlying pattern /HL/. I leave the matter open for now since whether the underlying form is /M/ or /HL/ makes no difference to the main proposals of this paper; discussing the matter at length would only detract from the focus of the presentation.

ically indistinguishable from underlying /L/ stems in the same environment. The /L/ and toneless underlying stem patterns only contrast when they follow floating (H)- prefixes, in which case, the toneless stem is realized [H], and the /L/ stem is realized [M].

As stated above, I propose /H/, /M/, /L/, and /Ø/ (toneless) as underlying tone patterns for simple monosyllabic noun stems. Since there is no single context that demonstrates this four-way tone contrast, it is necessary to compare these patterns in two environments: singular and plural.[8] All words in (11) are taken from Pairing B nouns, whose singular forms begin with floating (L)- prefixes and whose plurals begin with floating (H)- prefixes.

(11) Stem contrasts following singular (L)- and plural (H)-

Stem	Singular	Plural	Gloss
/H/	[dã̄]	[dá]	'cutlass'
/M/	[t͡sɛ̄]	[t͡sɛ́]	'chest'
/L/	[t͡sè]	[t͡sē]	'guinea fowl'
/Ø/	[wò]	[wó]	'mosquito'

Looking at the examples in (11), we begin with the singular forms, since three of the four underlying contrasts are revealed in this context. When preceded by the (L)- singular prefix, a three-way contrast emerges between /H/, /M/, and /L/ on the one hand, and between /H/, /M/, and /Ø/ on the other hand. Regarding /L/ and /Ø/, the contrast between them is neutralized in this environment, with both realized as [L]: /L/ realized as [L] because it is underlyingly /L/ and preceded by a floating (L)- prefix, and /Ø/ realized as [L] because L is the default tone. /L/ and /Ø/ do contrast, however, when compared in their plural forms, where both are preceded by floating (H)- prefixes: /L/ realized as [M] in t͡sē 'guinea fowl', and /Ø/ realized as [H] in wó 'mosquito'. As discussed above, a floating (L)- that precedes a /H/ tone causes the /H/ to be realized as [MH], and a floating (H)- that associates to a toneless stem causes that stem to be realized as [H].

Questions perhaps arise at this point, regarding why I analyze stems like that of wò 'mosquito' as toneless, and why I consider L to be the default tone in Mada; the answers to these questions are related. First, /Ø/ cannot be /H/, /M/, or /L/ because it contrasts with those tones, as demonstrated immediately above. Second, unlike stems with other underlying tones, toneless stems in Mada are consistently realized with the pitch of

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8. For presentations on how best to establish tonal contrast, see Snider (2014 and 2018).

the floating tone prefix before them, [H] when preceded by (H)-, and [L] when preceded by (L)-, as demonstrated in (9). In this respect, they behave like toneless morphemes in other languages in that they have no inherent tones of their own, but instead accept those of neighbouring tones when available.

So unlike $\widehat{ts}\grave{e}$ 'guinea fowl', which is underlyingly /L/ but realized as [M] in its plural form, toneless $w\grave{o}$ 'mosquito' is realized as [H] in its plural form. However, when no floating tones are available, as is the case when they follow segmental prefixes (e.g., the plural $m\grave{\partial}$- and the diminutive prefix $V\bar{\partial}$-), toneless stems are consistently realized with default [L] tones (e.g., $v\bar{\partial}$-$w\grave{o}$ 'small mosquito', $f\acute{\partial}$-$\widehat{d\jmath}\grave{\imath}$ 'small mortar'). Lest it be thought the surface [L] on diminutive forms with toneless roots is due to something other than a default tone, toneless roots are the only ones in diminutive words other than underlyingly /L/ roots that are realized with surface [L] (cf. $v\bar{\partial}$-$p\bar{\partial}$ 'small thing', which is underlyingly /M/). The assignment of default tones to toneless morphemes when other tones are unavailable to them (floating tones in the case of Mada) is very much in keeping with the cross-linguistic behaviour of default tones. In this respect, by positing L as the default tone in Mada, the present work supplements those studies that challenge Pulleyblank's (1986) assertion that M is the default tone for toneless tone-bearing units (TBUs) in three-tone languages. Paster, for example, argues that the default tone in three-tone languages can be H (Mixtepec Mixtec [mix], Paster 2005),[9] M (Yoruba [yor], Pulleyblank 1986), or L (Leggbo [agb], Paster 2003). Campbell (2014a and 2014b) also makes the case for L being the default tone in Zenzontepec Chatino [czn].

Returning to /H/, /M/, and /Ø/ in their singular forms, the three-way contrast between them is clear; however, when we look at them in their plural forms, they are all realized as [H] due to their interactions with the floating (H)- prefix of this pairing (cf. the interactions discussed above and summarized in (10)). So, while the floating (L)- singular prefix neutralizes the contrast between /L/ and /Ø/ stems, it reveals the contrasts between /H/, /M/, and /L/ stems, on the one hand, and between /H/, /M/, and /Ø/ stems, on the other hand. And while the floating (H)- plural prefix neutralizes the contrasts between /H/, /M/, and /Ø/ stems, by the same token, it reveals the contrast between /L/ and /Ø/ stems. We therefore have a four-way contrast between /H/, /M/, /L/, and /Ø/.

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9. My thanks to Will Leben for drawing the Paster (2005) reference to my attention.

3.1 Pairing A interactions

We next look at the interactions between Pairing A prefix tones and the underlying tones of CV stems in (12) and of CVC stems in (13). Regardless of which prefixes are interacting with which stems, the correspondences between underlying and surface representations in these paradigms are consistent between CV stems and their CVC counterparts.

(12) Pairing A with simple CV stems

Stem	Singular (H)-		Plural mә̀-		Gloss
/H/	/ ́-lá/	→ [lá]	/mә̀-lá/	→ [mә̀lá]	'debt'
/M/	/ ́-fū/	→ [fú]	/mә̀-fū/	→ [mә̀fū]	'lung'
/L/	/ ́-kә̀/	→ [kā]	/mә̀-kә̀/	→ [mә̀kә̀]	'compound'
/Ø/	/ ́-ŋɔ̃/	→ [ŋɔ̃́]	/mә̀-ŋɔ̃/	→ [mә̀ŋɔ̃̀]	'hand'

(13) Pairing A with simple CVC stems[10]

Stem	Singular (H)-		Plural mә̀-		Gloss
/H/	/ ́-gár/	→ [gár]	/mә̀-gár/	→ [mә̀gár]	'axe'
/M/	/ ́-dār/	→ [dár]	/mә̀-dār/	→ [mә̀dār]	'boundary'
/L/	/ ́-tàr/	→ [tār]	/mә̀-tàr/	→ [mә̀tàr]	'room'

As may be expected, the floating (H)- singular prefix has no effect on underlying /H/ stem tones. It does, however, raise underlying /L/ stem tones to [M] pitch, and underlying /M/ stem tones to [H] pitch. Also, as discussed above, toneless stems are realized with the pitch of the floating tone prefix, or a default L tone when they follow plural mә̀-.

The L-toned plural prefix mә̀- has no effect on stem tones other than to induce automatic downstep on following H tones. Throughout the language, automatic downstep occurs whenever a H tone follows a L tone. Downstep is a register phenomenon whereby a H tone and all H tones that follow it are lowered following a L tone. Following common practice, automatic downstep is not phonetically indicated throughout this paper. Although more rigorous study is clearly needed, the results from a small sample point to the tentative conclusion that downstepped H tones may be phonetically indistinguishable from M tones in the same environment.[11]

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10. In my database, toneless roots are unattested in Pairing A nouns with simple CVC stems. This lacuna is considered accidental due to the limited size of the corpus (only six nouns in Pairing A with CVC stems).

11. The average difference between pitches of underlying /L+M/ for single repetitions of nine plural nouns (mә̀- 'PL'+monosyllabic /M/ stems, e.g., /mә̀-fū/ → [mә̀fū] 'lungs') was 17.2 Hz. The aver-

Regardless of whether /H/ and /M/ roots are distinguishable following L tones, they clearly contrast elsewhere (e.g., following diminutive prefixes, cf. /H/ *fɔ́-lá* 'small debt' with /M/ *fɔ́-fū* 'small lung').

3.2 Pairing B interactions

We next look at examples of the interactions between Pairing B prefix tones and underlying stem tones, beginning with CV stems in (14) and then CVC stems in (15). See also the examples in (11), which also belong to Pairing B.

(14) Pairing B with simple CV stems

Stem	Singular (L)-		Plural (H)-		Gloss
/H/	/ ˋ-kɔ́/ →	[kɔ̌]	/ ´-kɔ́/ →	[kɔ́]	'bushfowl'
/M/	/ ˋ-pə̄/ →	[pə̌]	/ ´-pə̄/ →	[pə́]	'shoulder'
/L/	/ ˋ-kì/ →	[kì]	/ ´-kì/ →	[kī]	'thing'
/Ø/	/ ˋ-rɛ̃/ →	[rɛ̰̀]	/ ´-rɛ̃/ →	[rɛ̰́]	'pot'

(15) Pairing B with simple CVC stems

Stem	Singular (L)-		Plural (H)-		Gloss
/H/	/ ˋ-ɲɔ́r/ →	[ɲɔ̌r]	/ ´-ɲɔ́r/ →	[ɲɔ́r]	'tooth'
/M/	/ ˋ-jūr/ →	[jūr]	/ ´-jūr/ →	[júr]	'goat'
/L/	/ ˋ-pàr/ →	[pàr]	/ ´-pàr/ →	[pār]	'digging stick'
/Ø/	/ ˋ-t͡ʃar/ →	[t͡ʃàr]	/ ´-t͡ʃar/ →	[t͡ʃár]	'monkey'

In (14) and (15), the floating (L)- tone singular prefix has no effect on underlying /L/ and /M/ stem tones, but it does cause underlying /H/ stem tones to be realized as [MH] rising pitches. And again, toneless stems are realized with the pitch of whichever floating tone prefix is affixed to the stem: in this case, [L] pitch because the prefix is a floating (L)- tone.

Regarding the floating (H)- tone plural prefix, the interactions between it and the underlying stem tones to which they are affixed are the same as those between the singular floating (H)- prefix and the corresponding underlying stem tones to which they are affixed in Pairing A nouns in (12) above.

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age difference between pitches of underlying /L+H/ for single repetitions of 12 plural nouns (mə̀-'PL'+monosyllabic /H/ stems, e.g., /mə̀-gár/ → [mə̀⁺gár] 'axes') was 17.8 Hz. (Calculations were based on a single pitch-value for each syllable that was determined following the methodology described in Snider (1998). The results of a Wilcoxon Mann-Whitney rank sum test show that the difference in pitch between L and a following M is not significantly different from that between L and a following automatically downstepped H (Z = -0.107, p = 0.9151).

3.3 Pairing C interactions

Finally, we look at examples of the interactions between Pairing C prefix tones and underlying stem tones. There are only 14 Pairing C words in my database, and only four are monosyllabic. Of the four, two are underlyingly toneless, one is /H/, one is /L/, and none are /M/. All four monosyllabic nouns appear in (16).

(16) Pairing C with simple monosyllabic stems

Stem	Singular (H)-			Plural (L)-			Gloss
/H/	/ˊ-m͡bú/	→	[m͡bú]	/ˋ-m͡bú/	→	[m͡bū]	'mat'
/L/	/ˊ-n͡zàr/	→	[n͡zār]	/ˋ-n͡zàr/	→	[n͡zàr]	'hoe (n)'
/Ø/	/ˊ-d͡ʒi/	→	[d͡ʒí]	/ˋ-d͡ʒi/	→	[d͡ʒì]	'mortar'
/Ø/	/ˊ-ŋ͡klʷe/	→	[ŋ͡klʷé]	/ˋ-ŋ͡klʷe/	→	[ŋ͡klʷè]	'cloth'

Comparing these data with those of the other pairings, one can see that Pairing C singular forms behave identically with Pairing A singular forms, and Pairing C plural forms behave identically with Pairing B singular forms.

When both singular and plural prefixes of nouns consist of floating tones, the result is minimal tone pairs between the singular and plural forms of the nouns (e.g., *pā̄/pá̄* 'shoulder SG/PL'). The reader might therefore be interested to see what predictions the proposed analysis makes regarding which singular/plural minimal tone pairs are possible in Mada. In their presentation of singular/plural minimal tone pairs, Blench & Kato (2019: 8-12), document, but do not attempt to explain, six singular/plural minimal pair combinations, which they had discovered. Their list is set out in (17) and discussed further below.

(17) Blench & Kato's (2019) list of singular/plural minimal pair
combinations

	SG	PL	
1.	L	M	
2.	L	H	
3.	M	R	only one example, *jū/jǔ* 'water-yam'[12]
4.	M	H	
5.	R	H	
6.	H	R	

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12. My corpus, unfortunately, does not include this word.

Assuming the correctness of the analysis proposed above and summarized in (10), singular/plural minimal tone pairs are only possible with Pairing B nouns (singular (L)- and plural (H)-) and with Pairing C nouns (singular (H)- and plural (L)-). With four possible underlying stem patterns and two possible floating tone prefix pairings, Pairings B and C, the analysis predicts a total of eight (4 x 2) possible minimal tone pair patterns for singular and plural nouns. These are set forth in (18) and (19). The numbers in the B&K columns in (18) and (19) refer to Blench & Kato's pairings from (17), that correspond to my predictions.

(18) Pairing B singular/plural minimal pair possibilities

	SG/PL	Stem		SG	PL	Example	Gloss	B&K
a)	(L)-/(H)-	/H/	→	[MH]	[H]	kɔ́/kɔ́	'bushfowl/s'	5.
b)	(L)-/(H)-	/M/	→	[M]	[H]	pɔ̄/pɔ́	'shoulder/s'	4.
c)	(L)-/(H)-	/L/	→	[L]	[M]	kì/kī	'thing/s'	1.
d)	(L)-/(H)-	/Ø/	→	[L]	[H]	rɛ̀/rɛ́	'pot/s'	2.

(19) Pairing C singular/plural minimal pair possibilities

	SG/PL	Stem		SG	PL	Example	Gloss	B&K
a)	(H)-/(L)-	/H/	→	[H]	[MH]	m͡bú/m͡bū	'mat/s'	6.
b)	(H)-/(L)-	/M/	→	[H]	[M]	unattested		
c)	(H)-/(L)-	/L/	→	[M]	[L]	n͡zār/n͡zàr	'hoe/s'	
d)	(H)-/(L)-	/Ø/	→	[H]	[L]	d͡ʒí/d͡ʒì	'mortar/s'[13]	

As one can see, the H/M alternation predicted for Pairing C in (19b) does not occur in my corpus. This, of course, is not surprising given the limited size of the corpus and given that only 10% of nouns that have different singular and plural forms belong to Pairing C, the pairing that would be required to produce a H/M alternation. The expectation, of course, is that this prediction would be borne out in a larger corpus, and indeed that a larger corpus of nouns would continue to fit into these patterns.

Of Blench & Kato's six singular/plural minimal pair combinations in (17), all but the third one, M/R, are accounted for in the predicted combinations in (18). Since Blench & Kato found only one instance of M/R, *jū/jǔ*

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13. Blench & Kato (2019: 9) transcribe the tones for 'mortar' as ji/jĭ (H/R). In Blench & Kato (2019), H tone is unmarked, and R represents a "rising tone" (p. 6). In my data, I transcribe their R as [MH]. Roger Blench (personal communication) has suggested that some of the differences between the present work and that of Blench & Kato (2019) are possibly due to dialectal differences, given the fragmented nature of the Mada dialectal situation, and I am open to this possibility.

'water-yam', and I found none, it would be helpful to re-visit this word. In
my analysis, only singular forms with [H] pitch can pair with plural forms
with [MH] rising pitches. In any case, if this alternation truly exists, the
proposed analysis is unable to account for it. That aside, in addition to the
five combinations of Blench & Kato accounted for in monosyllabic forms,
the present analysis predicts three additional ones, the final three in (19).
As discussed above, of these three, only the H/M alternation of (19b) is
unattested in my corpus.

4. Comparison with an alternative phonemic analysis

Since conclusions regarding Mada tone in all publications to date appear to
be based on phonemic analyses, I next discuss some of the implications for
the Mada tone system if one were to assume a phonemic analysis. A peru-
sal of monosyllabic singular nouns in Mada reveals four phonemic tones:
/L/, /M/, /H/, and /R/ (Rising),[14] supported by the surface contrasts in (20).

(20) Four phonemic tones of singular nouns

Phonemes	Singular	Gloss
/L/	kì	'thing'
/M/	pə̄	'shoulder'
/H/	dó	'market'
/R/	kɔ̌	'bushfowl'

Similarly, a perusal of monosyllabic plural nouns reveals these same four
phonemic tones, as shown in (21).

(21) Four phonemic tones of plural nouns

Phonemes	Plural	Gloss
/L/	d͡ʒì	'mortars'
/M/	t͡sē	'guinea fowls'
/H/	rɛ̋	'pots'
/R/	m͡bǔ	'mats'

Given the four tones available for singulars and the four available for plu-
rals, in a phonemic analysis, one would expect lexical tone distinctions
between singular and plural forms of the same nouns to be non-predict-

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14. Quite apart from the evidence presented in this paper that the rising tones in this language are com-
binations of level tones, phonological unitary contour tones of the type found in Asia (Yip 1989) and
implied in a phonemic analysis, are typically not found in Africa.

able. That is, one might logically expect to find 16 (4 x 4) distinct singular/ plural tone combinations (e.g., $\widehat{d\mathfrak{z}}i/\widehat{d\mathfrak{z}}i$ 'mortar SG/PL', $ki/k\bar{i}$ 'thing SG/PL', etc.). However, four of the 16 logical combinations would leave singular and plural forms identical (viz. H/H, M/M, L/L, and R/R) so that leaves 12 combinations for which the singulars would be different from the plurals. These 12 logically possible combinations are set forth in (22), together with those that are attested or, as in the case of the H/M combination, are assumed to exist.

(22) Logically possible singular/plural tone combinations

Possible combinations		Attested combinations
SG	PL	
/H/	/M/	unattested, but assumed to exist
/H/	/L/	X
/H/	/R/	X
/M/	/H/	X
/M/	/L/	X
/M/	/R/	1 questionable example in B&K
/L/	/H/	X
/L/	/M/	X
/L/	/R/	
/R/	/H/	X
/R/	/M/	
/R/	/L	

Despite there logically being 12 possible pairing combinations, the language appears to employ only eight, as discussed at the end of Section 2. The occurrence of these eight, seemingly random combinations, out of a possible total of 12, begs the question why the other four combinations do not occur. More importantly, it begs the question why the combinations that do not occur should be L/R, M/R, R/L, and R/M, as opposed to other combinations.

Let us examine these exclusions more closely as they are not random. For each missing pair, one member is always /R/, and the other either /L/ or /M/. Singular/plural pairs with both combinations of /R/ and /H/, however, do exist (e.g., *mbú/mbŭ* 'mat SG/PL' and *kɔ́/kɔ́* 'bushfowl SG/PL'). While one might not necessarily expect Mada to employ every possible singular/plural combination of tone phonemes in (22), one would nevertheless expect whatever exclusions exist to be random in a phonemic analysis.

If however, one instead accepts the proposed analysis, there is a compelling reason why the phoneme /R/ does not co-occur with the phonemes /L/ and /M/ in singular/plural minimal pairs. For one member of a singular/plural pair to have a surface [MH] pitch (i.e., /R/), the stem of the pair would have to be underlyingly /H/ and the prefix of the member with the [MH] pitch would have to be a floating (L)-. To generate a surface [L] or [M] pitch for the other member of the pair, the stem would have to be something other than /H/ (cf. the possibilities in (10)). For example, a surface [L] pitch could only be generated by a floating (L)- prefix and an underlying /L/ stem or an underlying toneless stem. As for a surface [M] pitch, it could only be generated by a floating (L)- prefix and an underlying /M/ stem, or by a floating (H)- prefix and an underlying /L/ stem (cf. the forms in (18)). In other words, it would take something other than an underlying /H/ stem to generate the needed [L] or [M] pitch of the other member of the pair.

The fact that only eight of the 12 possible singular/plural minimal pair tone combinations occur, together with the predictable nature of the four missing combinations, greatly undermines the credibility of a phonemic analysis for these data.

5. Diminutive prefix /Vɛ̄-/

We turn now to the diminutive prefix /Vɛ̄-/, with allomorphs [fɔ́-] and [vɛ̄-]. In this section, I first establish the correlation between floating (H)- prefixes and [fɔ́-], and floating (L)- prefixes and [vɛ̄-]. Then in Section 5.1, I account for the [H] and [M] tone alternation of [fɔ́-] and [vɛ̄-], and in Section 5.2, I discuss the consonant voicing alternation of [fɔ́-] and [vɛ̄-].

Despite Blench & Kato's assertion that "[t]here seems to be no easy way to predict which of the *fɔ́-/vɛ̄-* allomorphs will be applied to which stem…" (Blench & Kato 2019: 17), as noted above, singular stems with floating (H)- prefixes take only [fɔ́-], and singular stems with floating (L)- prefixes take only [vɛ̄-]. This may be seen in (23) through (25), which take [fɔ́-], and in (26) and (27), which take [vɛ̄-].

(23) Pairing A, CV stems

Stem	SG (H)-			DIM.SG [fɔ́-]	Gloss
/H/	/ ́-lá/	→	[lá]	[fɔ́lá]	'debt'
/M/	/ ́-fū/	→	[fú]	[fɔ́fū]	'lung'
/L/	/ ́-kə̀/	→	[kə̄]	[fɔ́kə̀]	'compound'
/Ø/	/ ́-ŋɔ̃̀/	→	[ŋɔ̃́]	[fɔ́ŋɔ̃̀]	'hand'

(24) Pairing A, CVC stems

Stem	SG (H)-			DIM.SG [fə́-]	Gloss
/H/	/ ´-gár/	→	[gár]	[fə́gár]	'axe'
/M/	/ ´-dār/	→	[dár]	[fə́dār]	'boundary'
/L/	/ ´-tàr/	→	[tār]	[fə́tàr]	'room'
/Ø/	No data				

(25) Pairing C, mixed stems

Stem	SG (H)-			DIM.SG [fə́-]	Gloss
/H/	/ ´-m͡bú/	→	[m͡bú]	[fə́m͡bú]	'mat'
/M/	unattested				
/L/	/ ´-n͡zàr/	→	[n͡zār]	[fə́n͡zàr]	'hoe'
/Ø/	/ ´-d͡ʒi/	→	[d͡ʒí]	[fə́d͡ʒì]	'mortar'

(26) Pairing B, CV stems

Stem	SG (L)-			DIM.SG [və̄-]	Gloss
/H/	/ `-kɔ́/	→	[kɔ̄]	[və̄kɔ́]	'bushfowl'
/M/	/ `-pə̄/	→	[pə̄]	[və̄pə̄]	'shoulder'
/L/	/ `-kì/	→	[kì]	[və̄kì]	'thing'
/Ø/	/ `-rɛ̃/	→	[rɛ̃̀]	[və̄rɛ̃̀]	'pot'

(27) Pairing B, CVC stems

Stem	SG (L)-			DIM.SG [və̄-]	Gloss
/H/	/ `-ɲə́r/	→	[ɲə̄r]	[və̄ɲə́r]	'tooth'
/M/	/ `-jūr/	→	[jūr]	[və̄jūr]	'goat'
/L/	/ `-pàr/	→	[pàr]	[və̄pàr]	'digging stick'
/Ø/	/ `-t͡ʃar/	→	[t͡ʃàr]	[və̄t͡ʃàr]	'monkey'

From these data sets, one can see there is a clear patterning of [fə́-] with singular stems from Pairings A and C, which take floating (H)- prefixes, and of [və̄-] with singular stems from Pairing B, which take floating (L)-prefixes. Next, we investigate the tone alternation between the two allomorphs.

5.1 [fə́-] ~ [və̄-] tone alternation

Regarding the alternation between the H and M tones of the diminutive prefix [fə́-] ~ [və̄-], since the H tone correlates with the occurrence of voice-

less [f], and the M tone with the occurrence of voiced [v], it is tempting to wonder if the voiced obstruent is perhaps lowering the tone of the prefix from H to M in the case of *və̄-*. I believe this is unlikely for two reasons. First, if this is a case of a consonant affecting tone, then it is the only case in Mada of which I am aware. For example, lowering does not occur with other voiced obstruents (e.g., *d͡ʒí* 'mortar', *gɔ̃́* 'back', and *dó* 'market'). Moreover, I was unable to discover any statistical correlations between tone and consonant types known to affect tone other than with this prefix.

Second, the historical source of the prefix argues against this. As is documented for many languages (Gibson *et al.* 2017), diminutive morphemes often originate with the word for 'child', and this is the case in Mada as well. According to Blench & Kato (2019: 16), /Və̄-/ finds its origin in *vɛ̃̄*, the singular form for 'child' (cf. *vɛ̃̄/ŋʷɛ̃́* 'child SG/PL'). This is undoubtedly the case, supported by the use of *ŋʷɛ̃́*, the suppletive plural form for 'child',[15] as a prefix for the diminutive plural for certain words (e.g., *və̄-n͡zɛ̀/ ŋʷɛ̃́-n͡zɛ̀* 'young man SG/PL'). The M of *vɛ̃̄* is therefore probably the source of the M tone of *və̄-*. That being said, the M tone of *vɛ̃̄* is itself derived from /L/ (cf. /(H)-vɛ̀/ → [vɛ̃̄] 'child' and /(H)-Və̄-vɛ̀/ → [fə́-vɛ̃̀] 'little child'). See also further discussion below.

In their discussion of diminutives in Bantu, Gibson *et al.* (2017: 345), claim the following:

> Whilst many languages, like Herero, use noun class 12 for the formation of diminutives, there is variation in this regard, with some languages employing a different class (and associated class morphology) for the formation of either the singular or plural forms. Other languages do not use dedicated diminutive noun classes but instead rely on processes of reduplication, on the addition of a diminutive suffix, or on the formation of diminutives through nominal compounding.

I propose that the diminutive prefix is not a noun class prefix, as it might first appear to be, but rather a derivational prefix that attaches directly to the noun root, thereby creating a complex stem. By forming diminutives by means of complex stems, Mada adopts a modification of Gibson *et al.*'s last strategy of forming diminutives "through nominal compounding". This complex diminutive stem, in turn, is prefixed by whichever noun class prefix is appropriate for the noun's class, and it is this floating tone prefix that is responsible for whether the surface tone of the diminutive prefix is M or H, and whether the prefix consonant is *f* or *v* (discussed further below). Here are some examples that illustrate the morphological structure of diminutive nouns.

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15. Dave Roberts (personal communication) informs me that the plural form for 'child' is also suppletive in Gworok [kcg], another Plateau language of Nigeria.

(28) Morphological structure of diminutive nouns

        Pairing A with /L/ root

        [´ [[t͡ʃàr]$_{ROOT}$]$_{STEM}$]$_{NOUN}$ →   [t͡ʃār]   'stranger'

        [´ [Və[t͡ʃàr]$_{ROOT}$]$_{STEM}$]$_{NOUN}$ →   [fə́-t͡ʃàr] 'little stranger'

        Pairing B with toneless root

        [` [[t͡ʃar]$_{ROOT}$]$_{STEM}$]$_{NOUN}$ →   [t͡ʃàr]   'monkey'

        [` [Və[t͡ʃar]$_{ROOT}$]$_{STEM}$]$_{NOUN}$ →   [və̄-t͡ʃàr] 'little monkey'

In their treatment of Mada nominal morphology, Blench & Kato (2019: 16-17) likewise do not consider the diminutive prefix to be a noun class prefix, preferring instead to call it a "pseudo class-prefix", on par with other "person nouns acting as pseudo-prefixes", like *wɔ̄*- and *bɔ̄*- in words like *wɔ̄-dɔ̀*/*bɔ̄-dɔ̀* 'farmer SG/PL' and *wɔ̄-dɛ̃̄*/*bɔ̄-dɛ̃̄* 'medicine man SG/PL'. Blench & Kato consider such words to be compounds. In support of this, they assert (2019: 16) that "*wān* [wɔ̄] and *bān* [bɔ̄] can also function independently as relative pronouns", and also (2019: 17) that "words which use the *wān*/*bān* alternation cannot also take the *və*- prefix". To further support the notion that the stem of diminutive nouns consists of the diminutive prefix and the root, I argue next that the floating tone singular prefix is affixed to the complex (diminutive) stem, as opposed to the noun root.

    In (23) through (25), one can see that /Və/ must be affixed directly to the root prior to affixation of the floating (H)- singular prefix on its left edge. If not, following the schema set forth in (10) above, the diminutive form for the underlyingly M-toned *fū* 'lung' would be **fə́fú* instead of *fə́fū*, the diminutive of the underlyingly L-toned *kā* 'compound' would be **fə́kā* instead of *fə́kà*, and the diminutive of the underlyingly toneless *ŋɔ́* 'hand' would be **fə́ŋɔ́* instead of *fə́ŋɔ̀*. Recall that toneless stems are realized with default L pitches unless there is a floating tone adjacent to them. The floating tone noun class prefix also appears on the left edge of compound stems, as may be seen by comparing the forms in (29).

(29) Compound stems

           / ´ tàr-kòr/   →   [tārkòr]   'bedroom'

        cf. /mə̀-tàr-kòr/   →   [mə̀tàrkòr] 'bedrooms'

        cf. / ` kì-kòr/   →   [kìkòr]   'bed'

Regarding the influence of /Və-/ on root tones, with the exception of /H/ roots, the roots themselves are realized with pitches consistent with their underlying tones: Roots with /M/ tones are realized as [M], and roots with

/L/ tones are realized as [L]. Toneless roots, of course, are realized with default L tones in this environment. Following /Və̄-/, /H/ roots are realized as [H] if the prefix is fə́-. However, if the prefix is və̄-, /H/ roots are realized as [MH] (e.g., və̄-kɔ̌ 'bushfowl (DIM)' in (26) and və̄-ɲə̌r 'tooth (DIM)' in (27)).

Regarding the [MH] rising pitch of words like və̄kɔ̌, I propose that it is not the floating (L)- prefix, but rather the M tone of /Və̄-/ that is responsible for the rising pitch. When the roots of complex stems are respectively M-toned and H-toned, the M of the first root spreads rightwards onto the second root where it joins the H of the second root to also form a [MH] rising pitch. This may be seen in (30).

(30) Mid tone spreading

M H

vəkɔ   [və̄kɔ̌] 'little bushfowl'
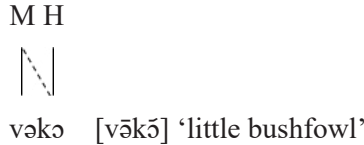
This notion finds support in that other M-toned derivational prefixes do this as well, e.g., wɔ̄-gǐ 'thief' and k͡pə̄-wǔ 'burn (n.)' (cf. /wú/ 'burn (v.)').

So we conclude that the floating tone prefix does not occur between the diminutive prefix and the root to which it is affixed, but rather associates to the left edge of the diminutive prefix (i.e., the left edge of the (complex) stem), as it does with compound stems like tārkòr 'bedroom' in (29).

Derivations of the diminutive forms for Pairings A and B are provided in (31) and (32).

(31) Derivations of Pairing A diminutives

Stem	SG (H)-		DIM.SG [fə́-]		Gloss
/H/	/´-lá/	→ [lá]	/´-Və̄-lá/	→ [fə́lá]	'debt'
/M/	/´-fū/	→ [fú]	/´-Və̄-fū/	→ [fə́fū]	'lung'
/L/	/´-kə̀/	→ [kā]	/´-Və̄-kə̀/	→ [fə́kə̀]	'compound'
/Ø/	/´-ŋɔ̃̌/	→ [ŋɔ̃́]	/´-Və̄-ŋɔ̃̌/	→ [fə́ŋɔ̃̌]	'hand'

(32) Derivations of Pairing B diminutives

Stem	SG (H)-		DIM.SG [və̄-]		Gloss
/H/	/`-kɔ́/	→ [kɔ̌]	/`Və̄-kɔ́/	→ [və̄kɔ̌]	'bushfowl'
/M/	/`-pə̄/	→ [pə̌]	/`Və̄-pə̄/	→ [və̄pə̌]	'shoulder'
/L/	/`-kì/	→ [kì]	/`Və̄-kì/	→ [və̄kì]	'thing'
/Ø/	/`-rɛ̃́/	→ [rɛ̃̌]	/`Və̄-rɛ̃́/	→ [və̄rɛ̃̌]	'pot'

Perusal of the derivations in (31) shows that when the floating (H)- prefix occurs before the underlyingly /M/ of the diminutive prefix, the prefix is realized as [H], in keeping with the behaviour of (H)- when it occurs before stems with underlying /M/ tones (e.g., / ́-fū/ → [fú] 'lung'). Similarly, the derivations in (32) show that when the floating (L)- prefix occurs before the /M/ of the diminutive prefix, the latter is realized as [M], in keeping with the behaviour of floating (L)- tones when they occur before stems with underlying /M/ tones (e.g., / ̀-pā/ → [pā] 'shoulder'). By accepting the presence of underlying floating prefixes, we can account for the [H] ~ [M] tone alternations of the diminutive prefix in Mada in a straightforward manner, without having to resort to additional rules or novel ideas.

5.2 [fɘ́-] ~ [vɘ̄-] consonant voicing alternation

As mentioned above, singular nouns with floating (L)- prefixes take only the [vɘ̄-] allomorph in their diminutive forms, and singular nouns with floating (H)- prefixes take only [fɘ́-]. Initially, this would appear to be a clear case of tone affecting consonants. However, the case for this is not as straightforward as it might first seem to be.

First, if tone is indeed affecting consonants in Mada, it would appear to be limited to a single morpheme: the diminutive /Vɘ̄-/. Obstruent devoicing is not induced by other H tones (e.g., d͡ʒí 'mortar', gɔ̌ 'back', and dó 'market'), nor, for that matter, is obstruent voicing induced by L tones (e.g., t͡sè 'guinea fowl', t͡ʃɑ̀r 'monkey', and kì 'thing'). And again, as mentioned above, I was unable to discover any statistical correlations between tone and consonant types known to affect tone other than with this prefix. So, if tone is indeed influencing consonants in Mada, the limitation to a single morpheme, although possible, is certainly puzzling.

That consonants can affect tone is, of course, well-established: Phonetically, voiced obstruents are known to have a lowering effect on the F_0 of adjacent TBUs, as well as a blocking effect on H-tone spreading, and voiceless obstruents are known to have a raising effect, as well as a blocking effect on L-tone spreading (Hombert 1978; Bradshaw 1999). However, in Mada, as we will see, the situation is the opposite, that of tone affecting consonants, and this is more controversial and certainly rarer. On the one hand, Hyman (1976) and Hyman & Schuh (1974) claim that tone does not affect consonants. On the other hand, Maddieson (1974 and 1976) presents a few cases in which L tone appears to effect voicing of consonants. In his discussion of the subject, Schuh (1978) speculates that apparent instances of L tones inducing voicing are probably instances of creakiness or breathiness accompanying L tone, and that the voicing is correlating with these secondary features as opposed to correlating with pitch. More recently,

however, other studies, particularly of Asian languages, suggest that tone can indeed affect consonants (cf. Poser 1981; Hansson 2004). Hansson (2004: 319) claims that in Yabem [jae], it is tone that is the independent variable and that "obstruent voicing is fully predictable from tone: stops are voiced in L-toned syllables, otherwise all obstruents are voiceless". African languages also are not excluded from tone affecting consonants. Pearce (2009 and 2013) claims this for Kera [ker], a Chadic language spoken in Chad and Cameroon, and Sossoukpe (2017) makes a case for L tone inducing obstruent voicing in Akebu [keu], a Ghana-Togo Mountain language spoken in Togo. The situation in Akebu is even more relevant to the present concerns because the tone that induces the voicing in Akebu is a floating (L)- tone noun class prefix. So, while perhaps rare, floating tones can indeed affect consonants. And this, of course, raises the question of whether the Mada phenomenon is indeed a case of tone affecting consonants, since the initial consonant of the diminutive is entirely predictable from the floating tone of the prefix of the noun it combines with: [v] if the prefix is (L)-, and [f] if the prefix is (H)-.

To further muddy the waters, the cases presented in the literature all appear to be instances of L tone effecting voicing. If Mada is indeed a case of tone affecting consonants, the situation would be rarer still because in Mada, it would appear to be H tone inducing de-voicing, as opposed to L tone inducing voicing. As discussed above, /Vɜ́-/ undoubtedly finds its source in vɛ̄̃ 'child'. The question then becomes whether the [v] in vɛ̄̃ is a reflex of *v, or of *f. If of *f, it is possible that the [v] was later induced by L tone. And, as discussed above, the root for vɛ̄̃ is underlyingly /L/, so this is possible. However, it is also unlikely as it is difficult to make the case that this word began historically with *f.

In her discussion regarding the unity of the Benue-Congo subgroup, Williamson (1971: 252) notes that there is little evidence for words that are shared innovations within Benue-Congo (i.e., for words occurring in all four subgroups of Benue-Congo languages that do not also occur outside of Benue-Congo). Using the word for 'child' as an example of a word within Benue-Congo that is also found elsewhere, she cites Greenberg (1963: 32) as saying, "[t]he Proto-West Sudanic [one of Greenberg's Benue-Congo subgroups to which Mada belongs] form is *vi and is found virtually everywhere outside of the Benue-Cross group". Mada vɛ̄̃ is therefore most certainly a reflex of Greenberg's *vi and Gerhardt's (1983) Proto-Ninzic *ú-vín 'child', and cognate with *uvin* 'child' in Che [ruk].[16] Che, also known as Rukuba, is another Ninzic language, closely related

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16. The Che word list (no tones in source) was contributed by T. J. Bryan to Williamson & Shimizu (1971).

to Mada. It would therefore be difficult to contend that the [v] of *vɛ̄́*, and therefore of [vɜ̄-], is a reflex of *f. Accordingly, if the consonant voicing alternation in the Mada diminutive prefix is indeed a case of tone affecting consonants, then it would need to be H tone de-voicing the /v/ to [f]. If true, then Mada would probably be the only known case of H tone inducing consonant de-voicing.

Given the difficulty in making a compelling case for the [H] tone of [fɜ́-] inducing de-voicing, we next explore the possibility that [vɜ̄-] and [fɜ́-] derive historically from different sources. If so, the case for tone affecting consonants in this instance is significantly weakened.

As discussed above, there is good reason to believe that /Vɜ̄-/ finds its origin in *vɛ̄́* 'child'. As for making a case that [fɜ́-] has an origin separate from that of [vɜ̄-], this is as problematic as is making the case of it having the same origin. One possibility is that Mada [fɜ́-] is cognate with Noun Class 9 (NC 9) *fè-* in Amo [amo], a Kainji language spoken in central Nigeria, or perhaps with NC 19 *fì-* in the Grassfields Bantu languages, e.g., NC 19 *fì:-* in Dzodinka, also known as Adere [add] (Voorhoeve 1980: 62), and NC 19 *fì-* in the Mankon dialect of Ngemba [nge] (Leroy 1980: 116). There are problems, however, with these hypotheses. First, neither NC 9 in Amo nor NC 19 in the Grassfields languages hosts diminutives. Second, although Mada, Amo, and the Grassfields languages all belong to the Benue-Congo subgroup of Niger-Congo languages, neither Amo nor the Grassfields languages are closely related to Mada: Mada is a Plateau language, Amo a Kainji language, and the Grassfields languages are Bantoid. So the notion that Mada may have inherited [fɜ́-] from some ancestor language common to Mada and Amo, or to Mada and the Grassfields languages, is unlikely. This is further supported by the fact that a prefix *fə-* does not occur in other Plateau languages, more closely related to Mada (Roger Blench, personal communication). Finally, Mada, which is spoken in central Nigeria, and the Grassfields languages, which are spoken in southwestern Cameroon, are not particularly close to each other geographically. This distance undermines the notion that Mada may have somehow borrowed [fɜ́-], at least from the Grassfields languages.

Another possibility is that like [vɜ̄-], which derives from *vɛ̄́* 'child', [fɜ́-] derives from a different root, perhaps for 'son'. For example, in Williamson & Shimizu (1971: 69), *fan* (no tones provided in source) is the word for 'child' in Kwanka and for 'son' in Boyama. Kwanka and Boyama are both dialects of Vaghat-Ya-Bijim-Legeri [bij],[17] which, like Mada, is another Ninzic language. While I offer this as a possibility, it also is not overly

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17. The Kwanka data in Williamson & Shimizu (1971) were submitted by T. J. Bryan, and the Boyama data were adapted from Gowers (1907) and submitted by Kay Williamson.

compelling. I therefore leave the matter to further research to determine whether the allomorphs for the diminutive prefix historically derive from one source or two.

Cross-linguistically, when consonants and tone interact, whether it is consonants influencing tone, or tone influencing consonants, the correlation is always between L tones and voiced obstruents and/or H tones and voiceless obstruents. It is therefore hardly a coincidence that in Mada, *v* correlates with floating (L)-, and *f* with floating (H)-. I therefore conclude that regardless of how it came to be, synchronically, Mada has a single diminutive prefix. An anonymous reviewer has suggested that the consonant of this prefix is possibly unspecified for voicing (i.e., /Vɔ̄-/) and is realized [−voice] in the context of high tone due to markedness restrictions, and [+voice] elsewhere (i.e., in the context of mid). This analysis meshes nicely with my own theoretical persuasions, and it is the analysis adopted here. Hence the use of uppercase V throughout this paper in representations of /Vɔ̄-/.

6. Historical justification for floating tone prefixes

A comparison, conducted by Norm Price,[18] of Gerhardt's (1983) Proto-Plateau 4 (Ninzic) reconstructed nouns with identifiable reflexes in Mada, reveals a strong correlation between the tones of the Proto-Ninzic prefixes reconstructed for those reflexes and the floating tone prefixes proposed for those reflexes in the present work. These correlations are set out below in (33) through (35), together with the count of Mada nouns in my corpus attributable to each correlation.

Note especially the correlation in (33) between Proto-Ninzic singular nouns that begin with the prefix *ú- and Mada nouns from Pairing A, which begin with a singular floating (H)- prefix (cf. Proto-Ninzic *ú-vín 'child' with Mada /(H)-vɛ̀/ → [vɛ̃́] 'child'). Pairing B nouns in Mada are even more interesting because their singular forms begin with (L)-, a floating low tone prefix, and their plurals with (H)-, a floating high tone prefix. A comparison of Gerhardt's Proto-Ninzic reconstructions with their Mada reflexes in (34) also reveals a strong correlation between Proto-Ninzic nouns with the singular/plural prefix pairing *ì-/*í- and their Mada reflexes, from Pairing B, with the singular/plural prefix pairing floating (L)-/(H)- (e.g., Proto-Ninzic *ì-rén 'pot' and Mada /(L)-rɛ̃/ → [rɛ̃̀] 'pot').

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18. I am grateful to Norm (personal communication) for passing on to me these correlations.

(33) Pairing A singular/plural prefixes

Mada	Proto-Ninzic	Count
(H)-/mə̀-	*ú-/bá-	3
(H)-/mə̀-	*ú-/*ì-	3
(H)-/mə̀-	*ú-/*í-	1
(H)-/mə̀-	*kú-/*lá-	2
(H)-/mə̀-	*kí-/*á-	1
(H)-/mə̀-	*kú-/?	1
(H)-/mə̀-	*ká-/?	1
(H)-/mə̀-	*á-/?	1

(34) Pairing B singular and plural prefixes

Mada	Proto-Ninzic	Count
(L)-/(H)-	*ì-/*í-	7
(L)-/(H)-	*ì-/?	1
(L)-/(H)-	*kí-/*á-	1*

* Exception to expected correlation.

(35) Pairing C singular and plural prefixes

Mada	Proto-Ninzic	Count
(H)-/(L)-	*kú-/*ì-	1
(H)-/(L)-	*ú-/*ì-	1

Of the 24 Mada words from Pairings A, B, and C that Price was able to es-tablish as reflexes of Gerhardt's Proto-Ninzic reconstructions, all but one[19] show a correlation between my proposed floating tone prefixes and the pre-fix tones of Gerhardt's reconstructions. These correlations strongly support the notion that the floating tone prefixes proposed in the present work are vestiges of earlier prefixes whose segments eroded over time.

7. Does Mada have a noun class system?

The historical erosion of segments of most class prefixes in Mada has led some linguists (e.g., Blench (2015 and 2018) and an anonymous reviewer) to question whether Mada has a noun class system. The following quota-tion from Blench (2015: 4) is illustrative:

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19. The single counterexample is in (34), where the reconstructed singular prefix *kí- bears a H tone instead of the expected L tone.

> As the examples given below demonstrate, tone-alternations in Mada plurals are highly diverse, pointing to a complex history of compounding, borrowing and reanalysis. Although some patterns are common and others very rare, it would be stretching the case to call these patterns noun-classes. Certainly, they seem to have little semantic unity.

Ideally, Niger-Congo noun class systems are characterized by a) a system of singular and plural prefixes and/or suffixes affixed to nouns that help to identify the classes of nouns, b) nouns of the same class often, though not always, sharing the same singular/plural pairing strategy, c) a system of pronominal concord (i.e., agreement) between nouns and related constituents such as adjectives, demonstratives, and verbal subject and object markers, and d) at least vestiges of semantic unity within nouns of the same class. The main arguments from the sources cited above against Mada having a noun class system are summed up in (36).

(36) Reasons against Mada having a noun class system

  a) Most nouns in Mada lack prefixes or suffixes.
  b) There is no apparent rhyme or reason to the singular/plural pairing strategies in Mada nouns.
  c) There is no concord marking between nouns and the different constituents to which they relate.
  d) There does not appear to be any shared morphological or phonological traits among nouns that are semantically related (e.g., animals such as $\widehat{t\int}\grave{a}r/\widehat{t\int}\acute{a}r$ 'monkey SG/PL', $\widehat{ts}\grave{e}/\widehat{ts}\bar{e}$ guinea fowl SG/PL', $\widehat{ts}\bar{\partial}/\widehat{ts}\acute{\partial}$ 'leopard SG/PL').

In essence, the diagnostics characteristic of Niger-Congo noun class systems are significantly lacking in Mada; ergo, Mada does not have a functioning noun class system.

These arguments, however, are based on an incomplete understanding of the Mada tone system and the assumption that a lack of segmental affixes equates with a lack of affixes in general. Let us discuss each of these arguments. Regarding a), the present work clearly establishes that Mada has a robust system of prefixes that includes two floating tone singular prefixes, (H)- and (L)-, two floating tone plural prefixes (L)- and (H)-, and one segmental plural prefix, $m\grave{\partial}$-. Regarding b), as demonstrated above, the seemingly random assortment of singular/plural pairing strategies based on tone is neither multitudinous nor random.

Regarding c), I have not had the opportunity to investigate the existence of concord between nouns and related constituents. Blench (2015: 4)

however, claims that "[c]oncord of a sort, based on tonal correspondences, exists in Mada, although this will be discussed in a study of adjectives". Given this hint and the extensive employment of floating tone singular/ plural prefixes on nouns in the language, I would not be surprised to find solid evidence of concord based on floating tone pronominal marking.

Finally, regarding argument d), establishing semantic unity in the noun classes of many Niger-Congo languages is often difficult due to the historical mergers of many classes; for most Niger-Congo languages, semantic unity can often be established only partially for some classes. For example, in Bantu languages, many nouns that denote human beings have singular/ plural pairings of classes 1/2, and many nouns that denote animals have singular/plural pairings of classes 9/10; however many other classes are harder to define semantically. While further research needs to be carried out with a larger corpus of data, my own investigations of semantic class unity, based on classes established by floating tone noun prefixes, reveal that most nouns in my corpus that denote body parts belong to Pairing A, most nouns that denote animals (see also (36d)) belong to Pairing B, and most nouns that denote tools and utensils belong to Pairing B. Also, the singular prefix of most nouns that denote human beings is (H)-, although their singular/plural pairing strategies are quite varied (e.g., Pairing A, reduplication, suppletion). Examples of these appear in (37).

(37) Semantic groupings in singular/plural noun class pairings

	Singular (H)-			Plural mə̀-			Gloss
Body parts (Pairing A)	/ˊ-t͡ʃ ĩ̄/	→	[t͡ʃ ĩ́]	/mə̀-t͡ʃ ĩ̄/	→	[mə̀t͡ʃ ĩ́]	'forehead'
	/ˊ-ŋà/	→	[ŋā]	/mə̀-ŋà/	→	[mə̀ŋà]	'cheek'
	/ˊ-ŋɔ̃/	→	[ŋɔ̃́]	/mə̀-ŋɔ̃/	→	[mə̀ŋɔ̃̀]	'hand'
Animals (Pairing B)	/ˋ-g͡bã̄/	→	[g͡bã̄]	/ˊ-g͡bã̄/	→	[g͡bã́]	'frog'
	/ˋ-gʲɔ̃/	→	[gʲɔ̃̀]	/ˊ-gʲɔ̃/	→	[gʲɔ̃́]	'hare'
	/ˋ-jūr/	→	[jūr]	/ˊ-jūr/	→	[júr]	'goat'
Utensils (Pairing B)	/ˋ-dá/	→	[dā]	/ˊ-dá/	→	[dá]	'cutlass'
	/ˋ-gɔ̃/	→	[gɔ̃̀]	/ˊ-gɔ̃/	→	[gɔ̃́]	'bag'
	/ˋ-rɛ̃/	→	[rɛ̃̀]	/ˊ-rɛ̃/	→	[rɛ̃́]	'pot'
Humans (varied plurals)	/ˊ-t͡ʃ ŏ̃/	→	[t͡ʃ ŏ̃]	/mə̀-t͡ʃ ŏ̃/	→	[mə̀t͡ʃ ŏ̃]	'chief'
	/ˊ-t͡ʃ àr/	→	[t͡ʃ ār]	/mə̀-t͡ʃ àr/	→	[mə̀t͡ʃ àr]	'stranger'
	/ˊ-vɛ̃̀/	→	[vɛ̃̄]	/ˊ-ŋʷɛ̃̀/	→	[ŋʷɛ̃́]	'child'

Once one recognizes the existence of floating tone prefixes, Mada is little different from many other Niger-Congo languages whose noun class systems are unquestioned.

8. Conclusion

The elegance of the present analysis may be summed up as follows. There are reasonable and intuitively satisfying explanations for the (at first glance) seemingly inexplicable tone alternations that occur between the singular and plural forms of many monosyllabic nouns. The surface tone realizations of different prefix and stem combinations are predictable given the proposed floating tone prefixes of (H)- and (L)-, the underlying stem tone patterns of /H/, /M/, /L/, and /Ø/, and the proposed prefix-stem tone interactions. The analysis accounts for the absence of four surface contrasting singular/plural minimal tone pairings (viz. L/MH, M/MH, MH/L, and MH/M) that should logically otherwise be present if one assumed a phonemic analysis. The proposed analysis also accounts for why the diminutive prefix is [fə́-] for some nouns and [və̄-] for others. The strong correlation between the proposed Mada floating tone noun class prefixes and the tones of Gerhardt's (1983: 198) reconstructed Proto-Plateau 4 (Ninzic) noun class prefixes provides important historical support for the floating tone prefixes proposed in the present work. Finally, previous claims, based on an incomplete understanding of the tone system, that a noun class system is all but non-existent in Mada need to be revised in light of the present work.

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