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Phrasal Construction Tonology

The case of Kalabari*

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Although it is common for “replacive” tonal patterns to be assigned by word-level morphological constructions, it is far less common for such overriding schemas to be assigned by specific phrase-level syntactic constructions. Kalabari, an Ijo language of Nigeria, does exactly this: Whenever the noun is preceded by a modifier, it loses its tones and receives different “melodies” depending on the constructional word class of the preceding specifier/modifier, either /HL/, /HLH/, /LH/, or /L/. In this paper, we first document the assignment of these different syntactic melodies and then provide evidence for how they developed diachronically. We then present a brief survey of other linguistic phenomena which partially resemble the Kalabari system, but conclude that tone is the only phrasal phonological property that can be assigned by construction from word to word.

Keywords: tone, constructions, phrasal phonology

1. Introduction

The purpose of this paper is to present an analysis of an unusual situation whereby phrasal tones are assigned by construction in Kalabari [kálábàri], an Ijo language spoken in Nigeria (Harry 2004).¹ As seen in Table 1, Kalabari distinguishes H(igh) vs. L(ow) lexical tones which exhibit the following patterns on mono-, bi-, and trisyllabic words:²

In addition to H and L, \downarrow represents a “downstepped” H tone, which is lower in pitch than the preceding H, but higher than the pitch of a L tone, hence $bá^{\downarrow}rá$ [– –] ‘hand’ vs. $bélè$ [– –] ‘light’. In what follows, we first present an unusual set of facts concerning the realization of these tones in different constructions and then present an account of how this situation arose diachronically. We then consider phenomena in other languages which are in part reminiscent, but not identical to the Kalabari system. We conclude that the assignment of phonological features by

Table 1. Tone patterns in Kalabari

monosyllabic			bisyllabic			trisyllabic		
L	sò	'go'	L-L	mèni	'flesh'	L-L-L	kpikpirì	'blunt'
H	só	'sky'	L-H	dāwó	'learn'	L-L-H	èrisé	'storm'
			H-H	kúró	'fall'	L-H-L	wònkírè	'now'
			H-L	bélè	'light'	L-H- [↓] H	gìló [↓] lí	'lure'
			H- [↓] H	bá [↓] rà	'hand'	H-H-H	ákpákpá	'shell'
						H-H- [↓] H	sá [↓] lámá	'separate'
						H-H-L	énémè	'oil palm'
						H-L-H	wásàrà	'overflow'

construction is a unique property of tone, and thus of considerable typological significance both for phonology and for how syntactic constructions can be marked.

While the examples in Table 1 illustrate lexical tones, we note that it is common for tone to be assigned instead by WORD-LEVEL morphological constructions. For example, as seen in (1), when Kalabari verbs are detransitivized, a /LH/ “melody” replaces their lexical tones:

(1)	<i>transitive</i>			<i>intransitive</i>		
a.	kán	H	'tear, demolish'	káán	LH	'tear, be demolished'
	kòn	L	'judge'	kòón	LH	'be judged'
b.	ányá	H-H	'spread'	ànyá	L-H	'be spread'
	dímà	L-L	'change'	dímá	L-H	'change'
	sá [↓] kí	H- [↓] H	'begin'	sàkí	L-H	'begin'
c.	kíkímà	H-H-L	'hide, cover'	kikímá	L-L-H	'be hidden, covered'
	pàkírí	H-L-H	'answer'	pàkírí	L-L-H	'be answered'
	gbóló [↓] má	H-H- [↓] H	'join, mix up'	gbòlómá	L-L-H	'be joined, mixed up'

As the above examples illustrate, transitive verbs contrast a number of tone patterns which, when detransitivized, neutralize to monosyllabic LH, bisyllabic L-H, or trisyllabic L-L-H. The above is a classic case of what Welmers (1973: 132–3) termed “replacive tone”: A morphological process assigns a tone pattern which overrides the input lexical tones of the base. One can also view the /LH/ intransitive melody as templatic, i.e. not unlike inflectional or derivational features assigning different CV structures, as in Arabic (McCarthy 1981).

Far less common, however, is for such overriding schemas to be assigned by specific PHRASE-LEVEL syntactic constructions. Kalabari does exactly this: Within the noun phrase, the noun appears finally, potentially followed only by plural and definite markers or one of a few other isolated modifiers (see §4). Whenever the noun (N) is non-initial, it loses its tones and receives one of four different tonal “melodies” depending on the constructional word class of the preceding specifier/modifier. Thus compare the different realizations of the underlying /H-H/ tone pattern of /námá/ ‘meat’:

(2)	<i>construction</i>	<i>phrasal tones</i>	<i>example</i>	
a.	N + N	HL	tùbò námà	‘the child’s meat’
			child meat	
b.	PossPro + N	HLH (→ H- [↓] H)	ìnà ná [↓] má	‘their meat’
			3pl meat	
c.	Determiner + N	LH	tò námá	‘which meat?’
			which meat	
d.	Quantifier + N	L	jà námà	‘some meat’
			some meat	

As seen in (2a), a nominal possessor assigns a /HL/ melody to the possessed noun, while a pronominal possessor assigns a /HLH/ melody, realized as H-[↓]H (H followed by downstepped H) on the last two syllables in (2b). In (2c) a /LH/ melody is assigned by determiners such as the interrogative *tò* ‘which’, while (2d) shows that a /L/ melody will be assigned by quantifiers (including numerals). The following shows that the five tonal patterns found on bisyllabic nouns neutralize and receive the indicated construction-specific tones (‘garrí’ is a West African food made with cassava):

(3)				‘the child’s’	‘their’	‘which’	‘some’
				(HL)	(HLH)	(LH)	(L)
a.	námá	‘meat’	H-H →	tùbò námà	ìnà ná [↓] má	tò námá	jà námà
b.	pùlò	‘oil’	L-L →	tùbò pùlò	ìnà pú [↓] lò	tò pùlò	jà pùlò
c.	bélé	‘light’	H-L →	tùbò bélé	ìnà bé [↓] lé	tò bélé	jà bélé
d.	gàrí	‘garrí’	L-H →	tùbò gàrí	ìnà gá [↓] rí	tò gàrí	jà gàrí
e.	bá [↓] rà	‘hand’	H- [↓] H →	tùbò bá [↓] rà	ìnà bá [↓] rà	tò bàrà	jà bàrà

Such data raise two types of questions. First, how should the constructional tones be analyzed synchronically? That is, how are they assigned, and how do they potentially interact with each other? Second, why does Kalabari have constructional tones? Specifically, how are they related to what is found in other languages, and where do they come from diachronically? In the following sections we will first

document the different constructional tones in further detail (§2), then consider how the different melodies interact (§3). This is followed by discussion of the few post-nominal modifiers (§4) and tone reduction in the verb phrase, including relative clauses (§5). After presenting a diachronic analysis which accounts for how the system arose (§6) we examine potentially related phenomena in other languages (§7) but conclude that tone is the only phonological property that can be assigned from word to word (§8).

2. The tonal melodies

As mentioned, there are four phrasal tonal melodies in all: /HL/, /HLH/, /LH/, and /L/. As we will see, these are found in well-defined constructions. In this section we follow Harry's (2004) two-step analysis involving tone deletion (TD) + assignment of a tonal melody.³ After illustrating how each of these affects a simple noun head in this section, we consider cases involving more complex noun phrase structures in §3.

2.1 Tone deletion + /HL/ melody: $N_1 + N_2$

In Kalabari, nominal possession consists of simple juxtaposition of the possessor before the possessed. The resulting sequence, which we indicate as $N_1 + N_2$, is superficially non-distinct from noun compounding.⁴ As was seen in (3), the possessor noun (N_1) keeps its lexical tones, while the second, possessed noun (N_2) receives a HL melody. The examples in (5) show that the same tone melody assignment applies independent of the tonal shape of N_1 :⁵

- (5) a. féní 'bird' H-H → féní námà 'the bird's meat' (cf. námá 'meat')
- b. tùbò 'child' L-L → tùbò námà 'the child's meat'
- c. sírí 'leopard' H-L → sírí námà 'the leopard's meat'
- d. èkpé 'he-goat' L-H → èkpé námà 'the he-goat's meat'
- e. é[↓]bé 'insect (sp.)' H-[↓]H → é[↓]bé námà 'the insect's meat'

The trisyllabic N_2 nouns in (6) show that the /HL/ links to last two syllables, suggesting for the moment that the melody targets the right edge of the second noun:

- (6) a. lùbùlù ‘sheath’ L-L-L → tòbò lùbùlù ‘the child’s sheath’
 búrúamá ‘indigo’ H-H-H → tòbò búrúamá ‘the child’s indigo’
 kókàlí ‘fruit’ H-L-H → tòbò kòkàlí ‘the child’s fruit’
 b. lùbùlù ‘sheath’ L-L-L → féní lùbùlù ‘the bird’s sheath’
 búrúamá ‘indigo’ H-H-H → féní búrúamá ‘the bird’s oil’
 kókàlí ‘fruit’ H-L-H → féní kókàlí ‘the bird’s light’

As will be confirmed by numerous further examples below, any syllable that does not receive a H or L tone from a constructional melody receives its output tone from what precedes it. Thus, when the N_1 ends L in (6a), the underlined first syllable of the N_2 nouns is realized L (either by spreading or as a default), while in (6b) the first syllable of N_2 is realized H when the N_1 ends H. In this case the H of /féní/ ‘bird’ has spread onto these syllables. Such H tone spreading is quite frequent and will be seen in many of the examples to follow.

Since nominal possession is recursive, the question naturally arises as to what happens in a $N_1 + N_2 + N_3$ construction, as in the representative forms in (7).

- (7) a. tòbò + féní + nàamá → tòbò féní nàmà ‘the child’s bird’s meat’
 L-L H-H H-H H L
 child bird animal
 b. féní + mìnjì + kúkú → féní mìnjí kùkù ‘the bird’s water pot’
 H-H L-L H-H H L
 bird water pot

As seen, the H of the HL melody goes on the last syllable N_2 , while the L goes on the first syllable of N_3 . Unmarked syllables receive their tone as in earlier examples: The tone of the first syllable of N_2 is L in (7a) vs. H in (7b), the latter resulting from H tone spreading from *féní*. It is not possible to tell if the unmarked final syllable of each N_3 is L by tone spreading or by default. The generalization which we will be able to draw from further examples is that a melodic H targets a word-final syllable, while a melodic L targets a word-initial syllable. This yields the assignments shown on N_2 and N_3 in (7).

2.2 Tone deletion + /HLH/ melody: PossPro + N

As was seen in (3), possessive pronouns assign a HLH tonal melody to the following noun. In the first two output columns in (8) we see that /HLH/ will map as H-^lH on a bisyllabic noun, whether the possessor ends H or L.⁶

(8)					'your (sg.)'	'their'	'my'
a.	námá	'meat'	H-H	→	í ná [↓] má	ì nà ná [↓] má	ì nàmá [↓] á
b.	pùlò	'oil'	L-L	→	í pú [↓] lò	ì nà pú [↓] lò	ì pùlò [↓] ó
c.	bélé	'light'	H-L	→	í bé [↓] lé	ì nà bé [↓] lé	ì bèlé [↓] é
d.	gàrí	'garri'	L-H	→	í gá [↓] rí	ì nà gá [↓] rí	ì gàrí [↓] í
e.	bá [↓] rá	'hand'	H- [↓] H	→	í bá [↓] rá	ì nà bá [↓] rá	ì bàrá [↓] á

The 'my' forms in the third output column show a curiosity of the possessive construction: If the pronoun consists of a L tone vowel and the noun is bisyllabic, rather than deriving H-[↓]H, the HLH melody links to the final syllable, which then undergoes lengthening in order to accommodate the tonal contour. (As in many tone languages, Kalabari does not allow a tonal contour on a short vowel.) This thus yields *ì nàmá[↓]á* instead of **ì ná[↓]má*, etc.⁷ The output forms of /námá/ 'meat' in (9) show both of these two realizations, but more importantly that all possessive pronouns assign the same /HLH/ melody to the following noun:

(9)	ì nàmá [↓] á	'my meat'	wánà ná [↓] má	'our meat'
	í ná [↓] má	'your meat'	ómìnà ná [↓] má	'your (pl.) meat'
	ò nàmá [↓] á	'his meat'	ì nà ná [↓] má	'their meat'
	á ná [↓] má	'her meat'		
	ànì ná [↓] má	'its meat'		

In general, the HLH melody otherwise has mapping properties similar to HL. Thus, the HLH is right-aligned on trisyllabic nouns as seen in (10), the first syllable taking the same tone as the end tone of the preceding pronoun:

(10)					'your (sg.)'	'their'	'my'
a.	lùbùlù	'sheath'	L-L-L	→	í lúbú [↓] lú	ì nà lúbú [↓] lú	ì lubú [↓] lú
b.	búrú má	'indigo'	H-H-H	→	í búrú [↓] má	ì nà búrú [↓] má	ì burú [↓] má
c.	kókálí	'fruit'	H-L-H	→	í kóká [↓] lí	ì nà kóká [↓] lí	ì kóká [↓] lí

Also as in the case of HL, the tones of the HLH melody separate over a $N_1 + N_2$ sequence. As seen in (11), the first H goes on the last syllable of the N_1 , the L on the first syllable of N_2 , and the second H on the last syllable of the N_2 :

(11)	a.	ì	+	féní	+	námá	→	ì	fèní	námá	'my bird's meat'
		L		H-H		H-H		H	L	H	
		1sg		bird		animal					
	b.	í	+	mìnjí	+	kúkú	→	í	mínjí	kúkú	'your sg. water pot'
		H		L-L		H-H		H	L	H	
		2sg		bird		animal					

The same mapping is seen even more clearly when there is an N_3 :

- (12) a. ì + fèní + minjì + kúkú → ì fèní minjì kúkú ‘my bird’s
 L H-H L-L H-H H L H water pot’
 1sg bird water pot
- b. í + túbò + sírì + námá → í túbò sírì námá ‘your
 H L-L H-L H-H H L H child’s
 2sg child leopard meat
 leopard
 meat’

These forms make it even clearer that the tones have a preference for mapping by word: The first H goes on the last syllable of N_1 , the L goes on the first syllable of N_2 , and the second H goes on the last syllable of N_3 . Otherwise, it would have been possible for the second H to map onto the last syllable of N_2 , incorrectly yielding *ì fèní minjì kúkù. That the melodic tones are distributed by word is further evidence that we are dealing with a constructional phenomenon, not a purely phonological one (see further below).

2.3 Tone deletion + /LH/ melody: Determiner + N

In addition to the interrogative *tò* ‘which’ in (3), prenominal demonstratives, which distinguish sex-based gender in the singular, assign a LH melody to the following noun:⁸

- (13) bí námá ‘this animal’ (m.) má námá ‘these animals’
 má námá ‘this animal’ (f.) ~ mí[↓]ná námá ‘these animals’
 mí námá ‘this animal’ (n.)

The following shows that all bisyllabic nouns neutralize as L-H after demonstratives:

- (14) a. námá ‘meat’ H-H → mí námá ‘this animal’ mí[↓]ná ‘these
 námá animals’
 b. pùlò ‘oil’ L-L → mí pùlò ‘this oil’ mí[↓]ná ‘these oils’
 pùlò
 c. bèlè ‘light’ H-L → mí bèlè ‘this light’ mí[↓]ná ‘these lights’
 bèlè
 d. gàrí ‘garri’ L-H → mí gàrí ‘this garri’ mí[↓]ná ‘these garris’
 gàrí
 e. bá[↓]rà ‘hand’ H-[↓]H → mí bàrà ‘this hand’ mí[↓]ná ‘these hands’
 bàrà

(17)		féní ‘bird’	sàni ‘pepper’	bélè ‘light’	gàrí ‘garri’	wá ¹ rí ‘house’	
	‘1’	gbóró	fèni	sàni	bélè	gàri	wàri
	‘2’	mà	fèni, féní	sàni	bélè (*bèlè)	gàri, gàrí	wàri, wá ¹ rí
	‘3’	tírá	fèni, féní	sàni, sàni	bélè	gàri, gàrí	wá ¹ rí, wàri
	‘4’	íníá	fèni	sàni	bélè	gàri	wàri
	‘5’	sóná	fèni	sàni	bélè	gàri	wàri
	‘6’	sóníá	fèni	sàni	bélè	gàri	wàri
	‘7’	sónómá	fèni	sàni	bélè	gàri	wàri
	‘8’	níná	fèni	sàni	bélè	gàri	wàri
	‘9’	éséníá	fèni	sàni	bélè	gàri	wàri
	‘10’	óyíá	fèni	sàni	bélè	gàri	wàri

That *gbóró* ‘one’ assigns HL, e.g. *gbóró fèni* ‘one bird’, suggests that it is a noun.¹⁰ The numeral *mà* ‘2’ either reduces all but /H-L/ nouns to all L or allows the base tones of the noun to be realized. The numeral *tírá* ‘3’ either assigns HL to the noun or allows the latter to be realized with its base tone. The remaining numerals assign an all L tonal melody to the following noun.

2.5 Tone deletion + no melody assigned

In addition to the above melodies, a further tone pattern concerns four toneless kinship terms which are irregular after a possessive pronoun (Harry 2004:56). Rather than receiving the /HLH/ melody expected after a possessive, the tone of the possessive pronoun spreads onto them:¹¹

(18)	a.	dā	‘father’	L	→	ì dā	‘my father’	í dā	‘your father’
	b.	jìngì	‘mother’	L-L	→	ì yìngì	‘my mother’	í yìngì	‘your mother’
	c.	dì	‘husband’	L	→	ì dì	‘my husband’	í dí	‘your husband’
	d.	tà	‘wife’	L	→	ì tà	‘my wife’	í tá	‘your wife’

As in the preceding cases we assume that tonal deletion first applies. The difference here is that no tonal melody is assigned, thus making this construction distinct from the quantifier construction, which assigns a /L/ melody (§2.4). We will see in §5 below that a similar tone deletion + spreading pattern occurs between an object and a verb.

2.6 No tone deletion + variability

The last construction to be considered in this section concerns adjectives, which are very few in Kalabari as most lexemes that express property concepts are verbal.

As seen in (19), nouns generally occur in their base tones after the adjectives *òpù* ‘big’ and *kálá* ‘small’:

(19)		fénì ‘bird’	finì ‘fire’	sírì ‘leopard’	èkpé ‘he-goat’	wá [↓] rí ‘house’
	‘big’	òpù + fènì, fénì	finì	sírì	èkpé	wá [↓] rí
	‘small’	kálá + [↓] fénì	finì	[↓] sírì	èkpé	[↓] wá [↓] rí

The one exception is that an all H noun tends to lower to all L after *òpù* (cf. *búrumá* → *òpù búrumà* ~ *òpù búrumá* ‘big indigo’). Failure to lower is less preferred, indicating emphasis on the noun. Since the adjective *kálá* ‘small’ imposes a downstep before H-initial nouns, we assume that it ends in a floating L, i.e. /kálá’/.

There is reason to believe that *òpù* and *kálá* are the only adjectives in Kalabari, as all other lexemes expressing qualities can be fully conjugated. Thus observe that the four major conjugational categories of the sentences on the left are also distinguished in the corresponding noun phrases on the right:

(20)	FACT	námá sì [↓] m	‘the animal became bad, is bad’	sì námà ¹²	‘bad animal’
	PROG	námá sì ári	‘the animal is becoming bad’	sì ári námà	‘animal becoming bad’
	FUT	námá sì òà	‘the animal will become bad’	sì òà námà	‘future bad animal’
	PERF	námá sì tè [↓] é	‘the animal has become bad’	sì tè námà	‘completely bad animal’
		animal bad TAM			

The forms to the right are nominalizations identical to subject relative clauses (‘animal which is bad’ etc.), which we will further discuss in §5. For now, note that the modified noun has all L tone in the progressive and future vs. a HL tone pattern in the factative and perfect. We attribute this to a H tonal morpheme in the case of the factative, and a floating H which follows the perfect marker *tè* (cf. (51) and subsequent examples for comparable facts in other relative clauses). After the H tone adjectival verb *íwó* ‘new’, the only difference is that the perfect marker *té* now has a H tone:

(21)	FACT	námá íwó [↓] m	‘the house became new, is new’	íwó wári	‘new house’
	PROG	námá íwó ári	‘the house is becoming new’	íwó ári wári	‘house becoming new’
	FUT	námá íwó òà	‘the house will become new’	íwó òà wári	‘future new house’
	PERF	námá íwó tè [↓] é	‘the house has become new’	íwó tè wári	‘completely new house’
		animal new TAM			

We conclude that true adjectives tend not to affect the base tones (other than lowering an all H noun to all L), while verbal adjectives assign a tonal pattern according to their last tone: after L, the noun will be all L; after H it will receive a HL melody.¹³

3. Tone melodies in complex noun phrases

Having established the four tonal melodies in §2, each of which is assigned by a modifier to the following noun, the question we now ask is what happens if there is more than one such modifier. Table 2 summarizes the tone patterns we have seen thus far (recall that both *fèní* ‘bird’ and *námá* ‘meat’ are H-H):

Table 2. The four tonal melodies in Kalabari

Construction	Tonal melodies	Example	
Noun + Noun	HL	tòbɔ̀ fèní nàmá H L	‘the child’s bird’s meat’
PossPro + N	HLH	ì fèní nàmá H L H	‘my bird’s meat’
Determiner + N	LH	mí fèní nàmá L H	‘this bird’s meat’
Quantifier + N	L	sóná fèní nàmá L	‘five birds’ meat’

We already saw in (7), (11), and (12) that the respective HL or HLH melody is mapped over however many nouns may be in a genitive relationship. But what if the melodies conflict?¹⁴

For the purpose of addressing this question the word order possibilities of the elements we have seen thus far within the Kalabari noun phrase are schematized in (21).

- (22) Dem / Poss + { Num₁ + Adj₁ } + Noun₁ + { Num₂ + Adj₂ } + Noun₂ + Def
 LH→ HLH→ L→ HL→ L→

As seen, demonstratives and possessive pronouns are mutually exclusive (indicated by the slash) and precede both numerals and adjectives. The latter two preferably occur in this order, although Adj + Num is also sometimes possible (as indicated by the braces). As also indicated, a Noun₂ can (only) be modified by a numeral and/or adjective. Thus, for descriptive purposes, one way to capture the recursive [(Num) (Adj) Noun] constituent is to recognize a determiner phrase (DP) and the following phrase structure rules in (23).

- (23) a. DP → Spec NP D (where D = the definite marker and Pl = the
 b. NP → Num Adj N Pl (NP) plural marker *àméè* or *mámgbà* ‘all’; see §4)
 c. Spec → Det / Poss (where Det = a demonstrative or *jǎ* ‘which’)

Recall that adjectives are the only modifiers that can have no tonal effect on a following noun. It is thus interesting to observe that they occur closest to the modified noun. With this established, we can now ask the following two questions: (i) What happens if multiple modifiers precede the head noun? (ii) What happens if each noun is modified in an $N_1 + N_2$ construction? (The definite marker and other postnominal modifiers are treated in §4.)

The short answer is that the first word can usually assign its tone melody to what follows, but in some cases there are other possibilities. Consider first structures where there is a specifier plus a numeral or adjective. In (24) we observe that if the specifier is a demonstrative, the only acceptable resolution is for its LH melody to be assigned to the entirety of what follows:

- (24) a. DEM + NUM + N *mí*[↓]*ná* + *sóná* + *féní* → *mí*[↓]*ná* *sònà* *fèní* ‘these five
 HLH H-H H-H L H animals’
 these five bird
 b. DEM + ADJ + N *mí* + *òpù* + *sírì* → *mí* *òpù* *sírì* ‘this big
 H L-L H-L L H leopard’
 this big leopard

On the other hand, if the specifier is a possessive pronoun, either its HLH or a HL melody may be used:¹⁵

- (25) a. POSS + NUM + N: *ì* + *sóná* + *féní* → *ì* *sòná* *fèní* ‘my five animals’
 L H-H H-H H L H
 ~ *ì* *sòná* *fèní*
 H L
 b. POSS + ADJ + N : *ìyè* + *òpù* + *sírì* → *ìyè* *òpù* *sírì* ‘my big leopard’
 L-L L-L H-L H LH
 ~ *ìyè* *òpù* *sírì*
 H L

If the first word is a numeral and the second an adjective, either the numeral L is assigned or a HL melody is again possible:

- (26) a. NUM + ADJ + N: sóná + òpù + féní → sóná òpù fèni 'five big birds'
 H-H L-L H-H L
 b. ~ sóná + òpù + féní → sóná ópú fèni
 H-H L-L H-H H L
 five big bird

As in (25b), (26) shows that although adjectives do not assign a tone melody to a following single head noun, they can themselves be targeted by a melody from the left. When followed by an $N_1 + N_2$, an adjective can either allow the N_1 to be realized with its base tones, as expected, or optionally allow a HL melody to be assigned to a $N_1 + N_2$ sequence:

- (27) a. ADJ + $N_1 + N_2$: òpù + námá + wá¹rí → òpù námá wári 'big animal's
 L-L H-H HLH HL house'
 b. ~ òpù námá wàri
 H L
 big animal house

There also is variation in $N_1 + N_2 + N_3$ constructions, this time involving how the /HL/ melody assigned by N_1 is mapped onto what follows:

- (28) a. é¹né + mìnjì + fú¹rú → é¹né mínjí fùrò 'rainwater smell'
 HLH L-L HLH H L [[$N_1 - N_2$] - N_3]
 rain water smell
 b. ~ é¹né mìnjì fùrò
 H L
 c. tòbò + àbàjì + námá → tòbò àbàjí nàmà 'child's ocean animal'
 L-L L-L-L H-H H L [$N_1 - [N_2 - N_3]$]
 child ocean animal
 d. ~ tòbò àbàjì nàmà
 HL

In (28a,c) the HL melody assigned by the N_1 is mapped over N_2 and N_3 , as expected. However, (28b,d) show that it is also possible to assign the HL to the N_2 . As seen in the choice of examples, this occurs independently of whether the tripartite noun phrase is left- vs. right-branching and does not seem to have to do with different emphases or the distinction between possession and compounding.

While the above gives an idea of the range of variation found in relatively simple noun phrases, more possibilities arise with more complex structures. As an example, note the three possibilities in (29) where the compound 'water pot' is preceded by three modifiers:

(29)	má	+ sóná	+ íbì	+ mìnjì	+ kúkú	→
	H	H-H	L-L	L-L	H-H	
	these	five	good	water	pots	
a.	má	sònà	íbì	mìnjì	kúkú	‘these five good water pots’
	H	L			H	
b.	má	sònà	íbì	mìnjì	kúkú	
	H	L				
c.	má	sònà	íbì	mìnjí	kúkú	
	H	L		H	L	

As seen in all three variants, the demonstrative *má* ‘these’ requires an immediate drop to L after it. The expected output is in (29a), where the L and H of the demonstrative LH melody are mapped to the first and last syllables of the entire string. In (29b) we see that the final H is unexpectedly missing, as it is in (28c), where a HL melody is assigned to the last two words. While further investigation of every potential phrase structure is needed, about all we can say is that after one exceeds a certain complexity, the two possibilities in (29b,c) become available: either failure of the final H of the LH melody to be realized or assignment of a default HL somewhere in the string (recall the second variants in (25) where the final H of the possessive HLH melody also failed to surface).

While the above concerns multiple modifiers on a single head noun, it is also possible that the two (or more) nouns of an $N_1 + N_2$ structure each have their own modifier(s). In this case the unexpected variants similar to those seen above are again observed. Thus, in (30), the final H of the demonstrative LH melody is not realized:

(30)	a.	má	+ sóná	+ námá	+ òpù	+ wá [↑] rí	→
		H	H-H	H-H	L-L	HLH	
		these	five	animal	big	house	
		má	sònà	nàmà	òpù	wàrì	‘these five animals’ big house’
			L				
	b.	mí	+ òpù	+ námá	+ sòná	+ wá [↑] rí	→
		H	L-L	H-H	H-H	HLH	
		these	big	animal	five	house	
		mí	òpù	nàmà	sònà	wàrì	‘this big animal’s five houses’
			L				

Similarly, the examples in (31) show that the final H of the possessive HLH melody is also not realized in comparable structures:

- (31) a. $\grave{\text{i}}$ + $\text{s}\acute{\text{o}}\text{n}\acute{\text{a}}$ + $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ + $\text{k}\acute{\text{a}}\text{l}\acute{\text{a}}$ + $\text{w}\acute{\text{a}}\downarrow\text{r}\acute{\text{i}}$ →
 L H-H H-H H-H ` HLH
 1sg five animal small house
 $\grave{\text{i}}$ $\text{s}\grave{\text{o}}\text{n}\grave{\text{a}}$ $\text{n}\grave{\text{a}}\text{m}\grave{\text{a}}$ $\text{k}\grave{\text{a}}\text{l}\grave{\text{a}}$ $\text{w}\grave{\text{a}}\text{r}\grave{\text{i}}$ ‘my five animals’ small house’
 H L
- b. $\grave{\text{i}}$ + $\text{k}\acute{\text{a}}\text{l}\acute{\text{a}}$ + $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ + $\text{s}\acute{\text{o}}\text{n}\acute{\text{a}}$ + $\text{w}\acute{\text{a}}\downarrow\text{r}\acute{\text{i}}$ →
 L H-H ` H-H H-H HLH
 1sg small animal five house
 $\grave{\text{i}}$ + $\text{k}\grave{\text{a}}\text{l}\grave{\text{a}}$ + $\text{n}\grave{\text{a}}\text{m}\grave{\text{a}}$ + $\text{s}\grave{\text{o}}\text{n}\grave{\text{a}}$ + $\text{w}\grave{\text{a}}\text{r}\grave{\text{i}}$ ‘my small animal’s five houses’
 H L

It would appear that the recursive NP structure from (23b) somehow blocks the final H of both LH and HLH melodies, thereby suggesting that these final Hs may be related. In §6 we suggest that the final H of the possessive HLH melody has the same determiner origin as the final H of the demonstrative LH melody.¹⁶

4. Postnominal modifiers

We have seen in the preceding sections that almost all modifiers precede the noun in Kalabari. Notable exceptions are the plural marker *àméè*, a few quantifiers such as *mámgbà* ‘all’, and the singular and plural definite markers which distinguish gender in the singular, as illustrated in (32).¹⁷

- (32) $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{b}\acute{\text{e}}$ ‘the animal’ (m.) $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{m}\acute{\text{a}}$ ‘the animals’
 $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{m}\acute{\text{a}}$ ‘the animal’ (f.)
 $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{m}\acute{\text{e}}$ ‘the animal’ (n.)

As seen in (33), neither an initial noun nor the following modifier undergoes tonal reduction:

- (33)
- | | | ‘plural’ | ‘all’ | ‘definite’ |
|----|---|---------------------|--|---|
| a. | $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ ‘meat’ | H-H → | $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{ám}\acute{\text{e}}\acute{\text{e}}$ | $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{m}\acute{\text{a}}\text{m}\text{g}\text{b}\grave{\text{a}}$ $\text{n}\acute{\text{a}}\text{m}\acute{\text{a}}$ $\text{m}\acute{\text{e}}$ |
| b. | $\text{p}\grave{\text{u}}\text{l}\grave{\text{o}}$ ‘oil’ | L-L → | $\text{p}\grave{\text{u}}\text{l}\grave{\text{o}}$ $\text{ám}\acute{\text{e}}\acute{\text{e}}$ | $\text{p}\grave{\text{u}}\text{l}\grave{\text{o}}$ $\text{m}\acute{\text{a}}\text{m}\text{g}\text{b}\grave{\text{a}}$ $\text{p}\grave{\text{u}}\text{l}\grave{\text{o}}$ $\text{m}\acute{\text{e}}$ |
| c. | $\text{b}\acute{\text{e}}\text{l}\acute{\text{e}}$ ‘light’ | H-L → | $\text{b}\acute{\text{e}}\text{l}\acute{\text{e}}$ $\text{ám}\acute{\text{e}}\acute{\text{e}}$ | $\text{b}\acute{\text{e}}\text{l}\acute{\text{e}}$ $\text{m}\acute{\text{a}}\text{m}\text{g}\text{b}\grave{\text{a}}$ $\text{b}\acute{\text{e}}\text{l}\acute{\text{e}}$ $\text{m}\acute{\text{e}}$ |
| d. | $\text{g}\acute{\text{a}}\text{r}\acute{\text{i}}$ ‘garri’ | L-H → | $\text{g}\acute{\text{a}}\text{r}\acute{\text{i}}$ $\text{ám}\acute{\text{e}}\acute{\text{e}}$ | $\text{g}\acute{\text{a}}\text{r}\acute{\text{i}}$ $\downarrow\text{m}\acute{\text{a}}\text{m}\text{g}\text{b}\grave{\text{a}}$ $\text{g}\acute{\text{a}}\text{r}\acute{\text{i}}$ $\downarrow\text{m}\acute{\text{e}}$ |
| e. | $\text{b}\acute{\text{a}}\downarrow\text{r}\acute{\text{a}}$ ‘hand’ | H- \downarrow H → | $\text{b}\acute{\text{a}}\downarrow\text{r}\acute{\text{a}}$ $\text{ám}\acute{\text{e}}\acute{\text{e}}$ | $\text{b}\acute{\text{a}}\downarrow\text{r}\acute{\text{a}}$ $\text{m}\acute{\text{a}}\text{m}\text{g}\text{b}\grave{\text{a}}$ $\text{b}\acute{\text{a}}\downarrow\text{r}\acute{\text{a}}$ $\text{m}\acute{\text{e}}$ |

As also observed, the L tone of the initial vowel of the plural marker *àméè* assimilates to a preceding H tone, while in (33d) both *mámgbà* and *mé* undergo downstepping after *gàrí*. This latter change is due to a general rule in the language that inserts a downstep after a word-final L-H sequence which is followed by H in

The final postnominal modifiers are the definite markers listed earlier in the table in (32). As was seen in the examples in (33), these markers are all /H/ and do not undergo tone reduction. The main issue that comes up is whether the final H of LH and HLH melodies are realized when followed by a H tone definite marker. When the definite marker co-occurs with an initial demonstrative, two variants are regularly observed:

- (40) a. mí + námá + mé → mí námá ↓mé 'this animal'
 H H-H H L H
 this animal DEF
- b. ~ mí námà mé
 L
- c. mí + búrumá + mé → mí búrumá ↓mé 'this indigo'
 H H-H-H H L H
 this indigo DEF
- d. ~ mí búrumà mé
 L

In (40a,c) the H of LH is realized and the rule in (34) results in the H of the definite marker *mé* being downstepped. In the slightly dispreferred variants in (40b,d) the final H of the LH melody does not appear on the noun, although one interpretation is that it is realized via the H of the definite marker *mé* (cf. §6).

When we turn to the possessive HLH melody, we find the following skewing:

- (41) a. ìnà + námá + mé → ìnà ná↓má mé 'this their animal'
 L-L H-H H H L H
 3pl animal DEF
- b. *ìnà námà mé
 H L
- c. ìnà + búrumá + mé → ìnà búru↓má mé 'this their indigo'
 L-L H-H-H H H L H
 3pl indigo DEF
- d. ~ ìnà búrumà mé
 H L

As seen in (41a,b), when the noun is bisyllabic, the HLH possessive melody must be fully realized. However, as seen in (41c,d), when the noun trisyllabic (or longer), it can be realized with the HLH melody or (with a slight dispreference) with only HL. Again, one is tempted to propose that the H of the final definite marker is standing in for the last part of the HLH melody.

Finally, let us consider one other effect of the definite markers about which we shall have to speculate. As seen in (42), there sometimes appears to be an unaccounted for H tone assigned by the definite article.

- (42) a. $\grave{o}p\grave{u}$ + $f\acute{e}n\acute{i}$ + $m\acute{e}$ → $\grave{o}p\grave{u}$ $f\acute{e}n\acute{i}$ $m\acute{e}$ ‘the big bird’
 L-L H-H H H-H
 big bird DEF
- b. ~ $\grave{o}p\grave{u}$ $f\grave{e}n\grave{i}$ $m\acute{e}$
 L
- c. ~ $\grave{o}p\grave{u}$ $f\acute{e}n\acute{i}$ $\downarrow m\acute{e}$
 L H
- d. $f\acute{e}n\acute{i}$ + $p\grave{u}l\grave{o}$ + $m\acute{e}$ → $f\acute{e}n\acute{i}$ $p\acute{u}l\grave{o}$ $m\acute{e}$ ‘the bird’s oil’
 H-H L-L H HL
 bird oil DEF
- e. ~ $f\acute{e}n\acute{i}$ $p\acute{u}l\acute{o}$ $\downarrow m\acute{e}$
 H H

In each set, the first output is the one expected from the discussions in previous sections. In addition (42b) is also expected in that an all H noun can optionally lower to all L after the adjective $\grave{o}p\grave{u}$ ‘big’ (cf. (19)). The output in (42c) is surprising in that there appears to be an extra floating H tone between the noun and the definite marker (which in turn undergoes downstepping by the rule in (34)). Perhaps even more intriguing is (42e), where the output is H-H with the definite marker again downstepping. To produce this output we would need the derivation in (43), where the first step is to insert a floating L by rule (34):

- (43) ... $p\acute{u}l\grave{o}$ + H + $m\acute{e}$ → $p\acute{u}l\grave{o}$ + H + L + $m\acute{e}$ → $p\acute{u}l\acute{o}$ + ` + $m\acute{e}$ [$p\acute{u}l\acute{o}$ $\downarrow m\acute{e}$]

Whether this is motivated or not, what is significant is that the definite article is partially determining the output of what precedes, something which also arises in relative clause constructions (cf. note 23). If this were to develop further, Kalabari could become like Tommo So (Heath & McPherson 2013, McPherson 2012), where the triggers of tonal melodies could be either on the left or the right of their targets (cf. §7).

To conclude this section, let us briefly mention that the definite markers occur in absolute last position, potentially preceded by the plural marker, e.g. *námá àmèè má* ‘the animals’. No other combinations of post-nominal modifiers are grammatical.

5. Tone reduction in the verb phrase

While all of the preceding discussion has concerned cases where tone reduction and tonal melodies target the head noun within the noun phrase, we now show that the lexical verb of a verb phrase also undergoes tonal reduction. We illustrate this first in main clauses and then consider relative clauses.

As seen in (44a), bisyllabic verbs contrast the same five tone patterns we have seen in nouns, repeated in (44b).

(44)	a. <i>verbs</i>	b. <i>nouns</i>
	L-L	sèlè 'choose' pùlò 'oil'
	H-L	kámà 'increase' bélé 'light'
	L-H	dókí 'discover, find out' gàrí 'garri'
	H-H	éí 'see' námá 'meat'
	H-↓H /HLH/	kó↓kó 'keep' wá↓rí 'house'

Kalabari is a head-final (OV) language. Whenever an object is present before the verb, the verb loses all of its tones and the last tone of the object spreads onto the verb:

(45)	a. the object ends L	éí → èrí	(=sèlè, kámà, dókí, kókò)
	pùlò 'oil' L-L	→ ò pùlò èrí té↓é	'he has seen the oil'
	bélé 'light' H-L	→ ò bélé èrí té↓é	'he has seen light'
	lùbùlù 'sheath' L-L-L	→ ò lùbùlù èrí té↓é	'he has seen the sheath'
	b. the object ends H-H, H-↓H	sèlè → sélé	(= kámá, dókí, éí, kókó)
	námá 'meat' H-H	→ ò námá sélé té↓é	'he has chosen the meat'
	wá↓rí 'house' H-↓H	→ ò wá↓rí sélé té↓é	'he has chosen the house'
	búrú má 'indigo' H-H-H	→ ò búrú má sélé té↓é	'he has chosen the indigo'
	c. the object ends L-H	sèlè → ↓séle	(= ↓kámá, ↓dókí, ↓éí, ↓kókó)
	gàrí 'garri' L-H	→ ò gàrí ↓séle té↓é	'he has chosen the garri'
	kókàlí 'fruit' H-L-H	→ ò kókàlí ↓séle té↓é	'he has chosen the fruit'
		3sg object verb TAM	

The verb also remains unchanged when directly preceded by the subject, e.g. the verb *sèlé* ‘be chosen’ derived from /*sèlè*/ ‘choose’ by the detransitivizing process illustrated earlier in (1):

- (48) a. *pùlò* ‘oil’ L-L → *pùlò sèlé* [↓]*té*[↓]*é* ‘the oil has been chosen’
 b. *bélè* ‘light’ H-L → *bélè sèlé* [↓]*té*[↓]*é* ‘the light has been chosen’
 c. *námá* ‘meat’ H-H → *námá sèlé* [↓]*té*[↓]*é* ‘the meat has been chosen’
 d. *wá*[↓]*rí* ‘house’ H-[↓]H → *wá*[↓]*rí sèlé* [↓]*té*[↓]*é* ‘the house has been chosen’
 e. *gàrí* ‘garri’ L-H → *gàrí sèlé* [↓]*té*[↓]*é* ‘the garri has been chosen’
 subject be.chosen TAM

It should also be noted that each noun phrase constitutes a separate prosodic constituent. Thus, there is no tonal interaction between the subject and object:

- (49) a. *féní* + *pùlò* + *érí* + *té*[↓]*é* →
 H-H L-L H-H HLH
 bird oil see TAM
féní *pùlò* *èrì* *té*[↓]*é* ‘the bird has seen the oil’
 b. *tòbò* + *námá* + *sèlè* + *té*[↓]*é* →
 L-L H-H L-L HLH
 child meat choose TAM
tòbò *námá* *sé*[↓]*lé* *té*[↓]*é* ‘the child has chosen the meat’

Object + verb sequences exhibit the same reduction + unbounded spreading in any type clause, affirmative or negative, declarative or interrogative. This includes relative clauses. In the following examples, the verbs *fúru* ‘steal’ and *sèlé* ‘choose’ undergo reduction and spreading from the preceding object, as before; *bé* is the masculine definite singular marker:

- (50) a. *pùlò* ‘oil’ L-L → *pùlò fùrù* *tòbò* *bé* ‘the child that stole the oil’
 b. *bélè* ‘light’ H-L → *bélè fùrù* *tòbò* *bé* ‘the child that stole the light’
 c. *námá* ‘meat’ H-H → *námá sé*[↓]*lé* *tòbò* *bé* ‘the child that chose the meat’
 d. *wá*[↓]*rí* ‘house’ H-[↓]H → *wá*[↓]*rí sé*[↓]*lé* *tòbò* *bé* ‘the child that chose the house’
 e. *gàrí* ‘garri’ L-H → *gàrí* [↓]*sé*[↓]*lé* *tòbò* *bé* ‘the child that chose the garri’
 object verb child DEF

What is particularly significant is the H-L tone on /*tòbò*/ ‘child’. It turns out that the head of the object relative construction regularly receives a H-L melody in the factative tense:

- (51) a. *tòbò* ‘child’ L-L → *pùlò fùrù* *tòbò* *bé* ‘the child that stole the oil’

b.	sírì	'leopard'	H-L	→	pùlò fùrù sírì b́é	'the leopard that stole the oil'
c.	fénì	'bird'	H-H	→	pùlò fùrù fénì b́é	'the bird that stole the oil'
d.	pèlí [↓] á	'ladyfish'	L-H- [↓] H	→	pùlò fùrù pèlíá b́é	'the ladyfish that stole the oil'
e.	kòkòrà	'fish (sp.)'	L-L-H	→	pùlò fùrù kòkòrà b́é	'the fish (sp.) that stole the oil'
					oil steal subject DEF	

Even though such relative clauses are possibly nominalizations ('the oil stealing child', 'the meat choosing child' etc.), this H-L should not be identified with the N₁ + N₂ HL melody. When we consider all four of the TAMs seen earlier in (20), the situation becomes clearer:

(52)	FACT	námá	pùlò fùrù	↓m	'the animal stole the oil'	/ 'm' / → ' '
			pùlò fùrù námá	b́é	'the animal that stole the oil'	
	PROG	námá	pùlò furu	ári	'the animal is stealing the oil'	/ ári /
			pùlò fùrù ári	námà b́é	'the animal that is stealing the oil'	
	FUT	námá	pùlò fùrù	b́à	'the animal will steal the oil'	/ 'b́à /
			pùlò fùrù b́à	námà b́é	'the animal that will steal the oil'	
	PERF	námá	pùlò fùrù	té [↓] é	'the animal has stolen the oil'	/ té [↓] é / → tè ' '
			pùlò fùrù tè	námà b́é	'the animal that has stolen the oil'	
	main:	animal	oil	steal	TAM	
	rel:	oil	steal	TAM	animal	DEF

The first line of each pair illustrates the TAM marking in the main clause, while the second line shows the corresponding object relative clauses. As seen, in the main clause, the factative and future place a H tone on the final syllable of the verb, which we set up as an initial floating H in the underlying representations / 'm' / and / 'b́à / . In the corresponding relative clauses, the future continues to assign a H to the preceding syllable, this time the relativized verb, while both the factative and perfect assign a H tone onto the head noun, as seen earlier with adjectives in (20) and (21). As seen in the last column of (52), we consider this floating H to be from the form that the TAM marker takes in relative clauses.²⁰ The same facts are seen in the following intransitive relative clauses involving the verb / d́èrì / 'laugh' and the noun / tóbàrà / 'antelope':

(53)	FACT	d́èrì	tóbàrà	b́é	'the antelope that laughed'	
	PROG	d́èrì	ári	tóbàrà	b́é	'the antelope that is laughing'
	FUT	d́èrí	b́à	tóbàrà	b́é	'the antelope that will laugh'

PERF *d̥ɛ̀rì t̃è tòbàrà bé* ‘the antelope that has laughed’
 laugh TAM subject DEF

As in the case of transitive relatives, we consider the above to be nominalizations (the ‘laughing antelope’, ‘the having laughed antelope’ etc.). As seen, the H assigned by the factative and perfective maps onto the penult of the trisyllabic noun *tòbàrà*. When the subject noun is a compound, e.g. *pìrì nàmà* ‘bush animal’ (from *pìrì* ‘bush’ + *nàmà* ‘animal’), the H goes on the final of the first noun and the L begins on second noun:

- (54) FACT *d̥ɛ̀rì pìrì nàmà bé* ‘the bush animal that laughed’
 PROG *d̥ɛ̀rì árì pìrì nàmà bé* ‘the bush animal that is laughing’
 FUT *d̥ɛ̀rì ɓà pìrì nàmà bé* ‘the bush animal that will laugh’
 PERF *d̥ɛ̀rì t̃è pìrì nàmà bé* ‘the bush animal that has laughed’

This is rather significant, since such mapping is exactly what we reported in the case of a $N_1 + N_2 + N_3$ construction (cf. (7)).²¹ Since we have attributed this H to the TAM markers, relative clauses provide an important window into the origin of the tonal melodies. Specifically, the HL melody observed in the above factative and perfect relatives is from the floating H of the TAM marker + the L that results from tone reduction. Having established this rather clear case, we now turn to the question of diachronic origins in the next section.²²

6. Towards a diachronic account

In the past sections we have seen that Kalabari has a system whereby the tones of non-domain-initial words are deleted, and the tonal melodies /HL/, /HLH/, /LH/, and /L/ are assigned by construction. The tones of a verb are also deleted when preceded by an object and replaced by the last tone of the object NP. The questions which remain are the following:

- i. Why does Kalabari reduce non-initial tones in the above syntactic contexts? A partial answer we can give is that prosodic reduction frequently targets the lexical head of an XP constituent, e.g. the N of an NP, the V of a VP, whether a language is head-initial or head-final (cf. §7).
- ii. Why does Kalabari assign these different melodies? The answer we will propose in this section is that there has been a reanalysis of original syntactic markers.
- iii. Why does most of this happen in the noun phrase? Could another language assign different melodies to the verb, depending on what kind of complement

precedes (object, adpositional phrase, adverbial etc.) or perhaps different kinds of objects?

In answer to the third question, we would suggest yes, but it would require special diachronic sources parallel to those which we will now consider. We propose two such sources:

- i. The L of the /LH/ melody is the result of tone reduction. The H of this melody is a final determiner tone.
- ii. The L of /HL/, /L/ and probably /HLH/ melodies again comes from reduction. The H of /HL/ is from a lost linker or “connective” particle, while the final /H/ may again originate as a mark of determination.

Starting with the source of the demonstrative LH melody, we saw in §4 that Kalabari has a system of final /H/ tone definite markers. We also saw that although an initial demonstrative assigns a LH melody, as in (55a), when a definite marker is present, the final H of the LH melody is usually not realized, as in (55b), but may also be, as in (55c).

- (55) /námá/ ‘animal’
- a. mí nàmá ‘this animal’
 - b. mí nàmà mé w/def. marker
 - c. mí nàmá ↓mé *idem*.

Recall also from (24) that a demonstrative generally assigns a /LH/ melody in more complex noun phrases. We propose therefore to identify the H of the /LH/ melody with the mark of final determination. This could either mean that another /H/ tone morpheme was present or, more likely, that the final H seen on an overt determiner became generalized to noun phrases (or perhaps more aptly, determiner phrases) with an initial demonstrative or other determiner. The two-step development would have thus been to reduce everything after the initial determiner to L, followed by the assignment of a right-edge H.

A two-step reconstruction is also required for the HL and HLH melodies. This time the initial H comes from a lost or reanalyzed connective particle that occurred in the relevant constructions. As our first piece of evidence, we note that Kalabari currently maintains two overt connectives, *ná* and *bé*, used in specific constructions only. As seen in (56), both have H tone and both make the following noun L:

- (56) a. *ná* is used to mean ‘associated with’ a particular people or language
 Kálábàrí ná fèni ‘Kalabari bird’ (a bird that the Kalabaris have)
 H L (cf. fèní ‘bird’)

- b. *bé* is used to indicate something associated with a place (whether a proper or common noun)
- | | | | | | | | |
|--------|-----------|-----|------------------|--------------------|-----------|------|-------------------|
| Dégémà | <i>bé</i> | fiè | ‘Degema food’ | wá [↓] rí | <i>bé</i> | nùmè | ‘the house song’ |
| H | L | | (cf. fié ‘food’) | H | L | | (cf. nùmè ‘song’) |

To get the /HL/ melody of the $N_1 + N_2$ construction, we assume that there was a /H/ tone connective that has since been lost. After the N_2 was reduced to all L, the H of the connective was assigned to the N_2 to produce the observed /HL/ melody. We saw a similar development in factative and perfect tense relative clauses in (52)–(54), where a grammatical H tone combines with the L from tone deletion to form a HL melody.

The /L/ melody has the most direct source: all we need to say is that there was reduction to L after a quantifier or numeral. For this account to go through, we have to dismiss the possibility that there was a *L tone connective that caused the tonal changes. Recalling the numerals presented in (17), one might observe that all of them end in [a] except *gbóró* ‘one’ (which was said to be a noun). In addition, a number of other inherently plural morphemes also end in [a]: *jà* ‘some’, *t̀wá* ‘many’, *mí[↓]ná* ‘these’, *má* ‘definite (pl.)’. There is good evidence that [a] was originally a plural prefix on nouns — cf. *àwò(méè)* ‘children’ (sg. *t̀b̀b̀*) and the general plural marker *àméè*, both with *a-*. In fact, Jenewari (1977: 193) writes it as a prefix: *ibì b̀r̀r̀* ‘good yam’, *ibì à-b̀r̀r̀* ‘good yams’. However *ibìà b̀r̀r̀* is also possible, since this *a-* cannot occur if the noun is initial or in isolation (**à-b̀r̀r̀*). Thus **a-* appears to have undergone resegmentation onto the preceding numeral, quantifier or determiner. In the case of numerals the final *-a* is always H tone in agreement with the preceding syllable, e.g. *tírá* ‘three’, *íníá* ‘four’, *síná* ‘five’ (monosyllabic *ma* ‘two’ is L tone). Although the noun had an historical **a-* prefix after numerals, we do not believe there was any connective. As a result, the melody is simply L from tone deletion.

This leaves the more complex /HLH/ melody assigned by possessive pronouns. We suggest a tripartite reconstruction of reduction to L both preceded and followed by a H: the first H would be the connective tone, the L from reduction, and the second H from the H of determination. In other words, the HL of /HLH/ is the same as the $N_1 + N_2$ HL melody, and the LH of HLH is the same melody as assigned by demonstratives and other initial determiners. Recalling from (23c) that possessive pronouns and demonstratives are mutually exclusive, both being spell-outs of the specifier of NP, we can perhaps view final H also as a specifier tone.

With this reconstruction we can now better address question (iii) above, whether a corresponding system could potentially arise in the verb phrase. We think so — and, in fact, it is already happening with respect to the different TAMs

in relative clauses. Further distinctions could potentially arise from different post-positions marking objects, obliques etc. which could combine with a reduced all L verb pattern. As mentioned, the head of an XP often undergoes tone reduction (cf. §7), especially in the case of the verb, which may have fewer or no tonal contrasts to begin with. This raises the interesting question of whether in such cases the prosodic reduction of heads begins historically in the verb phrase or the noun phrase — with or without the additional complication of assigned melodies. What we can conclude from the Kalabari case, at least, is that tone patterns can be assigned by syntactic construction, something that rarely, if ever, occurs with other phonological features. For example, we know of no cases where, say, a possessive nominal assigns penultimate stress and a demonstrative assigns final stress on a following head noun. In the next section we compare Kalabari with other languages where one word determines the tones of another.

7. Other systems resembling Kalabari

In the preceding sections we have proposed a two-step analysis of the facts under consideration: the tones of non-initial words in an XP are deleted, followed by the assignment of the specific tonal melodies HL, HLH, LH and L. Further evidence for this two-step approach comes from the closely related language Nkoroo. As Akinlabi, Connell & Obikudo (2009:449) show, the N_2 tones of an $N_1 + N_2$ compound neutralize as all L when the N_1 ends L:

- (57) a. *mìndì* ‘water’ + *íkákí* ‘tortoise’ H-H-H → *mìndì* *íkàkì* ‘turtle’
 b. *dùù* ‘farm’ + *kírì* ‘ground’ H-L → *dùù* *kírì* ‘village’
 c. *ḃḃkò* ‘chicken’ + *tòkú* ‘child’ L-H → *ḃḃkò* *tòkù* ‘chick’
 d. *mìndì* ‘water’ + *àbàná* ‘pit’ L-L-L → *mìndì* *àbàná* ‘well’

When the N_1 ends H, however, the tones of N_2 all neutralize as H-L (pp. 449–451):

- (58) a. *fóní* ‘bird’ + *bébé* ‘mouth’ H-H → *fóní* *bébé* ‘beak’
 b. *ḃíḃ* ‘leg’ + *kírì* ‘ground’ H-L → *ḃíḃ* *kírì* ‘foot’
 c. *ánáná* ‘sheep’ + *tòkú* ‘child’ L-H → *ánáná* *tòkù* ‘lamb’
 d. *ḃíḃ* ‘leg’ + *tòṅgù* ‘edge’ L-L → *ḃíḃ* *tòṅgù* ‘heel’
 e. *námá* ‘animal’ + *dí[↓]mé* ‘hair’ H-[↓]H → *námá* *dímè* ‘fur’

The most straightforward interpretation is that N_2 reduces to all L followed by one-syllable H tone spreading from the N_1 . A much more widely known similar situation is found in Shanghai Chinese, where all but the first tone of nominal

constituents is deleted, with subsequent adjustments dependent on the nature of the first tone (see Zee & Maddieson 1980, Selkirk & Shen 1990, among others).

Concerning, however, the constructional nature of the tone assignments in Kalabari, which differs from other Ijo languages (see below), the only other clearly similar cases come from the Dogon languages recently surveyed by Heath & McPherson (2013). In Tommo So, for instance, adjectives and demonstratives cause a preceding head noun of an NP to become all L (McPherson 2012):

- | | | | | | |
|------|-------------|---------------|-------------|---------------------------|------------------------------|
| (59) | | | | <i>reduction to all L</i> | <i>no reduction</i> |
| | <i>noun</i> | <i>gloss</i> | <i>tone</i> | <i>'black'</i> | <i>'this'</i> <i>'three'</i> |
| a. | gámmá | 'cat' | H-H → | gàmmà gém gámmà | nó gámmá tààndù |
| b. | tàgá | 'shoe' | L-H → | tàgà gém tàgà | nó tàgá tààndù |
| c. | pàllà | 'cloth strip' | H-L → | pàllà gém pàllà | nó pàllà tààndù |

As the above examples show, the reduction process is anticipatory in Tommo So vs. perseverative in Kalabari. Another difference is that numerals do not condition tonal reduction in Tommo So vs. adjectives in Kalabari. As in Kalabari, intervening modifiers may also be affected by reduction:

- | | | | | | | | | | |
|------|----|----------------|---------------|----|----------------|----------------|-------|----------------|----------------|
| (60) | a. | <i>'black'</i> | <i>'this'</i> | b. | <i>'three'</i> | <i>'black'</i> | c. | <i>'three'</i> | <i>'these'</i> |
| | | 'cat' | gámmà gém | nó | gámmà | tààndù gém | gámmà | tààndù | nò=mbé |
| | | 'shoe' | tàgà gém | nó | tàgà | tààndù gém | tàgà | tààndù | nò=mbé |
| | | 'strip' | pàllà gém | nó | pàllà | tààndù gém | pàllà | tààndù | nò=mbé |

Although numerals do not condition reduction, we see in (60b,c) that an adjective or demonstrative can cause both the numeral and the preceding noun to become all L. While the above examples are ambiguous between tone deletion and assignment of a L melody, possessive constructions support the latter interpretation. The examples in (61a,b) show that nouns and alienable possessive pronouns assign a L melody to the following noun (McPherson 2012: 14–15):

- | | | | | | | | | | | |
|------|----|---------|----------|-------|---|-------|---------|---------|-------------------|---------------|
| (61) | a. | gámmá | 'cat' | H-H | → | íí=ge | gámmà | L-L | 'the child's cat' | |
| | | | | | | | | | (ge = def.) | |
| | | | | | | → | wómɔ | gámmà | L-L | 'his/her cat' |
| | b. | jàndùlu | 'donkey' | L-H-Ø | → | sáná | jàndùlu | L-L-L | 'Sana's donkey' | |
| | | | | | | → | mímɔ | jàndùlu | L-L-L | 'my donkey' |
| | c. | bàbé | 'uncle' | L-H | → | mí | bàbé | H-H | 'my uncle' | |
| | | ánigé | 'friend' | H-H-H | → | mí | ánigé | H-L-L | 'my friend' | |

However, as seen in (61c), inalienable possessive pronouns assign H-H to a bisyllabic noun, H-L-L to a trisyllabic noun. It is clear that Tommo So assigns melo-

dies, as in Kalabari, although in this case the conditioning modifier/specifier can be on either side of the head noun.

While it is hard to find other examples of the Kalabari and Tommo So type, where different word classes or constructions assign different melodies, there are analogous systems where phrasal tone assignments are lexically conditioned, i.e. where the different melodies are assigned by words belonging to the SAME word class. In fact, this is the general case in Ijo, as reported by Williamson (1988): Within a noun phrase, all tones are deleted except those of the first word, which appears to assign an arbitrary (i.e. unpredictable) tone pattern to the remainder of the phrase. A case in point comes from the Bumo dialect of Izon for which Efere (2001: 158–9) sets up the following arbitrary tone classes A–D, where (L) indicates that a word can start with a L tone vowel:

- (62) *class schema* *tone pattern determined by the A-D class of phrase-initial word*
- | | | |
|---|------------|--|
| A | (L) H + H | first word = all H followed by all H syllables in the phrase |
| B | (L) H + L | first word = all H; subsequent syllables = L |
| C | (L) HL + L | first word keeps its HL drop, subsequent syllables = L |
| D | (L) H + HL | first word = all H, H on first syllable of second word; subsequent syllables = L |

Classes A–D are illustrated below in the frame ... /náná kímí/ ‘man who owns/has...’ (whose tones are deleted):

- (63) A (L) H + H bélé ‘pot(s)’ → bélé náná kímí (no L: H all the way to the end)
- B (L) H + L wárí ‘house’ → wárí nà̀nà kìmì (L starts on σ_1 of second word)
- C (L) HL + L sérí ‘scarf’ → sérí nà̀nà kìmì (L starts on σ_2 of first word)
- D (L) H + HL ikíé ‘friend’ → ikíé nánà̀ kìmì (L starts on σ_2 of second word)

Ignoring the initial *ì-* of ‘friend’ (which is irrelevant for tone assignment), classes A, B, and D have all H tones in isolation. However, their tonal effects on the rest of the phrase are different. From the descriptions to the right it is clear that the A–D distinctions have to do with where L tone begins in the phrase: Whereas class C begins its L on the first word itself, and class A does not impose a L, classes B and D assign a L to the first vs. second syllable of the following word. Once a L has been assigned, all successive syllables are L. Building on Efere’s insights, we might propose a Japanese-like analysis with a HL “pitch-accent”:

(64)	A	B	C	D
	bé.lé	wá.rí	sé.rí	i.kí.é
		HL	HL	HL

In this analysis, the first word contributes at most one HL pitch-accent to the phrase whose H is realized on the indicated syllable, the L beginning on the following syllable. Class A words have no pitch accent and are realized with default H tones. Class B words have pitch accent on their final syllable, while Class C consists of words that have a HL pitch accent on a non-final syllable (hence on either the first or second syllable or a trisyllabic word): together with class B they exploit all of the possible placements of the HL pitch-accent within the first word. Class D words have a floating HL pitch accent and are thus post-accenting: the H goes on the first syllable of the following word, the L on its second syllable. Any syllable following the L will be pronounced L; otherwise the default tone is H.

A similar situation is observed in the Move dialect of Yagaria, a Papuan language of Papua New Guinea. In this language, Ford (1993:196–7) distinguishes between “stable” (S) and three types of “unstable” (U) adjective classes:

(65)	a.	S	hógà	‘left’	→	hógà kàyàlè	‘left pig’	(no change) + all L
		S	fáipái	‘white’	→	fáipái kàyàlè	‘white pig’	(no change) + all L
	b.	U ₁	lòlé	‘two’	→	lòlè kàyàlé	‘two pigs’	(L–L + L–L–H)
		U ₂	fèlá	‘wild’	→	fèlà kàyálé	‘wild pig’	(L–L + L–H–H)
		U ₃	kòlí	‘scared’	→	kòlí káyálé	‘scared pig’	(L–L + H–H–H)

As seen in (65a), the stable adjectives *hógà* ‘left’ and *fáipái* ‘white’ cause the following noun /kàyàlè/ ‘pig’ to become all L. In (65b), the unstable adjectives modify their /L–H/ to L–L and have three different tonal effects on the following noun. Here it would appear that the noun undergoes tonal deletion with the /LH/ of the adjective mapping differently according to tone class: the H starts immediately after U₃, on the second syllable after U₂, and on the third syllable after U₁. Perhaps we can attribute this to the distinct representations in (66).²³

(66)	U ₃	U ₂	U ₁
	koli	fela	lole
	LH	LH	LH

Again inspired by Japanese, unstable adjectives have a single underlying LH pitch accent either on the first syllable (U₃), the second syllable (U₂), or floating after the adjective (U₁). For this to work we have to assume that that H links to the following syllable, followed by a rule of L tone spreading, as in (67).

(67)	a.	b.	c.	
	U ₃ ko.li kayale	→ ko.li ka.ya.le	→ ko.li ka.ya.le	'scared pig'
	LH	LH	L L H	
	U ₂ fe.la kayale	→ fe.la ka.ya.le	→ fe.la ka.ya.le	'wild pig'
	LH	L H	L L H	
	U ₁ lo.le kayale	→ lo.le ka.ya.le	→ lo.le ka.ya.le	'two pigs'
	LH	L H	L L H	

In (67a) we begin with the LH assignments from (66) with the noun having undergone tonal deletion. In (67b) the H is assigned to the following syllable. In the case of the floating LH of U₁, both tones are assigned to the following noun. This is followed by a rule of L tone spreading, which extends the L to the following syllable. All we need to add is that syllables preceding the L are L and those following the H are H. Although this works, it is not clear if this analysis has merit. We cite it only to show that an analysis in terms of three different underlying representations does not seem terribly unreasonable.

While it is possible to account for Bumo and perhaps also Yagaria by assigning different underlying representations to the tonal classes, such an analysis is not always motivated. As a case in point, consider Urarina, an isolate spoken in Peru, in which most words are pronounced all L with one final H in isolation. However, in the right phrasal context the tonal effect can be quite different. In order to account for these differences, Olawsky (2006: 128) distinguishes tonal classes A-D, whose effects are indicated in (68).

- (68) class tone pattern determined by A-D class of the phrase-initial word
- A first word = L; H is assigned to the initial syllable of the following word
 - B first word = L; H is assigned to the second or third syllable of the following word depending on syllable weight
 - C first word = L; H is assigned to last syllable [mora?] of the final word of phrase
 - D first word keeps its final H tone, the following word being all L

Examples are given in (69).

- | | | | | |
|------|--------------|-----------------|-----------------------|-----------------------------|
| (69) | A raaná | 'peccary (sp.)' | → raana rú.a.kaa | 'he has carried a peccary' |
| | B obaná | 'peccary (sp.)' | → obana rú.a.káá | 'he has carried a peccary' |
| | C reemaé | 'dog' | → reemae rú.a.kaá | 'he has carried a dog' |
| | D makusajari | 'pepper' | → makusajari rú.a.kaa | 'he has carried the pepper' |

Like Kalabari, Urarina is a head final (OV) language in which the tone of the verb is determined by the direct object. Although lexical classes A-D determine where a single H tone will be realized, it is not clear in this case how one might derive these facts by proposing different underlying representations for the four tone classes of nouns.

While the Bumo, Yagaria, and Urarina tonal outputs are determined by lexical properties of the initial word, not by its word class (or by tone spreading in the case of OV in Kalabari), the similarities are striking. What is clearly needed is a systematic comparison of all known systems where phrase-level tones are exclusively determined by a specific constituent within the respective phonological phrase. Recall that the above phenomena are relatively rare in the world's languages. Nevertheless, although rather limited, we summarize our survey to date in (70), where the numbers in parentheses refer where the examples are cited in the present paper:²⁴

(70)	$N \rightarrow N' / _ Y$	$N \rightarrow N' / Y _$	$V \rightarrow V' / _ Y$	$V \rightarrow V' / Y _$
	Haya	Kalabari (3)	Haya	Urarina (69)
	Tommo So (59)	Bumo (63)		Kalabari (45)
		Tommo So (61)		
		Yagaria (65)		
		Shanghai		
		Barasana (72)		
		N. Mao (74)		

In the above table, Y stands for the element determining the tonal realization of a head N or V (indicated as a change to N' or V'). From the above we arrive at the following five generalizations, all of which need to be tested against a larger sample:

(i) *Generalization 1*: The tonal reductions and melodies mostly involve a modifier, specifier, or (less often) an object targeting the head N or V of an NP/VP. The only potential case we have found where a lexical head triggers a tonal change on a modifier comes from Urarina noun + adjective sequences (Olawsky 2006: 122), as seen in (71).

(71)	B	hjaané 'achiote (tree)'	→	hjaane lanáhaj 'red achiote'	(H on second syllable of A)
	C	hjaané 'urine'	→	hjaane lanaháj 'red urine'	(H on third syllable of A)

Although Olawsky mentions certain complexities concerning adjectives, *lanaháj* 'red' is listed as being deverbal and not obviously the head of the above

construction. It may be significant that the example is a perseverative one, particularly with respect to the next two generalizations.

- ii. *Generalization 2*: The tonal effects are more commonly perseverative than anticipatory.
- iii. *Generalization 3*: The multiple melody cases are all perseverative. While the perseverative cases can assign melodies or condition simple tone reduction, the anticipatory cases (Haya, Tommo So) involve reduction/assignment of L tone only.
- iii. *Generalization 4*: The constructional cases may involve the assignment of distinct tonal melodies, while the lexical cases involve different placements of a tone (H, L).
- iv. *Generalization 5*: Only tone can do this. We now take this up in the final section.

8. Conclusion: What else, if anything, is like this?

We have seen that tone patterns can be assigned by syntactic construction, something that rarely, if ever, occurs with other phonological features. Whereas featural harmonies and stress assignment are almost exclusively word-bound (though possibly extending to “clitic groups”), the phenomena in Kalabari and the other cited languages provide further confirmation that tone can do much more than any other phonological property at the phrase level (Hyman 2011). This is true in two senses. First, there are phonological operations available only to tone, e.g. one word shifting its underlying tone(s) to an internal position in the next word, as we saw in the analysis of Izon in (64). Second, tone has greater versatility in marking phrasal syntactic properties. Since there does not seem to be anything else quite like the constructional and lexical tonal triggers described in the previous sections, we now raise the question of whether we can relate the above to other phenomena in grammar.

In presenting this work orally, we have posed this question to colleagues. The suggestions we have received is that we should try to relate the tonal melodies of Kalabari to: (i) clitics; (ii) agreement; (iii) case marking; (iv) construct state. The idea behind clitics is that different modifiers would each come in with potential enclitics, =HL, =HLH, =LH, =L, which vie with each other to be realized within the phrase. Since we know of no parallels involving segmental clitics, we do not find this interpretation appealing.²⁵

The Kalabari facts also do not seem to be what we expect of agreement, which should go from lexical head to modifier rather than the reverse. In fact, there are

rare cases of what might more aptly be identified as tonal agreement. As seen in the following table, in Barasana, a Tukanoan language of Colombia, possessive pronouns copy their tone, here H-H vs. H-L, on the possessed noun (Gomez-Imbert & Kenstowicz 2000:438–9):²⁶

(72)		~kúbú (H-H) ‘shaman’ ~bídi (H-L) ‘pet’ ~ = nasal	
~bádí (H-H) ‘our’	~bádí ~kúbú	~bádí ~bídi	prosody
~ídà (H-L) ‘their’	~ídà ~kúbù	~ídà ~bídi	

Clearly there is no such surface agreement in Kalabari or the other cited cases.

Another suggestion for comparison is case. Our hypothetical *H connective should of course be identified as a genitive case marker. But what about the other melodies? Again, where is the language in which nouns, possessive pronouns, numerals, and demonstratives assign different segmental case markers?

This leaves the idea of the construct state, where nouns have special forms in different syntactic configurations. Creissels (2009) surveys phenomena in African languages which he interprets as construct state, “a general label for noun forms that are obligatory in combination with certain types of noun dependents” (p. 74). This includes a tonal example from Tswana, where nouns ending H-H have an alternative H-L realization if followed by certain dependents, including a demonstrative, genitive, adjective, or relative clause (p. 80). He also considers the case of Mende where nouns have both a free and construct form. In the following examples, *ndopò* ‘child’ is in free form, while the second nouns appear in the construct state form:

(73)	<i>Free forms</i>		<i>“Construct state” forms</i>
	tokó ‘arm’	→	ndopó-i lok-í ‘the child’s arm’
			child-DEF CSTR.arm-DEF
	ngíla ‘dog’	→	ndopó-i yile-í ‘the child’s dog’
			child-DEF CSTR.dog-DEF

Creissels (1994: 152ff) analyzes the free forms as having an underlying nasal prefix which is lacking in the construct state forms. Similar facts occur in closely related Kpelle (Welmers 1969). In the cases Creissels reports, it is the head noun that is affected, not a full phrasal domain. Unless we bring in different series of consonant gradation as found, say, in Fula (Arnott 1970), there is usually a binary contrast between two forms (cf. also N. Mao in the next paragraph). We thus again do not know of anything comparable to Kalabari whereby nouns (and intervening modifiers) have multiply distinct syllable shapes or other segmental realizations after another noun vs. possessive pronoun, numeral or demonstrative.

A rather interesting tonal construct state phenomenon is found in Northern Mao, an Omotic language spoken in Ethiopia, brought to our attention by Gwendolyn Hyslop and Mary Pearce. According to Ahland (2012:145), "... the [nine] citation melodies of two-syllable nouns (the vast majority of nouns in the language) collapse into three melodies when they are modified by any element: MM, ML and LL," as seen in the following table:

(74) <i>Citation Tone Classes</i>	<i>"Construct Noun Melody"</i>
H-H ₁	> M-M
M-M, L-L, H-L ₁ , M-H, M-L	> M-L
H-H ₂ , H-L ₂ , L-H	> L-L

As indicated by the subscripts, there are two H-H and two H-L classes which have the same citation forms, but exhibit different behavior with respect to their construct noun tone. The above changes take place on the noun independent of the nature of the preceding modifier or its tone (Ahland 2012: 147–9):

(75) a.	k'èts'é	'land'	H-H ₁	→	íʃ	k'èts'è	M-M	'the land'	
					→	nà	k'èts'è	M-M	'this land'
b.	p'ìʃè	'child'	M-M	→	íʃ	p'ìʃè	M-L	'the child'	
					→	nà	p'ìʃè	M-L	'this child'
c.	mùnts'è	'woman'	H-L	→	íʃ	mùnts'è	L-L	'the woman'	
					→	nà	mùnts'è	L-L	'this woman'

However, this phenomenon is quite different: Whereas modifiers intervening between the initial word and the head noun are targeted by the tonal melodies in both Kalabari and Tommo So (recall (60)), "...only the head noun/nominal (i.e. whatever serves as the head of the NP) takes on the construct form". (Michael Ahland, personal communication). While it is possible to adopt the term, there is no known segmental parallel which distinguishes several different "construct forms". In this case one may ultimately attribute this to a quantitative, rather than qualitative difference between tonal and segmental marking. Cf. Hyman (2011:214):

"Tone is like segmental phonology in every way — only more so!

- a. QUANTITATIVELY more so: tone does certain things more frequently, to a greater extent, or more obviously (i.e. in a more straightforward fashion) than segmental phonology.
- b. QUALITATIVELY more so: tone can do everything segments and non-tonal prosodies can do, but segments and non-tonal prosodies cannot do everything tone can do."

Although it has not been our intention to provide a formal implementation of the above facts from Kalabari, let us conclude by briefly asking the question of how such phenomena should be analyzed. While Hayes' (1990) "precompiled phrasal phonology" seems related, it would be quite complex to apply it to the Kalabari case. In Hayes' framework certain rules apply lexically but come with a specific syntactic frame in which the derived forms must be lexically inserted. One might therefore be tempted, for example, to propose a morphological HLH tonal override which requires that the word be inserted after a possessive pronoun, e.g. /pulo/ 'oil' → *pú^lló* /]_{POSSPRO} _____. Recall, however, from (12) that this HLH melody is distributed over as many words as follows the possessive pronoun. In such cases it would seem counter-intuitive to apply separate lexical tone rules to each of these words. Rather, the assignment of the melody and its mapping are clearly phrasal.

Also seemingly related, and although applying at the phrase level, the above phenomena have all of the properties of lexical "co-phonologies" (see Inkelas 2011 and references therein). Setting up a set of constraints that have different rankings seems particularly appropriate in the Bumo, Yagaria, and Urarina cases, where different lexical items determine where a H tone is placed or a drop to L begins on the lexical head. One might therefore attempt to do the same with different constructions in conflict, each of which has its own "preferences" for how the phrasal tones should surface.

For us, what is interesting is how tone, more than any other phonological property, provides the linguistic GLUE holding together the various parts of the grammar. There is a wide range of tonal phenomena which seem related to morphology, which is why agreement, case, and construct state have been proposed as analogues to the Kalabari melodies (but not, presumably, to the lexical classes in §7). This presumably has to do with the medium (pitch), syntagmatic aspects of which speakers can and do package in a wider range of ways than any other phonological property. As seen above, this results in rather impressive phrase-level tonology, only some of which has been described, let alone analyzed at the present time.

Notes

* Our thanks to Sharon Inkelas for suggesting the connection to construction morphology (Booij 2010). Earlier versions of this paper were presented at the University of California, Berkeley (Feb. 27, 2012), the Fifth Conference on Tone and Intonation in Europe (TIE5), Oxford University (Sept. 8, 2012), the Laboratoire de Phonétique et Phonologie, Université Paris 3 (Oct. 19, 2012), the Universität Zürich (Nov. 2, 2012), and the University of Pennsylvania (March 28, 2013). Our thanks to the audiences at these presentations for their comments and suggestions, especially Laura McPherson, Mark Van de Velde, Balthasar Bickel, and Jeff Heinz. The first

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1. All of the data presented in this study are from the Asari dialect of Kalabari, as spoken by the first author. For further information on the grammar of Kalabari see especially Jenewari (1977).
2. In these and all examples an acute (´) accent marks H(igh) tone, while a grave accent marks L(ow) tone. The raised descending arrow (↘) indicates a following downstepped H tone, a pitch level intermediate between H and L, which derives from an unlinked “floating” L tone wedged between two H tone syllables, e.g. /sá`kí/ → sá[↘]kí ‘begin’ in (1b). Kalabari has a system of nine vowels, eight of which are distinguished by their Advanced Tongue Root feature: /i, e, u, o/ are [+ATR], while /ɪ, ɛ, ʊ, ɔ/ are [–ATR]. Due to a system of ATR vowel harmony which affects roots, affixes, and proclitics, vowels from the two sets generally do not co-occur. The vowel /a/, however, can occur with either set, hence sá[↘]kí ‘begin’ vs. pákírí ‘answer’. For more on the nature and areal distribution of African ATR systems see Casali (2003) and Clements & Rialland (2000); for more on Kalabari, see Jenewari (1977) and Akinlabi (1997).
3. Evidence for the logical separation of the two steps will be seen in §5, where verb tones are deleted after a direct object without a specific melody being assigned.
4. When N₂ is modified, the result is of course non-ambiguous. Thus, *féni wári* can mean ‘bird’s house’ or ‘nest’ (lit. ‘birdhouse’), while *féni ópú wári* ‘bird’s big house’ is unambiguously phrasal.
5. For the sake of simplicity we will generally avoid examples where the N₂ is monosyllabic or vowel-initial, which sometimes affect how the tonal melodies are mapped. For example, when the HL melody is assigned to a monosyllabic noun, either the L is not realized, or the vowel lengthens to accommodate it: /tòbò/ ‘child’ + /sò/ ‘sky, heaven, destiny’ → tòbò só ~ tòbò sóò ‘child’s destiny’. Similar realizations are observed when the second noun has the shape VCV: /àkò/ ‘bee’ + /àsù/ ‘odor’ → àkò àsù ~ àkò àsùù ‘bee odor’. The expected form àkò àsù with HL assigned to the N₂ by underlying syllable can be heard only in very careful, perhaps unnatural speech. Similarly, melodies are assigned starting with the first CV of longer V-initial nouns: /tòbò/ ‘child’ + /òbirí/ ‘dog’ → tòbò òbirí ‘child’s dog’. We also ignore the fact that the first vowel of V+V sequences is normally elided. None of these minor complications affects the basic issues being discussed here, namely the assignment of tonal melodies by construction. For more discussion, see Harry (2004).
6. Differing slightly from the HL melody (note 6), HLH requires that the vowel of a monosyllabic or VCV noun lengthens: /sò/ ‘sky, heaven’ → ì só[↘]ó ‘my destiny’; /ílá/ ‘intestines’ → ìyè ìlá[↘]á ‘my intestines’. The HLH melody skips over the initial vowel of longer V-initial nouns: /òbirí/ ‘dog’ → ìyè òbí[↘]rí ‘my dog’. As seen in the last two examples, longer pronominal allomorphs are used before V-initial words. This does not affect the tonal assignments.
7. We have no explanation for this other than to note that it is as if the L tone V pronoun forms a prosodic constituent with the first syllable of the noun, i.e. ì + ná[↘]má → (ì ná) (má), with the /HLH/ melody then being assigned to the remaining syllable (má).
8. There is one exception to this statement. The possessive pronoun àní ‘its’, which was seen in (9), has a second function as a distal demonstrative. Thus, àní ná[↘]má can mean ‘its animal’ or

'that animal' (Harry 2004: 67). Despite its innovative demonstrative function, *àni* still assigns the possessive /HLH/ melody.

9. In order not to interfere with the tone marking, nasalization is transcribed by a tilde under the vowel, e.g. *t̀̀wá* 'many'.

10. Certain higher numbers and *bébé* 'whole' also assign HL and are also presumably nouns: *sí f́́eni* 'twenty birds', *bébé sáni* 'whole pepper', etc.

11. We of course cannot distinguish between L tone spreading vs. default L assignment. Minimally, we have to say that the preceding H of 'your' spreads onto these nouns.

12. These categories are Factative (FACT), Progressive (PROG), Future (FUT), and Perfect (PERF). That the factative has a floating H that creates a HL melody directly supports the diachronic origin of HL that we propose in §6. It may not however always be present: another variant of 'bad animal' is *sí nàma*, where the noun is realized all L.

13. Another modifier which exceptionally does not affect the base tone of the following noun is *jé* 'another': *jé f́́eni* 'another bird', *jé f́́ni* 'another fire', *jé bélé* 'another light', *jé gári* 'another garri', *jé wáári* 'another house'. However, since *jé* occurs in absolute initial position and is mutually exclusive with both demonstratives and possessive pronouns, we consider that it is not an adjective, but rather a specifier within the DP (cf. (23a)).

14. In (11) and (12) we already saw that the HLH melody assigned by the possessive pronoun overrides the HL melody that an N_1 would have assigned to an N_2 . Thus /i + f́́eni + námá/ 'my bird's meat' is realized *i f́́eni námá* and not **i f́́éni námá*, where the pronoun assigns HLH to the N_1 'bird', and 'bird' assigns HL to the N_2 'meat'.

15. Although we have seen the HL melody to be associated with a $N_1 + N_2$ construction, the HL variants in (25) are the first indication that HL may be in the process of becoming an alternative default assignment in complex constructions. Re (25b), recall that the longer allomorphs of the possessive pronouns are required before a vowel, a detail of the language which has no effect on the assignment of melodies (cf. note 6).

16. Note that the phrases in (30) and (31) can in fact end with a final H% boundary tone, which marks emphasis on utterances that end with either underlying or derived L. Thus compare also the normal realization of the numeral L melody in *ś́ná ibi wári* 'five good houses' with emphatic *ś́ná ibi wári*. Perhaps related to this is that imperatives also end H, e.g. *yéé wá d̀̀éri* 'let's laugh!' (/d̀̀éri/ 'laugh'). We ignore emphatic final H% in this study.

17. Higher numbers might also appear to be exceptions, e.g. *f́́eni má sí* 'forty birds' (< /f́́eni + má + sí/; lit. 'birds two twenties'; cf. *sí f́́eni* 'twenty birds'), *f́́eni mákpá* 'four hundred birds' (< /f́́eni + má + ákpá/). However, in these cases the head noun /f́́eni/ acts as the modifier on the numerals, assigning them a HL melody, as expected.

18. Curiously, downstep insertion does not apply in $N_1 + N_2$ constructions. Thus recall *ékpé námá* 'he-goat's meat' from (5d). While downstep insertion is a very unusual rule whose history is not completely understood, we speculate that it has to do with protecting the H of word-final L-H, since a L-H-H sequence has a tendency to become L-L-H (Hyman & Schuh 1974: 98). This in fact does optionally occur in $N_1 + N_2$, hence the variant *ékpè námá*.

19. If the assimilation is interpreted as autosegmental spreading, this would mean that the L inserted by rule (34) would have to split up the multilinked H. This and similar such phenomena are discussed by Hyman (2014).
20. The full TAM forms are in fact found only in main clause affirmative declaratives, i.e. not in negative, interrogative, copular, or relative clauses.
21. Also like $N_1 + N_2 + N_3$, there is some flexibility in assigning the HL melody. Thus, the factative and perfect forms can also be realized *dɛ̀ri píri nàmà bé* and *dɛ̀ri tɛ̀ píri nàmà bé* with the HL melody assigned to the first noun of the compound. This supports our claim in (28) that the two mappings of HL have nothing to do with left- vs. right-branching.
22. Although not discussed here for reasons of space, the final definite marker can condition the same H + ⁴H sequence in relative clauses seen above in §4: *pùlò fùrù tóbò bé ~ pùlò fùrù tòbò ⁴bé* ‘the child that stole the oil’. What this potentially means is that there is a competition between the HL melody coming from the TAM marker vs. the LH that definiteness would like to impose. The downstep is from rule (34).
23. Unfortunately, Ford does not give enough information to determine if all unstable adjectives are L-H, or what the tonal possibilities are of stable adjectives. Neither of the two which he gives has L-H tone, as seen in (65a).
24. Among the languages not mentioned thus far, Haya nouns and verbs lose their H tones when followed by certain modifiers/complements (Hyman & Byarushengo 1984), while the Barasana and N. Mao phenomena are presented below in (72) and (74), respectively.
25. Concerning Ijo in general, Williamson (1988) analyzes tonal classes such as Izon’s A-D as having different floating tones to assign to the rest of the noun phrase (often with OCP violations). For an interesting parallel analysis in San Marcos Zacatepec Eastern Chatino (Otomanguean, Mexico), see Woodbury (2012).
26. The tilde ~ marks a nasal prosody on the whole morpheme.

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