

The tone system of Ibibio

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1. Introduction

A fair amount of attention has been devoted to the study of Ibibio tone, the first serious one being that of Kaufman (1968). Other descriptions of the Ibibio tone system or aspects of it, include Boys (1979), Essien (1983, 1990), Essien (1992), Umoh (1985), Urua (1987, 1990, 1995, 2000), Akinlabi & Urua (2000), etc.

Ibibio is a Lower Cross language spoken in the South-Eastern part of Nigeria, specifically in Akwa Ibom State and some parts of Cross River State and has been described as having two contrastive level pitches, High and Low, a contrastive downstepped High tone, in addition to the contour pitches, High-Low and Low-High. Having said that, tonal alternation also occurs as a result of dialect variation in Ibibio. This alternation is generally between a level Low tone and a High-Low contour tone in nouns and in certain verb constructions.

Given the types of tones attested in Ibibio, it is classified as a classical terrace system. Features of terrace tone system manifested in Ibibio include both downdrift and downstep. There is instrumental evidence to show that both High and Low tones downdrift in this language.

In this paper we present a comprehensive description of the Ibibio tone system with particular attention to contour tones, terracing, floating tones, tonological processes and then assess the implication of some of these for phonological theory.

Floating tones are postulated for the language and there is both synchronic and diachronic support for this position (Winston 1960, Cook 1985, Urua 1995, 2000, etc.). Floating tones also perform various grammatical functions in the language and the presence of floating

tones (in addition to other tonological processes), underscore the autonomy of tones from the units that anchor them.

Some of the tonal processes to be discussed in this paper include spreading, replacement, simplification and deletion with the Ibibio tone rules appearing to operate from left to right. Grammatically, the function of tone in Ibibio is varied and very complex and we hope to discuss a few of the salient ones. To some extent, word classes may be distinguished tonally. Disyllabic verbs, for instance, have a predictable final High tone in the basic form while nouns and other word classes are more varied in size and tone patterns and therefore are not so tonally constrained. First, we introduce the Ibibio tone system and the work done previously in this area in section 2, then we discuss the phonetic and phonological characteristic features of Ibibio tones in section 3. Section 4 presents the functions of tone in Ibibio, particularly the grammatical aspect, while section 5 examines the Ibibio tone system vis-à-vis phonological theory and in section 6, the concluding remarks are presented.

2. Ibibio tone system

Ibibio, a Lower Cross language is spoken predominantly in Akwa Ibom State and parts of Cross River State. According to Faraclas (1989), Ibibio belongs to the Eastern branch of Lower Cross, although Connell (1994) classifies it as belonging to the Central branch of Lower Cross. We shall not go into a debate over this since it bears no immediate relevance to the present work. The Ibibio tone system has been described by Simmons (1957), Kaufman (1968), Boys (1979), Essien (1983, 1990), Umoh (1985), Urua (1987, 1990, 1996/1997, 2000) amongst others.

Simmons (1957) is a description of the Ibibio verb system but he first introduces the tone system observing that pitch is phonemic in Ibibio and goes on to provide numerical notation marks for eight tones as follows:

(1)	
Low	– no notation
High	– 1
Midhigh (a tone between mid and high tones)	– 2
Mid	– 3
Rising	– 4
Falling	– 5
Midhigh-one (a tone halfway between midhigh and high tones)	– 6
High-one (a tone slightly higher than high tone)	– 7
Low-one (a tone halfway between low and mid tones)	– 8

The explanations in parenthesis are provided by Simmons. Clearly, the eight levels must include tonal alternations, modifications and sandhi as it is not possible to have eight distinctive pitch levels. Some of the actual Ibibio language examples that Simmons provides reflect such alternations. Kaufman (1968), a Ph.D. dissertation on Ibibio grammar, is the first in-depth study of the Ibibio tone system. Kaufman succeeded in capturing the insights into the Ibibio tone system. She correctly identified two basic pitches, High and Low, a modified High pitch which she refers to as the drop pitch, i.e., the downstepped High tone, !H, and the contour tones, HL and LH. She treats contour tones as combinations of the level pitches and not contrastive, having exhaustively explored the limited distribution of the contour tones plus the fact that in some instances they even occur in free variation with level pitches. In Kaufman's work, the idea that the drop tone, also known as downstepped High tone, !H, may have a historical origin, is also hinted at. In addition, she explored in detail the intricate question of grammatical tone in Ibibio, which she refers to as 'construction tones'. Boys (1979) proposes a phonemic five tone system for Ibibio, i.e., High, Low, downstepped High, High-Low and Low-High contour tones,

even though he admits to the very limited distribution of the contour tones High and Low. Essien (1983, 1990), like Boys (1979), also argues for a phonemic five tone system for Ibibio, i.e. High, Low, !H, the contour tones, HL and LH. His argument is based on apparent surface contrastive pairs in the language. Umoh (1985) and Urua (1987, 1990, 2000), argue for three contrastive pitches, i.e., H, L, and !H; the contour tones HL and LH are considered by both as combinations of the level tones, H and L.

In this study, we distinguish between the phonemic tones and the surface phonetic ones. We also maintain that the phonemic tones are High, Low and downstepped High tone while the surface phonetic tones are High, Low, downstepped High, in addition to the contour tones, Low-High and High-Low. Although the downstepped High tone has a restricted distribution, occurring only after a preceding High tone and never in the initial position, we argue that it is contrastive because it contrasts with Low and High tones in the stem as we show in (3). Tone marks used are as provided in (2). Examples of Ibibio contrastive pitches are presented in (3).

(2)	H = ´
	DS = !
	L = `
	HL = ^
	LH = ˇ

(3)	bák	'be surplus/cheap'
	bàk	'be early'
	kọp	'dish out (food)'
	kọp	'lock'
	ọbọñ	'mosquito'
	ọbọñ	'cane/acne'
	ọbọọñ	'king'
	ọbọọñ	'place name'
	níbọk	'wrestling (noun)'
	níbọk	'please'

Observe that a downstepped high tone is generally preceded by a High tone as in the item for 'king' and 'please'. Notice

also in (3) that the downstepped High tone contrasts with Low and therefore cannot be another Low tone. We have mentioned that Ibibio exhibits downdrift, implying that subsequent level pitches are progressively lowered. Both High and Low pitches in Ibibio are affected by downdrift. This fact is also reported for Efik (Cook 1985:101), but see contra position in Welmers (1966) cited in Cook (1985); it would be of interest to find out whether downdrift is widespread in the other members of the Lower Cross language group. Downdrift will be discussed further under the phonetic characterisation of Ibibio tones in section 3.

3. Methodology

In this section, we present a phonetic characterisation of Ibibio tones following instrumental work done in the past year and before. Two Ibibio female speakers were recorded using an enlarged Ibibio database. One of the speakers is an adult speaker who has lived all of her life in Ibibioland, with occasional sojourns of not more than two years at a time in Scotland and Germany; the other has also lived most of her adult life in Ibibioland but has lived in England for the past nine years. The prompts used for the study consisted of one-hundred-and-fifty-two (152) utterances with all possible tonal patterns of varying syllable lengths. Mono- and disyllabic verbs were read in isolation as well as within a carrier sentence. High tone verbs were read within the carrier sentence: Kóót ----- sóp ídém (Read ... quickly) while L(H) verbs were read within the carrier sentence: Kàp ----- èsè kèèt (Just ... one antelope). The recordings were made with a Sony TCD-100 digital audio tape-corder, with Audiotechnics headset microphones in Bielefeld and in Oxford with the assistance of Dr. Bruce Connell. Each prompt was written out on a card and

shuffled to reduce the incidence of repetition effect. Five repetitions of each of the prompts were recorded. Segmentation, labelling and F_0 measurements were made using the speech analysis software, Praat, developed by Paul Boersma and co in Holland. The prompts were labelled in three tiers of sentence, syllable and tone. Labelling and taking the F_0 measurements involved a synchronisation of auditory and visual observation of the speech wave forms, spectrograms and pitch tracings. The F_0 was taken at the mid point of the vowels. We begin However, there is a problem when taking the F_0 values for a Low tone preceding by a High at the mid point. Since the Low is falling from the level of a High tone, a midpoint F_0 value for the Low tone would be much higher than expected. Also, in addition to taking the midpoint value of a final Low tone, the final fall of the final Low tone is also taken at approximately the last 25ms to 35ms.

4. Phonetic Characteristics of Ibibio tones

4.1 High Tone

In Ibibio, a High tone is found in all positions in a phrase, initial – medial and final. A High tone on a monosyllabic word is fairly steady. So also is a sequence of High tones in Ibibio, with pitch ranges remaining more or less the same. Differences in F_0 values are quite insignificant. In a High tone sequence spanning several syllables, a ‘start-up’ effect (Bruce Connell, personal communication) is observed. This had been observed in the earlier studies (Urua 1994, 1996/97). A start-up effect is the phenomenon in which the High tone target is not reached on the first syllable; usually this is attained in the second or third syllable after which the subsequent High tones stabilise (see Tables 1 and 2).

Table 1

	kóó	ttó	ró	só	βí	dém
Tone:	H	H	H	H	H	H
Hz:	263,78	270,29	268,61	264,67	267,39	262,30
Diff:		-6.51	1.68	3.94	-2.72	5.09

Table 2

	sé	kú	bók	kú	kót	ké	kít
Tone:	H	H	H	H	H	H	H
Hz:	228,51	236,48	226,93	226,20	225,71	225,15	223,35
Diff:		-7,97	9,55	0,73	0,49	0,56	1,80

The implication of this is that in a High tone sequence (more than two syllables in length), the High tone begins at a lower pitch and gradually rises to its target. The start-up effect is also observed at the intervention of a Low tone in a High tone sequence, where subsequent Highs after the Low show a rise until the High tone target is reached. On the whole, a High tone sequence appears to be steady with very slight perturbations depending on whether or not the surrounding consonants are voiced or voiceless. However, in a shorter High tone sequence (e.g. disyllabic length), there generally is a slight difference between an initial High tone and the second High tone. The initial High tone is slightly higher in pitch than the second High tone. And the start-up effect appears not to be applicable here as shown in Table 3 below.

Table 3

	ké	dõñ
Tone:	H	H
Hz:	248,90	246,69
Diff:		2.21

There seems to be a converse relationship between the length of an utterance and the difference in pitch – a shorter utterance, e.g. a disyllabic tone sequence has a larger pitch difference than a longer utterance (Gibbon, Urua and Gut 2000; Cook 1985). This is irrespective of whether we are dealing with non-identical or identical tone sequences, although it is more relevant to non-identical sequences. This seems to indicate an overlaid look-ahead component (Gibbon, Urua and Gut 2000). We also observed that one of the speakers seemed to have a final raising in a High tone sequence as observed in 1994, 1996/97; this has not been observed for all the speakers and we think it is not in any way significant since it occurs only in some speakers and only in the last 10 ms

or so of the vowel. Moreover, it does not even occur consistently in all the utterances of the same speaker in which it is found. In Figure 1 we present both the speech wave forms and pitch tracings of monosyllabic and disyllabic H tone utterances.

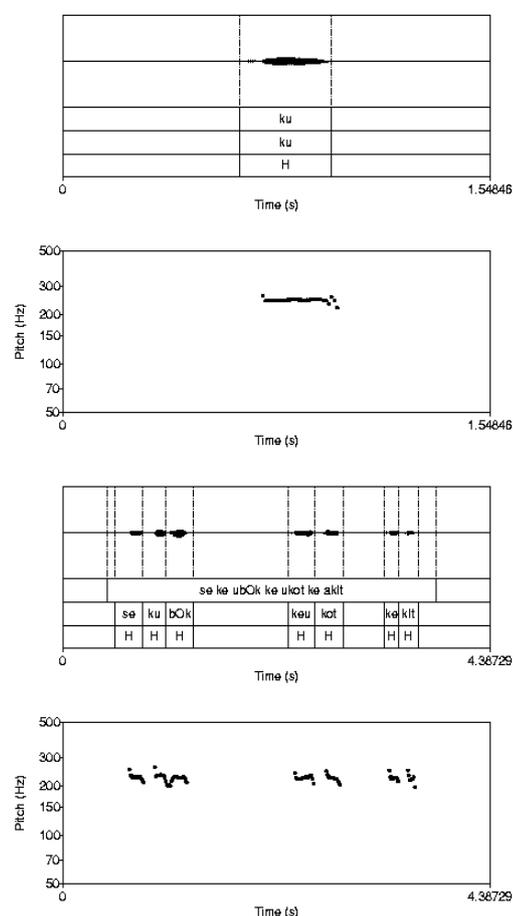


Figure 1: High Tone(s)

What seems to be clear from Figure 1 on High tones is that there appears to be no downdrift of High tone sequences in the absence of any intervening Low tones, implying that downdrift may be a ‘local’

rather than a ‘global’ event. It can therefore not be equated with ‘declination’ usually associated with non-tone languages. More importantly, this seems to be strong instrumental support to the theory that a lowered High tone, i.e., downstepped High tone may be from a lost or floating Low tone as will be shown later.

4.2 Low Tone

Low tones, like High tones, can be found in any position in a phrase – initial, medial and final. A single low tone starts at the level of a High and falls to the level of a Low, which gives the Low tone its characteristic falling tonal shape. This had been observed in Kaufman (1968). Initial Low tones therefore have higher pitch values than subsequent Low tones since they begin at the level of a High tone.

After an initial Low tone has stabilised from the level of a High, subsequent Low tones appear to be stable until they get to the final Low, where there is a downglide, indicating a fall of approximately 10Hz in the final 0.25ms to 0.35ms; in Table 4, the fall is 11.28Hz. There is evidence of a final lowering whenever a Low tone is the final tone in the sequence, even when immediately preceded by a High tone, which is further proof that a Low tone has a falling contour. Because both sequences of Highs and Lows have a level pitch realisation, the final fall in a Low tone sequence serves to distinguish Lows from Highs (Kaufman 1968). This is a feature of a terraced-level tone system known as downglide (Urua 1987, 1990, 2000).

Table 4

	tè	mè	sò	bò	è	nò	
Tone:	L	L	L	L	L	L	FLF*
Hz:	210,9	203	196,7	197	199,5	194,3	183,03
Diff:		7,84	6,36	-0,31	-2,56	5,26	11,28

*FLF means the final lowering of a final Low tone.

Both the speech waveforms and the pitch tracings for the Low tone are presented in Figure 2. The first pair illustrates the waveform and pitch tracing of a single Low toned syllable while the second pair

illustrates a sequence of Low tone utterance spanning five syllables. Observe that the Low pitches are level until the very final syllable where there is a fall.

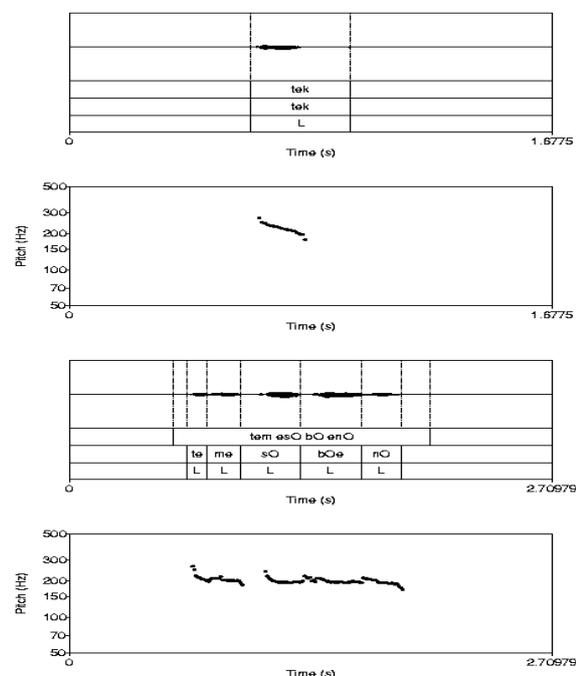


Figure 2: Low Tone(s)

4.3 Downstepped-High Tone

Downstepped Highs have been distinguished from the Mid tone because whereas after a Mid tone a following High tone may be realised at the same level as earlier preceding High tone or at least higher than the intervening Mid tone, a downstepped High tone sets a ceiling beyond which other following tones may not exceed (Winston 1960, Hyman 1975, Stewart 1983, Kaufman 1968, etc). This is the case with the downstepped High tone in Ibibio, (barring neighbouring consonant perturbations) although Ibibio has no Mid tone. A downstepped High tone is always preceded by a High tone, never occurs in word-initial position (although it occurs in stem-initial position), and never occurs alone as do High and Low tones and always minimally in a disyllabic utterance.

Table 5

	sé	ń	ká	ńí	ká	sé	ń	ké	!dé	Bá	kít
Tone:	H	H	H	H	H	H	H	H	!H	H	H
Hz:	260,78	312,10	268,67	267,10	257,81	266,47	265,19	252,83	232,83	224,49	224,72
Diff:		-51,32	43,43	1,57	9,29	-8,66	1,28	12,36	20,00	8,34	-0,23

The downstepped High tone in Ibibio is lowered from the level of a basic High tone (Kaufman 1968). The downstepped High tone is also not a falling tone from the level of High as is a HL contour tone. In fact, we will show that the downstepped High tone has a different tonal shape than a HL, when Figures 3 and 4 are compared. Phonetically, the downstepped High tone has an F₀ value which is lower than the preceding High tone, approximately a difference of about 30Hz between the preceding High tone and the downstepped High tone. The phonetic pattern of a sequence of High-Downstepped-High tone is steady with the initial High tone higher in pitch than the following downstepped High tone. In Figure 3 we present the wave forms and pitch tracings of utterances with the H!H pattern. The first pair illustrates a disyllabic item and the last pair shows a list of items with H!H pattern.

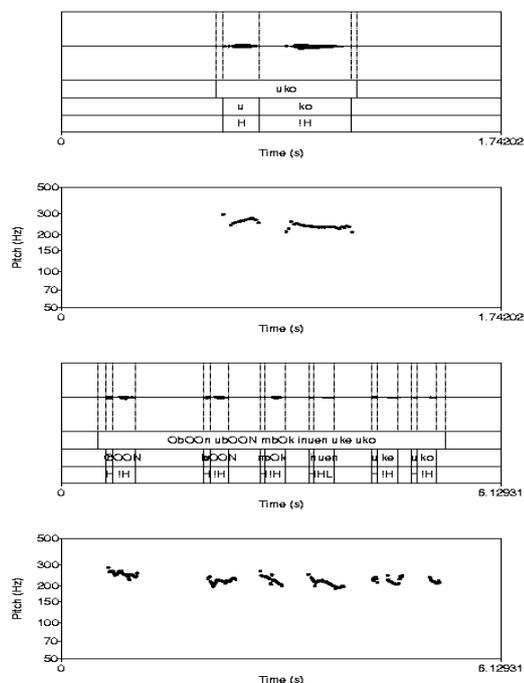


Figure 3: Downstepped High Tone(s)

We said at the beginning of this section that a downstepped High tone in Ibibio or any other language with terracing for that matter, sets a ceiling beyond which a following tone may not exceed. However, this statement needs some qualification. This constraint applies only within a phrase/clause group. With the inception of a new phrase/clause group, a new range is set and the process commences all over again. Given a list of items or repetitive utterances with a H!H pattern, at the end of one item, the initial H tone of the next item starts at a level higher than that of the preceding downstepped High tone, even though it is not at the level of the initial High tone in the series (e.g. ó!bóóń, ú!bóóń, m!bók, í!núen, ú!ké, ú!kó, etc.).

We provide details of actual F_0 values in Table 6 below:

Table 6

	ó	!bóóñ	ú	!bóóñ	mí	!bók	í	!núén	ú	!ké	ú	!kó,
Tone:	H	!H	H	!H	H	!H	H	!H	H	!H	H	!H
Hz:	274,4	236,74	270,53	230,53	265,87	229,05	261,36	228,36	265,39	227,79	265,07	221,14
Diff:		37,66	-33,79	40,00	-35,34	36,82	-32,31	33,00	-37,03	37,60	-37,88	43,93

4.4 Contour Tones and Non-identical Tone sequence

HL and LH contour tones have been recognised in Ibibio (Kaufman 1968, Boys 1979, Essien 1983, 1990, Umoh 1985 and Urua 1990, 1995, etc) and have received different analyses. Kaufman, Umoh and Urua analyse them as combinations of level tones while Boys and Essien argue that they are distinctive. In fact, Boys (1979) discusses the shortcomings of analysing them as unit tones but surprisingly opts for a contrastive position. In this paper, we provide further evidence to treat contour tones in Ibibio as combinations of the level tones, High and Low. First, they have a very limited distribution. The LH contour tone, for instance, only occurs on long vowels and on CCV syllables, rarely in initial position (except in personal names) and almost always restricted to the verbs. The implication is that Lower Cross lects that do not attest such V_1 deletion in an underlying $C_1V_1C_2V_2$ resulting in a $C_1C_2V_2$ structure, the LH contour tone is unlikely to be attested. The HL contour tone generally occurs after a preceding High tone (sharing the same distribution as a !H ~ L_H tone), and restricted generally to nouns, nominals and adjectives. Contour tones in Ibibio arise mainly from tone spreading, segment deletion and devocalisation/loss of syllabification (Kaufman 1968, Urua 1990, 1995). In connected speech this has been observed, where vowel deletion sets its tone afloat with a subsequent relinking to the next available tone bearing unit to the right.

In a non-identical sequence, a High tone is lower after a Low tone than a High tone after a High tone; a Low tone after a High is lower than an earlier Low tone. This is downdrift and is different from downstep where a ceiling is set after which no tone may exceed. In downdrift, a High

tone may be higher than the immediately preceding and/or following Low tones. This indicates that a High tone towards the end of an utterance within an alternating non-identical tone sequence is realised at a lower fundamental frequency value than a High tone at the beginning of that utterance. The result is a downward slope, which affirms the theory of terracing in the Ibibio tone system. The pattern illustrates that both High and Low tones in Ibibio manifest the property of downdrift (see Table 7, Figures 4 and 5). In terms of the precise degree of lowering in terms of absolute F_0 values, the difference between a Low and a following High is generally less than the difference between a High and a following Low.

The FLF of the final Low tone in Table 7 is 7.37Hz. We now consider each of the non-identical sequences.

4.4.1 Low after High (HL) sequence

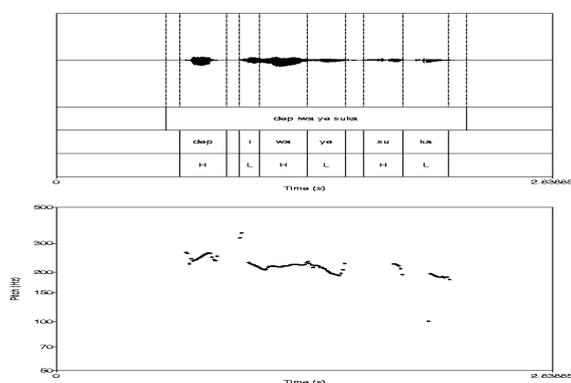
After a High tone a Low tone falls from the level of the High tone to a Low. However, if there are subsequent Lows between the Highs, the fall continues as we show in Figure 4 below until it gets to the final Low where there is a further final fall of about 10Hz. The mid point of a HL contour is equivalent to the peak of the High pitch component, but an approximate value of the Low tone is best taken towards the end of the vowel/syllable, which is still much higher than a regular Low tone. The High tone itself before a Low is realised at a much higher frequency than when we have a sequence of Highs. There appears to be no difference between a HL contour and a contiguous H-L sequence in terms of tonal shape.

Table 7

	dé	Bì	wá	yè	sú	kà	ké	sí	sǐ	
Tone:	H	L	H	L	H	L	H	H	L	FLF
Hz:	271,39	256,66	237,62	200,34	228,68	196,17	210,62	220,99	172,65	165,28 (0.023s)
Diff:		14,73	19,04	37,28	-28,34	32,51	-14,45	-10,37	48,34	7,37

Figure 4 illustrates both the speech wave form and pitch tracing for the utterance HLHLHL utterance **dép ìwá yè súkà** ‘buy cassava and sugar’. Observe the gradual lowering of both Highs and Lows in the pitch tracing in Figure 4.

Figure 4: HL Tone Sequence



4.4.2 High after Low (LH) sequence

A High tone following a Low tone has a rising contour from the level of the Low tone. The High tone is lower than an initial High tone although it is higher than the preceding Low tone. Cook (1985) makes a distinction between two kinds of lowering in a LHL sequence, i.e., the basic difference between a Low and a High tone on one hand, and lowering arising from downdrift. He argues, that the difference between a High tone following a Low is the basic distance between a Low and a High tone but that the distance between a High and a following Low is as a result of the intervening Low tone, which is what he refers to as downdrift.

Table 8

	kò	Bì	tá	yè	só	kò	rò	
Tone:	L	L	H	L	H	L	L	FLF
Mid:	232,25	225,34	281,89	199,75	221,21	188,04	165,04	160,24 (0.040s)
Diff:		6.91	-56.55	82.14	-21.46	33.17	23	4.8

Figure 5: LH Sequence

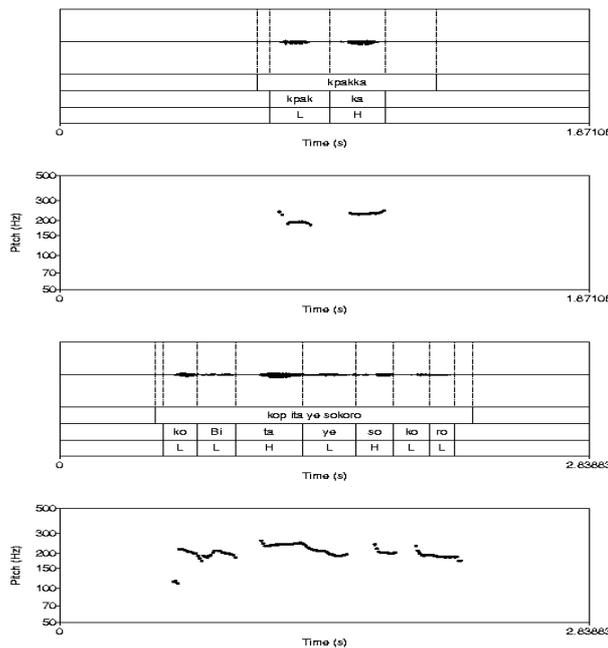


Figure 5 is an illustration of two wave forms and pitch tracings of the LH and LH sequence. Observe also the subsequent lowering of both Lows and Highs. When a single Low tone is flanked by a sequence of Highs (HHHHLHHH), the H immediately following the Low is generally realised at the level of the Low tone or even lower until the High tone reaches its target in the second or third High after the Low. This is very common especially when the vowel bearing the Low tone in the TBU deletes or coalesces into a single vowel. We illustrate in Tables 9 and 10. If the F_0 value of the Low tone is taken at the midpoint of the vowel, then the result is as in Table 9, with the Low being much higher than a normal Low and the following High. But if the F_0 value of the Low is taken at the very end of the fall from the High tone then the Low and the following High have approximately the same F_0 value as in Table 10.

Table 9

	ú	ká	ra	y	è	ọ	kpọ	nọ
Tone:	H	H	H	L	H	H	H	
Hz:	277,50	282,56	282,50	222,57	207,36	223,14	215,59	
Diff:		-5,06	0,06	59,93	15,21	-15,78	7,55	

Table 10

	ú	ká	rá	yè	ọ	kpọ	nọ
Tone:	H	H	H	L	H	H	H
Hz:	277,5	282,5	282,5	208	207	223	215,5
Diff:		-5	0	74,5	1	-15	7,55

4.5 Floating tones

Apart from the overt tones, H, L and !H, one other interesting characteristic of the Ibibio tone system is the influence or effect of floating tones. It is not easy to characterise the phonetic properties of a floating tone, which we have defined as a phenomenon where the impact of an unanchored tone is felt in an utterance. Since the claim has been made in the literature that the downstepped High tone is from a floating or lost Low tone, we set out to find out if there was any difference between an overt Low tone and a floating Low tone plus their impact on surrounding segments or syllables (Gibbon, Urua and Gut 2000). This was done by taking the fundamental frequency measurements of sequences of HLH and H!H, i.e., HL₀H utterances. We discovered that there were indeed similarities and differences. Both the overt Low tone in a HLH sequence and the floating Low tone in a H!H sequence exerted some degree of lowering on the following H tone. However, there was a difference in the degree of lowering. The overt Low tone seemed to exert a higher degree of lowering than the L₀ tone judging by the difference in the F_0 values. This seems to support the claim of a floating Low tone, which accounts for the !H. The exclamation mark used with downstepped tones actually represents a floating Low tone, thus wherever there is a !H it can be read as L₀H.

In addition to the phonological function of floating tones, many of the grammatical tones in Ibibio are floating tones. Such floating tones have been referred to variously in the literature as construction tones (Kaufman 1968), tonal morphemes (Welmers 1973), grammatical floating tones (Hyman & Tadadjeu 1976) and more recently as tomorphs (Elugbe 2000). Elugbe (2000) postulates four sources for floating tones. These are tonal morphemes, e.g. markers of grammatical constructions in many African tone languages, tones set afloat through the phonological process of segment deletion, tonal replacement/displacement/spreading and finally phonologically contrastive floating tones. All four types may be manifested in Ibibio. Some of the ones that mark grammatical constructions will be discussed in Section 4.

4.6 Tone and segment interaction

Although the primary goal of this research was not to investigate the interaction between segments and tones in Ibibio, however, in the course of our instrumental investigation, it seemed to us that there may be evidence that certain consonants have a raising effect on tones in Ibibio. This is especially the case with the voiceless consonants, particularly the voiceless alveolar fricative, /s/ and the voiceless velar stop, /k/. We will refrain from using the terms non-depressor or depressor consonants for now. However, the Ibibio data clearly seems to suggest that fundamental frequency values are raised in the vicinity of voiceless consonants, especially strident fricatives and perhaps, lowered with voiced consonants. We have not also investigated what the possible effect of vowels on fundamental frequency would be in Ibibio (but see Connell 2000), neither have we in any way explored the possibility of the influence of tones on the segments themselves. We plan to carry out a separate study on this in the future.

4.7 Tonological Processes

Mention had been made at the beginning that contour tones may arise from the

phonological processes of tonal spreading, segment deletion and sometimes devocalisation or loss of syllabicity (Urua 1995). In this section we substantiate these claims and provide a discussion of some of the issues arising there from.

4.7.1 Tonal spreading

Some Ibibio dialects show contour tones in certain items while others have only level tones in the identical item. We provide examples in (4) beginning with the HL contour tone.

HL contour tone

(4) úfòk	~	úfòk	‘house’
ásàn	~	ásân	‘living room’
éyòp	~	éyôp	‘palm tree or fruit’
éđi	~	éđi	‘pig’
áyàñ	~	áyâñ	‘broom’
éĩ	~	éĩ	‘good’

Items on the first have a H-L level pitch while those on the second column have a H-HL pattern with a contour tone on the second syllable. Regardless of historical developments, the simple straightforward analysis is that the preceding H tone on the initial syllable spreads to the following syllable, which has underlying L tone, thereby creating a HL contour tone. In Autosegmental theory, this simply means that the High tone occupies two tone bearing units, the first is linked and the second is from spreading – in other words, one TBU is linked to two tones. This is easy to explain in autosegmental terms, since tones occupy separate tiers from their TBUs. This therefore is the source of the HL contour tone in (4).

4.7.2 Segment Deletion

Two contiguous vowels at word boundaries create a deleting environment for one of the vowels, usually the one that is lower, in terms of vowel height, than the other. Since vowels bear tones within syllables, vowel deletion should suggest that the tone is deleted along with the vowel. This is not always the case; sometimes the tone does not delete with

the vowel. In such instances, the tone on the deleted vowel is set afloat – this is one source of floating tones. Such a floating tone is then re-linked or re-associated to the next TBU, usually to the right. We illustrate with the examples in (5)

Low-High Contour tone

- (5) fidé → frě ‘forget’
 bǐdé → brě ‘play’
 m̀bǐdé → m̀brě ‘play’
 fòró → frǒ ‘prosper’

The deletion of V_1 in a $C_1V_1C_2V_2$ structure produces a $C_1C_2V_2$ structure. What is crucial here is that although V_1 is deleted, the tone is not deleted but is set afloat and is later re-linked to the now only available tone-bearing unit to the right. The result is a LH contour tone since there previously had been a High tone already linked to this TBU. Again as we show in (5).

4.7.3 Devocalisation/Loss of syllabicity

It is not always the case that a vowel deletes when there are two contiguous vowels at a word boundary. Vowel quality and order determines whether a vowel is deleted or whether there is loss of syllabicity. Where there are two contiguous vowels but vowel deletion fails to occur, one possible outcome in this scenario is a glide formation, iff V_1 is a High vowel, /i, u/. When a glide is formed from contiguous vowels, there is loss of syllabicity and the glide can no longer support the tone of the vowel, which is then set afloat to be re-linked to the next TBU to the right. Let us consider the examples in (6)

- (6) kpǐ ++ étó → kpjětó ‘cut (a) tree’
 CV VCV CCVCV
 dí ++ ùtòk → djútòk ‘come for a
 quarrel’
 CV VCVC CCVCVC

Observe that in these examples, a preceding high front vowel loses its syllabicity and is devocalised. Its licensed tone is now delinked and re-associated to the TBU to the right, creating both LH and

HL contour tones, depending on the adjacent input tones.

4.7.4 Tonal templates

What we refer to as ‘tonal templates’ are more commonly known as tonal melody in tonal literature. Certain items or grammatical constructions have specific tonal templates, irrespective of the length of the syllable. Such tonal templates are quite common in Ibibio and if they consist of polar tones, contour tones may be created where the syllable length is unable to support a one-to-one association of the tonal template. We illustrate with simple examples of the imperative contrastive reduplication in Low toned verbs in (7) leaving out the more complicated cases.

- (7) b̀ò ‘receive’
 b̀ò̀ò̀-b̀ò̀ ‘receive rather than ...’
 b̀èt ‘push’
 b̀èè-b̀èt ‘push rather than ...’
 k̀èrè ‘be called’
 k̀èè-k̀èrè ‘be called rather than ...’
 s̀ò̀ò̀ ‘squat’
 s̀ò̀ò̀-s̀ò̀ò̀ ‘squat rather than ...’

In these examples, the tonal template for the imperative contrastive reduplication, as far as the Low toned verbs are concerned, is the LH-HL, irrespective of the available number of syllables. The reduplicant has a LH pattern while the verb stem changes to a HL pattern. Observe that the reduplicant is uniformly CVV but the verb stem varies between a monosyllable and a disyllable. What is important for the discussion is that when a stem is monosyllabic, the HL tonal template shrinks onto the only available TBU, creating a HL contour tone. However, in a disyllabic stem, the HL template stretches to accommodate the two polar tones and no contour tone is created. For more detailed discussion of this see Akinlabi and Urua (2000).

- (7b) ñkóyò → ñkò

In the female personal name, ñkóyò, the tonal template is LHL, irrespective of the

syllable size. In the long version of the name, the tones of the template are realised per syllable but in the short version the tonal template is realised on the two available syllables, with the result that a HL contour is created on the final syllable of **ńkó**.

4.7.5 Contour simplification

Contour tones may be simplified to level tones in grammatical processes. For instance, verbs with LH contour pattern are regularly simplified to Low, and they then pattern with Low tone verbs as we saw in (7) above. Examples of tonal simplification follow in (8).

- (8) **ńíé** ‘sit’
áké **ńíé** **ké** **àkwàń** ‘S/he/it sat on the bed.’
dùó ‘fall’
áké **dùò** **ké** **úsáń** ‘S/he/it fell on the road.’

Notice that the LH contours on the verbs have been simplified to L in the underlined verbs in the above two sentences.

5. Functions of tone in Ibibio

Whether or not tone systems exploit tone for lexical and/or grammatical purposes is one way in which tone systems have been typologised. Certain systems have been shown to make a more extensive use of lexical tone (Asian tone systems), while others manifest more grammatical function of tone (African and native American languages). For a summary of the characteristics peculiar to each system see Ratliff (1992).

Although it makes a rich use of lexical tone, by far the more interesting aspect is the Ibibio grammatical tone. Ibibio has an extremely dynamic and complex grammatical function of tone. Kaufman (1968) first discussed grammatical tone in Ibibio which she called ‘construction tones’. Word classes may sometimes be distinguished by its tonal pattern. Disyllabic verbs almost always end in a predictable High tone, e.g., **kéré** ‘think’

and **kéré** ‘be called/be named’ plus a number of other grammatical categories relating to nouns, verbs, etc. which are marked by a modification of the tonal pattern and often by tones, independent of segmental melody. Such unanchored tones are referred to as ‘floating’ tones, discussed in Section 4.5 above. But because the grammatical function of tone in Ibibio is so robust, we will discuss just a few examples of grammatical tone in this paper.

5.1 Grammatical Tone

Commenting on what she refers to as ‘construction tones’, i.e., grammatical tones, Kaufman (1968:23) says of Ibibio ‘These tonal morphemes ... cancel out the inherent tones of some or all of the constituent morphemes and replace them with an overriding tone (pattern)’. Grammatical tone in Ibibio provides a far more interesting and complex analysis than lexical tone. First we present grammatical tone in the associative constructions, which is widely known and documented in many African tone systems.

5.2 Associative Constructions

5.2.1 Noun noun constructions

- (9)
- | | |
|---|---|
| $N_1 + AM + N_2$ | |
| HH + $\underline{H\bar{L}}$ + HH | → HHHL |
| ú b òk + ú t óm | → ú b òhútóm |
| | ‘work of (the) hand (handwork)’ |
| HL + $\underline{H\bar{L}}$ + HH | → HLHL |
| ú f òk + ú t óm | → ú f òhútóm |
| | ‘place of work (office)’ |
| H!H + $\underline{H\bar{L}}$ + HH | → H!HHL |
| ó! b (ó)ò ń + ú t óm | → ó! b (ó)ò ń útóm |
| | ‘king of work’ |
| LL + $\underline{H\bar{L}}$ + HH | → LLHL |
| ò f ò ń + ú t óm | → ò f ò ń útóm |
| | ‘cloth for work (working clothes)’ |
| LH + $\underline{H\bar{L}}$ + HH | → LHHL |
| ín ó + ú t óm | → ín ó útóm |
| | ‘thief of work’ |
| HH + $\underline{H\bar{L}}$ + HL ~ HHL | → HHHL |
| ú t óm + ú f òk | → ú t ómú f òk |
| | ‘work of (the) house’ |
| HL + $\underline{H\bar{L}}$ + HL ~ HHL | → HLHL |
| ís ò ń + ú f òk | → í s ò ń ú f òk |
| | ‘floor of (the) house’ |
| H!H + $\underline{H\bar{L}}$ + HL ~ HHL | → H!HHL |
| ó! b (ó)ò ń + ú f òk | → ó! b (ó)ò ń ú f òk |
| | ‘king of (the) house’ |

LL + H _L + HL ~ HHL	→	LLHL	
èdèm + úfòk	→	èdèmúfòk	
			'back of (the) house'
LH + H _L + HL ~ HHL	→	LHHL	
ĩnò + úfòk	→	ĩnòúfòk	
			'thief of (the) house'

HH + H _L + LL	→	HHHL	
úbòk + èkpàt	→	úbòhèkpàt	'handle of bag'
HL + H _L + LL	→	HLHL	
úfòk + èkpàt	→	úfòhèkpàt	'house for bags'
H!H + H _L + LL	→	H!HHL	
ó!b(ò)òñ + èkpàt	→	ó!b(ò)òñèkpàt	'king of bags'
LL + H _L + LL	→	LLHL	
èdèm + èkpàt	→	èdèmèkpàt	'back of bag'
LH + H _L + LL	→	LHHL	
ĩnò + èkpàt	→	ĩnòèkpàt	'thief of bag'

We selected disyllabic nouns from all the possible tone patterns. In the data in (9) above, it is observed that in all the tonal combinations, the tonal pattern of the first noun remains unchanged. This is not the case with the second noun. The basic or underlying tonal pattern of the second noun changes to a HL⁺ (the + sign after the L means that after the first syllable which bears the H tone, subsequent syllables bear a Low tone) pattern if they had underlying H-H, H-L ~ H-HL and L-L. The grammatical morpheme for this construction, we suggest is a floating H_L tone, originally associated with a disyllabic item (Urua, 2001). The reason for our position is the following:

First when we consider second nouns with underlying H-H, H-L ~ H-HL and L-L patterns, we note that in every instance they are replaced with a HL⁺ pattern. Postulating just a single floating L_o tone does not account for why the nouns with initial High tones now have a H. Urua (1990) postulated a H_o, but this has been seen on hindsight not to capture the situation correctly since a floating H_o does not also explain the presence of the Low tone on the second syllable of nouns without any such underlying Low tone. A floating H_L tone, which marks the noun plus noun associative construction, seems to best explain why the second nouns all have a HL⁺ pattern. We consider this process to be replacive, i.e., the floating H_L which marks this construction replaces the underlying tonal pattern of the noun,

irrespective of the basic tone of the noun as we observe in all the examples in (9) above. Next we look at nouns with basic LH and H!H tones presented in (10).

(10)			
HH + H _L + LH	→	HHH!H	
útóm + ìnò	→	útómí!nò	'work of (the) thief'
HL + H _L + LH	→	HLH!H	
úfòk + ìnò	→	úfòkí!nò	'house of (the) thief'
H!H + H _L + LH	→	H!HH!H	
ó!b(ò)òñ + ìnò	→	ó!b(ò)òñí!nò	'king of (the) thieves'
LL + H _L + LH	→	LLH!H	
èkpàt + ìnò	→	èkpàrí!nò	'bag of (the) thief'
LH + H _L + LH	→	LHH!H	
ìwá + ìnò	→	ìwáí!nò	'cassava of (the) thief'

HH + H _L + H!H	→	HHH!H	
útóm + ó!bòóñ	→	útóm ó!bòóñ	'work of (the) king'
HL + H _L + H!H	→	HLH!H	
úfòk + ó!bòóñ	→	úfòh ó!bòóñ	'house of (the) king'
H!H + H _L + H!H	→	H!HH!H	
ìnuén + ó!bòóñ	→	ìnuén ó!bòóñ	'bird of (the) king'
LL + H _L + H!H	→	LLH!H	
èdèm + ó!bòóñ	→	èdèm ó!bòóñ	'back of (the) king'
LH + H _L + H!H	→	LHH!H	
ìwá + ó!bòóñ	→	ìwá ó!bòóñ	'cassava of (the) king'

With nouns in this class, the situation appears to be different. When the second noun has an underlying L-H or H!H pattern, then the tone pattern of the second noun changes to a H!H. Total replacement of the tonal pattern of the second noun seems to be blocked when the noun has a LH or H!H pattern. In the LH nouns, the source of the downstepped High tone is obvious, an already present LH tone sequence and in H!H sequence, the immediately preceding L tone to the left of the downstepped High tone. Where the second noun has a LH pattern, the initial H_o of the H_L marker replaces the first tone which is L while the L_o downsteps the H of the noun. This explains the presence of the H!H tone on the second noun. Where the second noun has already been downstepped, the H_o again merges with the present H and the L_o is redundant since it

now encounters an already downstepped High tone.

Further evidence to suggest that the grammatical morpheme here is a $H\bar{L}_\circ$ tone comes from synchronic sources. In Urua (2001), we discuss the possessive morpheme $\acute{a}k\grave{e} \sim \acute{e}k\grave{e} \sim \acute{a}m\grave{e} \sim \acute{e}m\grave{e}$ meaning ‘belonging to’. For instance, $\acute{a}k\grave{e} \grave{e}n\grave{o}$ means ‘belonging to Eno’. This morpheme has a HL pattern and if we assume that the nouns in (9) and (10) above have some kind of possessive relationship, then it seems plausible to argue that such a morpheme with segmental component must have existed but which has now lost its segmental component, leaving behind its tonal pattern, which is a $H\bar{L}_\circ$.

5.1.5 Tone and Relativisation

Relative constructions in Ibibio are characterised by the lowering of all the tones on the verb (this tone lowering is not peculiar to relative constructions only). But this is not the entire story; in addition, there is also prefixation and suffixation of segmental material which we present in (11) and (12). The prefixes appear before the verb and the suffixes occur after the verb. For instance in $\acute{a}\acute{a}\text{-}s\grave{e}\grave{e}\text{-}h\grave{e}$ ‘one who looks’, an example taken from (11), $\acute{a}\acute{a}\text{-}$ is the prefix, $se\text{-}$ is the verb root and $-h\grave{e}$ is the suffix.

(11) High toned Verbs (Present tense)

$s\acute{e}$	“look”
$\acute{a}\acute{a}\text{-}s\grave{e}\grave{e}\text{-}h\grave{e}$	“one who looks”
$y\acute{e}t$	“wash”
$\acute{a}\acute{a}\text{-}y\acute{e}t\text{-}t\grave{e}$	“one who washes”
$d\acute{a}\acute{a}r\acute{a}$	“rejoice”
$\acute{a}\acute{a}\text{-}d\acute{a}\acute{a}r\acute{a}\text{-}k\grave{e}$	“one who rejoices”

(12) Low toned Verbs (Present tense)

$n\grave{o}$	“give”
$\acute{a}\acute{a}\text{-}n\grave{o}\grave{o}\text{-}h\grave{o}$	“one who gives”
$nw\grave{a}n$	“dry”
$\acute{a}\acute{a}\text{-}nw\grave{a}n\text{-}n\grave{a}$	“one who dries”
$d\grave{a}\grave{a}r\acute{a}$	“rinse”
$\acute{a}\acute{a}\text{-}d\grave{a}\grave{a}r\acute{a}\text{-}k\grave{e}$	“one who rinses”

Although the verbs have a CV suffix, note that each verb structure has different suffix content – monosyllabic CV verbs have either a uvular trill or uvular approximant as the C while the V is a copy or modification of the stem vowel; monosyllabic CVC verbs have the coda C as the C of the suffix with the vowel is a copy or modification of the stem; disyllabic verbs have an invariant CV suffix which is $-k\acute{e}$.

As previously pointed out in several places, the final syllable of an Ibibio disyllabic verb is predictably High toned, whether or not the verb is basically Low or High toned. Observe, however, that the verbs plus the suffixes have Low tones in the relative constructions in (11 – 12). The prefix $/\acute{a}\acute{a}\text{-}/$, which marks the pronoun, has a HL tone. Again, we postulate, in addition to the prefix a floating L_\circ tomorph which replaces the basic tone of the verbs.

In (13) and (14), we present the behaviour of relativised verbs in the past tense. Two types of past tense markers occur in Ibibio, the simple past tense $m\acute{a}\text{-}$ and another $k\acute{e}\text{-}$. The $k\acute{e}\text{-}$ marker is used in marked sentences such as relative, negative, progressive past, etc., while $m\acute{a}\text{-}$ is used in simple sentences.

(13) Relativised past tense verbs: High toned Verbs

$s\acute{e}$	“look”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}s\acute{e}\acute{e}\text{-}h\acute{e}$	“one who looked”
$y\acute{e}t$	“wash”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}y\acute{e}t\text{-}t\acute{e}$	“one who washed”
$d\acute{a}\acute{a}r\acute{a}$	“rejoice”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}d\acute{a}\acute{a}r\acute{a}\text{-}k\acute{e}$	“one who rejoiced”

(14) Low toned Verbs

$n\grave{o}$	“give”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}n\grave{o}\grave{o}\text{-}h\grave{o}$	“one who gave”
$nw\grave{a}n$	“dry”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}nw\grave{a}n\text{-}n\grave{a}$	“one who dried”
$d\grave{a}\grave{a}r\acute{a}$	“rinse”
$\acute{a}\acute{a}\text{-}!k\acute{e}\text{-}d\grave{a}\grave{a}r\acute{a}\text{-}k\acute{e}$	“one who rinsed”

Obviously, a tomorph is involved here – this time we that assume it is either the

preceding Low tone on the second /áà-/ prefix, which lowers the High tone of the past tense marker, *ké*, to a !H or more plausibly, a floating L_0 tomorph. We assume it is a floating L_0 tone since it has already been seen to mark relative constructions in general. Notice, however, that in the examples in (13 – 14), the basic tones of the verbs are left intact (although phonetically, the downstepped High tone on !*ke* sets a ceiling beyond which subsequent High tones may not exceed). We present the future tense with relative constructions in (15 – 16)

(15) Relativised future tense verbs: High toned Verbs

sé	“look”
áà-!dī-sé	“one who will look”
yét	“wash”
áà-!dī-yét	“one who will wash”
dáárá	“rejoice”
áà-!dī-dáárá	“one who will rejoice”

(16) Low toned Verbs

nò	“give”
áà-dī-nò	“one who will give”
nwàn	“dry”
áà-dī-nwàn	“one who will dry”
dààrá	“rinse”
áà-dī-dààrá	“one who will rinse”

The future tense is marked by *yá* and *yàá* in regular unmarked sentences. But /*dī*/ may be used in marked sentences, such as relative constructions, as we find in (15 – 16) above. In these examples, the construction is marked by a prefix and a floating L_0 tomorph. The presence of the L_0 downsteps the high portion of the HL contour tone of the future marker in this construction. This process of the floating L_0 tone downstepping only one portion of the HL contour tone is further support for the position that contour tones in Ibibio are combinations of level tones. As in the past tense examples in (13 – 14) above, the basic tonal patterns of the verbs remain unaltered. There are no suffixes here. This confirms the suggestion that a floating L_0

tomorph marks relative constructions in Ibibio. This floating L_0 can be completely replacive as in the present relativised verbs, however, when it encounters an intervening High tone between it and the verb stem, it only downsteps the intrusive High tone, as we find in the past and future relativised verbs.

The crucial question that this raises is: why does the L_0 not downstep the High toned verbs in (11-12) but only downsteps the High tone of the tense markers in (13-16)? One of two possibilities is suggested here. First, we can argue that the tense markers have an underlying L tone, i.e., the pattern of the tense markers is not just H but L_0H . Or secondly, we can say that there is a constraint barring two contiguous High tones from occurring together in this construction. Our thinking is that the L_0 , which marks this construction, has only a local effect, any intrusive High tone blocks the entire lowering process causing only the immediate adjacent High tone to be downstepped.

In concluding this section, we show that the L_0 characterises the *ké*- type of past tense marker as opposed to the simple past *má*-, which is beyond the scope of this paper.

6. Implications for phonological theory

In examining the tone system of Ibibio, the data presented has shown the independence of tones with evidence from grammatical tones, floating tones and tonal melody. The data thereby affirms the autonomy of tone systems as postulated in Autosegmental Phonology (Goldsmith 1976, etc). The issue of contour tones has been discussed and further evidence makes us conclude that they are combinations of level tones and should be treated as variants of the level tones, High and Low in Ibibio. Our evidence come from phonetic and phonological sources. On the phonetic side, there is no difference between the tonal shape of a contour tone and a sequence of two non-identical tones. And on the phonological end, we have seen how the endpoints of contour tones

behave like the endpoints of contour segments such as affricates. The Low portion of a HL contour tone downsteps a following H in certain grammatical constructions, i.e. HL-H → HL!H ~ H!H and a floating $\underset{\cdot}{L}$ has been shown to downstep the High portion of a HL contour tone in certain kinds of grammatical constructions. This is further proof that contour tones in Ibibio are combination tones since both constituents never affect neighbouring tones as a unit. In addition, we have shown that tone spreading rules also account for the HL contour tone in Ibibio and also phonetically that the duration of a High tone extends to that of the Low tone, linking the tone bearing unit with the contour tone to two tone positions, in autosegmental terms. A majority of African tone systems with contour tones have been analysed as combination tones, although Grebo, a Kru language spoken in Liberia appears to have distinctive contour tones (Newman 1995 citing Newman 1986). It would be interesting to subject the Ibibio tonal data, especially its contour tones, to the theory of Tonal complexes discussed in Akinlabi and Liberman (ms).

From a constraints-based approach as proposed in Prince and Smolensky (1993), McCarthy and Prince (1993), the Ibibio tone system also supports the position that different varieties or dialects of a language rank the constraints in a different order. Where, for instance, one Ibibio dialect may rank a High tone spreading on top of its list, another may not rank it as highly.

More light has also been shed on the intriguing and fascinating subject of the downstep tone. We have shown that although the downstepped High tone sets a ceiling after which a following tone may not exceed, in a list or repetitive utterance, this can be overturned because each item resets its own tone range.

7. Concluding remarks

We have attempted a comprehensive description of the Ibibio tone system, with a characterisation of its phonetic, phonological and grammatical aspects. The following constitute a summary of this study:

1. Ibibio is a terrace level tone system with contrastive !H tone.
2. Both High tones and Low tones exhibit downdrift when they alternate with non-identical tones.
3. There is little or no downdrift in sequences of identical tones.
4. Contour tones, High-Low and Low-High, have been shown to be combinations of the basic pitches.
5. The grammatical function of tone in Ibibio is as complex as it is fascinating.
6. The relevance of the Ibibio tone data in supporting phonological theory, especially Autosegmental Phonology and Optimality Theory has been clear.

We however, believe that there is still much more to be done especially in the area of the Ibibio grammatical tone for a better understanding of the issue.

References

- Akinlabi, A. & E. E. Urua 2000. Tone in Ibibio verbal reduplication. *Proceedings of the 2nd World Conference of African Linguistics Leipzig 1997* (eds.) H. Ekkehard Wolff & Orin D. Gensler, 279-291.
- Boys, W. E. 1979. *Ibibio phonology*. Ph.D. Dissertation, The Ohio State University, Ohio, USA.
- Connell, B. 1994. Lower Cross languages: a prolegomena to the classification of Cross River languages. *Journal of West African Languages* 24/1: 3-46.
- Connell, B. Tone languages and the universality of intrinsic F0: evidence from Africa. (submitted to *Journal of Phonetics*)
- Cook, T. L. 1985. *An integrated phonology of Efik Vol. 1*, Ph.D. Thesis, University of Amsterdam, The Netherlands.
- Elugbe, B. O. 1985. The tone system of Ghotuo. *Cambridge Papers in Phonetics and Experimental Linguistics* 4: 1-21.
- Elugbe, B. O. 2000. The tone system of Edoid languages (?).
- Essien, M. M. 1992. Deep-level High tone as a relational link in certain Ibibio constructions. *Journal of West African Languages* XXII/2, 59-67.
- Essien, O. E. 1983. *The orthography of the Ibibio language*. Calabar: Ibibio Language Panel/Paico Press and Books Ltd.

- Essien, O. E. 1990. *A grammar of the Ibibio language*. Ibadan: University Press Limited.
- Faraclas, N. G. 1989. Cross River. *Niger-Congo languages*. Bendor-Samuel, J. (ed.), Lanham: University Press of America, 377-399.
- Goldsmith, J. A. 1976. *Autosegmental phonology*. Ph.D dissertation, MIT. New York: Garland Press.
- Hyman, L. M. 1975. *Phonology: theory and analysis*. New York: Holt, Rinehart Winston.
- Kaufman, E. M. 1968. *Ibibio grammar*. Ph.D. dissertation. University of California, Berkeley.
- McCarthy, J. J. and A. Prince 1993. Generalised alignment ms. University of Massachusetts and Rutgers University.
- Newman, P. 1995. Hausa tonology: Complexities in an "Easy" tone language. J. A. Goldsmith (ed.) *The Handbook of phonological theory*. Oxford: Blackwell Publishers Ltd, 762-781.
- Prince, A. and P. Smolensky 1993. Optimality theory: constraint interaction in generative grammar, ms. Rutgers University and University of Colorado.
- Umoh, F. A. 1985. Aspects of Ibibio phonology: An Autosegmental approach. Ibadan, M.A. Project, University of Ibadan, Nigeria.
- Ratliff, M. 1992. Form and function in tone languages. *Proceedings of the Eighteenth Annual Meeting of the Berkeley Linguistics Society, Special Session on the Typology of tone languages*, 134-144, (eds.) L. A. Buszard-Welcher, J. Evans, D. Peterson, L. Wee and W. Weigel.
- Stewart, J.M. (1983) Downstep and floating low tones in Adiokrou. *Journal of African Languages and Linguistics*, 5 57-78.
- Urua, E. E. 1987. *Segment deletion and aspects of tone in Ibibio*. MA Project. University of Ibadan, Ibadan, Nigeria.
- Urua, E. E. 1990. *Aspects of Ibibio phonology and morphology*. Ph.D Dissertation. University of Ibadan, Ibadan, Nigeria.
- Urua, E. E. 1995. The status of contour tones in Ibibio. *Theoretical approaches to African Linguistics* (ed.) Akinbiyi Akinlabi, 329-343.
- Urua, E. E. 1996/1997. A phonetic analysis of Ibibio tones. *Journal of West African Languages* vol. XXVI (1), 15-26.
- Urua, E. E. 1997. Object position in Eastern Lower Cross. *Object position in Benue-Kwa*. Victor Manfredi and Rose-Marie Dechaine (eds.), HIL Publications, The Hague: Holland Academic Graphics, 189-206.
- Urua, E. E. 2000. *Ibibio phonetics and phonology*. Cape Town, South Africa: Centre for Advanced Studies of African Society.
- Urua, E. E. and S. Bird 1994. The phonetic description of Ibibio tones. *Proceedings of the University of Edinburgh Dept. of Linguistics Conference*, 210-216.
- Welmers, W. E. 1973. *African language structures*. Berkeley: University of California Press.
- Winston, F. D. D. 1960. The 'mid-tone' in Efik. *African Language Studies* 1: 185-192.