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Lexical tone contrast in Izon as ubiquitous floating tone

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This paper establishes the lexical tone contrasts in the Nigerian language Izon, focusing on evidence for floating tone. Many tonal languages show effects of floating tone, though typically in a restricted way, such as occurring with only a minority of morphemes, or restricted to certain grammatical environments. For Izon, the claim here is that all lexical items sponsor floating tone, making it ubiquitous across the lexicon and as common as pre-associated tone. The motivation for floating tone comes from the tonal patterns of morphemes in isolation and within tone groups. Based on these patterns, all lexical morphemes are placed into one of four tone classes defined according to which floating tones they end in. Class A morphemes end in a floating Ⓛ(Ⓗ) (/tà$^{(Ⓛ)Ⓗ}$/ 'wife'), class B in Ⓗ (/fú$^{Ⓗ}$/ 'salt'), class C in (/wún$^{Ⓛ}$/ 'sand'), and class D in ⒽⓁ (/wò$^{ⒽⓁ}$/ 'him'). This paper provides extensive empirical support for this analysis and discusses several issues which emerge under ubiquitous floating tone. Issues include the principled allowance of OCP(T) violations, and the propensity for word-initial vowels and low tone to coincide.

Keywords: prosody; lexical contrast; floating tone; tone association; Ijoid

1 Introduction

One of the most influential developments in 20th century phonology was formally separating the segmental tier from the suprasegmental tier, codified in the work of Autosegmental Phonology (Goldsmith 1976). A major part of its continuing success is its ability to represent multiple kinds of tonal configurations involving a tone (T) and a tone-bearing unit (TBU, conventionalized as τ), the structural unit to which the tone associates. Potential configurations are shown in Table 1, which include 'deficient' structures lacking either a tone (a.) or a TBU (b.), non-deficient structures where the two are associated (c.), structures where they both occur but remain unassociated (d.), or some combination (e.):

Table 1: Types of tonal configurations using autosegmental representation

			Ⓣ		T		Ⓣ		T	Ⓣ	
					|				|		
a.	τ	b.		c.	τ	d.	τ	e.	τ		

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Several of these configurations involve tones unassociated to TBUs, a representation referred to as 'floating tone' and notated with a circled Ⓣ. In most languages, floating tones are restricted in some way, such as appearing only on a minority of morphemes within the lexicon, or being restricted to some grammatical context (i.e. grammatical tone). The analytic claim of this paper is that in Izon – an Ijoid language of Nigeria's Niger Delta region – *all* lexical morphemes contain floating tones as part of their underlying representation. I refer to this as UBIQUITOUS FLOATING TONE, a typologically unusual system wherein floating tones constitute a core component of phonological contrast, with remarkable stability across the Izon dialect continuum (Williamson 1988). The motivation for floating tone comes from the tonal effects lexical morphemes exhibit in isolation and within multi-morpheme tone groups. The tone of all non-initial morphemes within the tone group is deleted and replaced by floating tones idiosyncratically associated by the initial morpheme.

Building on pioneering work on Ijoid in Williamson (1988), I present evidence that lexical morphemes fall into four tone classes, looking at two closely related dialects of Izon – Gbarain Izon and Kolokuma Izon. Classes are defined based their systematic effect on the following words, e.g. replacement by a LH pattern (class A), replacement by all H (class B), by all L (class C), or by a HL pattern (class D). Each of these replacement patterns is analyzed as a sequence of floating tones which appear after any pre-associated tones. This is illustrated below with four examples of nouns in object position, whose floating tones replace those of the verb /ẹ̀rí́/ 'see':

(1) Four tone classes in Izon – Defined based on their replacive tone pattern

a.	Class A:	ends in ⓁⒽ	/ tà$^{ⓁⒽ}$	+	ẹ̀rí́ /	→	[tà ẹ̀rí́]	'see wife!' [Gb-20190714:60]
b.	Class B:	ends in Ⓗ	/ fú$^{Ⓗ}$	+	ẹ̀rí́ /	→	[fú ẹ́rí́]	'see salt!' [Gb-20190714:60]
c.	Class C:	ends in Ⓛ	/ wún$^{Ⓛ}$	+	ẹ̀rí́ /	→	[wún ẹ̀rì]	'see sand!' [Gb-20190714:60]
d.	Class D:	ends in ⒽⓁ	/ wò$^{ⒽⓁ}$	+	ẹ̀rí́ /	→	[wè ẹ́rì]	'see him!' [Gb-20190706:30]

This paper highlights a number of issues which emerge under ubiquitous floating tone representations. First, Izon allows OCP(T) violations within a morpheme if the first tone is pre-associated and the second is floating (i.e. H Ⓗ), as long as the identical tones are linked to different phonological words. Second, vowel-initial targets have special effects on floating tone association, wherein a preference emerges for low tone and onsetless syllables to coincide. I analyze the initial vowel here as extrametrical, resulting from a misalignment of morphological and prosodic constituency (following Downing 1998). Finally, towards the end of this paper, I directly compare the floating tone analysis to an alternative involving 'obligatory tone spreading', whereby the final tone of a word is required to spread across its word boundary. Common to both approaches is that the tonal effects can be interpreted as the phonologization of pitch carry-over within its tonal domain (McPherson 2016).

This paper is structured as follows. §2 provides a brief overview of the Izon language, its tone system, and defines certain terms used throughout this paper. §3 establishes the four tone classes (A–D, above) and explicates their analysis via floating tone. §4 presents discussion on three final issues: the frequency of each tone class, a comparison of the attested Izon patterns to the logically possible patterns to determine systematic gaps, and contrasting the analysis of this paper with the alternative involving obligatory tone spreading. A summary is in §5, followed by four appendices. Appendix D in particular provides information on the conventions used in data citation, as well as background on data collection, subsequent databases, archiving information of recordings, and select `.wav` files for data points used in this paper (found in the supplemental materials).

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2 Relevant background on Izon

2.1 The Izon language

Izon [orthography: Ịzọn – IPA: ìzɔ́ – ISO code: ijc] is an Ijoid language spoken in the extreme south of Nigeria in the Niger Delta region, often known by alternative names 'Ijo', 'Ịjọ', or 'Ijaw'. Jenewari (1989) characterizes Izon as constituting approximately 30 dialects, the most prominent in the linguistics literature being Kolokuma due to the work by Kay Williamson. Despite a high ethnic population of at least one million (Jenewari 1989: 107), Izon is an endangered language due to the growing dominance of Nigerian Pidgin English [pcm] (as well as Standard Nigerian English). In what follows, I use 'Izon' to refer to the language and 'Ijoid' to refer to the language family, and avoid the names 'Ijo'/'Ijaw'.[1]

The focus of this paper are two dialects of Izon, Gbarain Izon ([gbàrɑ́] or [gbàrɑ̀ɑ́ĭ]) and the aforementioned Kolokuma Izon ([kólókùmá]). They are geographically proximate and each other's closest Izon relative (99% cognates in a modified Swadesh list – Lee & Williamson 1990). The data from Gbarain Izon were collected by the author in collaboration with Jumbo Gift during fieldwork in Nigeria in 2017 and 2019. The Kolokuma Izon data come from Williamson (1965, 1978, 1983, 1988) and Williamson & Timitimi's (1983) Izon dictionary (updated in Williamson & Blench 2011). For all data points in this paper, I cite the source in subscripted square brackets, which minimally includes the dialect (abbreviated as [Gb] and [Ko]), the date collected, and the page number within the archived field notes (again, see Appendix D).

2.2 Linguistic profile

All Izon varieties exhibit advanced tongue root (ATR) harmony, with [+ATR] /i e o u ĩ ẽ õ ũ/, [-ATR] /ɪ ɛ ɔ ʊ ɪ̃ ɛ̃ ɔ̃ ʊ̃/, and neutral /a ã/. As common in Nigerian orthographies, [-ATR] is written as a dot under the vowel and contrastive nasal vowels are written with an <n> following the vowel, e.g. as in the name *Ịzọn*. Within a word, all non-low vowels must agree in ATR value, but the neutral vowels /a ã/ may co-occur with both sets. Although ATR harmony is categorical within morphemes, few alternations are seen across morphemes. For example, the [+ATR] root [sèĭ] 'be bad/spoiled' appears in a derived causative form [sèìmŏ] 'spoil' and shows mixed ATR values. In general, Izon has a very low degree of bound segmental morphology, and bound morphemes are generally treated as simple cliticization. There is no clear vowel length distinction. For this paper, the few morphemes which appear to have long vowels are interpreted as adjacent short vowels, e.g. [gbḛ̀ḛ̀kĭ] 'short'.

Consonants are /p b t d k g kp gb m n ng f v s z r l y w/ where /y/ is IPA [j] and /ng/ is IPA [ŋ]. Syllable structure is generally V or CV, although homorganic nasals preceding voiced stops are found in some words, e.g. [àndá] wrestle'. Syllabic nasals are common variants of high vowels in a nasal context, e.g. 'breast' as [ìndóú~n̩dóú], /mị/ PERFECTIVE (PFTV) as [mɪ~m̩], among others. Although there are no morpheme-final codas underlyingly, in faster speech deletion of /i~ị/ at morpheme boundaries is common, resulting in surface codas (e.g. /wárị bị/ as [wár bì] 'the house').

Like all Ijoid languages, Izon shows canonical head-final properties such as (i) postpositions, (ii) adjectives, numerals, demonstratives, possessors, and relative clauses before nouns, but determiners and quantifiers after nouns, (iii) subject-adjunct-object-verb word order, and (iv) verb-auxiliary order (auxiliaries constituting inflectional enclitics denoting tense, aspect, mood, negation, and question marking). These properties render Izon and the Ijoid family in general quite anomalous compared to all

[1] Several other Ijoid varieties are represented in the Africanist literature, such as Bumo Izon (Efere 2001), Nembe [ijs] (Rowlands 1960), and Kalabari [ijn] (Jenewari 1977, Harry 2004, Blench 2008, Harry & Hyman 2014). As a whole, however, the Ijoid family is critically under-described, in part attributable to the ongoing strife in the Niger Delta concerning Nigerian oil resources.

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neighboring language families, which generally show head-initial properties (Niger-Congo sub-families Defoid, Edoid, Cross-River, and Igboid).[2]

2.3 Tone preliminaries

Tone in Izon is a contrastive property of morphemes, therefore meeting the definitional criteria of a tone language (Welmers 1959, 1973, Hyman 2018). Izon has two tonemes, high tone /H/ and low tone /L/. In this paper, all tone is marked overtly with standard conventions, e.g. acute [á] for high tone and grave [à] for low tone. Instances of falling [â] and rising [ǎ] are interpreted as a sequence of high and low tones on a single mora, which I take to be the tone-bearing unit (TBU).

The position of underlying tones is not predictable, e.g. Gbarain H.L.L [ánggìsì] 'handkerchief', L.H.L [ọ̀tọ́kọ̀] 'mud', and L.L.H [àkàlú] 'moon'. Surface contours are typically found at the right word edge, e.g. L.L.H͡L [ìsùsû] 'garden egg' or L.L.L͡H [ègbèrǐ] 'story'. Surface patterns of strings of high tones are very common, e.g. L.H.H [ìkókú] 'waist' and H.H.H [tékélé] 'lift up', and nearly all lexical items occur with a H tone somewhere (either pre-associated or floating). Entirely L-toned surface patterns do not occur in the Gbarain Izon dialect and are rare in the Kolokuma dialect where they are restricted to names for places or people, e.g. L.L [ìgbòn] 'northerner, Hausa'.

This paper does not examine the regular tone rules in Izon which are not morphologically-/lexically-conditioned. There are at least two such operations in Gbarain Izon, H-absorption and low-to-mid raising. These are described in Appendix A.

2.4 Tone classes

It is impossible to discuss underlying tonal contrast in Izon without discussing 'tone classes' and 'tone groups', terminology stemming from Williamson (1978). In Izon, morphemes belong to idiosyncratic TONE CLASSES, defined informally as the following:

(2) Tone class: a lexical item's unique combination of (i) pre-associated tones, and (ii) the systematic tonal effect it has on the following words to their right

The number of tone classes in Izon depends on dialect and level/type of analysis. For the Gbarain and Kolokuma dialects, I establish four tone classes labeled A, B, C, and D, and a number of subclasses. As stated, class A lexical items assign a LH pattern to the following sequence of words to its right, class B assigns an all H pattern, class C an all L pattern, and class D a HL pattern; see (1) above. In this paper, I attribute these tonal effects as stemming from sequences of underlying floating tones. These floating tones cannot be predicted based on the pre-associated tone of either the triggering morpheme or the target. This is seen in the following minimal pair from Kolokuma Izon which have identical segments and pre-associated tonal structure:

(3) Kolokuma Izon – Minimal pair based on tone class [Ko-K&B11:5]

a. Class B: / àká$^{Ⓗ}$ / 'tooth' → [àká óvúrú] 'space between two front teeth'

b. Class C: / àká$^{Ⓛ}$ / 'corn' → [àká àpụ̀rà] 'corn sheath'

In the underlying representation, floating tones appear only at the right edge of a lexical item and replace all tones to its right. In (3) above, the underlying tone of the second word – /òvùrù$^{ⓁⒽ}$/ 'space between' and /àpụ́rà$^{Ⓛ}$/ 'skin' – has no effect on the surface.

[2] Due to Ijoid's distinct structural profile compared to the neighboring Niger-Congo families, the lack of convincing systematic sound correspondence to other Niger-Congo families, or clear form-meaning vestiges of the Proto-Niger-Congo noun class system or verbal extension system, sources such as Glottolog (Hammarström *et al*. 2021) treat Ijoid as an isolate family altogether.

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2.5 Tone groups

The domain within which these floating tones show an effect is called the TONE GROUP, defined in (4):

(4) Tone group: The multi-morphemic unit which includes the morpheme sponsoring the floating tone and those morphemes to its right to which the floating tones are systematically assigned

Crudely, within a tone group the tone of all morphemes but the first are deleted, and are replaced by the floating tones of this first morpheme. Within the Africanist literature, this type of tonal phenomenon is often called 'replacive tone' (Welmers 1973: 132–133), and can be classified as a type of dominance effect (Kiparsky & Halle 1977, Inkelas 1998, Rolle 2018). The result is a complete neutralization of the underlying tones of the target morphemes, shown in a [MODIFIER NOUN] micro-paradigm in Table 2. Here, the lexical tone contrast of the nouns is neutralized and obligatorily replaced with the floating tones of the modifiers, whether Ⓛ Ⓗ from class A, Ⓗ from class B, or Ⓛ from class C. The data below is from Gbarain Izon.

Table 2: Gbarain Izon – Tone neutralization of nouns in tones groups

	Tone class		bùrùⓁⒽ 'yam'	námáⒽ 'meat'	
Modifier	A	èbìⓁⒽ	[èbì bùrú]	[èbì námá]	[LL ⓁⒽ]
		'good'	'good yam'	'good meat'	
	B2	ẹ̀ndị̀Ⓗ	[ẹ̀ndị̀ búrú]	[ẹ̀ndị̀ námá]	[LL ⒽⒽ]
		'that'	'that yam'	'that meat'	
	B3	ọ̀wọ́Ⓗ	[ọ̀wọ́ búrú]	[ọ̀wọ́ námá]	[LH ⒽⒽ]
		'alive, fresh, raw'	'raw yam'	'raw meat'	
	C	káláⓁ	[kálá bùrù]	[kálá nàmà]	[HH ⓁⓁ]
		'small'	'small yam'	'small meat'	

A simple spreading rule is insufficient to capture the tonal changes: some class B morphemes (subclass B2) end in L but sponsor a floating Ⓗ tone, while some class C morphemes end H but sponsor Ⓛ. Nor is a simple dissimilation rule sufficient, since class A both ends in and sponsors low, while subclass B3 ends in and sponsors a high. The tonal changes here are orthogonal to any phonological markedness conditions, e.g. the grammar preferring H over L, non-contours to contours, phrase-final low tones, etc. I will return to the role of tone spreading in understanding these patterns, and entertain an alternative analysis which attributes most floating tone effects to obligatory spreading (§4.3).

What defines a tone group? In Izon, tone groups largely correspond to major phrases: the noun phrase (NP) consisting of pre-modifiers and ending at the noun, and the verb phrase (VP) consisting of the complement object and ending at the verb. These may combine too, for example a [MODIFIER] [NOUN] [VERB] construction forms a single tone group. This paper will not discuss the details of tone group formation, only the tonal effects which take place after its formation, namely tonal replacement of all but the first. See Rolle (2018:§6.3ff.) for one proposal on tone group formation, discussing several competing analyses. An important issue which I return to is the behavior of the proposed floating tones when the following word's tones are *not* replaced (see §3.2.3).

3 The four tone classes

In each subsection below, I detail the patterns of the four tone classes (and their subclasses). This includes tonal forms in isolation and their forms in various tone groups. By virtue of all lexical items being classified into one of these four classes, all lexical items carry a floating tone, which was referred to as ubiquitous floating tone above. The analysis of this paper superficially resembles Williamson's (1988) analysis of Kolokuma Izon tone, which also captured tonal behavior by positing a combination of pre-associated and floating tones. A rudimentary comparison to Williamson's analysis is provided in Appendix C.

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3.1 Tone class A – Analysis as floating ⓁⒽ

We begin our discussion with class A which ends in a floating tone sequence ⓁⒽ. I first lay out the basic patterns of the Gbarain Izon dialect, then compare it to Kolokuma Izon.

3.1.1 Core patterns of class A in Gbarain Izon

Class A morphemes bear all low tones and sponsor a floating ⓁⒽ sequence. Example (5) shows that monosyllabic class A morphemes in Gbarain Izon are pronounced in isolation with a final rising tone, both for morphemes with a single vowel (a.) and those with two vowels forming a (surface) diphthong (b.). This is straightforwardly interpreted as the floating Ⓗ co-occurring with the lexical low.

(5) Gbarain Izon – Sample of class A (ⓁⒽ) monosyllabic forms in isolation

a.	dì$^{ⓁⒽ}$	[dǐ]	‘look at’	b.	bòù$^{ⓁⒽ}$	[bóú]	‘the bush’
	fà$^{ⓁⒽ}$	[fǎ]	‘finish’		dìè$^{ⓁⒽ}$	[dié]	‘share’ (split into sections)
	lẹ̀$^{ⓁⒽ}$	[lẹ̌]	‘hit’		sàị̀$^{ⓁⒽ}$	[sàí]	‘carry’ (in vehicle)
	sụ̀$^{ⓁⒽ}$	[sụ̌]	‘fight’		tụ̀ọ̀$^{ⓁⒽ}$	[tụ́ọ́]	‘cook’

With multi-syllabic class A items, multiple surface patterns are attested. The majority of tokens collected show an all low-pattern with a rise on the final TBU, mirroring the patterns in (5). An example set is in Table 3, including forms which end in a single vowel (a.–b.) and those with two (c.).

Table 3: Gbarain Izon – Class A multi-syllabic forms in isolation (majority pattern)

	UR: /L…$^{ⓁⒽ}$/	Surface: [L…L͡H]	Meaning
a.	bùrù$^{ⓁⒽ}$	[bùrǔ]	‘yam’
	dòrò$^{ⓁⒽ}$	[dòrǒ]	‘shout’
	àsị̀n$^{ⓁⒽ}$	[àsǐn]	‘blood’
b.	tùkònì$^{ⓁⒽ}$	[tùkònǐ]	‘praise’
	òkòlò$^{ⓁⒽ}$	[òkòlǒ]	‘voice’
	ọ̀gọ̀dụ̀mà$^{ⓁⒽ}$	[ọ̀gọ̀dụ̀mǎ]	‘duck’
c.	ọ̀sụ̀ọ̀$^{ⓁⒽ}$	[ọ̀sụ́ọ́]	‘rain’
	sùbèì$^{ⓁⒽ}$	[sùbèí]	‘gun’

In these patterns, the floating Ⓗ docks to the final TBU of the word which sponsors it, which I will refer to as ‘self-association’. In general, self-association in Izon primarily occurs when there is no host to the right of the trigger, though certain exceptions exist which I bring up at the appropriate point. In these patterns there is no evidence that the floating Ⓛ has any effect, and I therefore assume it deletes in isolation (or perhaps coalesces with the pre-associated low). During data collection, a small amount of variation with respect to tone association was documented. In the text body here, I strictly describe the majority patterns.[3]

In Gbarain, when class A lexical items are leftmost within the tone group, the floating ⓁⒽ sequence associates to the phonological words to the right of the sponsoring morpheme. This is exemplified below, with a single phonological word as the target. Example a. shows the class A noun /bùrù$^{ⓁⒽ}$/ ‘yam’ assigning its floating tones to the following lexically toneless words /kpọ/ ‘also’ and /kụmọ/ ‘only’. With single-TBU targets like /kpọ/, it was common to find both [kpǫ́] and [kpǫ̌] surface variants. Further, example b. shows a pre-nominal modifier /èbì$^{ⓁⒽ}$/ ‘good’ whose floating tones overwrite the lexical tones of the following noun. In this context, the majority of tokens show an all low pattern but high on the final TBU.

[3] For example, a minority of class A tokens were pronounced in isolation with a level high on the final TBU, e.g. /tụ̀kpà$^{ⓁⒽ}$/ ‘lamp’ as [tụ̀kpá], and /ị̀kpọ̀sọ̀$^{ⓁⒽ}$/ ‘dirt’ as [ị̀kpọ̀sǫ́]. Other items showed a different minority pattern, that of all low with no high at all, e.g. tokens of /tụ̀bọ̀$^{ⓁⒽ}$/ ‘child’ as [tụ̀bọ̀], and /bìlè$^{ⓁⒽ}$/ ‘dive in’ as [bìlè]. The lexical items exhibiting these minority patterns patterned identically to other class A items in all other regards, and in general class A is subject to more speaker and dialect variation than other tone classes. I therefore take these surface forms to be incidental surface variants of a single tone class.

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(6) Gbarain Izon – Class A association of floating ⓁⒽ in the tone group

a.	/ bùrù$^{ⓁⒽ}$	kpọ /	→	[bùrù kpǫ́ ~ kpǫ̌]	‘also yam’
	/ bùrù$^{ⓁⒽ}$	kụmọ /	→	[bùrù kụ̀mǫ́]	‘only yam’
b.	/ èbì$^{ⓁⒽ}$	bùrù$^{ⓁⒽ}$ /	→	[èbì bùrú]	‘good yam’
	/ èbì$^{ⓁⒽ}$	fụ́rǫ́ụ̀$^{Ⓛ}$ /	→	[èbì fụ̀rǫ̀ụ́]	‘good stomach’
	/ èbì$^{ⓁⒽ}$	dángílòkó$^{Ⓛ}$ /	→	[èbì dàngìlòkó]	‘good giant’

It is here that we see the evidence motivating the floating Ⓛ: the TBUs immediately following the first word are low-toned.

In tone groups with more than two morphemes, the ⓁⒽ sequence docks between the second and third phonological words in the tone group. In (7), the floating tones of the first word replace those tones of the second and third words. The second word appears with all low tones while the third appears with all high tones. This happens regardless of the number of TBUs in the second word, i.e. with 2 TBUs in (a.), 3 in (b.), and 4 in (c.). The tone group in c. is underlined. The words before and after it are not part of the tone group.

(7) Gbarain Izon – Class A association of ⓁⒽ between second and third words in tone group

a. / òsì$^{ⓁⒽ}$ námá$^{Ⓗ}$ wárị̀$^{Ⓛ}$ / [òsì nàmà wárị́] [Gb-20170711:21]
snail meat house ‘house of snail meat’

b. / ìnè$^{ⓁⒽ}$ gbẹ̀ẹ̀kị̀$^{ⓁⒽ}$ bùrù$^{ⓁⒽ}$ / [ìnè gbẹ̀ẹ̀kị̀ búrú] [Gb-20190705:23]
my short yam ‘my short yam’

c. [dèngí kị̀ <u>ìnè tègèrèì búrú</u> bị̀ à] [Gb-20190705:23]
/ dèngí$^{Ⓛ}$ kị̀ <u>ìnè$^{ⓁⒽ}$ tègèrèì$^{ⓁⒽ}$ bùrù$^{ⓁⒽ}$</u> bị̀ à /
where FOC my round yam DEF QUES
‘where is my round yam?’

The examples in (8) illustrate that the straddling of the floating tone sequence between the second and third words occurs in larger tone groups as well. All target TBUs in the third word and thereafter are high-toned, regardless of their length.[4]

(8) Gbarain Izon – Uniform association of class A ⓁⒽ in larger tone groups

a. / ìnè$^{ⓁⒽ}$ tárá dịbà$^{ⓁⒽ}$ bùrù$^{ⓁⒽ}$/ [ìnè tàrà dịbá búrú]
my three big yam ‘my three big yams’ [Gb-20170806:135]

b. / ìnè$^{ⓁⒽ}$ tárá$^{Ⓗ}$ dịbà$^{ⓁⒽ}$ kúlúkúlú$^{Ⓗ}$ bùrù$^{ⓁⒽ}$ / [ìnè tàrà dịbá kúlúkúlú búrú]
my three big black yam ‘my three big black yams’ [Gb-20190705:23]

The tonal association statements thus far hold for consonant-initial target words. Different patterns emerge if the target is vowel-initial, i.e. it begins with an onsetless TBU (effects of this type were previously identified for Izon in Williamson & Timitimi 1983:*xxx*). I refer to such vowel-initial TBUs as ‘V-TBUs’

[4] As discussed in footnote 3, a small amount of variation exists in these larger contexts. A minority of tokens were collected where a 2-TBU target surfaces with a final rising tone:

(i) Gbarain Izon variation: Minority pattern (cf. Majority pattern)
/ bùrù$^{ⓁⒽ}$ kụmọ / → [bùrù kùmǒ] ‘only yam’ ([… kụ̀mǫ́])

This variation is found with larger targets as well, e.g. targets with three or more TBUs, below. Across this variation, the floating Ⓛ consistently associates to the initial TBU of the target and the floating Ⓗ to the final.

(ii) Gbarain Izon variation in larger tone groups [Gb-20190702:7]
/ ìnè$^{ⓁⒽ}$ kúkíńdùkú$^{Ⓛ}$ ọmọ / ‘my sweet potatoes’
[ìnè kùkìǹdúkú ọ́mǫ́] (form provided by consultant)
[ìnè kùkíńdúkú ọ́mǫ́] ~ [ìnè kùkìǹdùkú ọ́mǫ́] ~ [ìnè kùkìǹdùkù ọ́mǫ́] ~ [ìnè kùkìǹdùkù ọ̀mǫ́]
(forms accepted by consultant when they were provided)

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(and its consonant-initial counterpart as 'C-TBUs'). In (9), the floating Ⓛ docks to the first V-TBU and the floating Ⓗ must dock immediately after it, onto the second TBU of the word (and thereafter). These association patterns hold regardless of the number of TBUs in the target (a.), or the number of words (b.).

(9) Gbarain Izon – Class A association of ⓁⒽ with V-TBU targets

a.	/ ìnèⓁⒽ	ínkìⓁ /	[ìnè ìnkí]	'my ink'	[Gb-20170711:20]
	/ èbìⓁⒽ	igbémáⒽ /	[èbì ìgbémá]	'good bell'	[Gb-20170723:78]
	/ mààⓁⒽ	ịsànịⓁⒽ/	[màà ịsánị]	'two peppers'	[Gb-20190702:4]
	/ òpùⓁⒽ	òpórìópòⓁ /	[òpù òpóríópó]	'big pig'	[Gb-20170711:21]
b.	/ ìnèⓁⒽ	ègbèrìⓁⒽ ọmọ /	[ìnè ègbérí ọ́mọ́]	'my stories'	[Gb-20170809:159]
	/ ìnèⓁⒽ	ịmbẹ̀lẹ́Ⓛ bùrùⓁⒽ /	[ìnè ịmbẹ́lẹ́ búrú]	'my tasty yam'	[Gb-20190705:23]

These data contrast with the patterns with C-TBUs, (6)–(8). There, in the majority pattern the Ⓗ associates to the rightmost TBU in the next word, e.g. [èbì dàngìlòkó], or the leftmost TBU of the third word, e.g. [òsì nàmà wárị́]. Importantly, the variation exhibited by C-TBUs is not replicated with V-TBUs (see footnotes 3 and 4); variants like *[òpù òpòrìòpó] 'big pig' are not attested.

These data suggest that low tones are attracted to V-TBUs, and that the floating tones in the ⓁⒽ sequence dock to adjacent TBUs. Attraction of the Ⓛ sequence to a V-TBU is illustrated with a 4-word tone group in (10) below. In a., the ⓁⒽ associates between the second and third words. In contrast, in b. the ⓁⒽ sequence docks entirely within the second word, pulled to the left from its 'normal' position of association. The pattern in c. shows that this floating sequence can also be pulled to the right if the third word begins with a V-TBU. Finally, d. shows that when both the second and third begin with V-TBUs, the sequence is oriented to the left.

(10) Gbarain Izon – Class A association with V-TBU targets in larger tone groups [Gb-20170806:135]

a.	/ ìnèⓁⒽ	táráⒽ	dịbàⓁⒽ	bùrùⓁⒽ /	[ìnè tàrà díbá búrú]
	my	three	big	yam	'my three big yams'
b.	/ ìnèⓁⒽ	èbìⓁⒽ	dịbàⓁⒽ	bùrùⓁⒽ /	[ìnè èbí díbá búrú]
	my	good	big	yam	'my good big yam'
c.	/ ìnèⓁⒽ	táráⒽ	òpùⓁⒽ	bùrùⓁⒽ /	[ìnè tàrà òpú búrú]
	my	three	big	yam	'my three big yams'
d.	/ ìnèⓁⒽ	èbìⓁⒽ	òpùⓁⒽ	bùrùⓁⒽ /	[ìnè èbí ópú búrú]
	my	good	big	yam	'my good big yam'

How can we account for the disparate behaviors of C- vs. V-TBU targets? I adopt an analysis where the initial vowel of the target domain is 'extrametrical' and not parsed as part of the following phonological word (p-words, ω). Compare the C- and V-TBU targets in Table 4 below, using data introduced above. In rows a. and b., the Ⓛ associates to the initial TBU in both. In row b., however, the initial vowel to which the Ⓛ associates is marked as extrametrical, marked in < > brackets. This therefore entails that the following C-TBU is what actually begins the phonological word. We may assume that the floating Ⓗ preferably associates to a word edge: if the left edge is occupied by the Ⓛ tone then it associates to the right edge (a.), but otherwise the Ⓗ associates to the leftmost free left-edge (b.). In the autosegmental representations, the underlying tonal structure of the target is in grey, constituting what is systematically replaced. The TBU to which the floating tones associate is represented as a solid line, and any TBUs to which this tone subsequently spreads are represented by dashed lines.

This analysis holds for multi-word targets as well, e.g. in rows c.–d. the Ⓛ docks to the following TBU, which is a C-TBU in c. but an extrametrical V-TBU in d. Consequently, the Ⓗ docks to the leftmost TBU of the first free phonological word, which is the third word (díbá) in c. but the second word (bí) in d. (from <è>(bí) *ebi* 'good'). Finally, in e. the floating Ⓛ is attached to the extrametrical <ò>, and the Ⓗ docks immediately after this.

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Table 4: Gbarain Izon – Autosegmental representations with initial V-TBU extrametricality

	Trigger		Target				Tone group
a.	L Ⓛ Ⓗ		H L H Ⓛ				L Ⓛ Ⓗ
	⋀	+	/⋀ | |			→	⋀ ↾ |
	èbì		dangiloko				(èbì)ω (dàngìlòkó)ω
	good		giant				'good giant'
b.	L Ⓛ Ⓗ		L HLH L Ⓛ				L Ⓛ Ⓗ
	⋀	+	| | || |			→	⋀ | ↾
	òpù		oporiopo				(òpù)ω <ò>(póríópó)ω
	big		pig				'big pig'
c.	L Ⓛ Ⓗ		H Ⓗ	L Ⓛ Ⓗ	L Ⓛ Ⓗ		L Ⓛ Ⓗ
	⋀	+	⋀	⋀	⋀	→	⋀ ↾ ↾
	ìnè		tara	dịba	buru		(ìnè)ω (tàrà)ω (dịbá)ω (búrú)ω
	my		three	big	yam		'my three big yams'
d.	L Ⓛ Ⓗ		L Ⓛ Ⓗ	L Ⓛ Ⓗ	L Ⓛ Ⓗ		L Ⓛ Ⓗ
	⋀	+	⋀	⋀	⋀	→	⋀ | ↾
	ìnè		ebi	dịba	buru		(ìnè)ω <è>(bí)ω (dịbá)ω (búrú)ω
	my		good	big	yam		'my good big yam'
e.	L Ⓛ Ⓗ		H Ⓗ	L Ⓛ Ⓗ	L Ⓛ Ⓗ		L Ⓛ Ⓗ
	⋀	+	⋀	⋀	⋀	→	⋀↖ | ↾
	ìnè		tara	opu	buru		(ìnè)ω (tàrà)ω <ò>(pú)ω (búrú)ω
	my		three	big	yam		'my three big yams'

Cross-linguistically, vowel-initial syllables/words often show anomalous prosodic effects compared to consonant-initial patterns. Odden (1995) and Downing (1998) present evidence of such effects looking at tone and prosodic domains in several Bantu languages. In Odden's (1995) study of Kikerewe [ked], vowels without onsets cannot bear tone. In a conditional construction, subject markers are assigned a high tone if they are consonant-initial (a.), which subsequently doubles to the following syllable. However, if the subject marker is vowel-initial, this high tone shifts to the following TBU (which again shows tone doubling).

(11) Kikerewe – Vowels without onsets cannot bear tone (Odden 1995: 97)
a. bá-ká-luunduma 'if they growl' b. a-ká-lúúnduma 'if he growls'

The core of these analyses is that vowels without onsets are non-optimal for starting prosodic constituents, and also non-optimal as tone-bearing units. I follow Downing (citing Inkelas 1989, 1993, a.o.) in interpreting extrametricality in Izon as misalignment between morphological and prosodic constituents. We will see with the other Izon tone classes how V-TBUs behave exceptionally, as well.

3.1.2 Core patterns of class A in Kolokuma Izon

Largely identical patterns are found for class A lexical items in the other dialect of focus, Kolokuma Izon. With forms in isolation, the high of class A's floating ⓁⒽ sequence generally docks to final TBU of the trigger. However, the Kolokuma dictionary (Williamson & Timitimi 1983, hereafter [W&T83]) describes a complex set of conditions dictating whether the final TBU surfaces as rising or level high. This is reflected in their dictionary's transcription convention, with rising tones represented via a doubled vowel (note that the vowel is not inherently long, and its phonetic duration is unclear). Representative examples are in Table 5. This dictionary was updated as Williamson & Blench (2011), hereafter [W&B11].

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Table 5: Kolokuma Izon – Sample of class A items in their isolation forms

	UR	Isolation	Meaning
a.	sụ̀$^{ⓁⒽ}$	[sụ̀ú]	‘fight’
	lẹ̀$^{ⓁⒽ}$	[lẹ̀é]	‘beat, sharpen’
b.	òpù$^{ⓁⒽ}$	[òpùú]	‘big, great, famous’
	àmà$^{ⓁⒽ}$	[àmàá]	‘right’
c.	dùò$^{ⓁⒽ}$	[dùó]	‘follow’
	pẹ̀ị̀$^{ⓁⒽ}$	[pẹ̀í]	‘break (a fragile thing)’
	ògòù$^{ⓁⒽ}$	[ògòú]	‘axe’
	ọ̀wẹ̀ị̀$^{ⓁⒽ}$	[ọ̀wẹ̀í]	‘fear, be forbidden’
d.	bị̀là$^{ⓁⒽ}$	[bị̀lá]	‘elephant’
	pẹ̀rẹ̀$^{ⓁⒽ}$	[pẹ̀ré]	‘be rich’
	àbàdị̀$^{ⓁⒽ}$	[àbàdí]	‘ocean’
e.	bùrù$^{ⓁⒽ}$	[bùrú ~ bùrùú]	‘yam’
	wụ̀rụ̀dụ̀$^{ⓁⒽ}$	[wụ̀rụ̀dụ̀ú]	‘be noisy’

If a morpheme is monosyllabic (row a.), of the shape VCV (b.), or ends in a diphthong (c.), the form in isolation is realized with a final rising tone. In other contexts such as CVCV or VCVCV words (d.–e.), the final TBU is a level high tone. In a minority of the dictionary entries there is “doubl[ing of] the final vowel when standing alone or emphasized” (W&T83:*xliii*), e.g. variation in [bùrú]~[bùrùú] ‘yam’ (row e.). The authors note that “this varies somewhat with different speakers” (p. *xliv*), and that in general vowel doubling can be found for emphasis and stylistic effect (p. *xlvi*). As stated, whether there is an underlying short vs. long vowel distinction is currently not resolved in Izon.

For Kolokuma Izon only, there exists a small exceptional subclass which I classify as subclass A2 (all other A morphemes are consequently classified as A1 in Kolokuma). With these A2 morphemes, K&W83 state that their pronunciation is all low even in isolation, with no final high. A complete list of A2 lexical items is in Table 6. These forms may end in a single vowel (a.), a diphthong (b.), or a double vowel (c.). I represent A2 as /L$^{ⓁⒽ*}$/, where the asterisk on the Ⓗ indicates that this floating tone does not show self-association. It remains to be tested whether these two classes in Kolokuma are consistently differentiated or are merely incidental variants.[5]

Table 6: Kolokuma Izon – Exceptional class A2 which surface as all L in isolation

	UR	Isolation	Meaning
a.	ùgè$^{ⓁⒽ*}$	[ùgè]	‘cry one calls when declared innocent’
	sèrì$^{ⓁⒽ*}$	[sèrì]	‘time, period’
	lụ̀ẹ̀kẹ̀$^{ⓁⒽ*}$	[lụ̀ẹ̀kẹ̀]	‘sway up and down’
	ìnìmà$^{ⓁⒽ*}$	[ìnìmà]	‘be stunted’
b.	kpàì$^{ⓁⒽ*}$	[kpàì]	‘completely finished’
	vàì$^{ⓁⒽ*}$	[vàì]	‘disappear completely’
	gbàìgbàì$^{ⓁⒽ*}$	[gbàìgbàì]	‘thump on’
c.	dẹ̀bẹ̀ẹ̀$^{ⓁⒽ*}$	[dẹ̀bẹ̀ẹ̀]	‘quiet, calm’
	fọ̀lọ̀ọ̀$^{ⓁⒽ*}$	[fọ̀lọ̀ọ̀]	‘be worn out’

Within tone groups, Kolokuma class A patterns by and large replicate the Gbarain patterns, shown in (12). With a 1-TBU target, the floating sequence docks to this final TBU (a.), while with two TBUs each

[5] It is of note that there are many ideophones in Kolokuma of class A2, e.g. [bẹ̀dẹ̀ẹ̀] ‘gently, calmly’, [gbàù] ‘with a thud’, [gèpèè] ‘stretching forward and gaping in an absorbed, rather unintelligent way’, [zàùù] ‘lonesome’, [zìì] ‘sound of heavy rain’, etc. All such ideophones end in a double vowel or diphthong. I do not survey ideophones in either dialect in this paper, which likely have phonological properties distinct from other parts of speech.

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tone docks to a TBU (b.). In larger tone groups the ⓁⒽ sequence straddles the second and third word with an initial C-TBU (c.), but associates entirely within the second word with an initial V-TBU (d.). These association patterns are identical to the findings of Gbarain.

(12) Kolokuma Izon – Class A ⓁⒽ association in a tone group

a.	/ ìfìrì$^{ⓁⒽ}$	fi̩$^{Ⓗ}$ /		[ìfìrì fí̩]	
	repayment	eat		‘receive compensation’	[Ko-W&T83:59,79]
b.	/ ìnè$^{ⓁⒽ}$	wárí̩$^{Ⓛ}$ /		[ìnè wàrí̩]	
	my	house		‘my house’	[Ko-W65:27]
c.	/ bùrù$^{ⓁⒽ}$	gbòrò$^{ⓁⒽ}$	kí̩mí̩$^{Ⓗ}$ /	[bùrù gbòrò kí̩mì̩]	
	yam	plant	person	‘yam-planter’	[Ko-W88:260]
d.	/ ìnè$^{ⓁⒽ}$	òpù$^{ⓁⒽ}$	wárí̩$^{Ⓛ}$ /	[ìnè òpú wàrì̩]	
	my	big	house	‘my big house’	[Ko-W65:98]

However, one can observe an important difference in Kolokuma. In Gbarain, the floating Ⓗ spreads rightward to all following TBUs within the group, e.g. [ìnè tàrà dí̩bá búrú] in (10) above. In Kolokuma, in contrast, TBUs after the floating tones are realized with default low tone, i.e. [ìnè òpú wàrì̩] ‘my big house’ in d. above. It can be concluded that Gbarain prefers to value toneless TBUs via spreading of the final tone, while Kolokuma prefers to value them by a default tone.

3.2 Tone class B – Analysis as floating Ⓗ

Next we examine class B which sponsors a floating Ⓗ tone. I treat Gbarain and Kolokuma Izon together as they show identical patterns. For each data set, I still denote it as Gbarain or Kolokuma.

3.2.1 Core patterns of class B in both dialects

Tone class B is split into three subtypes. The first (B1) is as an all H-toned morpheme which sponsors a floating Ⓗ tone, the second (B2) is represented as an all L-toned morpheme which sponsors a floating Ⓗ, and the third (B3) is a LH morpheme which sponsors a floating Ⓗ tone. These three subclasses are illustrated below with Gbarain Izon data, in isolation and in a simple tone group. In these tone groups, the tone of the target word (/bùrù$^{ⓁⒽ}$/ ‘yam’) is replaced with high tone.

(13) Gbarain Izon – Class B subclasses sponsoring Ⓗ

a.	B1: / tárá$^{Ⓗ}$ /	[tárá]	‘three’	→	[tárá búrú]	‘three yams’	[Gb-20170711:22]
b.	B2: / ẹ̀ndǐ$^{Ⓗ}$ /	[ẹ̀ndǐ]	‘that’	→	[ẹ̀ndì búrú]	‘that yam’	[Gb-20170711:21]
c.	B3: / ìné$^{Ⓗ}$ /	[ìné]	‘your’ (SG)	→	[ìné búrú]	‘your yam’	[Gb-20170809:155]

Example (14) shows that these patterns emerge regardless of the number of TBUs (a.) or words (b.–c.):

(14) Gbarain Izon – Class B targets receive all high pattern

a.	/ ìné$^{Ⓗ}$ kúkíńdùkú$^{Ⓛ}$ /	→	[ìné kúkíńdúkú]	‘your sweet potato’	[Gb-20190702:2]
b.	/ tárá$^{Ⓗ}$ dì̩bà$^{ⓁⒽ}$ bùrù$^{ⓁⒽ}$ /	→	[tárá dí̩bá búrú]	‘three big yams’	[Gb-20190703:11]
c.	/ kúlúkúlú$^{Ⓗ}$ òbórí$^{Ⓗ}$ pi̩ná$^{Ⓛ}$				
	black goat white	tí̩bí̩$^{Ⓗ}$ /	→	[kúlúkúlú óbórí pi̩ná tí̩bí̩]	
				‘a black goat’s white head’	[Gb-20190704:22]

In isolation, there is no evidence of this floating Ⓗ when the sponsor ends in high tone already (i.e. [tárá] ‘three’ in b. above). In the B2 pattern, however, the floating Ⓗ self-associates to its sponsor, resulting in a rising tone [ẹ̀ndǐ]. The presence of this rising tone distinguishes its use as the subject of a clause from its modificational use, shown in (15). In a., the modifier appears in subject position in a separate tone group

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and consequently surfaces as [ẹ̀ndǐ] with a final rise. The || indicates a tone group boundary, here between the subject and predicate. When acting as a modifier, the form surfaces as [ẹ̀ndì] (b.).

(15) Gbarain Izon – Class B2 minimal pair [Gb-20190702:2]

a. / ẹ̀ndì$^{Ⓗ}$ || kúkíńdùkú$^{Ⓛ}$ / → [(ẹ̀ndǐ) || (kúkíńdùkú)] ‘that is a sweet potato’

b. / ẹ̀ndì$^{Ⓗ}$ kúkíńdùkú$^{Ⓛ}$ / → [(ẹ̀ndì kúkíńdúkú)] ‘that sweet potato’

Unlike classes B1 and B3 which have many members, I have found only two words of class B2 in Gbarain, the other being /ị̀ndà$^{Ⓗ}$/ ‘how many’. In Kolokuma, there are no members. Two examples with this latter modifier are in (16). Note that the question particle /à/ falls outside of the tone group, and therefore surfaces with its lexical low tone.

(16) Gbarain Izon – Class B2 nominal modifier /ị̀ndà$^{Ⓗ}$/ ‘how many’ [Gb-20170711:22]

a. / ị̀ndà$^{Ⓗ}$ bùrù$^{ⓁⒽ}$ à / [(ị̀ndà búrú) à]
how.many yam QUES ‘how many yams?’

b. / ị̀ndà$^{Ⓗ}$ ìndì$^{ⓁⒽ}$ à / [(ị̀ndà ìndí) à]
how.many fish QUES ‘how many fish?’

Notice in b. that the Ⓗ does not directly dock to the initial V-TBU of the target, unlike consonant-initial targets. This represents another instance of V-TBUs showing exceptional tonal behavior, preferably associating to low tone of the first word rather than the floating Ⓗ. Parallel data are found with /ẹ̀ndì$^{Ⓗ}$/ ‘that’, e.g. in [ẹ̀ndì òpóríópó] ‘that pig’.

Comparable patterns are found for Kolokuma Izon subclasses B1 (/H$^{Ⓗ}$/) and B3 (/LH$^{Ⓗ}$/), in (17). These data are identical in Gbarain.

(17) Kolokuma Izon – Class B examples

a. B1: / dírí$^{Ⓗ}$ gụ́ọ́$^{Ⓗ}$ kịmí$^{Ⓗ}$ / [dírí gụ́ọ́ kịmí]
medicine make person ‘sorcerer’ [Ko-W88:269]

b. B3: / àmá$^{Ⓗ}$ nànà$^{ⓁⒽ}$ òwéí$^{Ⓗ}$ / [àmá náná áwéí]
town own man ‘king’ [Ko-W88:259]

Note that the floating Ⓗ spreads to all subsequent TBUs in the tone group in Kolokuma Izon, as it does in Gbarain. This is unlike the floating Ⓗ of class A in Kolokuma, which associated only to one TBU and those thereafter were valued with default low. Compare the form of non-initial words in class B context [dírí gụ́ọ́ kịmí] ‘sorcerer’ (a. immediately above) to class A context [bùrù gbòrò kịmì] ‘yam-planter’ (12).

An anonymous reviewer asks why high tone should spread in class B but not class A for Kolokuma. One way to understand this fact is that tone groups in Kolokuma prefer to maintain one single tone level, if possible. If the sole tone is H (as in class B contexts), then H spreads to maintain one tone level. If, however, the tones of the tone group contain both L and H (as in class A contexts), then spreading the final H would do nothing to maintain a one tone level. Instead, the (less marked) default low is inserted. An Optimality Theoretic constraint such as *CONTOUR(TONEGROUP) could model these patterns, defined as ‘a tone group does not have a contour (i.e. a transition from L to H, or H to L)’. Crucially, in B3 contexts the initial L is considered outside of the tone group due to initial extrametricality, discussed immediately below.

3.2.2 Near-complementarity of subclasses B1 and B3

While I have presented B1 and B3 as two subclasses, in both dialects they are in near-complementary distribution. In the majority of cases, if a class B morpheme begins with a consonant then it bears all high tones (the B1 pattern), but if it is vowel-initial then this vowel bears a low tone followed by all highs (the B3 pattern). This is shown in the Gbarain data in (18).

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(18) Gbarain Izon – Near-complementarity of B1 and B3

a. B3 vowel-initial (sample)

àlá$^{Ⓗ}$	'lazy'	ìsẹ́lẹ́$^{Ⓗ}$	'seed'	
àmá$^{Ⓗ}$	'town'	òróró$^{Ⓗ}$	'gutter, stream'	
ẹ̀rẹ́$^{Ⓗ}$	'name'	ọ̀wọ́$^{Ⓗ}$	'alive, fresh, raw'	etc.

b. B1 vowel-initial (complete list)

árú$^{Ⓗ}$	'canoe'	ọ́ụ́$^{Ⓗ}$	'calm air'
óú$^{Ⓗ}$	'(to) cry'	órú$^{Ⓗ}$	'native Izon deity'
óú$^{Ⓗ}$	'masquerade'	óyí$^{Ⓗ}$	'ten'

There are numerous members of the B3 class which begin with a low-toned vowel, a sample of which are in a. above. In contrast, there are very few class B1 members which begin with a high-toned vowel (hence, the near-complementarity); the complete list found for Gbarain is in b. above. All of these exceptional B1 forms begin with a non-high vowel, and either have no medial consonant (/óú$^{Ⓗ}$/ 'cry') or a high-sonorant medial consonant /r y/.

The consonant-initial B3 class is even smaller, consisting of only two items, /bọ̀ụ̀bọ́ụ́$^{Ⓗ}$/ 'very soft' and /bụ̀rụ̀bụ́rụ́$^{Ⓗ}$/ 'rotten' (both showing internal reduplication). An example is in (19), which is transparently related to class A /bụ̀rụ̀$^{ⓁⒽ}$/ 'be rotten'.

(19) Gbarain Izon – B3 consonant-initial example

/ bụ̀rụ̀bụ́rụ́$^{Ⓗ}$	bèrìbàà$^{ⓁⒽ}$ /	[bụ̀rụ̀bụ́rụ́ béríbáá]
rotten.REDUP	plantain	'rotten plantain'

[Gb-20190702:2]

No simple two-TBU morpheme exists in either dialect of the form /LH$^{Ⓗ}$/ with an initial C-TBU, i.e. non-attested *[bàrá$^{Ⓗ}$].

This near-complementarity is replicated in Kolokuma Izon. A greater number of exceptional vowel-initial B1 morphemes are found due to the available resources on Kolokuma being much greater at this point compared to Gbarain. The complete list is provided in Table 7. The near-complementarity of these subclasses is seen in pairs such as B1 /érí$^{Ⓗ}$/ 'dry' vs. B3 /èréín$^{Ⓗ}$/ 'day' in Kolokuma.

Table 7: Kolokuma Izon – Exceptional class B1 morphemes with high-toned initial vowel

Kolokuma	Meaning	
árí$^{Ⓗ}$	'trick'	(cf. àrú$^{Ⓗ}$ 'she')
árígídí$^{Ⓗ}$	'handwoven cloth from the north'	
árụ́$^{Ⓗ}$	'canoe'	
érí$^{Ⓗ}$	'dry'	(cf. èréín$^{Ⓗ}$ 'day')
ẹ́rị́$^{Ⓗ}$	'see'	
óí$^{Ⓗ}$	'ten'	
óín$^{Ⓗ}$	'(to) swell'	(cf. òwéín$^{Ⓗ}$ 'bite')
órú$^{Ⓗ}$	'deity, god, divinity, juju'	(cf. òróró$^{Ⓗ}$ 'gutter, stream')
óú$^{Ⓗ}$	'(to) cry'	
óú$^{Ⓗ}$	'masquerade'	
ọ́ụ́$^{Ⓗ}$	'air, steam'	

This near-complementarity in both dialects can be interpreted as another instance of an initial vowel showing extrametrical properties. We may represent the unexceptional B3 patterns as <è>réín$^{Ⓗ}$ 'day' with initial extrametricality (again, in angle brackets), and the exceptional B1 form as érí$^{Ⓗ}$ 'dry' without extrametricality. This allows us to state that class B1 and B3 morphemes both have entirely high tones across their tone group, with a potential low-toned vowel preceding it outside of the tone group domain.

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3.2.3 An argument for /H$^{Ⓗ}$/ structure

Classes B1/B3 are analyzed as ending in the sequence /H$^{Ⓗ}$/, where the final associated tone is followed by a floating tone of the same value. One might ask why posit this representation rather than simply allowing for the pre-associated high to spread. Evidence for /H$^{Ⓗ}$/ comes from the behavior of this class in complex tone groups, which we will briefly go through here using data from Gbarain.

To understand the argument, we must first establish the role of syntactic structure in dictating tone patterns. Within the noun phrase, we have seen several cases where pre-nominal modifiers replace the tones of the noun within the tone group, e.g. /ìné$^{Ⓗ}$/ 'your' and /ẹ̀ndị̀$^{Ⓗ}$/ 'that' in (20).

(20) Gbarain Izon – Pre-nominal modifiers replacing tone of noun [Gb-20190702:2]

a. / ìné$^{Ⓗ}$ tébùlù$^{Ⓛ}$ / [ìné tébúlú] 'your table'

b. / ẹ̀ndị̀$^{Ⓗ}$ kúkíńdùkú$^{Ⓛ}$ / [ẹ̀ndị̀ kúkíńdúkú] 'that sweet potato'

Modifiers in these cases are demonstratives, adjectives, numerals, possessive pronouns and nouns, components of noun compounds, among others.

Other modifiers exist which follow the noun, and consist primarily of determiners (e.g. markers of definiteness/indefiniteness) and quantifiers. We follow Carstens' (2002) analysis of Izon syntax, whereby pre-nominal modifiers are phrases before the head noun, while post-nominal modifiers are syntactic heads after it (also Carstens 1991, Giusti 1995, Harry 2004:18, a.o.). This is in a. in (21) below. The main point here is that post-nominal determiners and quantifiers are structurally higher than pre-nominal modifiers, schematically represented in b.

(21) Hierarchical structure of modified nouns in Izon (Carstens 2002:7)

a. $[_{QP}\ [_{DP}\ [_{XP}\ \text{DEM}P\ [_{NP}\ \text{ADJ}P\ \ldots\ N^{0}\ ]\ X^{0}\ ]\ D^{0}\ ]\ \text{QUANT}^{0}\ ]$

b. Schema: $\llbracket_{ZP}\ \lbrack_{YP}\ \text{MOD}\ [_{XP}\ \text{NOUN}\ ]\ \rbrack\ \text{MOD}\ \rrbracket$

Examples are in (22). Post-nominal modifiers may be toneless (e.g. /kpọ/ 'also', a.) or have inherent tone (e.g. low-toned /bị̀/ DEFINITE, b.). These are shown with the class B noun /námá$^{Ⓗ}$/ 'animal, meat'.

(22) Gbarain Izon – Post-nominal modifiers

a. / námá$^{Ⓗ}$ kpọ / [námá kpọ́] 'an animal/meat too' [Gb-20190716_b]

b. / námá$^{Ⓗ}$ bị̀ / [námá bị̂] 'the animal/meat' [Gb-20190703:12]

Toneless modifiers are valued by the floating Ⓗ tone sponsored by the noun; they have no tone to delete or to retain. However, unlike with the pre-nominal modifiers (20), b. above shows that the floating tone sponsored by the first word does *not* replace the tones of the second word. Instead, the floating Ⓗ co-occurs with the inherent L tone, resulting in falling tone [bị̂]. These patterns are representative of the role of syntax in dictating tonal patterns: if the second word is syntactically *higher* than the first word – e.g. determiners and quantifiers (D^{0} and Q^{0} heads) – then the floating tone co-occurs with the inherent tone rather than replaces it.

What happens when both pre- and post-nominal modifiers are present? In (23), a. shows that the floating tone of the pre-nominal modifier /ẹ̀ndị̀$^{Ⓗ}$/ 'that' replaces the tone of the noun but does *not* affect the underlying low tone of the post-nominal modifier. In contrast, example b. shows that this if the post-nominal modifier is toneless then the floating tone spreads to it as well. These facts are consistent with the interpretation that post-nominal modifiers are structurally higher than the pre-nominal ones, and consequently why the tones of the latter are retained.

(23) Gbarain Izon – Pre- and post-nominal modifier co-occurrence

a. / ẹ̀ndị̀$^{Ⓗ}$ námá$^{Ⓗ}$ bị̀ / [ẹ̀ndị̀ námá bị̀] 'that animal' [Gb-20190702:8]

b. Cf. / ẹ̀ndị̀$^{Ⓗ}$ námá$^{Ⓗ}$ kụmọ / [ẹ̀ndị̀ námá kụ́mọ́] 'only that animal' [Gb-20190702:8]

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Having established these facts, let us return to our argument for class B as /H$^{Ⓗ}$/, rather than /H/. The important contrast to observe above is between forms like [námá bî] 'the animal' from (22) versus [ẹ̀ndì námá bì] 'that animal' from (23). In the former, the floating Ⓗ docks to the post-nominal modifier, while in the latter it associates to the noun only and does not spread onto the post-nominal modifier. The same pattern holds if the pre-nominal modifier bears high tone itself, e.g. /wẹ́nḭ́$^{Ⓗ}$/ 'walk' in (24).

(24) / wẹ́nḭ́$^{Ⓗ}$ kḭ́mḭ́$^{Ⓗ}$ bì / [wẹ́nḭ́ kḭ́mḭ́ bì]
walk person DEF 'the one who moved' [Gb-20190711:46]

These facts fall out naturally under the /H$^{Ⓗ}$/ analysis, where floating tones dock onto a post-nominal modifier only as a 'last resort'. I illustrate this in Table 8 below.

Table 8: Gbarain – Floating tones dock to following post-nominal modifier only as last resort

	Proposed analysis: /H$^{Ⓗ}$/ Underlying forms							→	Ⓣ association				Cf. Alternative: /H/ with obligatory spreading (*rejected*)				
a.			H	Ⓗ		L			H	Ⓗ	L			H	L		
			/\		+	|		→	/\	`/			(Cf.	/\`	|	)	
			námá			bì			námá	bî				námá	bî		
b.	L	Ⓗ		H	Ⓗ	L			L	Ⓗ	L			L	H	L	
	/\		+	/\	+	|		→	/\	´`	|		(Cf.	/\	´`	|	)
	ẹ̀ndì			nama		bì			ẹ̀ndì	námá	bì			ẹ̀ndì	námá	bì	
c.	H	Ⓗ		H	Ⓗ	L			H	Ⓗ	L			H		L	
	/\		+	/\	+	|		→	/\	´`	|		(Cf.	/\		|	)
	wẹ́nḭ́			kḭmḭ		bì			wẹ́nḭ́	kḭ́mḭ́	bì			wẹ́nḭ́	kḭ́mḭ́	bì	

Under the floating tone analysis, the floating Ⓗ in row a. associates to the post-nominal determiner /bì/ only when there are no free TBUs for it to dock to. This results in the falling tone. In contrast, in rows b.–c. the Ⓗ is able to associate to toneless TBUs of the noun. Because it has a host already, it does not need to associate to the low-toned determiner, which it only does as a last resort.

Consider the alternative in the rightmost column, which I reject. Under this alternative, the representation of class B is /H/ without the floating Ⓗ. This H spreads obligatorily to the post-nominal determiner in a., while in b. and c. it spreads only to the head noun; it does not spread to the determiner in these latter contexts. To capture this, we would be forced to say that spreading *must* happen at least once. This would be a trigger-driven requirement, rather than a target-driven one. This is undesirable given the normal understanding of tone spreading, being licensed to avoid some marked structure (e.g. *TONELESS). If spreading of a phonological feature [F] is due to some markedness constraint prohibiting specific configurations, it is unclear what kind of constraint would require spreading onto /bì/ in a. but prevent it in b. and c. This cannot be attributed to any boundedness of the spreading operation, whose unboundedness we have encountered in many examples thus far, e.g. [kúlúkúlú óbórí pḭ́ná tḭ́bḭ́] 'a black goat's white head' in (14).

We return to discussing this alternative with obligatory spreading later in §4.3. I note that under Richness of the Base, both /H/ and /H$^{Ⓗ}$/ must be possible inputs and it may be the case that different speakers have different grammars but converge on the same surface patterns. Importantly, I emphasize that there is no contrast between /H/ vs. /H$^{Ⓗ}$/ in either Izon dialect, regardless of analysis.

3.3 Tone class C – Analysis as floating Ⓛ

3.3.1 Core patterns of class C in Gbarain Izon

The next class to discuss is Class C, which sponsors a floating Ⓛ. Beginning with Gbarain Izon, we can split class C into subclasses C1, C2, and C3, illustrated in (25). Subclass C1 ends in pre-associated L with

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a H somewhere before it, and sponsors a floating Ⓛ tone. Subclass C2 is all high-toned with a final floating Ⓛ, and C3 ends in pre-associated H (with a L before it) and sponsors a Ⓛ tone.

(25) Gbarain Izon – Class C subclasses with floating Ⓛ

a.	C1 / …HL$^{Ⓛ}$ /	dùrùkúù$^{Ⓛ}$	'dark'	[dùrùkúù wàrị]	'a dark house'	[Gb-20190702:4]
		òpórìópò$^{Ⓛ}$	'pig'	[òpórìópò kụ̀mọ̀]	'only a pig'	[Gb-20170711:22]
b.	C2 / H$^{Ⓛ}$ /	kálá$^{Ⓛ}$	'small'	[kálá tụ̀bọ̀]	'a small child'	[Gb-20170727:98]
		bárá$^{Ⓛ}$	'hand'	[bárá kụ̀mọ̀]	'only a hand'	[Gb-20190702:5]
c.	C3 / …LH$^{Ⓛ}$ /	àkụ́$^{Ⓛ}$	'bitter'	[àkụ́ wùrù]	'a bitter drink'	[Gb-20190702:4]
		ìngǒ$^{Ⓛ}$	'trap type'	[ìngǒ kụ̀mọ̀]	'only an *ingo* trap'	[Gb-20170711:22]

In multi-word targets, the floating Ⓛ spreads to all TBUs, resulting in low-toned stretches in surface forms:

(26) Gbarain Izon – Class C in multi-word targets

a.	/ béí$^{Ⓛ}$	màà$^{ⓁⒽ}$	bùrù$^{ⓁⒽ}$ /	[béí màà bùrù]	
	this	two	yam	'these two yams'	[Gb-20170711:23]
b.	/ ébì$^{Ⓛ}$	kúkíńdùkú$^{Ⓛ}$	ọmọ /	[ébì kùkìǹdùkù ọ̀mọ̀]	
	Ebi	sweet.potato	INDEF.PL	'Ebi's sweet potatoes'	[Gb-20190702:7]

For subclasses C2 and C3 (ending in H$^{Ⓛ}$) in isolation, in Gbarain the most common pattern is for the floating Ⓛ to delete, rather than self-associate to its sponsor. Note, however, that some class C morphemes in isolation waver between a final low tone (or falling tone if monomoraic) and a final high, in (27).

(27) Gbarain Izon – Class C2/C3 variation in isolation

a.	wún$^{Ⓛ}$	[wûn ~ wún]	'sand'
	tẹ́n$^{Ⓛ}$	[tện ~ tẹ́n]	'to flow (of water)'
b.	níní$^{Ⓛ}$	[nínì ~ níní]	'nose'
	kírí$^{Ⓛ}$	[kírì ~ kírí]	'ground'
	dángị́$^{Ⓛ}$	[dángị̀ ~ dángị́]	'tall'
c.	béí$^{Ⓛ}$	[béì ~ béí]	'this'
	pùkéí$^{Ⓛ}$	[pùkéì ~ pùkéí]	'morning'

Most tokens of C2/C3 morphemes in isolation were pronounced with a final high tone (reflected in the Gbarain lexicon, located in the supplemental materials – see Appendix A for details). For those morphemes which showed variation, I attribute this to variation in the underlying form, e.g. a. above as C2 /wún$^{Ⓛ}$/ ~ C1 /wûn$^{Ⓛ}$/ 'sand'. Further research may reveal whether this is incidental variation involving optional self-association.[6]

3.3.2 Gbarain variation in underlying representation: /L/ vs. /L$^{Ⓛ}$/

In Gbarain, there appears to be variation in the underlying representation of class C1 morphemes /…HL$^{Ⓛ}$/ words which end in low tone, between /L/ and /L$^{Ⓛ}$/. Evidence comes from effects with the post-verbal particle /kụmọ/ PROHIBITIVE (PROH) 'don't, shouldn't', a particle with particular tonal properties. To explain, consider the data in (28). When a verb and this particle form a tone group, the floating tones of the verb associate to /kụmọ/.

[6] Note, as well, that certain class C1 words consistently end in a falling tone, whether in isolation or in context. We saw one already in (25), /dùrùkúù$^{Ⓛ}$/ 'dark'. I denote these with a final underlying pre-associated low tone.

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(28) Gbarain Izon – Floating tones of verb associate to post-verbal particle

a.	A	ⓁⒽ:	/ bù̩ò$^{ⓁⒽ}$	kụmọ /	[bù̩ò̩ kù̩mò̩]	‘don’t agree’	[Gb-20190716_b]
b.	B	Ⓗ:	/ mú$^{Ⓗ}$	kụmọ /	[mú kú̩mó̩]	‘don’t go’	[Gb-20170716:48]
c.	C	Ⓛ:	/ gbé̩$^{Ⓛ}$	kụmọ /	[gbé̩ kù̩mò̩]	‘don’t pay’	[Gb-20170716:48]

From these data no pre-associated tones with /kụmọ/ are detected, and I therefore take it to be underlyingly toneless. However, in larger contexts we see that it displays tone polarity properties when the floating tone within a tone group does not directly associate to /kụmọ/. Consider the examples below which begin with A, B, and C nouns respectively:

(29) Gbarain Izon – Post-verbal particle /kụmọ/ shows tonal polarity [Gb-20190704:17]

a.	A:	/ bùrù$^{ⓁⒽ}$	ọmọ	gbòrò$^{ⓁⒽ}$	kụmọ /	[(bùrù ò̩mó̩ gbóró) kù̩mò̩]
		yam	INDEF.PL	plant	PROH	‘don’t plant yams’
b.	B:	/ ì̩sé̩lé̩$^{Ⓗ}$	ọmọ	gbòrò$^{ⓁⒽ}$	kụmọ /	[(ì̩sé̩lé̩ ọ́mọ́ gbóró) kù̩mò̩]
		seed	INDEF.PL	plant	PROH	‘don’t plant seeds’
c.	C:	/ àká$^{Ⓛ}$	ọmọ	gbòrò$^{ⓁⒽ}$	kụmọ /	[(àká ọ́mò̩ gbòrò) kú̩mó̩]
		corn	INDEF.PL	plant	PROH	‘don’t plant corn’

In a., we see that the floating tones on the object /bùrù$^{ⓁⒽ}$/ ‘yam’ dock to the toneless post-nominal modifier ọmọ and the verb (whose tones are replaced). Importantly, the Ⓗ does not spread onto /kụmọ/. Instead it appears with the opposite tone of whatever surface tone is on the word before it. Example b. is similar with the floating Ⓗ spreading to the verb and the particle bearing a polar low tone. In contrast, in c. we see the floating Ⓛ spread to the verb, but the particle bears the polar value high.

We can exploit this polarity property to diagnose underlying tonal structure of class C1 as /L/ or /L$^{Ⓛ}$/. Under an analysis where class C verbs end in /L/, the verb would assign no floating tone to /kụmọ/, and we would expect the form to surface as [kú̩mó̩] with a polar high when it is adjacent to the verb. In contrast, under the /L$^{Ⓛ}$/ analysis, the verb would assign the floating low and we would expect the form to surface as [kù̩mò̩] without polar tone.

The results are mixed. Only a small number of class C verbs end in a pre-associated low, such as [dǫ́ǫ̀] ‘be calm, peaceful, cool’, [dúùn] ‘be dusty’, and inherently reduplicated [pú̩ké̩pù̩kè̩] ‘put mouth where it doesn’t belong’ (≈ ‘gossip’). In (30), the verb [pú̩ké̩pù̩kè̩] appears with [kú̩mó̩] bearing polar high tone, suggesting that the verb does not sponsor a floating Ⓛ (supporting an analysis as /L/).

(30) Gbarain Izon – Support for /L/: [pú̩ké̩pù̩kè̩ kú̩mó̩] ‘don’t gossip’ [Gb-20190715:68]

However, multiple patterns were accepted with the other two verbs above, suggesting underlying variation. This is shown in (31).

(31) Gbarain Izon – Support for /…L/~/…L$^{Ⓛ}$/ underlying variation:

a.	Provided by consultant:	[yǫ́ bî	‖	dúùn kú̩mó̩]	‘this place should not be dusty’	
	Accepted by consultant:	[yǫ́ bî	‖	dúùn kù̩mò̩]		[Gb-20190708:41]
b.	Provided by consultant:	[árì̩	‖	dǫ́ǫ̀ kú̩mó̩]	‘you shouldn’t be peaceful’	
	Accepted by consultant:	[árì̩	‖	dǫ́ǫ̀ kù̩mò̩]		[Gb-20190715:67]

In the examples collected, the consultant provided surface forms with the verb ending low followed by [kú̩mó̩] with polar high, supporting an interpretation as /L/. However, the consultant also fully accepted forms where [kù̩mò̩] was low which supports /L$^{Ⓛ}$/. This variation cannot be attributed to class C items in general. For example, (29) above, [àká ọ́mò̩ gbòrò kú̩mó̩] ‘don’t plant corn’, a hypothetical variant *[…gbòrò kù̩mò̩] was explicitly rejected when presented to the consultant.

I interpret these findings as showing variation in the underlying form in the lexicon. This is plausibly due to analytic indeterminacy, noting that contexts which would differentiate /L/ vs. /L$^{Ⓛ}$/ are rare. Like we

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saw with the debate between /H/ vs. /H$^{Ⓗ}$/ in class B, I emphasize that regardless of analysis there is no contrast between /L/ versus /L$^{Ⓛ}$/. Even under the analysis of C1 as /L/, floating tone would still be required for C2 and C3, and would still be pervasive across the lexicon generally.

3.3.3 Core patterns of class C in Kolokuma Izon

For Kolokuma Izon, there is clear evidence for three subclasses of class C: C1 (…HL$^{Ⓛ}$), C3 (…LH$^{Ⓛ}$), and C4 (L$^{Ⓛ}$). As stated earlier, class C4 is found in Kolokuma but not in Gbarain. Even in Kolokuma, it is rare and restricted to names for places or people.

(32) Kolokuma Izon – Class C subclasses with floating Ⓛ

a.	C1 …HL$^{Ⓛ}$	àdùkúù$^{Ⓛ}$	[àdùkúù]	‘dark’	[Ko-W&B11:189]
			[àdùkúù pàịnàpụ̀lụ̀]	‘dark pineapple’	
b.	C3 …LH$^{Ⓛ}$	òsún$^{Ⓛ}$	[òsún]	‘cassava starch’	[Ko-W&B11:173]
			[òsún tàbụ̀]	‘pour water on broken up starch’	
			[òsún-gbè-bè̀lè̩]	‘pot for preparing starch’ (starch-stir-pot)	
c.	C4 L$^{Ⓛ}$	ìgbòn$^{Ⓛ}$	[ìgbòn]	‘northerner, Hausa’	[Ko-W88:262]
			[ìgbòn òtìtì]	‘pied-crow’	

Class C2 (all high plus floating Ⓛ, i.e. /H$^{Ⓛ}$/) is attested in only two lexical items in Kolokuma, both of which show variation with a final low and both appear to be derived. These are /fi̩kí̩fí̩kí̩$^{Ⓛ}$ ~ ì̩fi̩kí̩fí̩kì̩$^{Ⓛ}$/ ‘saw’ (showing reduplication), and /kíríyé$^{Ⓛ}$ ~ kíríyéì$^{Ⓛ}$/ ‘power of the ancestors’ (literally ‘ground-thing’) (W&B11: 54, 113). In tone groups, these pattern as they do in Gbarain: all high on the sponsor and a low tone on the first TBU target, e.g. [kíríyé wàrì] ‘type of ancestor shrine’. See Appendix B showing correspondences of C2 in Gbarain mostly to B and D classes in Kolokuma.

How are C3 (/…LH$^{Ⓛ}$/) items pronounced in isolation in Kolokuma? Within the Kolokuma dictionary, most entries of class C3 morphemes are transcribed without a final low or falling tone (representing their isolation pronunciations), indicating that the floating Ⓛ generally does not self-associate to its sponsor (as in Gbarain). Examples are provided in (33). Williamson (1965: 101) in fact notes this overtly: “a unit of class [C] in initial position keeps its isolation tone pattern”, whether ending in a single TBU (a.) or two (b.).

(33) Kolokuma Izon – Lack of self-association of class C3 in isolation

a.	/ àyán$^{Ⓛ}$ /	[àyán]	‘face’
	/ ẹ̀ngẹ́dụ́$^{Ⓛ}$ /	[ẹ̀ngẹ́dụ́]	‘red-headed malimbe bird’
	/ kúkúndùkú$^{Ⓛ}$ /	[kúkúndùkú]	‘sweet potato’
b.	/ èméín$^{Ⓛ}$ /	[èméín]	‘manatee’
	/ ìzózóbáụ́$^{Ⓛ}$ /	[ìzózóbáụ́]	‘type of fish spear’

However, there are a few morphemes which are transcribed with a final fall in isolation but have a final high tone in a tone group, in (34). It is unclear at this point whether this is self-association of a floating Ⓛ, some type of tone class variation in either underlying or surface forms, or some other explanation.

(34) Kolokuma Izon – Limited evidence for self-association of class C in isolation

a.	/ ị̀táụ́$^{Ⓛ}$ /		[ị̀táụ̀ ~ táụ̀]	‘grand-’ (familial relations)	
		cf.	[táụ́ tọ̀bọ̀ụ̀]	‘grandchild’	[Ko-W&T83:166]
b.	/ tìbú$^{Ⓛ}$ /		[tìbúù]	‘incitement’	
		cf.	[tìbú tụ̀à]	‘incite’ (< tụ́á ‘put’)	[Ko-W&T83:169]

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3.3.4 Class C tone alignment with V-TBU targets (both dialects)

We have seen for both classes A and B that there are specific tonal effects of vowel-initial words. Such effects are seen with class C as well. For example, there is a clear asymmetry in the distribution initial high and low tone across class C. For morphemes which begin with a vowel, this initial vowel is overwhelmingly low-toned with a ratio of 15:1 in the Kolokuma lexicon, shown in Table 9 with representative examples. This can be compared to consonant-initial class C morphemes (rightmost column) which are more evenly distributed.

Table 9: Kolokuma Izon – Co-occurrence of V-TBU and low tone across class C

Initial σ / Initial T	Vowel-initial			Consonant-initial		
L	ụ̀gbákà$^{Ⓛ}$	'dam'	(*n*=301)	sị̀kákà$^{Ⓛ}$	'ship mast'	(*n*=61)
H	ọ́gụ̀rụ̀$^{Ⓛ}$	'potassium iodide'	(*n*=18)	kẹ́kụ̀rụ̀$^{Ⓛ}$	'small squirrel'	(*n*=78)

Although this table clearly shows that initial V-TBUs prefer low tone, just as with class B there are exceptions. In Kolokuma Izon, exceptional class C morphemes (Table 10) include some basic nouns (a.), culturally-salient referents (b.), and plants, animals, and substances (c.)

Table 10: Kolokuma Izon – Sample of exceptional class C morphemes with high-toned initial vowel

	Izon	Meaning
a.	érì$^{Ⓛ}$	'thread'
	ị́kpà$^{Ⓛ}$	'pudding'
b.	ámà$^{Ⓛ}$	'type of charm'
	áyù$^{Ⓛ}$	'God'
	ínà$^{Ⓛ}$	'mother, mum'
c.	íngbè$^{Ⓛ}$	'mangrove oyster'
	ị́kị̀nrị́nrị̀n$^{Ⓛ}$	'bush okra' (*Corchorus olitorius*)
	ọ́gụ̀rụ̀$^{Ⓛ}$	'potassium iodide'
	óùn$^{Ⓛ}$	'sand'

In Gbarain Izon, examples are more limited, and include functional morphemes like /árị̀$^{Ⓛ}$/ 2SG.SUBJ 'you', and several loanwords like /ínkì$^{Ⓛ}$/ 'ink', /ánggị̀sị̀$^{Ⓛ}$/ 'handkerchief'.

An unexpected pattern emerges in Gbarain, however, with class C morphemes in tone groups. This involves classes C2 /H$^{Ⓛ}$/ and C3 /…LH$^{Ⓛ}$/, which show variation in the association of the floating Ⓛ with respect to a vowel-initial target. In one variant, the floating Ⓛ associates to the initial TBU of the target, just as with the consonant-initial targets in (32) above. This variant is the one which is expected as it shows the alignment of low tone with a V-TBU. This is exemplified in (35); the relevant portion is underlined.

(35) Gbarain Izon – Association of class C floating Ⓛ to a word-initial V-TBU

a.	/ pị́ná$^{Ⓛ}$	òbórí$^{Ⓗ}$	kúlúkúlú$^{Ⓗ}$	tị́bị́$^{Ⓗ}$ /	[pị́ná ò̲bòrì kùlùkùlù tị̀bị̀]	[Gb-20190705:22]
	white	goat	black	head	'a white goat's black head'	
b.	/ béí$^{Ⓛ}$	òwèì$^{Ⓛ Ⓗ}$	gbẹ́$^{Ⓛ}$	amẹ̀ /	[béí̲ ò̲wèì || gbẹ̲́ à̲mẹ̀]	[Gb-20190703:14]
	this	man	pay	COMPL	'this man did pay'	
c.	/ Ébì$^{Ⓛ}$	àká$^{Ⓛ}$	òvìnmọ̀$^{Ⓛ Ⓗ}$	mị /	[Ébì || àká̲ ò̲vìnmọ̀ m̀]	[Gb-20190714:61]
	Ebi	corn	put.out	PFTV	'Ebi put out the corn'	

In another variant, however, the final H of the sponsor spreads to this first V-TBU, and the floating Ⓛ associates immediately after it. This results in a [H#HⓁ] pattern, exemplified in (36). This is not expected given the propensity for onsetless syllables and low tone to coincide. Both patterns were common in the Gbarain data collected.

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(36) Gbarain Izon – Unexpected association of floating Ⓛ to second TBU of target

a.	/ dèngíⓁ	àmáⒽ /	[dèngí ámà]		[Gb-20170711:22]
	which	town	‘which town?’	(Cf. [dèngí bùrù] ‘which yam?’)	
b.	/ àkṵⓁ	ịsànịⓁⒽ /	[àkṵ ịsànị]		[Gb-20190702:4]
	bitter	pepper	‘bitter pepper’	(Cf. [àkṵ wùrù] ‘a bitter drink’)	
c.	/ gbánránⓁ	àpàpàⓁⒽ /	[gbánrán ápàpà]		[Gb-20190716:72]
	fry	groundnut	‘fried groundnuts’	(Cf. [gbánrán nàmà] ‘fried meat’)	
d.	/ èkéⓁ	ọmọ /	[èké ọ́mọ̀]		[Gb-20190702:3]
	rat	INDEF.PL	‘rats’		

We may tentatively state that within a tone group in Gbarain, there is a constraint which forbids a falling tone across adjacent vowels in separate words (i.e. *…V́#V̀…), but that it applies only optionally.

This constraint is only found in Gbarain Izon. In Kolokuma Izon, the data uniformly shows the expected pattern where the floating Ⓛ associates to the initial TBU of the next word, whether it begins with a consonant (32), or with a vowel (Table 11).

Table 11: Kolokuma – Uniform association of class C floating Ⓛ to a word-initial V [Ko-W&B11:5,9,24,246]

Underlying representation		In tone group	
/ àgbùnúⓁ/	‘type of clap-net’	[àgbùnú ìmbì]	‘to fish with a clap-net’
/ àkáⓁ /	‘corn, maize’	[àká ùngbòù]	‘empty maize-cob’
/ àmàtáⓁ /	‘circumcised woman’	[àmàtá ìkìrìkà]	‘older married women’
/ bịsáⓁ /	‘that’ (DEM)	[bịsá àràṵ]	‘that girl’
/ ṵkàsṵⓁ /	‘Antelope grass’	[ṵkàsṵ ìnkì]	‘(red) Antelope grass ink’

3.4 Tone class D – Analysis as floating ⒽⓁ

The final class is class D, which sponsors a floating ⒽⓁ sequence. This fills out the logically possible floating tone sequences: Ⓛ, Ⓗ, ⓁⒽ, and now ⒽⓁ.

3.4.1 Core patterns of class D in Gbarain Izon

In Gbarain Izon, no lexical items belong to class D. The only class D members are a small series of ‘pre-vocalic pronouns’. Across Izon varieties, pronouns have two allomorphs, one used before consonants and one before vowels. This allomorphy is exemplified in (37) with an imperative construction.

(37) Gbarain Izon – Pronoun allomorphy based on following segment (consonant or vowel)

a. [ọ̀ kùlé] ‘greet them!’ b. [ọ̀rị́ ẹ́rị́] ‘see them!’

Although the segmental shape and underlying tone of the pre-vocalic series is related to their pre-consonantal counterpart, these alternations cannot be reduced to any regular phonological process.

All pre-vocalic object pronouns pattern as class D by virtue of sponsoring ⒽⓁ floating tones which replace the tones of the following word. In (38), I divide them into three subclasses: D1 /HⒽⓁ/ (a.), D2 /LⒽⓁ/ (b.), and D3 /LHⒽⓁ/ (c.). These are each illustrated with the vowel-initial verb /ẹ̀rí́Ⓗ/ ‘to see’. Note that in these examples, there is an independent process which assimilates the vowel of the pre-vocalic pronoun.

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(38) Gbarain Izon – Class D pre-vocalic pronouns with vowel-initial verb /ẹ̀rí$^{Ⓗ}$/ ‘see’ [Gb-20190706:30]

a.	D1 /H$^{ⒽⓁ}$/	wó$^{ⒽⓁ}$	‘us’	[wó ẹ́rì]	(→ [wẹ́ẹ́rì])	‘see us!’
b.	D2 /L$^{ⒽⓁ}$/	ìnè$^{ⒽⓁ}$	‘me’	[ìnè ẹ́rì]	(→ [ìnẹ̀ẹ́rì])	‘see me!’
		wò$^{ⒽⓁ}$	‘him’	[wò ẹ́rì]	(→ [wẹ̀ẹ́rì])	‘see him!’
		ọ̀rì$^{ⒽⓁ}$	‘them’	[ọ̀rì ẹ́rì]	(→ [ọ̀rẹ̀ẹ́rì])	‘see them!’
c.	D3 /LH$^{ⒽⓁ}$ /	àrí$^{ⒽⓁ}$	‘her’	[àrí ẹ́rì]	(→ [àrẹ́ẹ́rì])	‘see her!’[7]

In contrast, the pre-consonantal pronouns are strictly classes A, B, and C, shown in (39).

(39) Gbarain Izon – Pre-consonantal pronoun series (classes A, B, and C only) [Gb-20190706:30]

a.	Class A	ọ$^{ⓁⒽ}$	[ọ kùlé]	‘greet them!’
b.	Class B	à$^{Ⓗ}$	[à kúlé]	‘greet her!’
c.	Class C	wó$^{Ⓛ}$	[wó kùlè]	‘greet us!’

Interestingly, there are no tonal effects due to the target being vowel-initial (40). The floating Ⓗ uniformly associates to the initial vowel (a.). Other association patterns are rejected as ungrammatical (b.).

(40) Gbarain Izon – Class D floating Ⓗ tone associating only to following vowel [Gb-20190714:61]

a.	Ébì$^{Ⓛ}$	ìnè$^{ⒽⓁ}$	òvìnmọ̀$^{ⓁⒽ}$	mị	[Ébì ìnè óvìnmọ̀ m̀]	(→ […ìnòóvì…])
	Ebi	1S.OBJ	put.out	PFTV	‘Ebi put me out’ (as if on fire)	
b.	Cf. *[Ébì ìnè òvínmọ̀ m̀]					

3.4.2 Core patterns of class D in Kolokuma Izon

In Gbarain, tone class D is limited to the small class of pronouns. In contrast, in Kolokuma they have a much wider distribution, found with many lexical items as well as several modifiers (e.g. demonstratives). However, even in Kolokuma class D is much smaller than the other three classes. Examples of lexical items of class D1, D2, and D3 are in (41).

(41) Kolokuma Izon – Class D lexical items in tone groups

a.	D1 /H$^{ⒽⓁ}$/	wárị́$^{ⒽⓁ}$	kọ̀rị̀$^{ⓁⒽ}$	kịmí$^{Ⓗ}$	[wárị́ kọ́rì kìmì]	
		house	build	person	‘builder’	[Ko-W88:260]
b.	D2 /L$^{ⒽⓁ}$/	ìmbẹ̀lẹ̀$^{ⒽⓁ}$	dúmá$^{Ⓗ}$	tún$^{Ⓗ}$	[ìmbẹ̀lẹ̀ dúmà tùn]	
		pleasant	song	sing	‘sing a pleasant song’	[Ko-W88:262]
c.	D3 /LH$^{ⒽⓁ}$/	ùkúlá$^{ⒽⓁ}$	kịmí$^{Ⓗ}$		[ùkúlá kịmì]	
		crippled	person		‘crippled person, lameness’	[Ko-W&T83:182]

Let us examine the pronunciations of Kolokuma class D morphemes in isolation. For D1 (/H$^{ⒽⓁ}$/) and D3 (/LH$^{ⒽⓁ}$/), the floating Ⓛ does not self-associate to its sponsor in isolation, reflected in the transcription in the Kolokuma dictionary. Examples of class D are in (42). These patterns suggest that the Ⓛ deletes, exactly as it did in the majority pattern for class C, e.g. C3 /LH$^{Ⓛ}$/ [èméín] ‘manatee’ from (33).

[7] Second person pre-vocalic pronouns are also D3 – ìné$^{ⒽⓁ}$ ‘you’ (SG) and ọ̀rí$^{ⒽⓁ}$ ‘you’ (PL) – not shown.

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(42) Kolokuma Izon – Class D lack of self-association of floating Ⓛ in isolation

a.	D1	bárá$^{ⒽⓁ}$	[bárá]	‘hand/arm’
		wárị́$^{ⒽⓁ}$	[wárị́]	‘house’
		fúmú$^{ⒽⓁ}$	[fúmú]	‘dirty’
		fọ́ụ́n$^{ⒽⓁ}$	[fọ́ụ́n]	‘drag’
		dángáị́n$^{ⒽⓁ}$	[dángáị́n]	‘be long’
b.	D3	àkụ́$^{ⒽⓁ}$	[àkụ́]	‘bitter’
		ụ̀wọ́$^{ⒽⓁ}$	[ụ̀wọ́]	‘alive, fresh, raw’
		èpépéré$^{ⒽⓁ}$	[èpépéré]	‘stammer’
		ụ̀sị́á$^{ⒽⓁ}$	[ụ̀sị́á]	‘hot’ (of pepper)
		ị̀fíf́ịyọ́ụ́$^{ⒽⓁ}$	[ị̀fíf́ịyọ́ụ́]	‘(to) whistle’

Notice as well that D1 and D3 are in complementary distribution: D1 always begins with a consonant and is all high-toned, while D3 begins with a low-toned vowel, followed by all high tones. This is parallel to the patterns in class B, where B3 patterns were analyzed with initial extrametricality of the low-toned vowel, i.e. /<è>réín$^{Ⓗ}$/ ‘day’. I therefore extend the extrametricality analysis to the b. forms in (42), e.g. /<ị̀>fíf́ịyọ́ụ́$^{ⒽⓁ}$/ ‘whistle’. While in class B there was only near-complementarity due to the presence of exceptional B1 forms such as /érí$^{Ⓗ}$/ ‘dry’, in class D there is complete complementarity, i.e. no items of the shape */átá$^{ⒽⓁ}$/ or */bàtá$^{ⒽⓁ}$/.

With Kolokuma D2 /L$^{ⒽⓁ}$/ items in isolation, the floating Ⓗ of the ⒽⓁ sequence always docks to the final TBU of the sponsor, resulting in a surface high or rising tone. D2 surface forms are never realized with a final falling tone, indicating that the floating Ⓛ goes unrealized (as with D1 and D3). This renders D2 morphemes surface identical in isolation with class A morphemes (/L$^{ⓁⒽ}$/), only differentiated when in tone groups. Representative examples are in Table 12, compared to analogous class A form.

Table 12: Kolokuma Izon – Self-association of floating Ⓗ in class D2 (cf. class A)

	Class D2			(Cf.	Class A			)
a.	èkè$^{ⒽⓁ}$	[èkèé]	‘rat’	(	ẹ̀dẹ̀$^{ⓁⒽ}$	[ẹ̀dẹ̀ẹ́]	‘yam barn’	)
	ọ̀ndụ̀$^{ⒽⓁ}$	[ọ̀ndụ̀ụ́]	‘that other’	(	ìndì$^{ⓁⒽ}$	[ìndìí]	‘fish’	)
b.	ọ̀mbìị̀$^{ⒽⓁ}$	[ọ̀mbìị́]	‘rub self with’					
	ị̀ngbàị̀$^{ⒽⓁ}$	[ị̀ngbàị́]	‘today’					
c.	bèkè$^{ⒽⓁ}$	[bèké]	‘English, White, European’	(	bùrù$^{ⓁⒽ}$	[bùrú] ~ [bùrùú]	‘yam’	)
	tị̀tẹ̀$^{ⒽⓁ}$	[tị̀tẹ́]	‘sit’	(	bụ̀rụ̀$^{ⓁⒽ}$	[bụ̀rụ́]	‘be rotten’	)
	ị̀mbẹ̀lẹ̀$^{ⒽⓁ}$	[ị̀mbẹ̀lẹ́]	‘sweet, tasty’	(	ìgònì$^{ⓁⒽ}$	[ìgòní]	‘stranger’	)

With VCV words (a.) and words ending in with a bimoraic syllable (b.), the surface form ends in a rising tone. However, CVCV (or bigger) forms end in high (c.). These patterns mirror the patterns of class A in isolation in Kolokuma (detailed in §3.1). That the high tone self-associates only in isolation suggests that it is truly floating and not a pre-associated H on the final TBU.[8]

3.4.3 Class D tone alignment with V-TBU targets (Kolokuma only)

In Williamson’s (1988) discussion of class D in Kolokuma, she states that the floating Ⓗ “is thrown back on the final syllable of the first morpheme when the second morpheme begins with a vowel” (p. 262), showing another tonal effect of V-TBU targets. This is demonstrated with the class D word /ị̀mbẹ̀lẹ̀$^{ⒽⓁ}$/

[8] Recall that class D does not exist in Gbarain outside of the few pre-vocalic pronouns. Given this, which tone classes do the class D lexical items in Kolokuma Izon correspond to in Gbarain Izon? I briefly take this up in Appendix B, where Kolokuma D1 largely corresponds to Gbarain C2, and D2 to C3, but D3 is inconclusive.

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'sweet, tasty, interesting' in (43). In a., the ⒽⓁ associates as expected, while in b. the floating Ⓗ self-associates to its sponsor while the Ⓛ associates to this initial V-TBU.

(43) Kolokuma Izon – Effect of V-TBU on ⒽⓁ association in class D [Ko-W&T83:91]
a. [ị̀mbẹ̀lẹ̀ fíyàị̀] 'tasty food'
b. [ị̀mbẹ̀lẹ́ ègbèrì] 'good news' (lit. interesting story)

This is a robust pattern in Kolokuma, seen across the collection of phrasal forms in (44) derived from /bèkè$^{ⒽⓁ}$/ 'English, White, European' ([bèké] in isolation). If the target word begins with a vowel, the Ⓗ consistently self-associates to the sponsor itself (b.). Data come from the updated Kolokuma dictionary (W&B11).

(44) Kolokuma Izon – ⒽⓁ association with derivatives of class D /bèkè$^{ⒽⓁ}$/
a. [bèkè bíbị̀] 'English' (language)
[bèkè fírị̀] 'salaried job'
[bèkè kírì] 'trading station'
[bèkè súọ̀] 'work in modern urban sector'
b. [bèké àmà] 'Europe'
[bèké ị̀gbà] 'European rope'
[bèké ùndù] 'pawpaw' (fruit)
[bèké àpàpà] 'breadnut' (fruit)
[bèké ẹ̀dẹ̀ị̀n] 'European-style knife'
[bèké ọ̀gọ̀nèì] 'calendar month'
[bèké ẹ̀kẹ̀n-òvùrù] 'week' (of seven days)

In contrast to the examples in (43)–(44) with class D2 /L$^{ⒽⓁ}$/, there is variation in the surface patterns with classes D1 (/H$^{ⒽⓁ}$/) and D3 (/LH$^{ⒽⓁ}$/) which end in a pre-associated high. Consider the D1 word /wárị́$^{ⒽⓁ}$/ 'house', whose floating tones straightforwardly associate to the target if it is consonant-initial, e.g. [wárị́ tẹ́mẹ̀] 'wall gecko' (lit. 'house spirit'). However, (45) shows that if the following word is vowel-initial, there is variation between the Ⓛ associating to the vowel (a., presumably with deletion of the Ⓗ), versus the Ⓗ associating to the vowel and the Ⓛ following it (b.). There does not appear to be a consistent pattern and I take this to be incidental variation. For example, the same phrase for 'wall' which has Ⓛ align to the vowel in a. shows Ⓗ aligning to this vowel in a sentence in c.

(45) Kolokuma Izon – Variation in ⒽⓁ association with derivatives of D1 /wárị́$^{ⒽⓁ}$/ 'house'
a. [wárị́ àkpàkpà] 'wall' [Ko-W&B11:256]
[wárị́ ùdùbù] 'tomb, grave' [Ko-W&B11:241]
[wárị́ ùtù] 'roof of the house' [Ko-W&B11:245]
b. [wárị́ ótù] 'house people' [Ko-W65:101]
[wárí ọ́fị̀n] 'sweep a house' [Ko-W&B11:256]
c. [èrí wárị́ ákpàkpà tị̀ẹ̀mẹ̀ị́n nìmí] [Ko-W&B11:227]

/ èrí	wárị́$^{ⒽⓁ}$	àkpákpà$^{Ⓛ}$	tị̀ẹ̀mẹ̀ị̀n$^{ⒽⓁ}$	nìmí /
he	house	wall	lean.against	ASP

'he is leaning against the wall'

This variation also affects D2 /L$^{ⒽⓁ}$/ words, e.g. the derivatives of /kẹ̀nị̀$^{ⒽⓁ}$/ 'one, a certain' in (46). Example a. shows the expected pattern where the Ⓗ self-associates to its sponsor due to the presence of a V-TBU in the next word, while b. shows examples of it associating to this initial vowel of the target.

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(46) Kolokuma Izon – Variation in ⒽⓁ association with derivatives of D2 /kẹ̀nị̀$^{ⒽⓁ}$/ ‘one’

a.	[kẹ̀nḯ òbìrì dìì mì]	‘looked at a (certain) dog’	[Ko-W88:262]
b.	[kẹ̀nị̀ ángà]	‘twining herb, Calopo plant’ (< lit. ‘one side’)	[Ko-W&B11:109]
	[kẹ̀nị̀ ópù òfònì]	‘one big bird’	[Ko-W65:108]

For our purposes, I generalize that the Ⓗ self-associates with D2 morphemes before a vowel-initial target, e.g. [bèké àmà] ‘Europe’; otherwise, I generalize that it associates to the initial TBU of the target.[9]

3.5 Summary of tone classes

A summary of tone class behavior is provided in Table 13. It is provided in tau-notation, where τ = a TBU. Tone class is indicated on the left, and the type of environments which they appear in are at the top (in isolation, or in tone groups). For each dialect, ✓ indicates the class is attested for lexical morphemes, (✓) indicates it is attested for other morphemes (e.g. pre-nominal modifiers, place names), (*) indicates it is marginal in that dialect, and * indicates it is absent. The TBUs to which the floating tones associate are indicated in red. Unless indicated, a given pattern applies to both dialects.

[9] Interestingly, a limited amount of variation in class D is found even with consonant-initial targets, as well:

(iii)	/ tụ̀bụ̀$^{ⒽⓁ}$ /	[tụ̀bṵ́]	‘(from) the beginning, ancient times’
	[tụ̀bṵ́ kụ̀mọ̀ ~ tụ̀bụ̀ kṵ́mọ̀]	‘from time immemorial’	[Ko-W&B11:239]
(iv)	/ ọ̀gọ̀nèì$^{ⒽⓁ}$ /	[ọ̀gọ̀nèí]	‘moon’ (< ọ̀gọ̀nọ̀$^{ⓁⒽ}$ ‘top’ + yé$^{Ⓗ}$ ‘thing’)
	[ọ̀gọ̀nèí bọ̀lọ̀ụ̀ ~ ọ̀gọ̀nèì bọ́lọ̀ụ̀]	‘first quarter of the moon’	[Ko-W&B11:180]

Accounting for the variation is beyond the scope of this paper.

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Table 13: Summary of tone class patterns (unless indicated, pattern applies to both dialects)
['Izon dialect' column: ✓ = attested for lexical morphemes, (✓) = attested for other morphemes, (*) = marginal, * = absent]
[Red = TBUs which floating tone associates to, <v> = extrametrical word-initial vowel, ~ = variation between forms, – = not possible]

		Izon dialect			Tone groups			
Class	UR	Gb	Ko	Isolation:	1 TBU: ___ τ	Multi-TBU: __ ττ	Vowel-initial (V-TBU): ___ vττ	Multi-word: ___ (ττ)ω (ττ)ω (ττ)ω
A	L$^{\text{Ⓛ Ⓗ}}$	✓	✓	(tǎ) ~ (tá)	(tà) (tá) ~ (tǎ)	(tà) (tá)	Gb: (tà) <và>(tá) Ko: (tà) <và>(tà)	Gb: (tà) (tà) (tá) (tá) Ko: (tà) (tà) (tà) (tà)
B1	H$^{\text{Ⓗ}}$	✓	✓	(tá)	(tá) (t)	(tá) (tá)	(tá) (vtá)	(tá) (tá) (tá) (tá)
B2	L$^{\text{Ⓗ}}$	(✓)	*	Gb: (tǎ)	Gb: (tà) (t)	Gb: (tà) (tá)	Gb: (tà) <và>(tá)	Gb: (tà) (tá) (tá) (tá)
B3	<và>H$^{\text{Ⓗ}}$	✓	✓	<và>(t)	<và>(t) (t)	<và>(t) (tá)	<và>(t) (vtá)	<và>(t) (tá) (tá) (tá)
C1	…HL$^{\text{Ⓛ}}$	✓	✓	(tà)	(tá) (tà)	(tá) (tà)	(tá) (vtà)	(tá) (tà) (tà) (tà)
C2	H$^{\text{Ⓛ}}$	✓	(*)	(tá)	(tá) (tà)	(tá) (tà)	Gb: (tá) (vtà) ~ (tá) (vtà) Ko: (*no data*)	(tá) (tà) (tà) (tà)
C3	…LH$^{\text{Ⓛ}}$	✓	✓	(tá)	(tá) (tà)	(tá) (tà)	Gb: (tá) (vtà) ~ (tá) (vtà) Ko: (tá) (vtà)	(tá) (tà) (tà) (tà)
C4	L$^{\text{Ⓛ}}$	*	(✓)	Ko: (tà)	Ko: (tà) (tà)	Ko: (tà) (tà)	Ko: (tà) (vtà)	Ko: (tà) (tà) (tà) (tà)
D1	H$^{\text{Ⓗ Ⓛ}}$	(✓)	✓	Gb: – Ko: (tá)	(*no data*)	Gb: – Ko: (tá) (tà)	Gb: (tá) (vtà) Ko: (tá) (vtà) ~ (tá) (vtà)	Gb: – Ko: (tá) (tà) (tà) (tà)
D2	L$^{\text{Ⓗ Ⓛ}}$	(✓)	✓	Gb: – Ko: (tǎ) ~ (tá)	(*no data*)	Gb: – Ko: (tà) (tà)	Gb: (tà) (vtà) Ko: (tá) (vtà) ~ (tà) (vtà)	Gb: – Ko: (tà) (tà) (tà) (tà)
D3	<và>H$^{\text{Ⓗ Ⓛ}}$	(✓)	✓	Gb: – Ko: <và>(t)	(*no data*)	Gb: – Ko: <và>(t) (tà)	Gb: <và>(t) (vtà) Ko: (*no data*)	Gb: – Ko: <và>(t) (tà) (tà) (tà)

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4 Discussion

4.1 Frequency of each tone class

What is the frequency of each tone class in the Izon lexicon? In this section, I catalogue class frequencies in both dialects, based only on lexical morphemes, i.e. nouns, verbs, and adjectives. This sample does not include proper names, transparently derived words, ideophones/adverbials, or any grammatical morphemes (numerals, quantifiers, determiners, auxiliaries/light verbs, inflectional enclitics, among others).

Gbarain Izon frequencies are shown in Table 14. From a sample of 513 lexical morphemes, classes A, B, and C are evenly distributed, constituting about a third of the vocabulary each. If a lexical item showed variation between two classes, each class was given 0.5. A database of these morphemes is found in the supplemental materials (see Appendix D).

Table 14: Gbarain Izon – Tone class frequency of lexical morphemes (N, V, Adj)

Class		*n*=513		Subclass		*n*	Subclass		*n*	Subclass		*n*
A	ⓁⒽ	165	(32.2%)	A1	$L^{ⓁⒽ}$	165	C1	…$HL^{Ⓛ}$	52.5	D1	$H^{ⒽⓁ}$	0
B	Ⓗ	173	(33.7%)	B1	$H^{Ⓗ}$	102	C2	$H^{Ⓛ}$	46.5	D2	$L^{ⒽⓁ}$	0
C	Ⓛ	175	(34.1%)	B2	$L^{Ⓗ}$	0	C3	…$LH^{Ⓛ}$	76	D3	<L>$H^{ⒽⓁ}$	0
D	ⒽⓁ	0		B3	<L>$H^{Ⓗ}$	71	C4	$L^{Ⓛ}$	0			

These 513 items were collected sporadically and opportunistically in order to have a large enough sample of vocabulary for deducing phrase and sentence level tonal changes. Nouns and verbs are represented in each subclass, however nouns of subclass C2 (/$H^{Ⓛ}$/) are quite rare compared to verbs.

Within class B (Ⓗ), no lexical morphemes are of class B2. This subclass strictly consists of a small number of grammatical morphemes, e.g. the demonstrative /ẹ̀ndị̀$^{Ⓗ}$/ ‘that’. Within class C, the distribution is fairly even internally, but recall that class C4 (/$L^{Ⓛ}$/) is missing in Gbarain. Finally, as stated class D (ⒽⓁ) is limited in Gbarain to the pre-vocalic pronouns; no class D lexical morphemes exist.

A much wider sample of lexical morphemes can be catalogued for Kolokuma Izon, based on Williamson & Timitimi’s (1983) dictionary. Excluding non-lexical morphemes (as well as proper names and ideophones), this results in a database of 1868 lexical morphemes. As above, the .5 designation indicates morphemes which varied between two subclasses. As above, see the supplemental materials for the corresponding database.

Table 15: Kolokuma Izon – Tone class frequency of lexical items (N, V, Adj)

Class		*n*=1868		Subclass		*n*	Subclass		*n*	Subclass		*n*
A	ⓁⒽ	609	(32.6%)	A1	$L^{ⓁⒽ}$	600	C1	…$HL^{Ⓛ}$	271.5	D1	$H^{ⒽⓁ}$	38.5
B	Ⓗ	713.5	(38.2%)	A2	$L^{ⓁⒽ}$*	9	C2	$H^{Ⓛ}$	2	D2	$L^{ⒽⓁ}$	22
C	Ⓛ	459	(24.6%)	B1	$H^{Ⓗ}$	422.5	C3	…$LH^{Ⓛ}$	184.5	D3	<L>$H^{ⒽⓁ}$	26
D	ⒽⓁ	86.5	(4.6%)	B2	$L^{Ⓗ}$	0	C4	$L^{Ⓛ}$	1			
				B3	<L>$H^{Ⓗ}$	291						

Classes A, B, and C are fairly evenly distributed, though fewer class C items occur than we saw in Gbarain. Class A were almost entirely /$L^{ⓁⒽ}$/, with a marginal number of A2 in which the floating Ⓗ does not self-dock (indicated by the asterisk – see §3.1.2). Subclass B2 is entirely missing in Kolokuma. Class C is particularly skewed. Classes C1 /…$HL^{Ⓛ}$/ and C3 /…$LH^{Ⓛ}$/ are well represented, but C2 /$H^{Ⓛ}$/ and C4 /$L^{Ⓛ}$/ are very marginal classes for lexical morphemes. Finally, class D constituted the smallest class. It is therefore not surprising that this class does not exist in Gbarain Izon (a loss reported even among certain Kolokuma Izon speakers as well – W&T83:*xxxii*).

Nouns and verbs in general are well-represented within each class in Kolokuma, but have an interesting distribution within class D. While D1 has only a moderately skewed distribution of nouns (*n*=10.5/38.5)

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versus verbs and adjectives (*n*=28/38.5), class D2 is made up almost entirely of nouns (*n*=20/22) while class D3 almost entirely of verbs/adjectives (*n*=25/26). Although D2 is rare for monomorphemic verbs, a productive process derives D2 verbs with the final intransitivizing suffix *–i/ị*. Part of the morphological expression is changing the tone pattern to D2 ($L^{ⒽⓁ}$), overwriting lexical tone. This is demonstrated in (47).

(47) Kolokuma Izon – Productive derivation of D2 verbs with intransitive *–i/ị*

a.	A1	finì$^{ⓁⒽ}$	[fíní]	‘open, unlock’
	D2	finì-ì$^{ⒽⓁ}$	[fìnìí]	‘be opened, unlocked’
b.	B1	gbábṵ́$^{Ⓗ}$	[gbábṵ́]	‘hold between lips, teeth’
	D2	gbàbṵ̀-ị̀$^{ⒽⓁ}$	[gbàbṵ̀ị́]	‘be contracted’ (e.g. of oysters)
c.	D1	fịná$^{ⒽⓁ}$	[fịná]	‘tie, bind’
	D2	fịnà-ị̀$^{ⒽⓁ}$	[fịnàí]	‘get entangled’
d.	D3	ìndé$^{ⒽⓁ}$	[ìndé]	‘be thick’ (e.g. of soup)
	D2	ìndè-ì$^{ⒽⓁ}$	[ìndèí]	‘be thickened’

4.2 Logically possible combinations of pre-associated tone and floating tone

I have proposed that tone class contrasts be analyzed as underlying sequences of pre-associated and floating tones. How do these representations stack up against the range of logically possible combinations of pre-associated tone and floating tone? This exercise will allow us to see common gaps, and help interpret them as accidental or systematic. In the tables below, possible combinations range from 0 to 6 individual tones in the input, forming various tone strings of H and L. For example, from a tone string of two tones H L, possible representations are (i) both pre-associated, HL, (ii) one pre-associated and the other floating, $H^{Ⓛ}$ and $^{Ⓗ}L$, or (iii) both floating, $^{ⒽⓁ}$. As throughout, underlying floating tones are circled.

We can begin by examining tone strings of 0–2 tones, and comparing it to the databases of lexical morphemes for both dialects (§4.1). Table 16 shows that lexical morphemes consisting of 0 tones (i.e. toneless) or 1 tone are absent in both dialects (a.–c.). I interpret this as a systematic gap for both dialects. All systematic gaps are denoted with asterisks, and are shaded gray. While absent for lexical morphemes, we have seen several functional morphemes which are toneless (e.g. /kpọ/ ‘also’) or have inherent but not floating tone (e.g. /bị/ DEFINITE).

Tone strings consisting of 2 tones (d.–g.) correspond to several attested Izon patterns, though most logically possible combinations are unattested. These include the four gaps in (48) below, which I interpret as systematic.

(48) Systematic gaps in Izon tone class contrasts

a. Tone identity: No adjacent identical tones of the same type (pre-associated or floating)
e.g. LL, HH, $^{ⓁⓁ}$, $^{ⒽⒽ}$ (note: this does *not* exclude $L^{Ⓛ}$ or $H^{Ⓗ}$)

b. Floating tone position: No floating tones before pre-associated tone
e.g. $^{Ⓛ}H$, $^{Ⓗ}L$, $^{Ⓛ}L$, $L^{Ⓗ}L$, $H^{Ⓛ}H$, etc.

c. Floating tone requirement: No sequences without floating tones
e.g. L, H, LH, HL, etc.

d. No all floating: No sequences consist only of floating tones
e.g. $^{Ⓛ}$, $^{Ⓗ}$, $^{ⒽⓁ}$, etc.

After these systematic gaps are taken into account, there are only four remaining patterns – $L^{Ⓛ}$, $L^{Ⓗ}$, $H^{Ⓛ}$, and $H^{Ⓗ}$ – all of which correspond to B and C tone classes in Izon (indicated in Table 16 in parentheses). While $L^{Ⓛ}$ is absent in Gbarain and rare in Kolokuma, it exists in enough names for places or people that it should not be considered a systematic gap. The same holds for $L^{Ⓗ}$, which does not occur as a lexical

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morpheme but found for some pre-nominal modifiers in Gbarain (/ẹ̀ndị̀$^{Ⓗ}$/ 'that', §3.2.1). Because I interpret these as non-systematic gaps, I denote them with 0 rather than *.

Table 16: Tone strings of 0–2 tones (lexical morphemes, both dialects)

Tone string	Patterns		Gb	Ko
a. Ø (no tone)	Ø		*	*
b. L	L		*	*
	$^{Ⓛ}$		*	*
c. H	H		*	*
	$^{Ⓗ}$		*	*
d. L L	LL		*	*
	L$^{Ⓛ}$	(C4)	0	1
	$^{ⓁⓁ}$		*	*
	$^{Ⓛ}$L		*	*
e. L H	LH		*	*
	L$^{Ⓗ}$	(B2)	0	0
	$^{ⓁⒽ}$		*	*
	$^{Ⓛ}$H		*	*
f. H L	HL		*	*
	H$^{Ⓛ}$	(C2)	46.5	2
	$^{ⒽⓁ}$		*	*
	$^{Ⓗ}$L		*	*
g. H H	HH		*	*
	H$^{Ⓗ}$	(B1)	102	422.5
	$^{ⒽⒽ}$		*	*
	$^{Ⓗ}$H		*	*

Next, consider tone strings consisting of three tones, in Table 17. Certain patterns are automatically ruled out from the systematic gaps in (48), e.g. gaps due to tone identity (rows a., h.) and the floating tone requirement (rows c., f.). Many other logically possible patterns are not shown, as they would be automatically ruled out as well, e.g. sequences of all floating tones.

Table 17: Tone strings of 3 tones (lexical morphemes, both dialects)

Tone string	Patterns		Gb	Ko
a. L L L	LL$^{Ⓛ}$ ~ L$^{ⓁⓁ}$ ~ etc.		*	*
b. L L H	L$^{ⓁⒽ}$	(A1)	165	600
	L$^{ⓁⒽ*}$	(A2)	0	9
c. L H L	LHL		*	*
	LH$^{Ⓛ}$	(C3)	68	146.5
	L$^{ⒽⓁ}$	(D2)	0	22
d. L H H	LH$^{Ⓗ}$	(B3)	2	0
	<L$_V$>H$^{Ⓗ}$	(B3)	68	291
e. H L L	HL$^{Ⓛ}$	(C1)	20.5	83.5
f. H L H	HLH		*	*
	HL$^{Ⓗ}$		*	*
	H$^{ⓁⒽ}$		*	*
g. H H L	H$^{ⒽⓁ}$	(D1)	0	38.5
h. H H H	HH$^{Ⓗ}$ ~ H$^{ⒽⒽ}$ ~ etc.		*	*

From these data, we can establish another systematic gap on tonal 'troughs', in (49), to be revised in (53).

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(49) Systematic gap – No troughs (to be revised): No sequences of tonal 'trough' H L H, e.g. HLH, HL$^{Ⓗ}$, H$^{ⓁⒽ}$, etc.

Such a constraint on tonal troughs is common cross-linguistically and tonologically natural (Yip 2002: 137). This automatically rules out all of the patterns in f.

Thus far, I have proposed that there is a contrast between pre-associated tones and tones which are not pre-associated and thereby 'floating'. It is worth asking at this juncture whether we can conflate these two tone types into a simpler representation. One alternative is having only pre-associated tones which delink under specific conditions, i.e. no floating tones in the input. A second alternative is having *only* floating tones which link to the sponsoring morpheme and target morphemes under specific conditions, i.e. no pre-associated tones in the input.

(50) Possible alternative representations for class D2
a. / L$^{ⒽⓁ}$ / (this paper) b. / LHL / (no floating) c. / $^{ⓁⒽⓁ}$ / (no pre-associated)

Such alternatives would have the advantage of being representationally uniform, and in most cases the corresponding surface pattern of the tone string is predictable from the tones in the input. For example, the tone string H L always corresponds to a morpheme with an underlying form /H$^{Ⓛ}$/, and does not contrast with /HL/ or /$^{ⒽⓁ}$/ representations.

The crucial evidence for positing representations with mixed pre-associated and floating structure comes from L H L tone strings (row c. in Table 17). Here, there *is* such a contrast, namely between /LH$^{Ⓛ}$/ (C3) vs. /L$^{ⒽⓁ}$/ (D2) in Kolokuma Izon. Examples are in Table 18.

Table 18: Kolokuma Izon – L H L tone string contrast: /LH$^{Ⓛ}$/ (C3) vs. /L$^{ⒽⓁ}$/ (D2)

/LH$^{Ⓛ}$/ (C3)			/L$^{ⒽⓁ}$/ (D2)	
èɡí$^{Ⓛ}$	'ganglion'	vs.	èkè$^{ⒽⓁ}$	'rat'
bẹ̀yọ́$^{Ⓛ}$	'floating mass of grass'	vs.	bèkè$^{ⒽⓁ}$	'English, White, European'
àndèí$^{Ⓛ}$	'small tsetse fly'	vs.	ịmgbàị$^{ⒽⓁ}$	'today'
àtàmgbàlá$^{Ⓛ}$	'ant species'	vs.	ọ̀kọ̀lọ̀bịrị̀$^{ⒽⓁ}$	'parrot'

These data show that it is not predictable whether the H in these strings will be pre-associated to the final TBU of the sponsor or will be floating and self-associates only in the absence of a suitable target host.

Finally, let us examine tone strings of 4 to 6 tones, which represent the upper limit of tones for single lexical morphemes, in Table 19. Most of the logically possible patterns in this table are ruled out by the systematic gaps above. For others, new statements are required. To rule out a tone string L L H L mapping to /L$^{ⓁⒽⓁ}$/ (row c.), I propose a systematic gap on a sequence of three floating tones, in (51).

(51) Systematic gap – No 3Ⓣ: No sequences of three floating tones, i.e. $^{ⓁⒽⓁ}$

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Table 19: Tone strings of 4–6 tones (lexical morphemes, both dialects)

Tone string		Patterns	Gb	Ko
a.	L L L L	LLL$^{Ⓛ}$ ~ etc.	*	*
b.	L L L H	LL$^{ⓁⒽ}$ ~ etc.	*	*
c.	L L H L	L$^{ⓁⒽⓁ}$ ~ etc.	*	*
d.	L L H H	LLL$^{Ⓗ}$ ~ etc.	*	*
e.	L H L L	LHL$^{Ⓛ}$ (C1)	32	185
f.	L H L H	LHLH	*	*
		LHL$^{Ⓗ}$	*	*
		LH$^{ⓁⒽ}$	*	*
		L$^{ⒽⓁⒽ}$	*	*
g.	L H H L	LH$^{ⒽⓁ}$	0	0
		<L$_{\dot{v}}$>H$^{ⒽⓁ}$ (D3)	0	26
h.	L H H H	LHH$^{Ⓗ}$ ~ etc.	*	*
i.	H L L L	HLL$^{Ⓛ}$ ~ etc.	*	*
j.	H L L H	HL$^{ⓁⒽ}$ ~ etc.	*	*
k.	H L H L	HLHL	*	*
		HLH$^{Ⓛ}$ (C3)	3	9
		HL$^{ⒽⓁ}$	*	*
		H$^{ⓁⒽⓁ}$	*	*
l.	H L H H	HLH$^{Ⓗ}$ ~ etc.	*	*
m.	H H L L	HHL$^{Ⓛ}$ ~ etc.	*	*
n.	H H L H	H$^{ⒽⓁⒽ}$ ~ etc.	*	*
o.	H H H L	HH$^{ⒽⓁ}$ ~ etc.	*	*
p.	H H H H	HHH$^{Ⓗ}$ ~ etc.	*	*
q.	L H L H L	LHLHL	*	*
		LHLH$^{Ⓛ}$ (C3)	4	29
		LHL$^{ⒽⓁ}$	*	*
r.	H L H L L	HLHL$^{Ⓛ}$ (C1)	0	2
s.	L H L H L L	LHLHL$^{Ⓛ}$ (C1)	1	1

The systematic gap on 'no troughs' (49) automatically rules out several logically possible patterns (e.g., within rows f., j., k., l., and n.). Underlying sequences of a pre-associated HLH trough are actually attested, however, in both Gbarain Izon and Kolokuma Izon (k., q., r., s.). Such sequences are rare, appearing in 8 of 513 lexical morphemes in Gbarain (1.6%), and 41 of 1868 (2.2%) in Kolokuma. The Gbarain examples are in Table 20, and a sample of Kolokuma examples are in (52).

Table 20: Gbarain Izon – Lexical morphemes with pre-associated trough /HLH/ (*n*=8/513)

Gbarain	English
kúkíńdùkú$^{Ⓛ}$	'sweet potato'
òdóbìá$^{Ⓛ}$	'cocoyam'
dángílòkó$^{Ⓛ}$	'giant' (n.)
òkókópọ̀lí$^{Ⓛ}$	'parrot'
òpórìópò$^{Ⓛ}$	'pig'
ọ̀vụ̂nrụ́n$^{Ⓛ}$	'crab'
àkákụ̀ụ̀mbá$^{Ⓛ}$	'praying mantis'
kɪ́lɔ̌$^{Ⓛ}$	'nearest, closest; do quickly, efficiently'

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(52) Kolokuma Izon – Lexical morphemes with pre-associated trough /HLH/ (*n*=41/1868)

a.	Core vocab.	árà**ụ́**$^{\text{Ⓛ}}$	‘female, she (subject pronoun)’	
		fúrò**ú**$^{\text{Ⓛ}}$	‘stomach’	
b.	Loans	kírísìmésì$^{\text{Ⓛ}}$	‘Christmas’	
		tòrótòró$^{\text{Ⓛ}}$	‘turkey’	(cf. Igbo [tòrótòró])
c.	Plants/animals	**ẹ̀fẹ́bụ̀á**$^{\text{Ⓛ}}$	‘cassava’	
		òdúbèrí$^{\text{Ⓛ}}$	‘stingray’	
d.	Reduplicants	gè**ní**gèní$^{\text{Ⓛ}}$	‘be spotted’	
		kèlékèlé$^{\text{Ⓛ}}$	‘trawl net’	

In both dialects, many of these words are loans, peripheral/special vocabulary (such as plants and animals), or reduplicants. Some words also appear to have multi-morphemic origins. For example, /òkókópọ̀lí$^{\text{Ⓛ}}$/ ‘parrot’ exhibits mixed vowel harmony categorically banned in single morphemes. Williamson & Blench (2011: 166) attribute this anomalous word to a borrowing from Igbo ([òkóòkó] ‘parrot’) in combination with the English word *Polly*, a common name for a parrot. Still, there are some basic vocabulary which cannot be explained away in this way, e.g. Kolokuma /árà**ụ́**$^{\text{Ⓛ}}$/ ‘she (full pronoun), female’ and /fúrò**ú**$^{\text{Ⓛ}}$/ ‘stomach’.

These findings require a revision to the systematic gap on troughs to only applying to *derived* troughs, i.e. those where the HLH pattern is not a pre-associated sequence in the input.

(53) Systematic gap (*revised*) – No derived troughs: No sequences of tonal ‘troughs’ H L H in the output which were not pre-associated in the input, e.g. HL$^{\text{Ⓗ}}$, H$^{\text{ⓁⒽ}}$, HLH$^{\text{Ⓗ}}$, HL$^{\text{ⓁⒽ}}$

Finally, one row from Table 19 still remains without explanation: the string of tones L H H L in row g. corresponding to a pattern /LH$^{\text{ⒽⓁ}}$/, which is unattested. A related string L H H (row d. in Table 17) corresponding to a pattern /LH$^{\text{Ⓗ}}$/ is also virtually unattested in either dialect. Examples with a L H H (L) string generally involve an initial extrametrical vowel, i.e. D3 <à>k**ụ́**$^{\text{ⒽⓁ}}$ ‘bitter’, where the initial L is not parsed as part of the phonological word. To account for the non-occurrence L H H (L) patterns, I posit a final systematic gap, *LH#H.

(54) Systematic gap – *(LH#H): No sequences of LH followed by H across a word boundary within a tone group

This gap would *not* rule out forms like <à>k**ụ́**$^{\text{ⒽⓁ}}$ because the initial vowel would be outside of the domain where this ban is evaluated, i.e. the tone group.[10]

4.3 Competing analyses: Ubiquitous floating tone vs. obligatory spreading

The analysis of this paper accounts for the various tonal patterns via ubiquitous floating tone: every lexical item in Izon has both pre-associated tone as well as floating tone at its right edge (with the possible exception of some class C subclasses – §3.3.2). This is typologically unusual, as floating tones are typically associated with only a minority of items in a lexicon or restricted to specific grammatical contexts.

A key aspect of this analysis is that a floating tone can be sponsored which is identical to the final pre-associated tone, i.e. adjacent low tones in class A /L$^{\text{ⓁⒽ}}$/ and classes C1 and C4 /…L$^{\text{Ⓛ}}$/, and adjacent highs for classes B1 and B3 /…H$^{\text{Ⓗ}}$/ and D1 and D3 /…H$^{\text{ⒽⓁ}}$/. One obvious objection to this analysis is that it is a contradiction of the OCP (Obligatory Contour Principle), which bans adjacent identical elements (Leben 1973, Goldsmith 1976, Kager 1999: 398, a.o.). Even early on, however, there emerged several analyses of tone systems which tolerated OCP violations, e.g. Odden (1982) for Shambala [ksb] and Clements’ (1984: 288) discussion of ‘geminate tone melodies’ in Kikuyu [kik]. Further, given the widespread adoption of

[10] A ban on LH#H sequences across words is in fact attested in another Ijoid language, Kalabari (Harry & Hyman 2014). There, if such a sequence arises across a word boundary, it is generally broken up by a downstep, i.e. [LH#ꜜH].

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Optimality Theory (Prince & Smolensky 2004) where constraints are violable with there being no restrictions on underlying structure (i.e., Richness of the Base), underlying sequences such as /H$^{Ⓗ}$/ must be seriously entertained. Such an analysis in fact has been recently argued for the Papuan language Awa [awb] in McPherson (2016) based on Loving (1973). From the tonal patterns in Awa, McPherson (2016:e43) concludes that "all L-final nouns are followed…by a floating L tone", a representation which "may be viewed as the phonologization of phonetic L carryover". Izon may have had a similar trajectory.

An alternative approach brought up by an anonymous reviewer is OBLIGATORY TONE SPREADING of the final tone of the first word of a tone group, an alternative brought up already in §3.2.3. The result would be a much more limited use of floating tone in underlying representations, i.e. it would no longer be 'ubiquitous' across the lexicon. The two analyses are compared in Table 21 with a tone group [wó wárị́] 'our house'. Under ubiquitous floating tone, the modifier would be represented /wó$^{Ⓗ}$/, while under obligatory tone spreading it would be simply /wó/.

Table 21: Ubiquitous floating tone vs. obligatory tone spreading

Ubiquitous floating tone:	H Ⓗ		H L Ⓛ		H Ⓗ	
(*analysis of this paper*)	|		| |	→	| ↾	
	wó	#	warị		wó	wárị́
Obligatory tone spreading:	H		H L		H	
(*alternative analysis*)	|		| |	→	↾	
	wó	#	warị		wó	wárị́

Under this alternative, lexical items of all tone classes would undergo obligatory tone spreading. A rendition of how this would look for each subclass is provided in Table 22, which consists of a proposed underlying representation for each tone class, and how tone would spread within a tone group. Spread tones are denoted with a checked underline. Floating tones are circled, as throughout.

Table 22: Analysis comparison across tone classes

Class	Ubiquitous floating tone			Cf.	Obligatory tone spreading alternative			
	UR	In tone group			UR	In tone group	→	Surface form
A	L$^{Ⓛ Ⓗ}$	(L.L) . (Ⓛ.Ⓗ)			L$^{Ⓗ}$	(L.L) . (L.Ⓗ)		
B1	H$^{Ⓗ}$	(H.H) . (Ⓗ.H)			H	(H.H) . (H.H)		
B2	L$^{Ⓗ}$	(L.L) . (Ⓗ.H)			L.L͡H	(L.L͡H) . (H.H)	→	[(L.L).(H.H)]
B3	<L>H$^{Ⓗ}$	<L> . (H.H) . (Ⓗ.H)			<L>H	<L> . (H.H) . (H.H)		
C1	…HL$^{Ⓛ}$	(H.L) . (Ⓛ.L)			…HL	(H.L) . (L.L)		
C2	H$^{Ⓛ}$	(H.H) . (Ⓛ.L)			H.H͡L	(H.H͡L) . (L.L)	→	[(H.H).(L.L)]
C3	…LH$^{Ⓛ}$	(L.H) . (Ⓛ.L)			…L.H͡L	(L.H͡L) . (L.L)	→	[(L.H).(L.L)]
C4	L$^{Ⓛ}$	(L.L) . (Ⓛ.L)			L	(L.L) . (L.L)		
D1	H$^{Ⓗ Ⓛ}$	(H.H) . (Ⓗ.Ⓛ)			H$^{Ⓛ}$	(H.H) . (H.Ⓛ)		
D2	L$^{Ⓗ Ⓛ}$	(L.L) . (Ⓗ.Ⓛ)			L.L͡H$^{Ⓛ}$	(L.L͡H) . (H.Ⓛ)	→	[(L.L).(H.L)]
D3	<L>H$^{Ⓗ Ⓛ}$	<L> . (H.H) . (Ⓗ.Ⓛ)			<L>H$^{Ⓛ}$	<L> . (H.H) . (H.Ⓛ)		

One can see several commonalities between the analyses. First, while the tone spreading alternative eliminates floating tone in classes B and C, it still requires it for classes A and D. Second, both analyses require spreading at some level: in the alternative, it is the primary means for valuing toneless TBUs within the tone group, whereas under ubiquitous floating tone it is secondary to floating tone association. Third, I mentioned above the idea that identical floating tones are the phonologization of phonetic carryover (McPherson 2016). Such a functional motivation equally applies if one interprets obligatory spreading as what has been phonologized.

Turning to key differences between the analyses, if one were to adopt the spreading analysis, two issues need to be settled. First, under the alternative all classes would undergo tone spreading. For classes such as C3 and D2 in Table 22, effects of such spreading would *not* be transparent in the tone groups (their surface

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forms are [(L.H).(L.L)] and [(L.L).(H.L)], respectively). One would be forced to posit underlying representations with final contours, i.e. /L.H͡L/ and /L.L͡H$^{Ⓛ}$/. Sample derivations involving C3 and D2 morphemes are in Table 23 (data from Kolokuma Izon).

Table 23: Kolokuma – Ubiquitous floating tone vs. obligatory tone spreading (classes C3 and D2)

Analysis		Underlying representation			Intermediate	Surface
Obligatory tone spreading: (*alternative analysis*)	C3	L HL | ⋁ òsûn 'starch'	#	L Ⓗ ∧ tabụ 'immerse'	→ L HL | ⋁ òsûn tàbù 'pour water on broken up starch'	(→ L H L | | ∧ [òsún tàbù])
	D2	L H Ⓛ ∧ | bèkě 'English'	#	H ∧ bịbị 'mouth'	→ L H Ⓛ ∧ | | bèkě bíbì 'English' (language)	(→ L H L ∧ | | [bèkè bíbì])
Ubiquitous floating tone: (*analysis of this paper*)	C3	L H Ⓛ | | òsún 'starch'	#	L Ⓛ Ⓗ ∧ tabụ 'immerse'	→ L H Ⓛ | | ∧ òsún tàbù 'pour water on broken up starch'	
	D2	L ⒽⓁ ∧ bèkè 'English'	#	H Ⓗ ∧ bịbị 'mouth'	→ L ⒽⓁ ∧ | | bèkè bíbì 'English' (language)	

Under the alternative, the underlying forms of these morphemes would have final contours, i.e. /òsûn/ and /bèkě$^{Ⓛ}$/. Intermediate representations would be required where the final tone of the contour spreads, followed by decontouring rules at the surface (i.e. falling H͡L#L becomes [H#L]). Although some decontouring is attested in Izon (see the general tone rules of Gbarain, Appendix A), we have seen several places already where falling tone appears before surface low, in (55). Here, there is no decontouring.

(55) C1 forms showing final falling tone before low tone

a. Gbarain Izon – dùrùkúù$^{Ⓛ}$ 'dark' → [dùrùkúù wàrị] 'a dark house'

b. Kolokuma Izon – àdùkúù$^{Ⓛ}$ 'dark' → [àdùkúù pàịnàpụlụ] 'dark pineapple'

Furthermore, under the ubiquitous floating tone analysis non-initial words of the tone group are valued with floating tones due to a straightforward constraint against unassociated tones in the output (e.g. *FLOAT in an OT approach). The alternative analysis would be required to employ some equivalent constraint to enforce tone spreading which must take place even in those contexts when all TBUs are already valued. Thus, it cannot be reduced to toneless TBUs needing valuation (see §3.2.3).

Two types of constraints in the (OT) literature could accomplish this task. One type are constraints which favor spreading, e.g. constraints EXPRESS(F) (Cole & Kisseberth 1994), SHARE(F) (McCarthy 2011), or SPREAD(F) (Kimper 2011), where F stands for a phonological feature (in the Izon data, it would be replaced by 'T' for tone). The other type of constraints are indirect, prohibiting sequences of mixed values of some feature in or across some domain, e.g. *INTERWORD[-ATR][+ATR] in Kügler (2015) and *INTERWORD[H][L] in Kula & Bickmore (2015). This could be generalized as a constraint *INTERDOMAIN[αF][βF].

Regardless of the exact type of constraint employed, it must specifically *not* apply iteratively to capture the fact that tone does not spread in several contexts, e.g. /ẹ̀ndị̀$^{Ⓗ}$/ does not spread to /bị/ in [ẹ̀ndị̀ námá bị] 'that animal' (cf. [námá bî] 'the animal'); again, see the data and argumentation in §3.2.3. How to accomplish this requires amending the grammar, e.g. incorporating Harmonic Serialism (Kimper 2011). I leave further comparison of these analyses to future work.

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5 Summary

I have proposed that all lexical morphemes (and many functional morphemes) fall into one of four tone classes in Izon, with several subclasses. This classification was based on the tonal behavior of morphemes in isolation and in multi-morphemic tone groups. To account for this behavior, all tone classes were decomposed into sequences of pre-associated tone and floating tone in their underlying representation. The four classes A–D are repeated in (56), which end with floating ⓁⒽ, Ⓗ, Ⓛ, or ⒽⓁ, respectively. The tonal structure of all non-initial morphemes in the tone group are deleted and replaced by these floating tones, e.g. that of the verb /ẹ̀rí$^{Ⓗ}$/ 'to see' below.

(56) Four tone classes in Izon

- Class A: ends in ⓁⒽ / tà$^{ⓁⒽ}$ + ẹ̀rí$^{Ⓗ}$ / → tà ẹ̀rí 'see wife!'
- Class B: ends in Ⓗ / fú$^{Ⓗ}$ + ẹ̀rí$^{Ⓗ}$ / → fú ẹ́rí 'see salt!'
- Class C: ends in Ⓛ / wún$^{Ⓛ}$ + ẹ̀rí$^{Ⓗ}$ / → wún ẹ̀rì 'see sand!'
- Class D: ends in ⒽⓁ / wò$^{ⒽⓁ}$ + ẹ̀rí$^{Ⓗ}$ / → wò ẹ́rì 'see him!'

By virtue of all lexical morphemes falling into one of these four classes, floating tone is found ubiquitously across the Izon lexicon, which I have referred to as 'ubiquitous floating tone'.

This paper examined two closely related dialects of Izon – Gbarain (Gb) and Kolokuma (Ko). From a basic lexicon of Gbarain, classes A, B, and C are evenly distributed, but class D is absent outside of certain pre-vocalic pronoun objects (d. in (56) above). Further, in the Kolokuma dictionary classes A, B, and C dominate but a smaller number of class D lexical morphemes occur as well. These frequencies are summarized in Table 24.

Table 24: Tone class frequency across lexical morphemes (both Izon dialects)

Tone class		Gb (*n*=513)		Ko (*n*=1868)	
A	ⓁⒽ	165	(32.2%)	609	(32.6%)
B	Ⓗ	173	(33.7%)	713.5	(38.2%)
C	Ⓛ	175	(34.1%)	459	(24.6%)
D	ⒽⓁ	0		86.5	(4.6%)

The proposed underlying representations of all Izon subclasses are summarized in Table 25.

Table 25: Proposed underlying representations of Izon subclasses (< > = extrametrical vowels)

Class A		Class B		Class C		Class D	
A1	L$^{ⓁⒽ}$	B1	H$^{Ⓗ}$	C1	…HL$^{Ⓛ}$	D1	H$^{ⒽⓁ}$
(A2	L$^{ⓁⒽ*}$)	B2	L$^{Ⓗ}$	C2	H$^{Ⓛ}$	D2	L$^{ⒽⓁ}$
		B3	<L>H$^{Ⓗ}$	C3	…LH$^{Ⓛ}$	D3	<L>H$^{ⒽⓁ}$
				C4	L$^{Ⓛ}$		

Based on examining the logically possible combinations of pre-associate and floating tone, I established the following systematic gaps in tone class contrasts:

(57) Systematic gaps in Izon tone class contrasts

- No adjacent identical tones of same type (pre-associated or floating), e.g. HH, $^{ⒽⒽ}$, etc.
- No floating tones before pre-associated tone, e.g. $^{Ⓛ}$H, L$^{Ⓗ}$L, etc.
- No sequences without floating tones, e.g. L, H, LHL, etc.
- No sequences of only floating tones, e.g. $^{Ⓛ}$, $^{Ⓗ}$, $^{ⒽⓁ}$, etc.
- No sequences of three floating tones, e.g. $^{ⓁⒽⓁ}$
- No sequences which would result in derived tonal 'troughs', e.g. HL$^{Ⓗ}$, H$^{ⓁⒽ}$, etc.
- No sequences which would result in LH followed by H across a word boundary within the same tone group, e.g. LH$^{Ⓗ}$

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Finally, several tone patterns illustrated a propensity for low tone to align with a vowel-initial word (a V-TBU), in contrast with the tone patterns with consonant-initial C-TBU counterparts. Such exceptional tone effects are summarized in (58).

(58) Exceptional tone effects of vowel-initial words
- Class A: Floating Ⓛ docks to the V-TBU, and floating Ⓗ docks immediately after it, analyzed as extrametricality of the initial vowel
- Class B (Gbarain only): L tone from initial word spreads to V-TBU, and Ⓗ docks immediately after it
- Class C: Vowel-initial words overwhelmingly have an initial low tone rather than high tone (e.g. ratio of 15:1 in Kolokuma)
- Class D (Kolokuma only): if target is vowel-initial, floating Ⓗ self-associates rather than associating to the V-TBU
- Class B and D: Subclasses B3 and D3 begin with an initial low-toned vowel, in (near) complementary distribution with consonant-initial high-toned B1 and D1

As stated, in at least some of these contexts I have interpreted the initial vowel as being extrametrical, which following Downing (1998) constitutes misalignment between morphological and prosodic constituents.

Finally, I compared the ubiquitous floating tone analysis advocated for here with an alternative involving obligatory tone spreading. While a full evaluation of this alternative remains, I identified several key differences and similarities. Importantly, positing ubiquitous floating tones at the right edge of a word or positing obligatory spreading of the final pre-associated tone both can be interpreted as the phonologization of pitch carry-over into the target domain.

Appendix A: General tone rules in Gbarain

There are two general tone rules in Gbarain Izon. The first rule is 'H-absorption', whereby a rising tone decontours and becomes low before a high tone, i.e. /LH.H/ → [L.H]. Examples (59)–(60) illustrate the absorption of the high component of an underlying rising tone. The relevant portion is underlined.

(59) Gbarain – H-absorption with /kù̱rè̱í/ 'be able to, can' [Gb-20190716:71]

a.	/ àrì̱ⓁⒽ	láⒽ	kù̱rè̱í	bùrùⓁⒽ	gbòròⓁⒽ	mí̱ /	[àr lá <u>kù̱rè̱í bùrù</u> gbòrò mí̱]
	I	reach	be.able	yam	plant	PRFV	'I was able to plant yam'
b.	/ àrì̱ⓁⒽ	láⒽ	kù̱rè̱í	námáⒽ	fé̱Ⓗ	mí̱ /	[àr lá <u>kù̱rè̱ì námá</u> fé̱ mí̱]
	I	reach	be.able	meat	buy	PRFV	'I was able to buy meat'

(60) Gbarain – H-absorption with /kí̱lǒⓁ/ 'do quickly, briefly, smartly, efficiently' [Gb-20190715:67]

a.	/ kí̱lǒⓁ	báráⓁ	kị	mị̀nⓁⒽ	/	[<u>kí̱lǒ bàrà</u> kị mị̀n]
	quickly	how	FOC	do		'do it smartly (and fast)'
b.	/ kí̱lǒⓁ	múⒽ	mà	bóⒽ	/	[<u>kí̱lò mú</u> mà bó]
	quick	go	and	come		'quickly go and come'

The second rule is 'low-to-mid raising', and applies when a high-low sequence appears at the end of an utterance, i.e. HL# > HM# utterance finally. In such sequences, the final TBU was produced higher in some tokens ([˥ ˩]) and lower in others ([˥ ˨], with a non-falling low tone), but was not produced with low tone which falls to the lowest part of the pitch range (i.e. *[˥ ˩]). Low-to-mid raising is demonstrated in (61).

(61) Gbarain – Low-to-mid raising: HL# → HM# utterance finally [Gb-20190706:30]

a.	/ wárì̱Ⓛ kpọ /	→	wárì̱ kpò	→	[wár kpō]	'also a house'
b.	/ wóⒽⓁ ẹ̀rí̱Ⓗ /	→	wó ẹ́rì̱	→	[wé̱ ẹ́rī̱]	'see us!'
c.	/ ìnèⒽⓁ ẹ̀rí̱Ⓗ /	→	ìnè ẹ́rì̱	→	[ìnè̱ ẹ́rī̱]	'see me!'

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Utterance final tokens across recording sessions consistently exhibited low-to-mid raising.

This rule applies only in declarative statements. In questions there is a final low tone which may be either interpreted as the realization of an utterance-final floating Ⓛ tone, or as the suspension of this low-to-mid raising rule. This creates quite salient sentence-level minimal pairs, distinguishing statements from questions:

(62) Gbarain – Low-to-mid raising does not apply in questions [Gb-20190710:44]

a. [béì kpọ̀ wárī] ‘this is also a house’

b. [béì kpọ̀ wárì] ‘is this also a house?’

Example (63) shows that the final mid tone is actually underlying low (rather than a bona fide mid toneme /M/). When the verb /sìn$^{ⓁⒽ}$/ ‘remove’ is clause-final, it surfaces as mid [sīn] (a.), but when it is followed by the clause-final particle /bâ/ ‘if’, it surfaces as low-toned [sìn] (b.).

(63) Gbarain – Demonstration that verb is underlyingly low-toned [Gb-20190708:41]

a. / èrí ìné$^{ⒽⓁ}$ ọ bárá$^{Ⓛ}$ sìn$^{ⓁⒽ}$ / [èrí ìnọ́ọ̀ bárá sīn]
he you on hand remove ‘He should leave you alone’

b. / èrí ìné$^{ⒽⓁ}$ ọ bárá$^{Ⓛ}$ sìn$^{ⓁⒽ}$ bâ / [èrí ìnọ́ọ̀ bárá sìn bâ]
he you on hand remove if
‘I thought you said he should leave you alone’, ‘If he should leave you alone…’

Independent corroboration of the low-to-mid rule comes from Williamson’s (1988: 254–255) comparison of tone classes across Ijoid. Where I have transcribed [HL] for several tone class C contexts in Gbarain – e.g. [kírì] (~[kírí]) ‘ground’, [kálá # bùrù] ‘small yam’, a.o. – she transcribes analogous forms with her Gbarain consultant as a high-downstep sequence [H$^{↓}$H] – e.g. [kí$^{↓}$rí] ‘ground’ and [bárá # $^{↓}$tọ́rṵ́] ‘wrist’. In her comparative dialect study, Williamson is careful to transcribe [HH] vs. [H$^{↓}$H] vs. [HL] across Ijoid varieties, indicating that she transcribed Gbarain as [H$^{↓}$H] purposely and in contrast to [HL].

Appendix B: Gbarain and Kolokuma tone class correspondences

Having established the tone class contrasts of Gbarain and Kolokuma Izon, let us briefly examine correspondences between tone classes in the two dialects. A summary of major correspondences is in Table 26. Keep in mind that at this point there are over three times as many lexical morphemes in the Kolokuma database compared to Gbarain. (As stated, for morphemes which varied across two tone classes, each class received .5). The number *n* indicates the number of corresponding pairs.

Table 26: Tone class correspondences between dialects

	Gbarain class			Kolokuma class		*n* =
a.	A	L$^{ⓁⒽ}$	↔	A	L$^{ⓁⒽ}$	135.5
b.	B1	H$^{Ⓗ}$	↔	B1	H$^{Ⓗ}$	96
c.	B3	<L>H$^{Ⓗ}$	↔	B3	<L>H$^{Ⓗ}$	57
d.	C1	…HL$^{Ⓛ}$	↔	C1	…HL$^{Ⓛ}$	26
e.	C2	H$^{Ⓛ}$	↔	B1	H$^{Ⓗ}$	25
f.	C3	…LH$^{Ⓛ}$	↔	(*frequent for all four classes*)		
g.	C2	H$^{Ⓛ}$	↔	D1	H$^{ⒽⓁ}$	14.5
h.	C3	L…H$^{Ⓛ}$	↔	D2	L$^{ⒽⓁ}$	21
i.	C3/B3 (*both small*)		↔	D3	<L>H$^{ⒽⓁ}$	11

Classes A and B in Gbarain correspond straightforwardly to the same classes in Kolokuma (a.–c.). The same holds for the C1 subclass in Gbarain (d.). Thereafter, there are mixed class correspondences (e.–i.). The majority of C2 morphemes in Gbarain correspond to B1 /H$^{Ⓗ}$/ in Kolokuma. Class C3 in Gbarain is the

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most complicated and irregular set. It corresponds fairly evenly to all four tone classes in Kolokuma (and many subclasses as well), with no clear majority and each correspondence set being relatively small (n<15).

Furthermore, as established class D is absent in Gbarain except for the few pre-vocalic pronouns. Class D lexical morphemes in Kolokuma generally correspond to the class C in Gbarain. One can see for D1 and D2 that the floating Ⓗ is 'pulled' one TBU to the left in Gbarain, e.g. docking to the final TBU in h. In contrast, no major patterns emerge with D3 given their limited number; they fairly evenly correspond to C3 (…LH$^{Ⓛ}$) and B3 (<L>H$^{Ⓗ}$) in Gbarain.

Appendix C: Comparison to the tone class analysis of Kay Williamson

The proposed analysis differs in crucial ways from the analyses in Williamson (1965, 1978, 1988) and Williamson & Timitimi (1983) of Izon. The clearest differences are with Williamson (1988), which examines tone in Kolokuma Izon against three other Ijoid varieties. Here, she posits three types of tone: pre-linked tone, domain tone, and floating tone. Pre-linked tone stays on the TBU syllable "with which it is associated in the lexicon" (Williamson 1988: 257). It is both immobile and does not spread to other TBUs. In contrast, domain tone (which I conventionalize as a circled lowercase ⓣ) is directly associated to the tone group itself, rather than to a traditional tone-bearing unit such as the mora. Williamson notes that the "defining feature of a domain tone is that it links to the leftmost free TBU and then automatically spreads through its domain until interrupted" (p. 256). Finally, floating tones – circled uppercase Ⓣ – are mobile and "surfaces in different positions in accordance with rules which vary from dialect to dialect" (p. 256). The behavior of these three tone types are summarized in Table 27.

Table 27: Williamson's three types of tone across Ijoid

Type		Is it mobile?	Does it spread?	Tone-bearing unit
Pre-linked	T	N	N	Syllable
Domain	ⓣ	N	Y	Tone group
Floating	Ⓣ	Y	N	Syllable (?)

Williamson proposes that these three types combine to form five tone classes across Ijoid, which she variably labels with Roman numerals (Williamson 1965), common numerals (Williamson & Timitimi 1983), or letters (Williamson 1988). Table 28 provides a comparison of the conventions of this paper to these previous works by Williamson.

Table 28: Tone class equivalences compared to work of Kay Williamson

Analysis of this paper:						W88 representation		
Class	UR	Cf.	W65	W&T83	W88	Pre-linked T	Domain ⓣ	Floating Ⓣ
A1	L$^{ⓁⒽ}$		I	1	C		ⓘ	ⓁⓁⒽ
B1/B3	H$^{Ⓗ}$		II	2	A		ⓗ	
C	…L$^{Ⓛ}$ / …H$^{Ⓛ}$		IV	4	D	…(H)…		
D1/D3	H$^{ⒽⓁ}$		III	3	B		ⓗ	Ⓗ
D2	L$^{ⒽⓁ}$		V	5	E		ⓘ	Ⓗ

Williamson proposes a complex grammar based on the three types of tone, coupled with multiple phonological cycles interacting with default tone. Full comparison between her analysis and the one in this paper would be too lengthy to include here; I leave the interested reader to compare the analyses directly.

Appendix D: Data collection and supplemental materials

The Gbarain data in this paper were collected in the summers of 2017 and 2019, in Port Harcourt and Ibadan, Nigeria. All Gbarain data comes from one proficient speaker named Jumbo Gift, from the Gbarain Izon community Okolobiri [òkólóbìrì] in Bayelsa State (5°02′N 6°19′E). He is highly proficient in Izon and uses it frequently with family and fellow Izon people. Recordings were made with a Tascam DR-

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100MKII recorder and an Audio-Technica AT803B omnidirectional lapel microphone. Due to environmental factors, sound quality varies by session. Recording sessions were transcribed using a Livescribe Echo smartpen, which aligns a set of recordings with the transcribed notes.

The primary goal of the fieldwork was to systematically document Izon grammatical tone patterns, based around hypotheses drawn from previous analysis of Izon tone (in particular Williamson 1965, 1988, Williamson & Timitimi 1983, and Efere 2001). The most effective way to complete this was through careful elicitation of particular words in isolation and in a set of carrier contexts designed to determine multi-word tonal effects. Due to the exhaustive (and exhausting) nature of this work, consultant choice was of utmost importance. The consultant was selected due to his fluency in the language, his ability to focus on subtle prosodic differences, and his consistency in replicating tone patterns across different recording sessions. Widespread dialectal differences in tone made working with multiple consultants simultaneously difficult. Sustained and widespread unrest in the Niger Delta made it unfeasible to reside in the indigenous Izon area to collect data. All recordings were made in Port Harcourt and Ibadan, large Nigerian cities.

The primary data found in this paper are drawn from an archived collection of Izon Field Materials (https://doi.org/10.7297/X2736P26) housed at the California Language Archive (https://cla.berkeley.edu/). Included in this archive are the original recordings (.wav format), copies of the original notes, as well as these notes aligned with the recording as made by the Livescribe Echo smartpen. All data points of this paper are specified with their location in the archive. For example, the data point [tà ẹ̀rí́] 'see wife!' from example (1) is accompanied by '[Gb-20190714:60]', which indicates it is from the Gbarain dialect, recorded on 2019-07-14, and found on p. 60 of the pdf of the digitized notes.

Finally, this paper includes supplemental materials, consisting of (i) an Excel spreadsheet with the lexicon of Gbarain Izon lexical items (nouns, verbs, adjectives) and a digitized and fully coded copy of the Kolokuma Izon dictionary (lexical items only); and (ii) a zip file containing extracted .wav files of select data points used in this paper (Gbarain dialect only).

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