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"Phonetics and phonology of Urhobo"[1]
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This paper describes the 14 vowel phonemes, 26 consonant phonemes, and 3 contrastive tone units in Urhobo. Accompanying .wav files mentioned in this paper are available upon request to the email provided above.

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[1] Many thanks go to Enojare Uadiale first and foremost for her patience and knowledge, and further to Herman Leung, Katie Sardinha, and Keith Johnson.

1. Section 1 – The language and the language consultant

Urhobo (ISO code: urh) is a South West Edoid language [Benue-Congo, Niger-Congo] spoken in Delta State, Nigeria, in the south-south geopolitical zone (see the genetic tree in Appendix 1, adopted from Elugbe 1989a,b). Population estimates range from approximately 500,000 (Lewis 2009) to 1.5 million (Mowarin 2004), with a significant population abroad (e.g. the Urhobo Progressive Union of Northern California, and Urhobo Congress USA Inc., *etc*.). No figures are available distinguishing number of speakers from number of ethnic group members. Although the language is widely spoken, Ojaide (2007: 3) reports that many of those who live in the urban centers of Urhoboland such as Effurun, Sapele, Ughelli, and Warri do not use and/or speak the language. This is particularly apparent among those who are under 21, who use Nigerian Pidgin English and Nigerian Standard English as the primary medium for inter-ethnic communication. Therefore, one should consider the Urhobo language highly endangered, despite a fairly large speaker population. A map of the Edoid languages locating where Urhobo is spoken is provided in Appendix 2.

The consultant identified for this paper was born in 1967 in the village of Eko in Urhoboland, and grew up most of their life in the cosmopolitan city of Warri (consisting of Urhobo, Ijaw, and Itsekiri people speaking quite distinct languages). They grew up speaking Urhobo with their parents, who spoke different dialects. They still speak with their mother in Urhobo, who remains in Nigeria. At 20 years old, they moved to Lagos (the largest city in the country within the Yoruba area in SW Nigeria), away from Urhoboland, and came to America at age 32. The consultant speaks both Urhobo and English fluently, though does not often speak Urhobo in the US. They know vocabulary and phrases from many other Nigerian languages, as well.

The earliest documentation on Urhobo is an 1828 word list by Hannah Kilham, as spoken by a freed slave in Freetown, Sierra Leone (Kilham 1828). In general, however, little research has been conducted on Urhobo and few resources exist. Two small dictionaries have been produced (Ukere 1986 and Usobele 2001), though no reference grammar exists. A number of articles exist written mostly for journals with areal commitments to West Africa. Previous phonetics/phonology research on Urhobo include Ladefoged (1968), Welmers (1969), Dunstan (1969), Iweh (1983), and Aziza (1997, 2002, 2003, 2006, 2008), among others.

2. Section 2 – Vowels

Urhobo contrasts seven vowels qualities. Each vowel has oral and nasal counterparts. Vowel length is not contrastive, and no distinctive phonations types exist. Vowels may occur in word initial or word final position. Phonetic diphthongs exist, but are restricted. We can therefore understand Urhobo as contrasting 14 vowel phonemes. This is summarized in the chart below:

Urhobo Vowels[2]	***Front***	***Central***	***Back***
Closed	i ĩ		u ũ
Mid-closed	e ẽ		o õ
Mid-open	ɛ ɛ̃		ɔ ɔ̃
Open		a ã	

Some near-minimal pairs involving oral and nasal vowels are provided below.

1. **Oral and Nasal pairs**

	Urhobo	**English**	**Wav**
a.	/ùdì/	"a drink"	Rolle_Urhobo_drink.wav
	/òdĩ̀/	"grass"	Rolle_Urhobo_grass.wav
b.	/úkpè/	"bed"	Rolle_Urhobo_bed.wav
	/ékpɛ́̃/	"sand"	Rolle_Urhobo_sand.wav
c.	/bɛrɛ/	"to tear"	Rolle_Urhobo_to tear - bere.wav
	/àbɛ̀rɛ̃̀/	"sword"	Rolle_Urhobo_sword - aberen.wav
d.	/ésàkpà/	"ant"	Rolle_Urhobo_ant - esakpa2.wav
	/ésɔ̃́/	"six"	Rolle_Urhobo_six - esan3.wav
e.	/ɔ́xɔ̀/	"chicken"	Rolle_Urhobo_chicken - oho1.wav
	/ér̥ɔ̃́/	"ears"	Rolle_Urhobo_ears - erhon1.wav
f.	/ùg͡bò/	"knee"	Rolle_Urhobo_knee.wav
	/àg͡bɔ̃̀/	"Agbon" (a clan of Urhobo)	Rolle_Urhobo_Agbon clan.wav
g.	/èwù/	"Ewu" (a village of Urhoboland)	Rolle_Urhobo_Ewu village.wav
	/éwṵ̀/	"clothes"	Rolle_Urhobo_clothes ewun - said to be bad when oral.wav

The distinction between the nasal mid-open and mid-close vowels is difficult to determine in certain words/tokens. Many neighboring languages only consists of one oral vowel at the mid-position, typically the mid-open vowels /ɛ̃/ and /ɔ̃/ (e.g. in Edo, Esan, Yoruba, among others).

There are no apparent restrictions on the distribution of the oral vowels. All may appear in word initial, word medial, and word final position, as shown below:

[2] Due to a lack of phonological process data, I do not make any claims as to the featural content of these vowels at this point; the labels "open", "closed", "back", etc. therefore should not be understood as coextensive with features at this point.

Distribution of Vowels	Word Initial	Word Medial	Word Final
/i/	/íbì/ “seeds”	/ɔ́fĩg͡bò/ “oil”	/èdì/ “palm nut”
/e/	/ébrì/ “darkness	/ìbê͡kpè/ “wings”	/ɔ̀bè/ “leaf, book”
/ɛ/	/èβ̩é/ “goat”	/ àbɛ̀rɛ̀/ “sword”	/ɔ̀r̩è/ “plantain”
/a/	/àmɛ̃̀/ “water”	/ɔ́ʃáɹè/ “man”	/ɔ́kà/ “corn”
/ɔ/	/ɔ́˗sé/ “father”	/ɔ̀gɔ̀rɔ̀/ “palm wine”	/ɔ̀wɔ̀/ “leg”
/o/	/ògbéĩ̀/ “tortoise”	/ùkònì/ “kitchen”	/èɣó/ “darkness”
/u/	/ùr̩ié/ “river”	/ùgbú˗kó/ “back”	/ísìù/ “stars”

Few examples occur with the mid-open vowels /ɛ/ and /ɔ/ in word medial position.

This 7-vowel quality system descended from a 10 vowel system which maintained an advanced tongue root [ATR]/retracted tongue root [RTR][3] distinction which has collapsed in Urhobo (Elugbe 1989b) [Only the Degema language maintains the conservative ATR proto-Edoid system, and exhibits full harmony (Kari 2004)]. Additional evidence that this system has collapsed is that vowels which would have formerly been classified as [–ATR] (/ɛ/ and /ɔ/) can appear freely with vowels which would have been classified as [+ATR] (/e/ and /o/). This is shown in the examples below.

2. <u>Free occurrence of mid vowels</u>

a. /ɔ̀wɔ̀/ “leg”
b. /ɔ́˗sé/ “father”
c. /ɛ̀β̩é/ “goat”
d. /ɔ̀bè/ “leaf, book”
e. among others

This is not so for other languages with a collapsed ATR system (e.g. Yoruba which forbids oCɔ type sequences). There is currently not enough data available to determine if all vowels occur with all others vowels in a word, though I do not suspect this to not be the case.

The distribution of nasal vowels is more complicated. This complication arises due to a phonological process of rightward (anticipatory) nasal spread from either (A) a nasal consonant, or (b) a nasal vowel (see section 5. Section 5 - Phonological process – Nasal spread on 41). From the data, however, we can make the following two observationally adequate statements:

[3] I will refer to this as [-ATR].

[1] When nasal spread does not occur, nasal vowels are found in word final position
e.g. /èvṵ̃/ [èvṵ̃] “belly”

[2] When nasal spread does occur, nasal vowels occur in word initial, medial, and final position
e.g. /íjòrĩ̀/ [ĩ́jò̰r̃ĩ̀] “five”
/àŋ͡mā́/ [ã̰̀ŋ͡mā́] “cloth”

The only possible exceptions are /èkā́ĩ́kā́ĩ́/ “local gin” (which has clear reduplication), and /íjā̋wɔ̀/ “soldier ant”, which is only variably nasalized, and may be a synchronic of diachronic compound. That nasals do not occur phonologically other than in the final position makes sense for two reasons. One is that these nasal vowels likely come from coda nasal stops which have been lost (research would need to be conducted looking at the diachrony). Secondly, the initial vowel on the nouns throughout are a remnant noun class marker which has been (arguably) incorporated into the stem (i.e. no longer combinatorial). Elugbe (1989b) reconstructs these noun class markers, and shows that they are all oral vowels with V (and a few CV) shapes. Nasal vowels or nasal consonants are not reconstructed for these noun class markers.

In certain tokens, nasal vowels are often difficult to hear, and can alternate with an oral counterpart in non-careful speech. This alternation has been noted by other researchers studying Urhobo as well (e.g. Welmers 1969:85). Variation in nasality is shown in the examples below:

3. /àbɛ̀rɛ̀/ “sword”
[àbɛ̀ɾ̃ɛ̃̀] Rolle_Urhobo_sword - aberen.wav
[àbɛ̀ɹɛ̀] Rolle_Urhobo_sword - abere - oral.wav

This variation in nasality is not noted for the nearby Edoid languages Edo and Esan.

No true diphthongs are attested in the language, that is, dynamic vowel sequences which consistently patterns as a single phoneme. There are instances of vowel-vowel sequences, however, though these are much more rare than single vowel occurrences, and depend on a particular analysis. The following chart displays vowel-vowel sequences attested in the language within words.

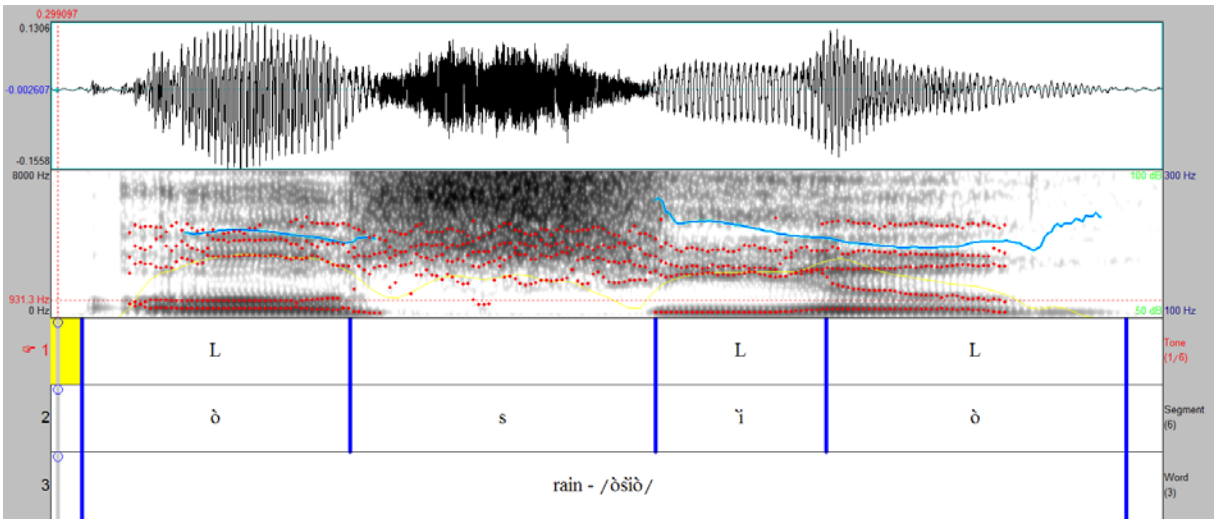
Vowel 2 / Vowel 1	i	e	ɛ	a	ɔ	o	u
i	-	/ie/ /díè/ “what”	/iɛ/ [jɛ] /èvìɛ̀/ [èvjɛ̀] “breast”	/ia/ [ja] /àɸíá/ [àɸʲá] “knife”	-	/io/ [jo] /àfíótɔ̀/ [àfjótʰɔ̀] “rabbit”	/iu/ [ju] /ísìù/ [ísjù] “stars”
e	/ei/ /ògb̀éì̀/ “tortoise”	-	-	-	-	-	-
ɛ	-	-	-	-	-	-	-
a	ai [aj] /èkā́ĭ̄kā́ĭ́/ [èkʰā́j̄kʰā́j̄] “local gin”		-	-	-	-	-
ɔ	-	-	-	-	-	-	-
o	-	-	-	-	-	-	-
u	-	-	/uɛ/ [wɛ] /èrúé/ [èɽwé] “cow”	/ue/ [we] /íxùè/ [ǐːxwè] “ten”	/uɔ/ [wɔ] /íɹúɔ́/ [íɹwɔ́] “job”	-	-

One can see from this chart that if one assumes that sequences [C{j/w}V] are underlyingly /C{i/u}V/, then there are many vowel-vowel sequences. If, however, one assumes that these are underlyingly /C{j/w}V/, then the only vowel-vowel sequences are /ei/ and /ai/[4]. The reason why I posit /C{i/u}V/ sequences as vowel-vowel sequences is because in some tokens, two vowels can clearly be heard. This is shown below:

4. Vowel-vowel sequences
    a. /òsìò/ “rain”
        [òsiʲò]~[òsjò] Rolle_Urhobo_rain - osio - diphthong.wav
    b. /òvìè/ “king”
        [òviʲè]~[òvjè] Rolle_Urhobo_King.wav

A spectrogram for /òsìò/ “rain” is provided below. Here, one can clearly see the two vowels /i/ and /o/, associated with distinct F2 values. The duration of /i/ lasts for a significantly long portion (roughly 123 ms, or about 1/3 the total vowel-vowel sequence duration).

[4] These should not be analyzed as /ej/ and /aj/ as there is no evidence for codas anywhere in the language.



[It should be noted, however, that the [wV] sequences sound more like a glide+vowel than a vowel+vowel sequence, perhaps suggesting that these are underlyingly /wV/ sequences. More research is required for vowel-vowel sequences in general, and more instrumental readings.]

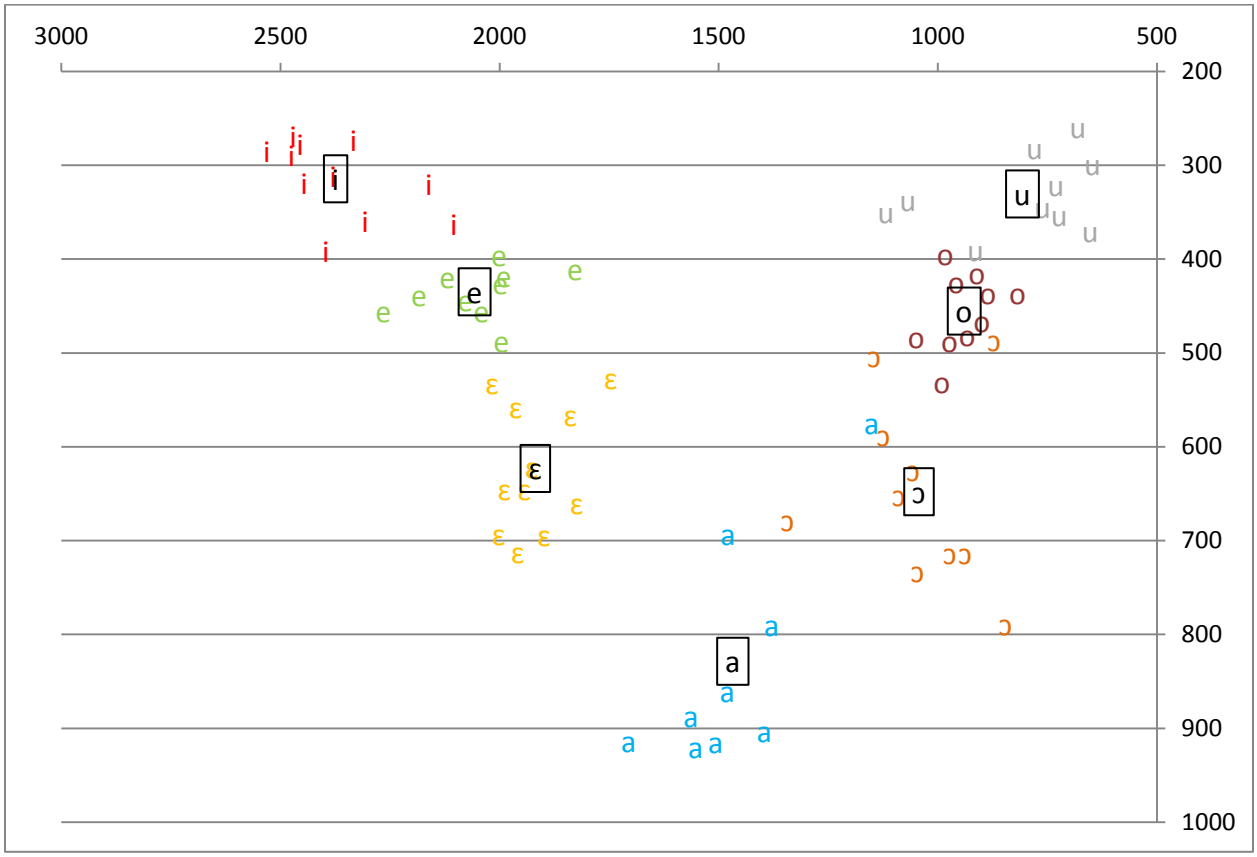
That vowel-vowel sequences are rare in Urhobo is interesting if we note how often they occur in more northerly Edoid languages, e.g. Emai (Data from Schaefer & Egbokahre 2007):

5. Emai:
   a. *òtọ̀ì* /òtɔ̀ì/ “origin, source”
   b. *éọ́khò* /éɔ́xɔ̀/ “fowls”
   c. *éèà* /ê:à/ “person”
   d. *háún* /hɐ̋ɐ̋/ “great distance”

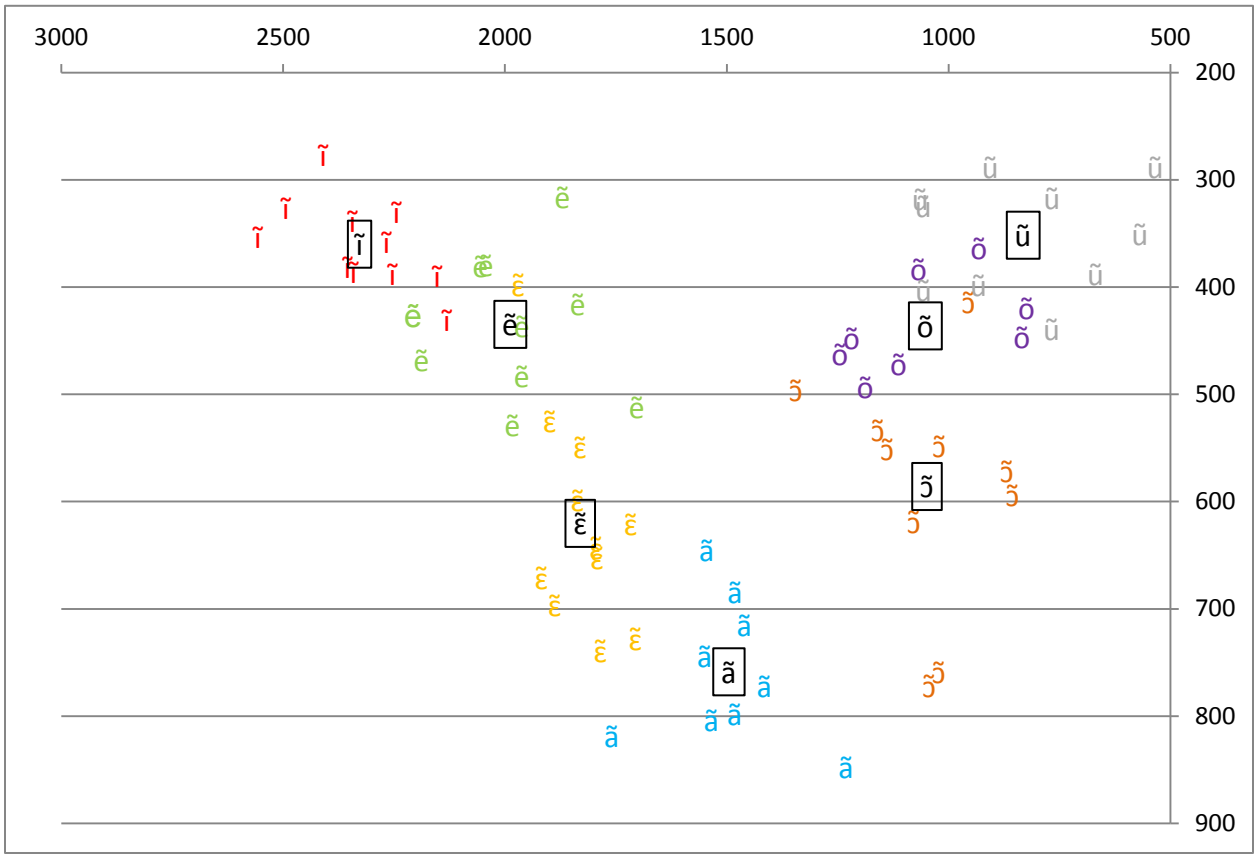
Urhobo, therefore, patterns much closer to the Delta Edoid language Degema, which has been claimed to have no non-identical vowel-vowel sequences (Kari 2004:383) [Refer to Appendix 1, the Edoid tree on page 45 for the relationship of Urhobo to Degema. These two languages are not geographically close, relatively.] Further research is required to determine if this is an areal feature, a genetic feature, or coincidence.

A vowel plot showing the F1 and F2 values of these 14 vowels (7 oral and 7 nasal) are provided below. Oral and nasal vowels are provided in separate charts. 10 tokens of each vowel were used. Raw data is provided upon request, in an excel file. The average is provided in the black box.

6. Oral vowels



7. Nasal vowels



The vowels are fairly cleanly distributed for the oral vowels, with very minimal overlap. The nasal vowels are not as cleanly distributed (especially with respect to the non-low, back vowels). The average of the vowels is similar for both sets, though two points should be made. First, the nasal /ã/ has a lower F1 than the oral /a/ counterpart, suggesting it may be characterized as [ɐ̃] (comparison to Portuguese low nasal vowel might be interesting here). Secondly, the oral vowel /o/ has a lower F2 than the nasal counterpart /õ/, therefore suggesting /o/ is pronounced further back (this should be looked at both with respect to tongue shape, but also tongue root position, a possible remnant of the former ATR system). Tokens of /õ/ were rare in this corpus.

3. Section 3 – Consonants

A list of the 26 (possibly 28) consonantal phonemes found in Urhobo is provided in the table below.

Consonants (Phonemic)	**Bilabial**		**Labio-dental**		**Alveolar**		**Post-alveolar**	**Palatal**		**Velar**		**Labial-Velar**	
Plosive	p	b			t	d		k^j	(g^j)	k	g	$\widehat{kp}$	$\widehat{gb}$
Nasal		m				(n)			ɲ				$\widehat{ŋm}$
Fricative	ɸ		f	v	s		ʃ			x	ɣ		
Affricate							$\widehat{dʒ}$						
Approximant		β̞							j				w
Lateral approximant						l							
Trill/Tap/Flap					ɾ̥	r							

A list of phonetic variants of these phonemes are below. These variants are explained in this section.

Consonants (Phonetic)	**Bilabial**		**Labio-dental**		**Alveolar**		**Post-alveolar**	**Retroflex**		**Palatal**		**Velar**		**Labial-Velar**	
Plosive	$p^ʻ$	b			t^h	d				k^{jh}, c^h	g^j, ɟ	k^h	g	$\widehat{kp}$	$\widehat{gb}$
Nasal		m				n					ɲ				$\widehat{ŋm}$
Fricative	ɸ		f	v	s		ʃ			ç	ʝ	x	ɣ		
Affricate					t^s, t^{hs}	d^z	$\widehat{dʒ}$			$\widehat{kc^h}$(?)	$\widehat{ɟʝ}$				
Approximant		β̞			ɹ̥	ɹ, ɹ̠		ɻ̊	ɻ		j	ɯ̊	ɯ		w
Nasal Approximant		$\tilde{β̞}$				ɹ̃			ɻ̃		j̃				w̃
Lateral approximant						l							ɬ		
Trill/Tap/Flap					ɾ̥, ɽ̥	r, ɾ		ɽ̊	ɽ						

3.1. Plosives

Urhobo contrasts stops at 5 places of articulation: bilabial, alveolar, palatal, velar, and labial-velar. Each of these has a voiceless/voiced pair (although the distribution of the voiced palatal is more complicated; see below). Voiceless stops /t k^j k/ are aspirated (i.e. there is a period of

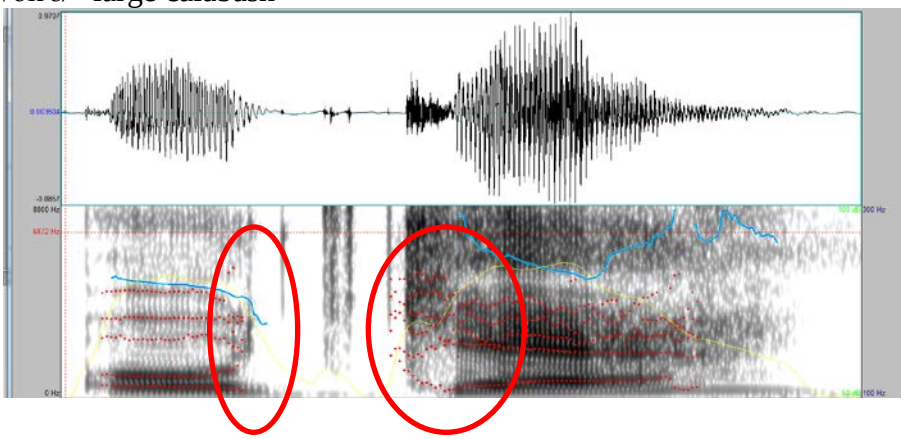
voicelessness after the release of the burst); /p/ is found only in loanwords and is lightly aspirated; /kp/ is not aspirated. Plosive contrasts are shown in the pairs below:

8. Plosives
    a. Bilabial
    /ìpɔ́tù/ [ìpˈɔ́tʰù] “pot”
    /àbɔ̀/ [àbɔ̀] “hands”
    b. Alveolar
    /tòdɛ̀/ [tʰòdɛ̀] “till tomorrow, good bye”
    /ódódó/ [ódódó] “flower”
    c. Palatal
    /kʲá/ [kʲʰá] [kʲʰǽ] [cʰá] “will” (future marker)
    (/ègʲèrè/ [ègʲèɹè] “crocodile”)
    d. Velar
    /ɔ́kà/ [ókʰà] “corn”
    /úgâvà/ [úgâvà] “stomach”
    e. Labial-velar
    /ɛ̀kpà/ [ɛ̀kpà] “fool”
    /àgbákàrà/[àgbákʰàɹà] “local gin”

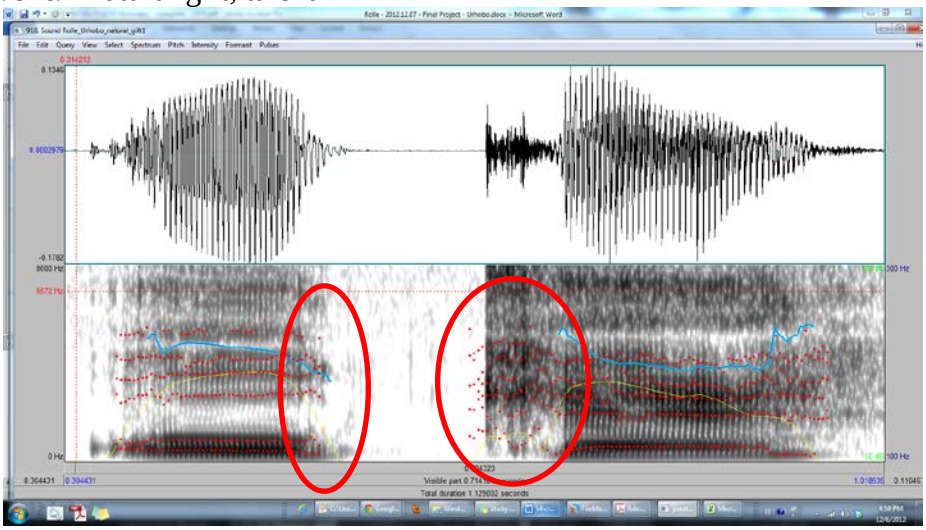
We present a spectrogram comparison of a three-way minimal pair for the stops /kʲ/, /k/, and /kp/ below (ignoring tone):

9. Spectrogram comparison
    a. /òkʲɛ́/ “large calabash”
    b. /òkɛ̀/ “natural gift, talent”
    c. /ókpɛ́/ “Okpe ethnic group”

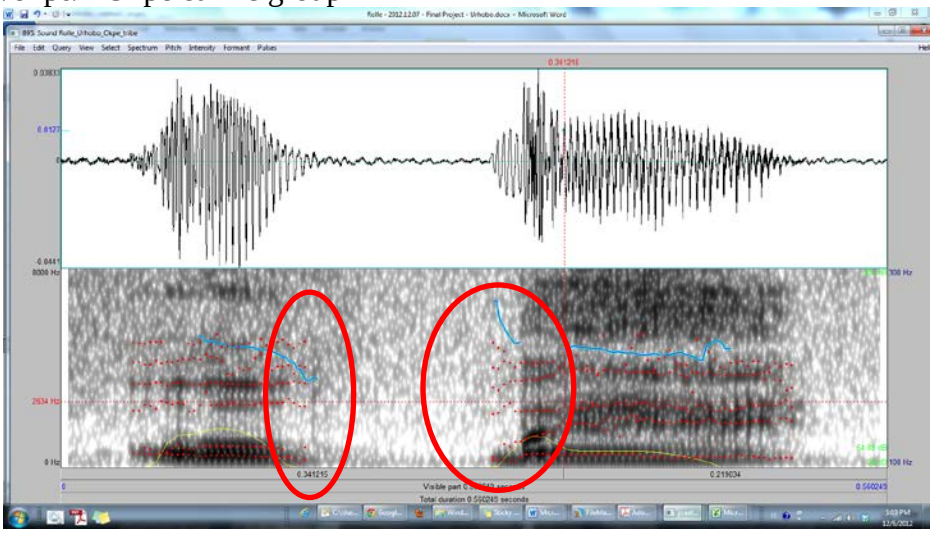
/òkʲé/ “large calabash”



/òkè/ “natural gift, talent”



/ókpé/ “Okpe ethnic group”



We can see from these spectrograms (at least) the following, which we can interpret as the acoustic cues in the signal to distinguish these phonemes (besides aspiration distinctions):

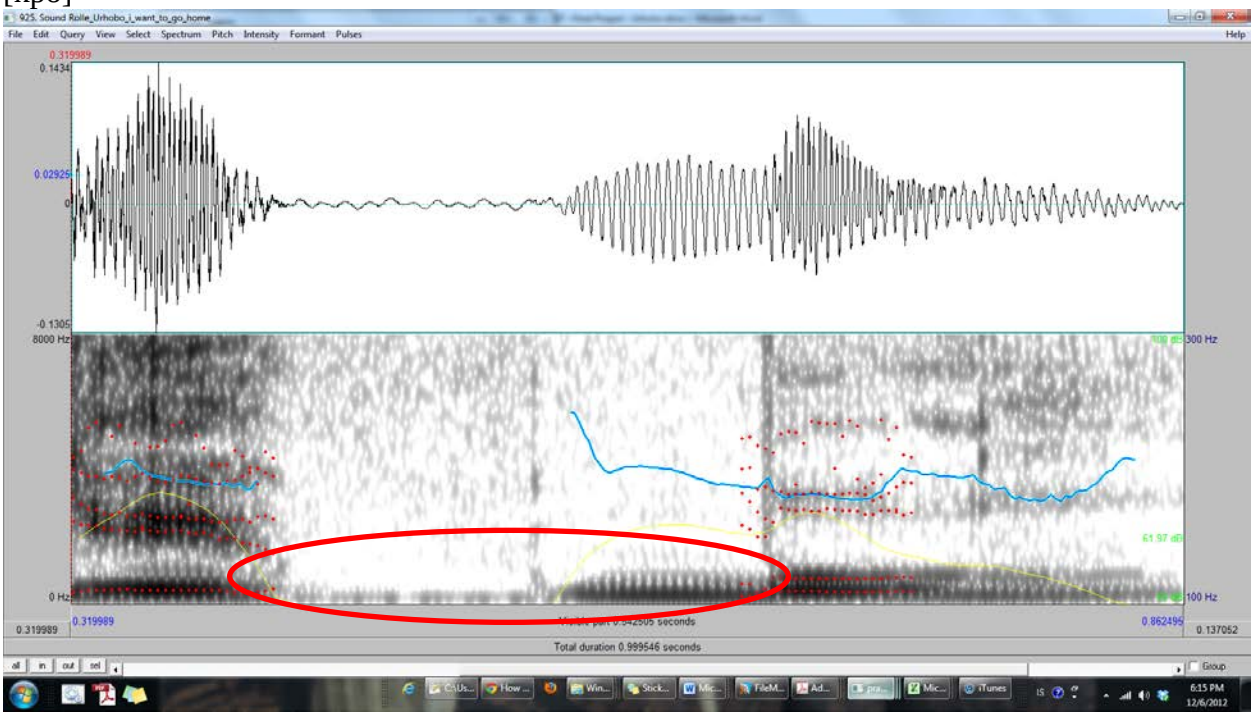
[1] The velar pinch for /kʲ/ is strong
[2] There is a rising of F1 and F2 for /kp/, which is typically associated with labial sounds (Ladefoged & Johnson 2011)
[3] There is a palatal period after the release burst of /kʲ/ in which F1 is lower and F2 is higher

Further, with respect to aspiration, the following VOT measurements have been made on a few select tokens.

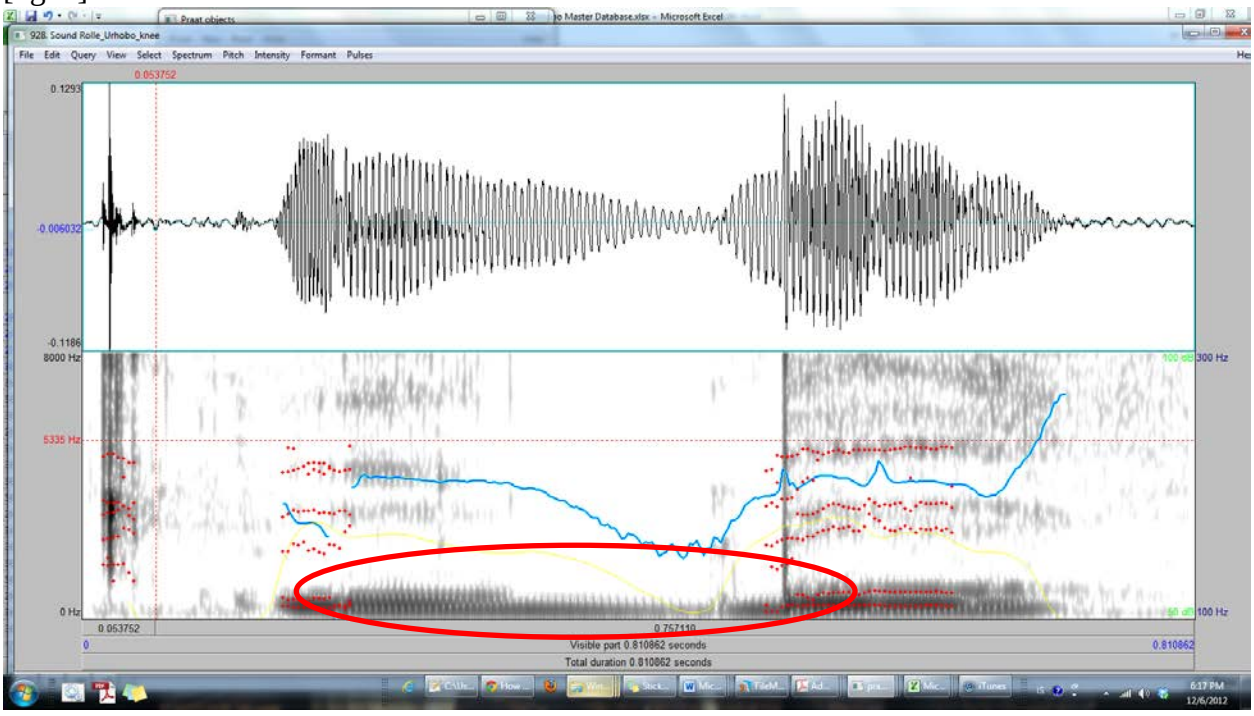
Phoneme	**Word (phonetic)**	**Meaning**	**VOT**	**.wav**
p	ɔ́sìpʿítʰo	hospital	36	Rolle_Urhobo_hospital - osipito.wav
p	ɔ́sìpʿítʰo	hospital	31	Rolle_Urhobo_hospital1.wav
p	ìpɔ́tʰù	hospital	13	Rolle_Urhobo_pot
t	àfjótʰɔ̀	rabbit	60	Rolle_Urhobo_rabbit
t	ùkʰòtˢʰì	needle	100	Rolle_Urhobo_needle1
t	ítʰábà	tobacco	83	Rolle_Urhobo_tobacco
kʲ	kʲʰùdʒì	to steal	93	Rolle_Urhobo_to_steal_-_kyuji
kʲ	òkʲʰɛ́	calabash large	111	Rolle_Urhobo_calabash_large1
kʲ	ɛ́kʲʰɛ̀	door	50	Rolle_Urhobo_door
k	kʰɛ̀ɹɔ̀vò	count one...	45	Rolle_Urhobo_count_one_-_kerovo
k	ɔ̀kʰè	time	76	Rolle_Urhobo_time1
k	ɛ̀kʰú	Eku town	66	Rolle_Urhobo_Eku_Town
kp	ókpɛ́	Okpe group	-18	Rolle_Urhobo_Okpe_tribe
kp	ìkpùkpùjɛ̀kʰɛ̀	duck	-25	Rolle_Urhobo_duck_-_ikpukpuyeke2
kp	mǐ kʰé ˬkpó	I want to go home	-109	Rolle_Urhobo_i_want_to_go_home

From this chart, we can see two things. First, the VOT is significantly shorter for /p/ than it is for the other voiceless stops. Secondly, the /kp/ sequence has a negative VOT, in some cases, quite dramatically, e.g. for the last token [kpó] from [mǐ kʰé ˬkpó] "I want to go home". The phoneme /kp/ is distinguished from the phoneme /gb/ by the amount of negative –VOT. A spectrogram comparison is below. This is the [kpó] from the token above, compared with [gb] in /ùgbò/ "knee" (Rolle_Urhobo_knee.wav).

[kpo]



[ùgbò] “knee”



When we compare these, we see that the voicing lasts throughout the duration of /gb/, whereas it only starts past the second half with /kp/.

There appears to be complementary distribution between [gʲ] and [g] in this data set, unlike with [kʲʰ] and [kʰ] (see minimal pair on page 11). [gʲ] appears before front vowels /i e ɛ/, while [g] appears before non-front vowels /a ɔ o u/:

	gʲ	**g**	**kʲʰ**	**kʰ**
i	ìgʲíɣ̩èɾè “bicycle”	-	ɔ̀kʲʰíósìò “rainy season”	ìkʰíʃ̃ènì “kitchen”
e	ègʲèɹè “crocodile”	-	-	úkʰéɻè “numeral”
ɛ	ìgʲèɻé “Idjere village”	-	ékʲʰè “door”	òkʰè “natural gift”
a	-	úgâvà “stomach”	kʲʰá “will”	àgbákʰàɻà “local gin”
ɔ	-	ɔ̀gɔ̀ɽɔ̀ “palm wine”	-	òkʰɔ̀ “boat”
o	-	ògòdè “sheep”	-	ùkʰòtˢʰì “needle”
u	-	èɡùsí “melon (dish)”	kʲʰùdʒì “to steal”	ùkʰú˗tʰá “grinding stone”

I assume that the gaps with /kʲ/ are accidental gaps. More data will reveal whether there is a true contrast between [gʲ] and [g], though for now I classify them as variants of the same phoneme /g/[5].

3.2. Affricate /dʒ/

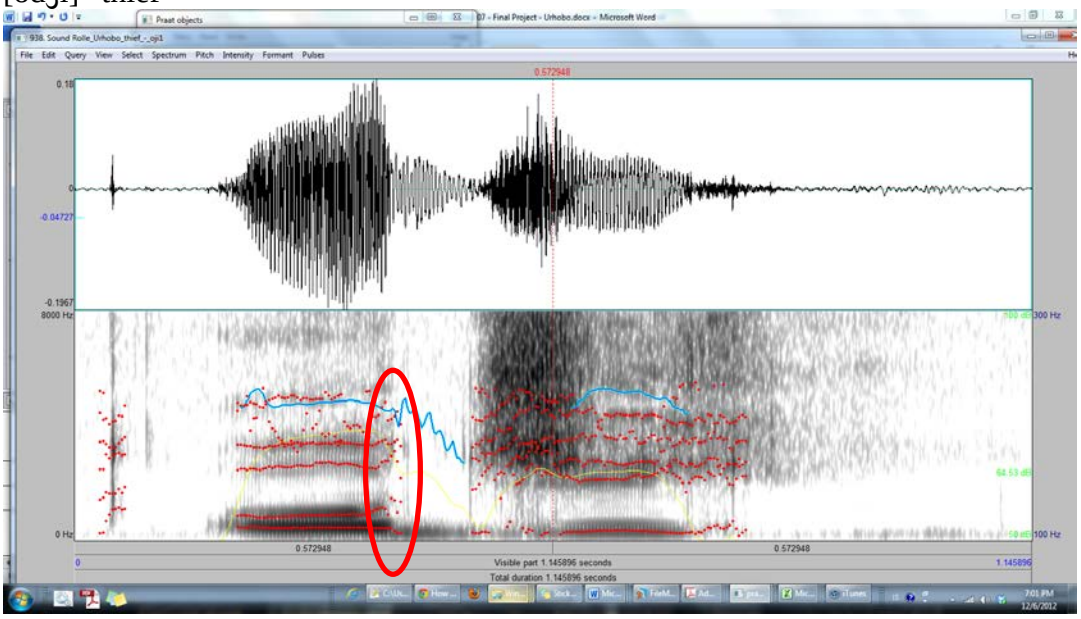
Urhobo has one phonemic affricate /dʒ/; no voiceless counterpart /tʃ/ exists. This phoneme appears to have two allophones. An allophone [dʒ] occurs before front vowels; an allophone [ʄ͡ʝ] appears before non-front vowels.

[5] The reason why I am hesitant to fully adopt this analysis that [gʲ] and [g] are allophones of /g/ is because, according to my consultant and verified with an Urhobo dictionary, [gʲ] is spelled with <dj>, while [g] is spelled with <g>. Much more work is needed here to tease apart this issue, especially with respect to the voiced post-alveolar affricated /dʒ/, discussed below.

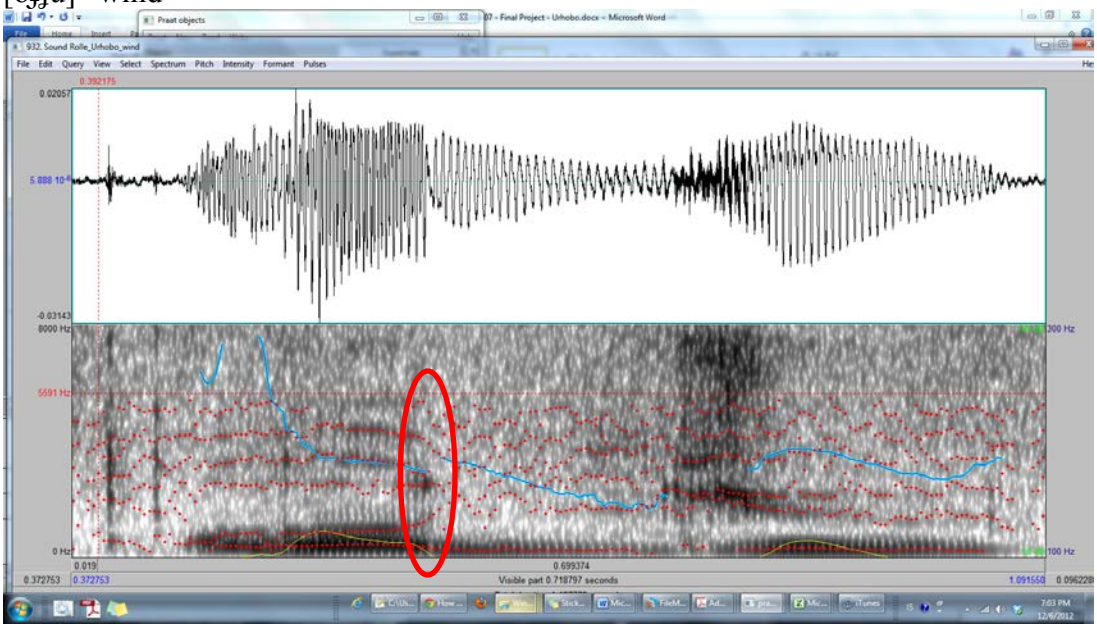
10. /dʒ/ Examples
    a. [dʒ] before front vowels
        i. [kʲʰùdʒì] “to steal”
        ii. [òdʒì] “thief”
        iii. [ùdʒì] “theft”
        iv. [dʒérwúò] “whats wrong with him?”
    b. [ɟ͡ʝ]~[ʝ] before non-front vowels
        i. [àɟ͡ʝá] “bat”
        ii. [òɟ͡ʝù] “wind”
        iii. [ɛ̀ɟ͡ʝóó]~ [ɛ̀ʝó] “no”

The clearest distinction between [dʒ] and [ɟ͡ʝ] is in [òdʒì] “thief” (Rolle_Urhobo_thief_-_oji1.wav) vs. [òɟ͡ʝù] “wind” (Rolle_Urhobo_wind.wav). Spectrograms are provided below:

[òdʒì] “thief”



[òʄ͡ʄù] “wind”



Here, we can see that the formant transitions into these two sounds are distinct, and that there is more of a pinch of F2 and F3 associated with back consonants with [òʄ͡ʄù]. In pronouncing these sounds back to my consultant, and making her aware of the differences, the consultant notes that different clans of Urhobo will pronounce this phoneme /dʒ/ differently. In my consultants own speech, the consultant sometimes goes between [d͡ʒ] and [ʄ͡ʄ] despite the conditioning environment. Therefore, I only tentatively claim that these sounds are in complementary distribution until more data can be obtained. What suffices at this point is that there exist no examples of these sounds in contrast with one another.

We can compare this phoneme /dʒ/ to both /d/ and /g/ [gʲ] before a front vowel to see a true phonological contrast.

11. Contrast between /dʒ/ and /g/ [gʲ] before front vowels
    a. [òdʒì] “thief”
    b. [ìgʲíɣ̞ɛɾè] “bicycle”
    c. [èdì]~[èdᶻì] “palm nut, palm fruit, a collection of them”[6]

3.3. Nasals

Urhobo has four nasal stops: bilabial /m/, alveolar /n/, palatal /ɲ/, and labial-velar /ŋ͡m/; no velar nasal /ŋ/ exists. The alveolar nasal /n/ is problematic, discussed below. These nasals are shown in the words below:

[6] Alveolar stops /d/ and /t/ are slightly spirantized before /i/. This spirantization is not as much as other languages with a similar phonetic implementation, e.g. Quebec French.

12. Nasals
    - **a. Bilabial**
        - i. /màlú/ “cow”
            1. Further examples
                a. /àmə̀̃/ “water”
                b. /ə̀̃mʉ̃nʉ̀̃/ “who”
                c. /ɔ́̃mɔ́̃/ “child”
                d. /mí/ “I” (subject)
    - **b. Alveolar**
        - i. /nà/ “the”
            1. Further examples
                a. /ɛ́̃nɛ̀̃/ “four”
                b. /í˗nʉ̃́/ “dirt”
                c. /ènɛ́/ “yams”
                d. /ùkònɪ̀̃/ “kitchen”
    - **c. Palatal**
        - i. /ɛ̀ɲə̀̃/ “spittle”
            1. Further examples
                a. /ɔ̃́ɲɔ̃̀/ “bee”
                b. /díé ɲɔ̃́rɪ̀̃/ “what’s the matter?”
    - **d. Labial-velar**
        - i. /ə̀̃ŋ͡mə́̃/ “cloth”

The labial stop /m/ occurs frequently in this corpus. The other nasal stops do not occur frequently. The alveolar nasal stop /n/ appears in only 12 lexical items, and appears to be in complementary distribution with /l/. The palatal stop /ɲ/ appears in only three lexical items, and before /a/ and /ɔ/; further research is required. The labial-velar /ŋ͡m/ appears only in one word, and is very difficult to hear. In one token, it sounds like a long [m̥ː] sound, with heavy nasalization on the neighboring vowels. All of these stops are distinct phonologically and phonetically from nasalized approximants/taps at the same place of articulation, i.e. there is a distinction between [m] vs. [β̃], [n] vs. [ɾ̃, r̃], [ɲ] vs. [j̃], and [ŋ͡m] vs. [w̃].

The distribution of nasal vowels with respect to nasal stops is complicated. I will discuss here only the stops /m/ and /n/. There are not enough tokens of /ɲ/ and /ŋ͡m/ to make any generalizations at this point with respect to nasal vowels (however, they seem to occur with nasalized vowels). Both nasal and oral vowels can appear before and after /m/, shown below:

13. Vowels with /m/
    - a. [VmV]
        - i. [òmà gáɹè] “how are you?”
          Rolle_Urhobo_how_are_you_-_omagare.wav
    - b. [ṼmṼ]
        - i. [ɔ̃́mɔ́̃] “child, kid”
          Rolle_Urhobo_kid.wav

However, despite this, no clear minimal pairs have been established, and it is unclear if nasal and oral vowels before and after /m/ are in free variation or not. [E.g. the word /ɔ́mɔ́ɸɹà/ "baby bird" does not sound like it contains nasal vowels (or at least less nasal) in the token "Rolle_Urhobo_baby_bird_-_omophra.wav"]. Attempts to introduce laboratory equipment into elicitation sessions to test for nasality have yet to be successful.

With respect to /n/, this almost always occurs followed by a nasal vowel (for example, the items listed in example (12.b) above). Because /n/ occurs with a nasal vowel and in the 4 instances involving /l/ (see 25 below), this phoneme appears with an oral vowel, we may make the following descriptive statement:

14. /l/ → [n] / __ [Ṽ]

This would make sense given that a nasalization process exists in the language which targets approximants.

The reason why I am hesitant to make this claim is that (1) there are very few tokens at this point of /l/ and /n/ (or [n]), (2) from my experience in studying West African languages, [l] and [n] often have a complicated relationship which does not lend itself to easy characterization, (3) from my knowledge of Edoid, there may be a fortis/lenis distinction in operation in this language which would justify two non-rhotic alveolar sonorant phonemes (though the SW branch is not known to have maintained this fortis/lenis Proto-Edoid feature more generally), and (4) in one token, the /n/ segment appears followed by a vowel which does not sound particularly nasal ("Rolle_Urhobo_yams.wav").

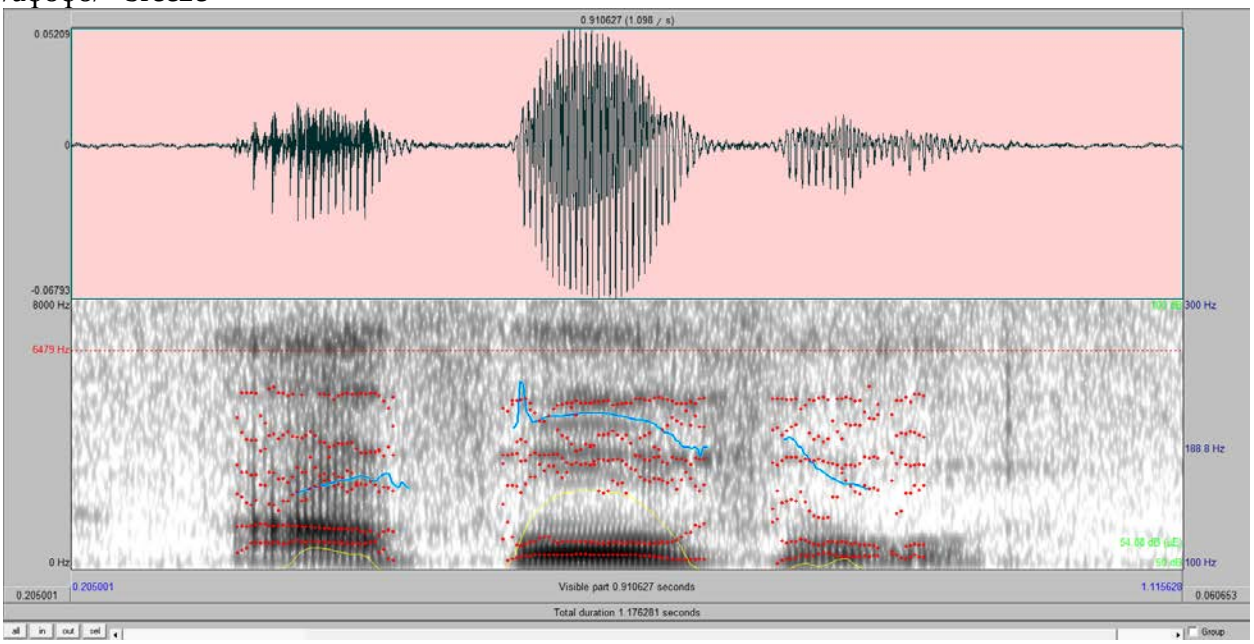
3.4. Fricatives

Urhobo has 7 fricatives, shown below.

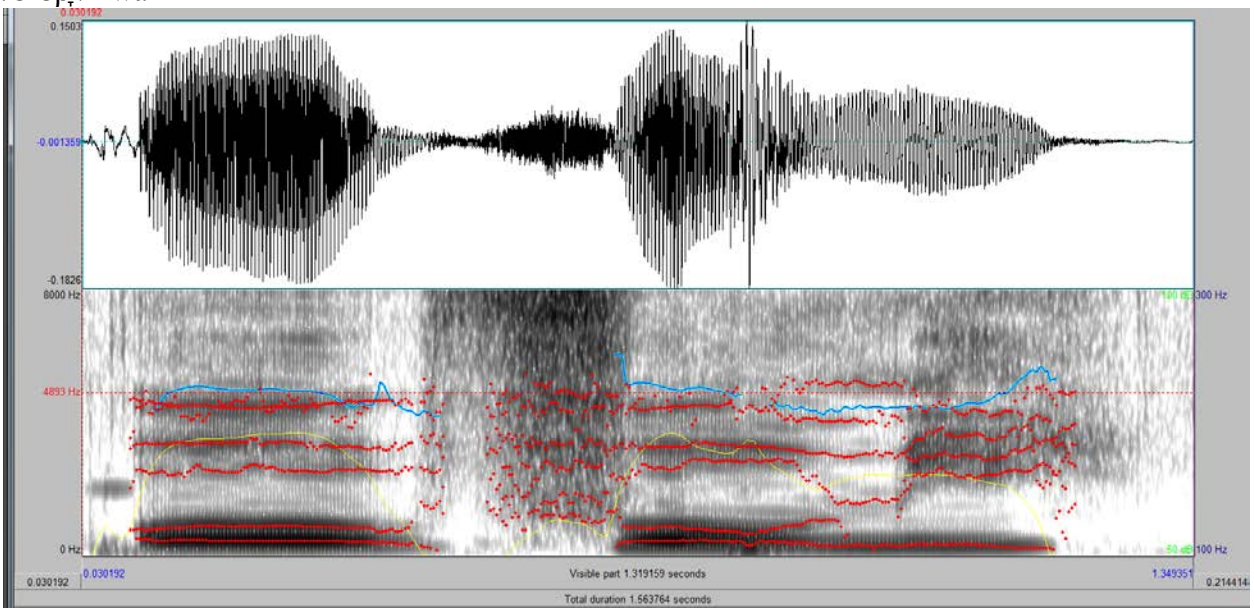
15. Fricatives:
    a. Bilabial
        i. Voiceless /ɸ/
            1. /àɸíá/ “knife”
            2. /àɸóɸò/ “breeze”
            3. /éɸɹà/ “birds”
            4. /òɸáɹò/ “face”
    b. Labio-dental
        i. Voiceless /f/
            1. /ɔ́fíbò/ “oil”
            2. /òfòβ̰̀ì/ “war”
            3. /úfí/ “rope”
            4. /àfíótɔ̀/ “rabbit”
        ii. Voiced /v/
            1. /èvjɛ̃̀ “breast”
            2. /ívɛ̀/ “two”
            3. /ùvò/ “Sun”
            4. /vwɛ/ “to tell”
    c. Alveolar
        i. Voiceless /s/
            1. /ɔ̀sò/ “hawk”
            2. /ɔ᷄sé/ “father”
            3. /ɛ̀gùsí/ “melon (dish)”
            4. /swùnɛ̃̀/ “to sing a song”
            5. /ìɹósù/ “rice”
    d. Post-alveolar
        i. Voiceless /ʃ/
            1. /ĭʃãβ̰̀ò/ “okra”
            2. /ìkíʃɛ̃̀nì/ “kitchen”
            3. /ùʃùɻ̰è/ “axe”
            4. /ʃe/ “to cut down, to fell”
    e. Velar
        i. Voiceless /x/
            1. /ɔ́xɔ̀/ “chicken”
            2. /ĭxwè/ “ten”
            3. /ùtòxɻ̰ì/ “pestle”
            4. /ùxòxì/ “navel”
        ii. Voiced /ɣ/
            1. /èɣó/ “darkness”
            2. /ìgíɣ̰ɛ̀rè/ “bicycle”
            3. /íɣwrɛ̃́/ “seven”
            4. /òɣèrésì/ “mouse”

The voiceless bilabial fricative /ɸ/ contrasts with the voiceless labiodental fricative /f/, rare cross-linguistically. A near-minimal pair is shown is provided below, with spectrograms.

/àɸóɸò/ “breeze”



/òfòβɨ̀/ “war”

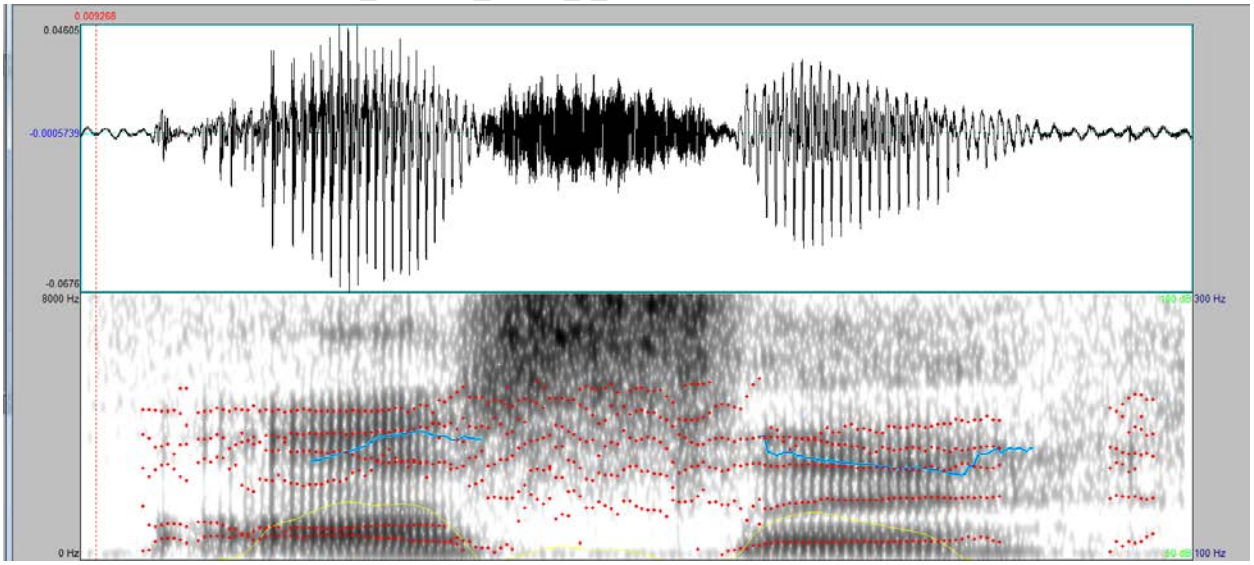


There is almost no frication with /ɸ/; this is distinguished from a glottal fricative [h] only by the formant transitions into and out of this fricative. This can be compared with /f/, which has a high degree of noise which reaches into the lower hertz range. There does not appear to a single locus of energy.

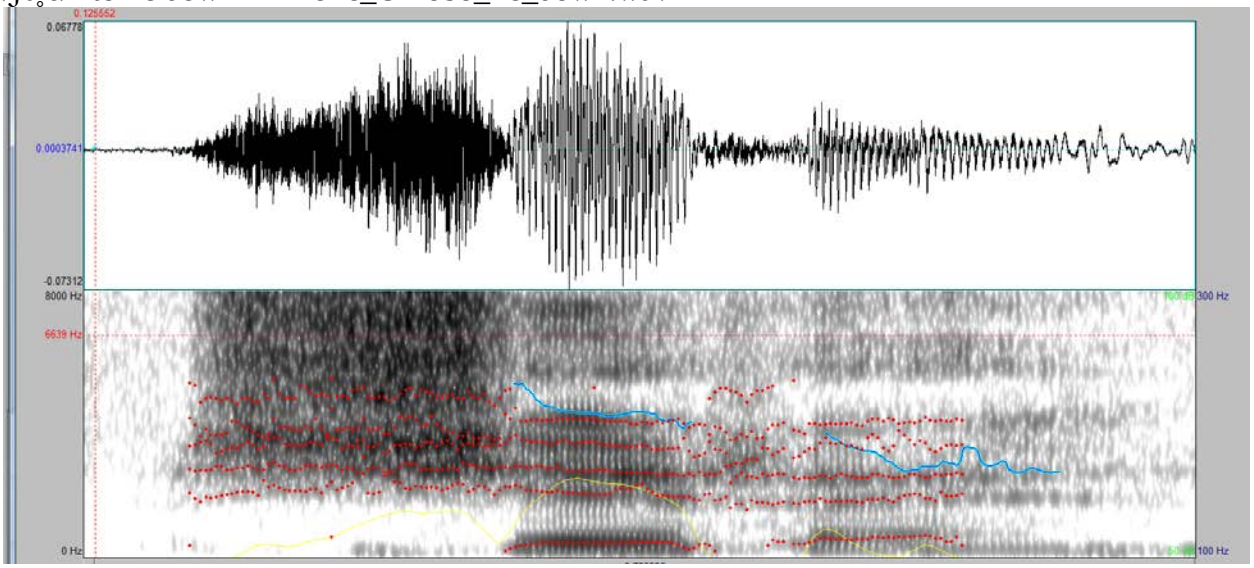
Urhobo maintains a distinction between two voiceless fricatives /s/ and /ʃ/. No voiced fricative counterparts /z/ and /ʒ/ have been attested (although /dʒ/ does exist as a phoneme). An example comparing these fricatives before /e/ is below. One can see that with /s/, the energy is

concentrated in the higher 8000 Hz region, whereas with /ʃ/, it is more distributed in the higher region.

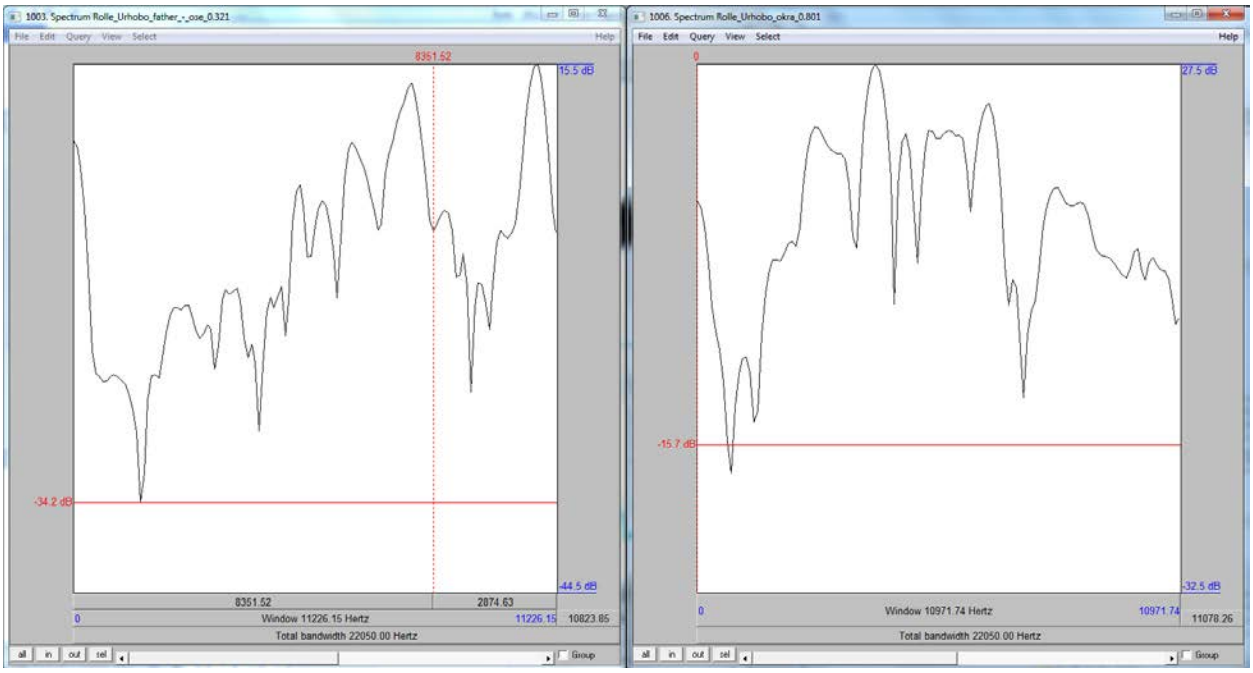
/ ɔ˖sé/ “father” Rolle_Urhobo_father_-_ose.wav



/ʃe̩rɛ/ “to lie down” Rolle_Urhobo_lie_down.wav

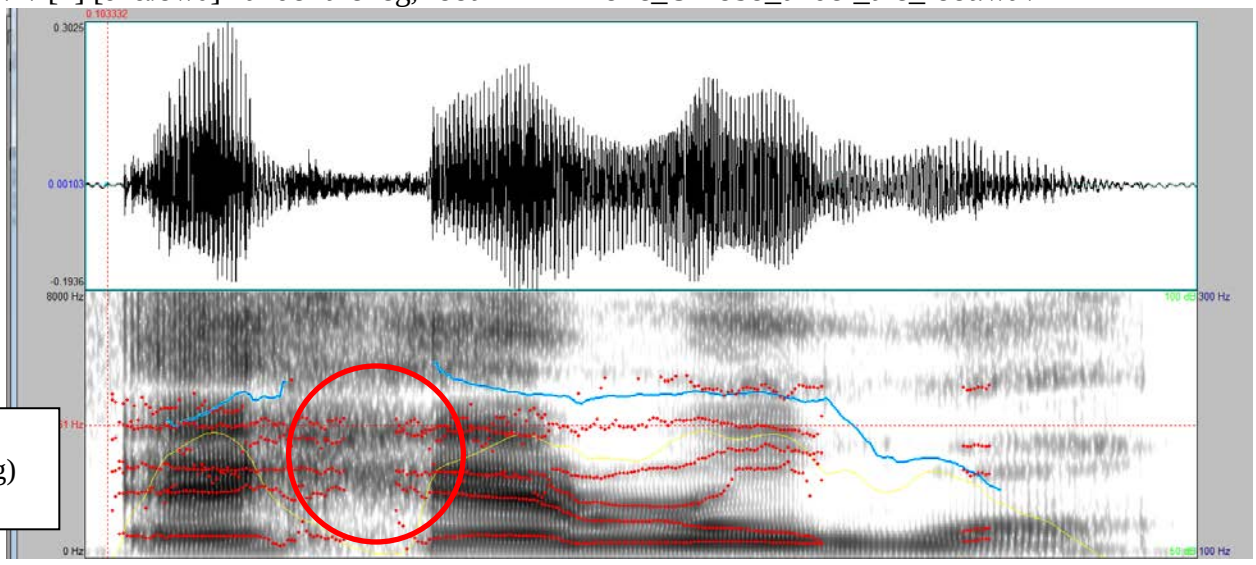


This is also seen in the spectral slices midway between these fricatives, as well. Here, [s] is in the left and [ʃ] is on the right; one can see the concentration of energy in the higher frequencies for [s].



The final two fricatives are /x/ and /ɣ̞/. These can be realized as [x̞] and [ɣ̞] (which can also be written as [ů̞] and [ɯ̞] respectively)[7]. Spectrograms are provided below.

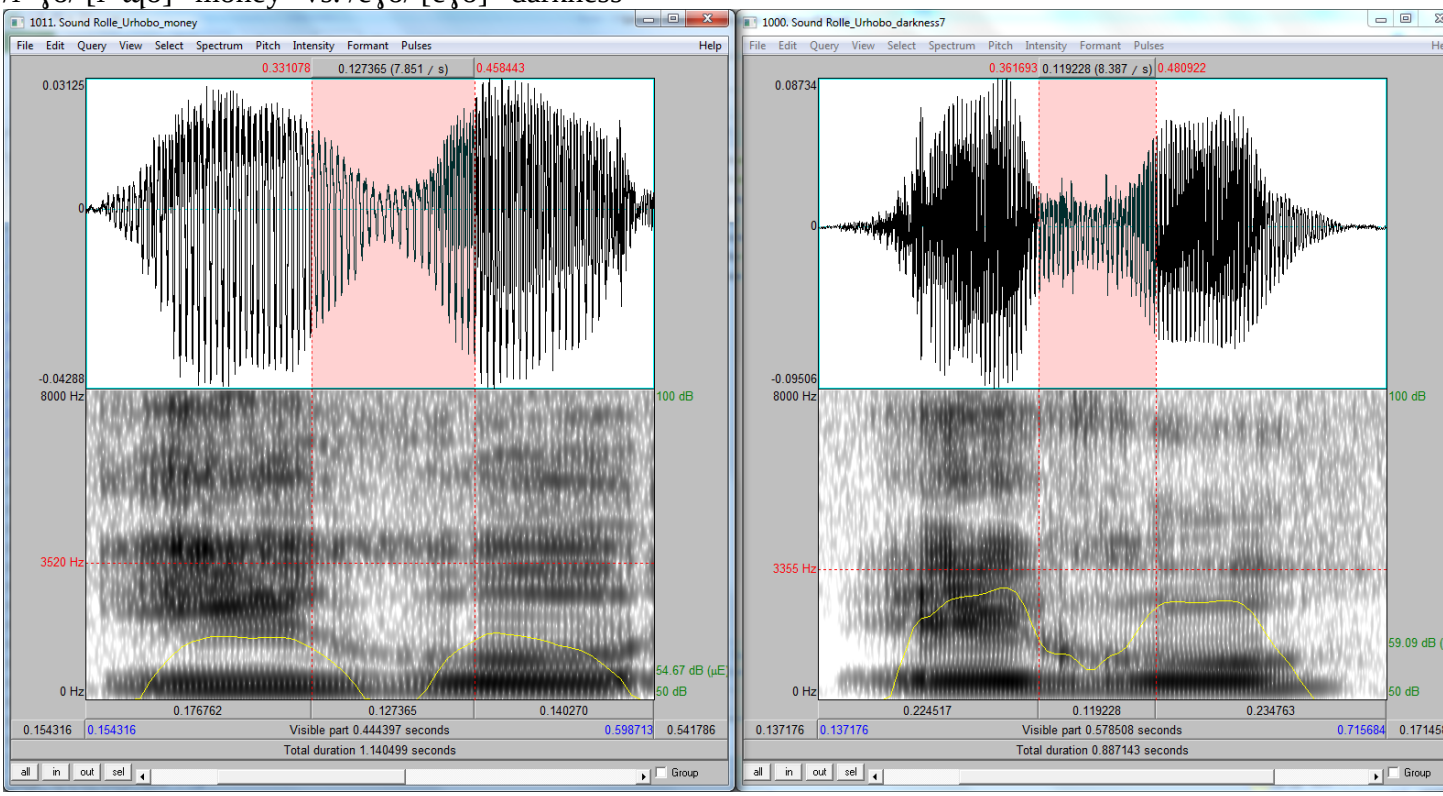
/x/ [x] [éxɛ́ɪówɔ̀] “under the leg, foot” Rolle_Urhobo_under_the_foot.wav



A spectrogram showing the variable pronunciation of /ɣ̞/ as [ɣ̞] vs. [ɯ̞] is below. It is difficult to see clear differences on the spectrogram, though the word [èɣ̞ó] which sounds more like a fricative has darker energy bands.

[7] This phoneme /x/ is not realized as [h], a glottal fricative. There are no spectrograms in which the formants of the fricative are identical with the following and preceiding vowels (which would suggest a [h], phonetically a voiceless vowel).

/íˈɣó/ [íˈɯ́ó] “money” vs. /èɣó/ [èɣó] “darkness”



In certain cases, /x/ can be realized as [ç], a voiceless palatal fricative, e.g. before /i/ in /ùxòxì/ [ùxòçìç] “navel” in Rolle_Urhobo_navel.wav.

3.5. Approximants

Urhobo has three non-liquid approximants phonemes (in addition to the approximant variants of fricatives discussed above), at three places of articulation: bilabial[8], palatal, and labial-velar; liquid approximants are discussed in the next section. A three way pair is shown below.

16. Non-liquid approximants
    a. /ĭʃâβ̞ò/ “okra”
    b. /ɔ́járò/ “bitterness”
    c. /àwɔ̀/ “foot, feet”

These approximants appear before most vowels, though not all. I provide a table below showing the distribution of approximants with respect to vowels, glides, and the rhotic /r/. A checkmark indicates a word which has been attested; n/a stands for “not attested”.

[8] In the speech of my consultant, visual confirmation supports the current analysis as [β̞], rather than the phonetically and articulatorilly similar [ʋ]. In her speech, it is observed that the bottom lip does not tuck behind nor approach the top teeth; rather the two lips approach each other (but not enough to produce frication). Visual recording is required.

	i	e	ɛ	a	ɔ	o	u	Cj	Cw	Cr
β̞	√	√	√	n/a	√	√	√	n/a	n/a	√
j	√	√	√	√	√	√	n/a	-	n/a	n/a
w	n/a	√	√	√	√	√	√	n/a	-	n/a

This chart shows an interesting distribution of approximants and vowels. Most striking is that there appears to be a constraint against an approximant occurring with a high vowel of an "opposite" place, i.e. *wi, *ju. This is a matter of interpretation and analysis, however. Recall that these approximants [j] and [w] are found after consonants in [CGV] sequences, unlike other consonantal segments (besides rhotics and in loanwords). As discussed in 2. Section 2 – Vowels, these sequences can be understood as /CGV/ or /CVV/ underlying sequences, depending on analysis. Sequences of [ju] are found only in this context (e.g. /ísìù/ 'stars"), and never at the beginning of a word, or after a vowel (i.e. there is no word found like *[eju] or *[jure]). If we understand that a constraint */ju/ applies only to [j] segments at the underlying level, then this gives evidence that such [CGV] sequences should be underlyingly analyzed as /CVV/. Further research is required.

These approximants are subject to nasalization when they occur next to a nasal vowel; they are realized as [β̞̃], [j̃], and [w̃]. These do not merge phonetically with [m], [ɲ], and [ŋ͡m], respectfully. This is discussed on page 41 in 5. Section 5 - Phonological process – Nasal spread.

3.6. Liquids

Urhobo has three liquid phonemes: /l/, /r/, and /r̥/.

3.6.1. Alveolar lateral /l/

The alveolar lateral /l/ is a rare phoneme, and occurs in only four lexical items:

17. Lateral approximant /l/
    a. /ólôgbò/ "cat"
    b. /li/ "to eat"
    c. /màlú/ "cow"
    d. /ólálɔ̀/ "stone"

As discussed above, this appears to be in complementary distribution with /n/; further research is required.

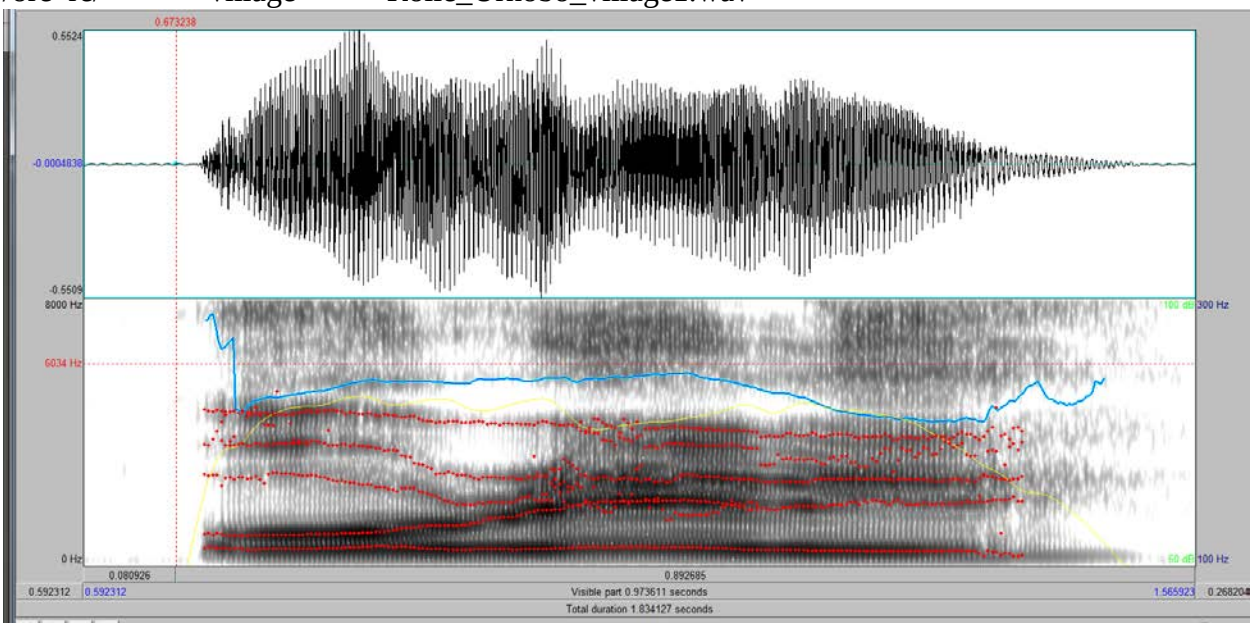
3.6.2. Rhotics /r/ and /r̥/

Urhobo contrasts two rhotics: /r/ and /r̥/. These have an inconsistent realization both with respect to manner and place of articulation. What is consistent is that the former is voiced and the latter is voiceless. A minimal pair is shown below:

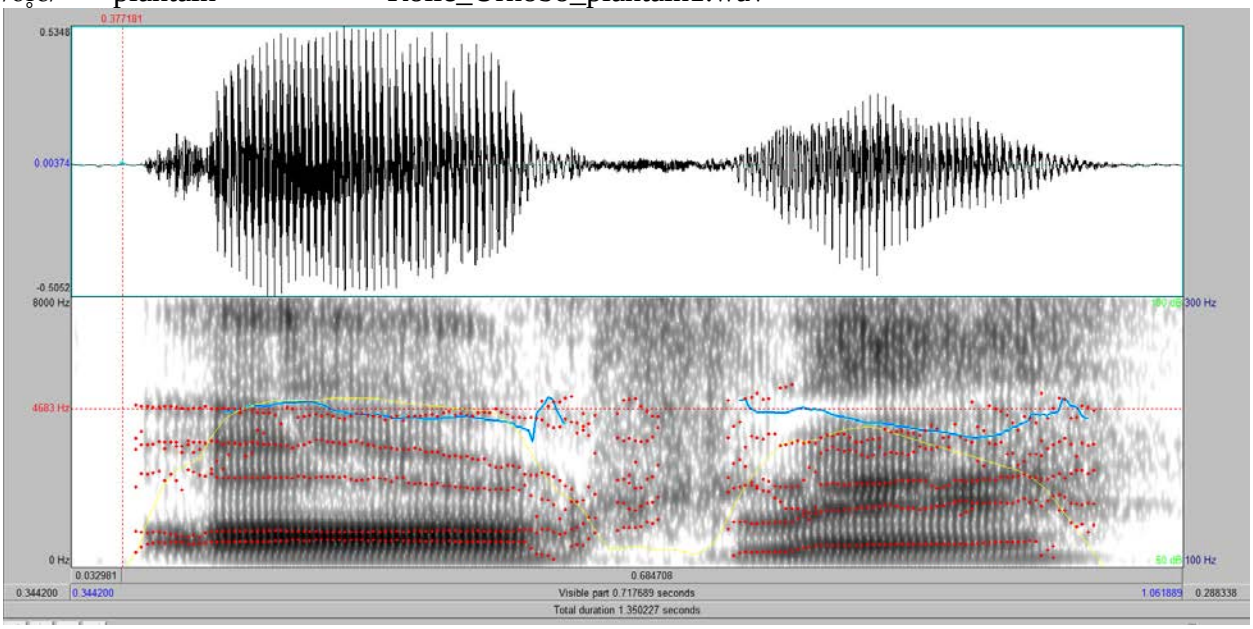
18. Rhotics
    a. /óré↓ré/ "village"
    b. /ɔ̀r̥ɛ̀/ "plantain"

This is shown in the spectrogram below. Here, the voiced /r/ has voicing throughout its production. One can see from the first /r/ token in this example (realized as [ɹ]~[ɻ]) the strong dip in F3 and F4. Compare this to the realization of /r̥/. Here, there is random, non-voiced noise of a significant duration associated with this phoneme. As in /r/, one can see a dip in F3 and F4, signaling rhoticity, but not as drastically.

/óréˬré/ “village” Rolle_Urhobo_village1.wav



/ɔ̀ɽ̥ɛ̀/ “plantain” Rolle_Urhobo_plantain1.wav



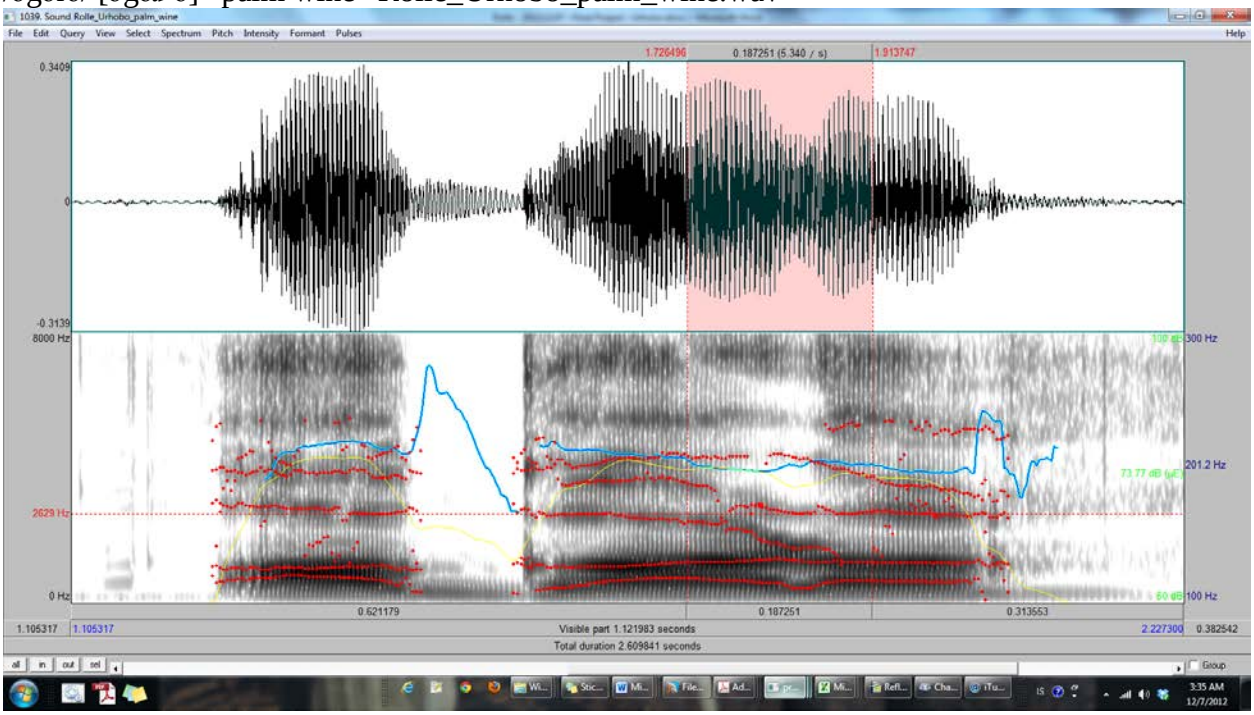
Depending on the token, voiced /r/ may be realized as alveolar or retroflex, and an approximant, tap, flap, or trill. I do not have evidence that these sounds are contrastive, and the speaker will often say the same word with a different realization. Therefore, I surmise that the target of this phoneme is underspecified generally. Some examples of voiced /r/ variants are below in example 19. The voiced trilled [r] occurs rarely, and only after consonants. The approximant is realized as alveolar or retroflex. Often, the sound file is ambiguous between these two. Only the alveolar approximant [ɹ] appears in word initial position.

19. Voiced /r/
    a. Trill [r]
        i. /ébrì/ [ébr̥ì] “darkness”
           Rolle_Urhobo_darkness.wav
    b. Approximant [ɹ] [ɻ]
        i. /brí˧ɣó/ [bɹí˧ɣó] “how much money”
           Rolle_Urhobo_how_much_money_-_brigho.wav
        ii. /bèrè/ [bèɹè] “to tear”
           Rolle_Urhobo_to_tear_-_bere.wav
        iii. /ògògòrò/ [ògògòɻò] “local gin”
           Rolle_Urhobo_gin_-_ogogoro.wav
        iv. /ră gbôdȉ̃ wɛ́̃/ [ɹãá gbôdȉ̃ wɛ́̃] “go clear your grass”
           Rolle_Urhobo_go_clear_your_grass.wav
    c. Retroflex lateral flap [ɭ˞][9]
        i. / ɔ̀gɔ̀rɔ̀/ [ɔ̀gɔ̀ɭ˞ɔ̀] “palm wine”
           Rolle_Urhobo_palm_wine.wav
    d. Tap [ɾ] [ɽ]
        i. /èrúɛ́/ [èɽwɛ́] “cow”
           Rolle_Urhobo_cow_-_erhue3.wav
        ii. /dí˧dírwó órùwè/ [dí˧díɹwó ‖ óɽùwè] “what kind of job does he do?”
           Rolle_Urhobo_what_kind_of_job_does_he_do.wav
        iii. /óɣóɣôrìè/ [óɣóɣôrìè] “lizard”
           Rolle_Urhobo_lizard - oghoghorie.wav

A spectrogram of the retroflex lateral flap [ɭ˞] is below, which is particularly interesting. Here, we see the F3 lower significantly, followed by the F3 immediately returning to its previous frequency range. This behavior of F3 suggests to me a flap; the contact of the tongue against the mouth can be clearly perceived in the wav file.

[9] This was the only token of this found.

/ɔ̀gɔ̀rɔ̀/ [ɔ̀gɔ̀ɹ̠ɔ̀] “palm wine” Rolle_Urhobo_palm_wine.wav



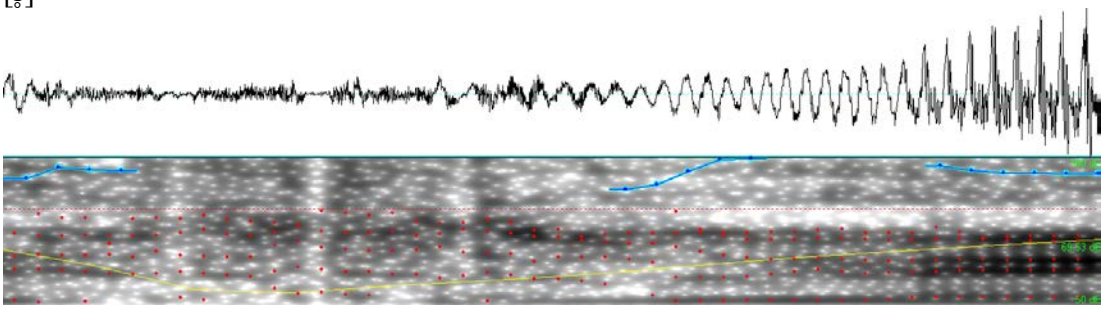
Further, a nasal tap [ɾ̃] occurs as an allophone before a nasal vowel.

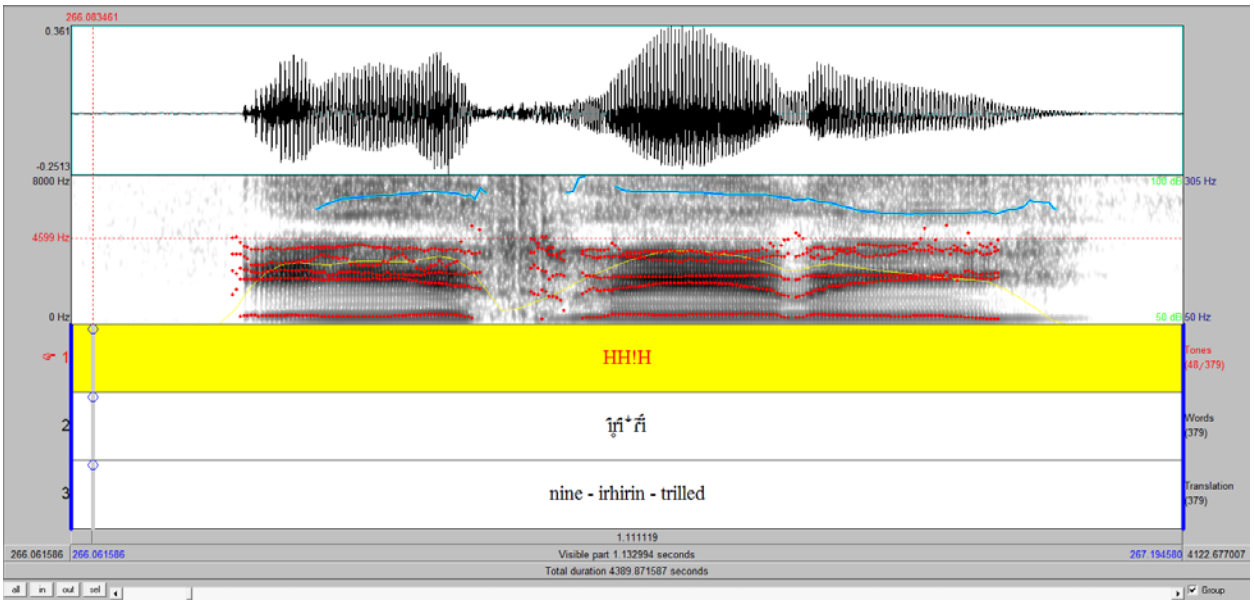
Depending on the token, voiceless /r̥/ may be realized as alveolar or retroflex, and an approximant, tap, of trill.

20. Voiceless /r̥/
    a. Trill [r̥]
        i. /ír̥íˬŕ̥/ [íŕ̥íˬr̥̃́ĩ] “nine’
            Rolle_Urhobo_nine - irhirin – trilled.wav
    b. Approximant [ɹ̥] [ɻ̊]
        i. /ér̥à/ [éɻ̊à] “three”
            Rolle_Urhobo_three_-_erha1.wav
    c. Tap [ɾ̥] [ɽ̊]
        i. /íwûr̥ìè/ [íwûɾ̥ìè] “ashes”
            Rolle_Urhobo_ashes.wav

The voiceless rhotic varies between a more approximant pronunciation and a trilled pronunciation. This is shown for the word /ír̥íˬŕ̥/ “nine”. In the trilled version below, one can see on the spectrogram the vertical bands of low noise corresponding to the tongue striking the rough of the mouth.

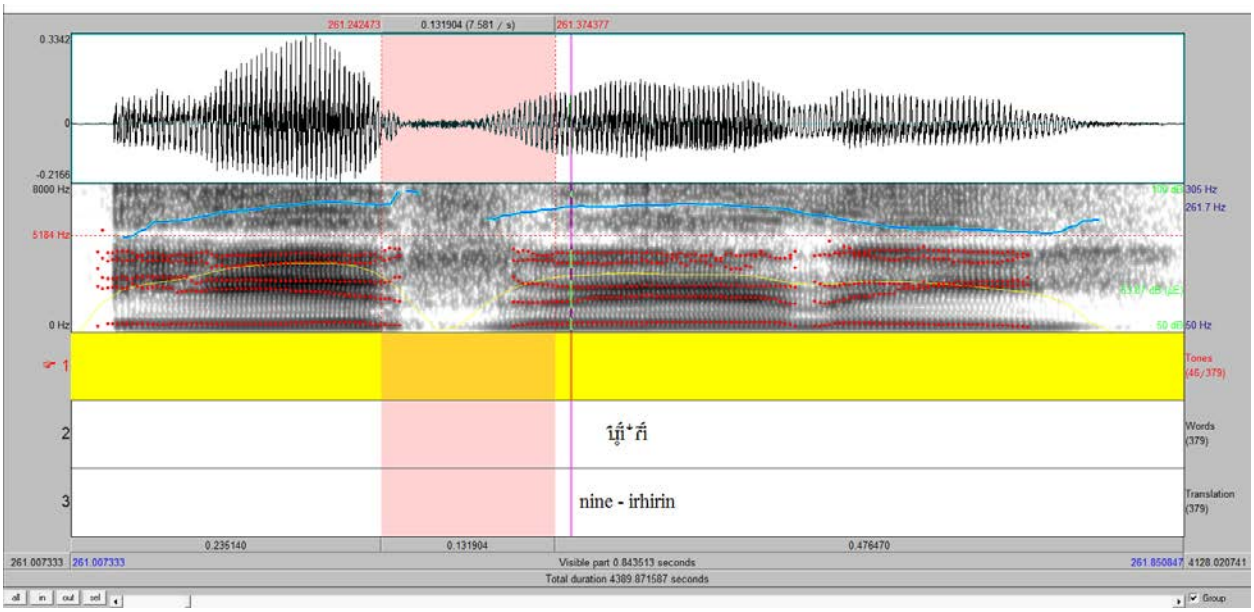
[ɾ̥]





In contrast, in the approximant realization, no such vertical bands occur:

[ɻ̊]



3. 7. Consonant clusters

Urhobo has very few consonant clusters. Only three consonants are allowed as the second consonant in a [CCV] sequence: /j/, /w/, and /r/. Some examples are below

21. Consonant clusters
    a. [Cj]
        i. [dĭ˩djódɛ̀wɛ́] “what’s your name?”
        ii. [ísjù] “stars”
        iii. [àfjótʰɔ̀] “rabbit”
        iv. [útˢjɛ́] “orange”
    b. [Cw]
        i. [ĭːxwɛ̀] “ten”
        ii. [ísâgwɛ̀] “groundnut”
        iii. [vwɛ] “to tell”
        iv. [swùnɛ̀̃] “sing a song”
    c. /Cr/
        i. [àgbɹáɻâ] “thunder”
        ii. [ɔ́bɻábɻà] “it’s bad”
        iii. [ìβ̞ɻ̀ì] “fat”
        iv. [ùtʰòxɻ̊ì] “pestle”

At this point, not enough data is available to make any strong generalizations about the distribution of the segments in consonant clusters (phonotactic restrictions). I present some brief generalizations which require further verification and elaboration:

[1] The labial sounds /p b kp gb/ do not occur followed by /j/ or /w/
[2] /j/ and /r/ occur with more consonants than do /w/
[3] Alveolar and labiodental segments do not occur with /r/, though bilabial, velar, and labial-velar segments do

Other consonants clusters appear only in loanwords, e.g. [sk] below (cf. "hospital", which is broken up by epenthetic [i]). These consonants following [s] are either lightly aspirated or not aspirated.

22. Loanword consonant clusters
    a. [ìbàsk͡ʻétʰì] "basket"
    b. [ìskù] "school"
    c. [ɔ́sìpítʰo] "hospital"

4. Section 4 - Prosody

This section presents on prosody in Urhobo. I mainly discuss tone here, at both the lexical and grammatical level[10].

4.1. Tone

Tone patterns exist at both the lexical and grammatical level in Urhobo to distinguish linguistic meaning. Tone is correlated with absolute pitch (f0) in Urhobo. Tests have not been taken to determine the degree to which loudness, duration, or phonation play as secondary cues for signaling particular tone categories.

4.1.1. Lexical tone

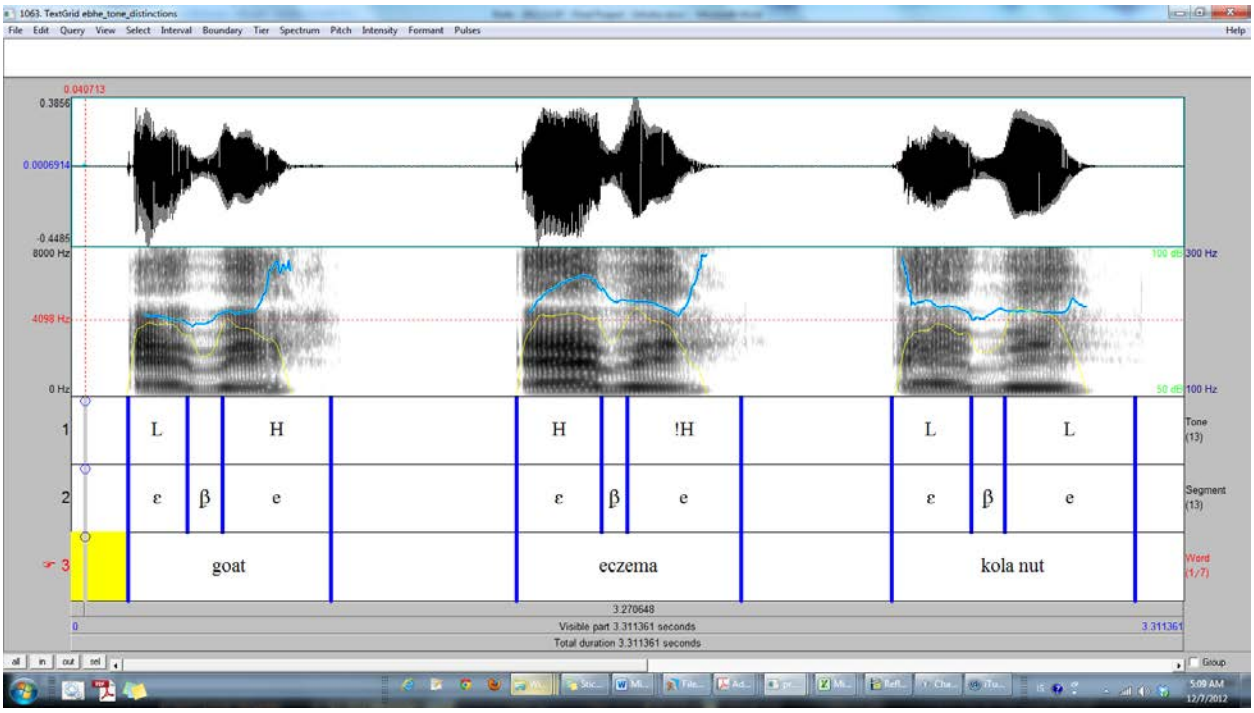
At the basic level, Urhobo distinguishes between three main tonemes: High, Low, and Downstepped High. Some minimal pairs are found in this dataset showing the role of tone in distinguishing meaning. From the limited number of data I have collected so far, tone is used to distinguish nouns, though not verbs. The typical case for Edoid languages is for verbs to only bare grammatical tone (Elugbe 1989a).

[10] It will be unlikely if I get every tone right here, as this is my first exposure to this language (though not this family). My experience with Edoid languages in general is that despite the fact that they only contrast two basic tones (H vs. L), the phonetic and phonological implementation of this system is in fact complex and difficult to pin down without substantial research. In particular, the most difficult aspect here is the distinction between a HL sequence and a H!H (a high followed by a downstepped high sequence) which in less careful speech can sound very much alike. All of these tone transcriptions need to be checked against the speaker again (as well as another speaker) before they can be confirmed.

23. Tone minimal (and near minimal) pairs

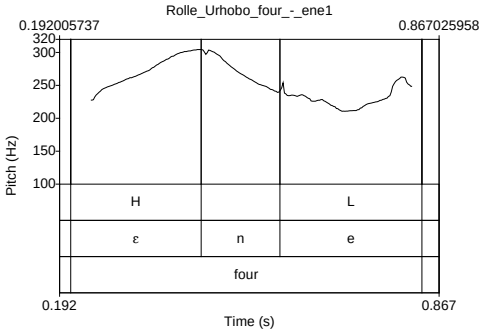
a.	LL	òdɛ̀	name
	HL	ódɛ̀	yesterday
b.	LH	èné	yams
	HL	ɛ́nɛ̀	four
c.	HL	éwṵ̀	clothes
	LL	èwù	Ewu village
d.	H!H	ɛ́ꜜβ̣é	eczema
	LH	ɛ̀β̣é	goat
	HH	ɛ̀β̣ɛ̀	kola nut
e.	LHL	ìgɛ́r̥è	road
	LLH	ìgɛ̀ré	Idjere village
	LLL	ègèrè	crocodile
f.	H!H	úꜜdí	grasscutter
	LL	ùdì	a drink, wine
g.	LLL	ùkpòkpò	big rock
	HH!H	úkpóꜜkpó	worrying, going through problems

A spectrogram is provided below which show the three way distinction between example (23.d) above involving the segments /ɛβ̣e/. [Note, the phonetic realization of these tones is not always consistent, or level]

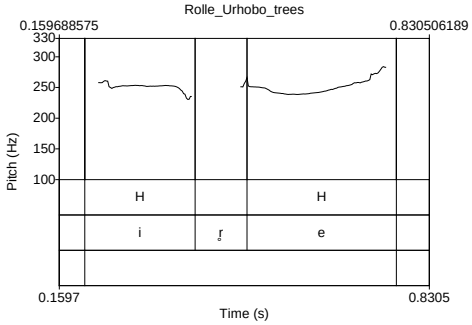


Pitch tracks for the five tone patterns associated with disyllabic words (LL, LH, HL, HH, H!H) are provided below:

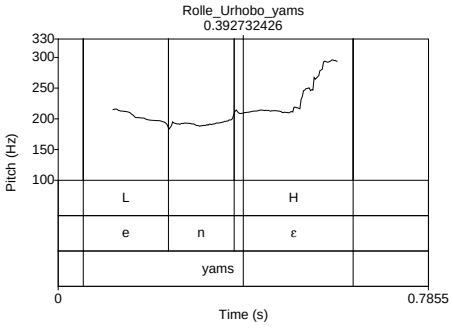
HL ɛ̋nɛ̀ four



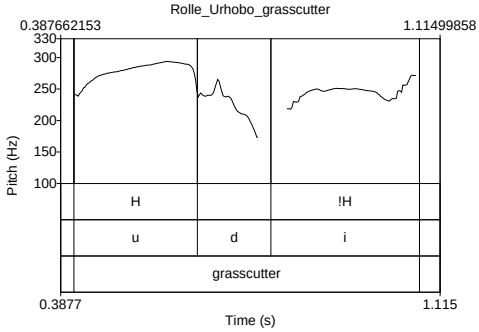
HH íɻ̥é trees



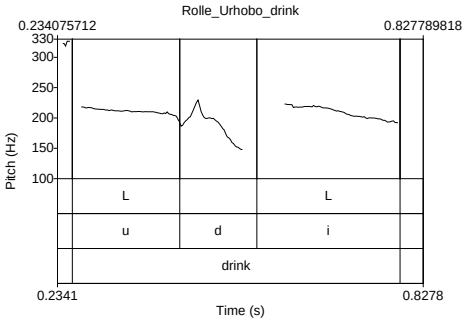
LH ènɛ́ yams



H!H úˈdí grasscutter



LL ùdì a drink, wine



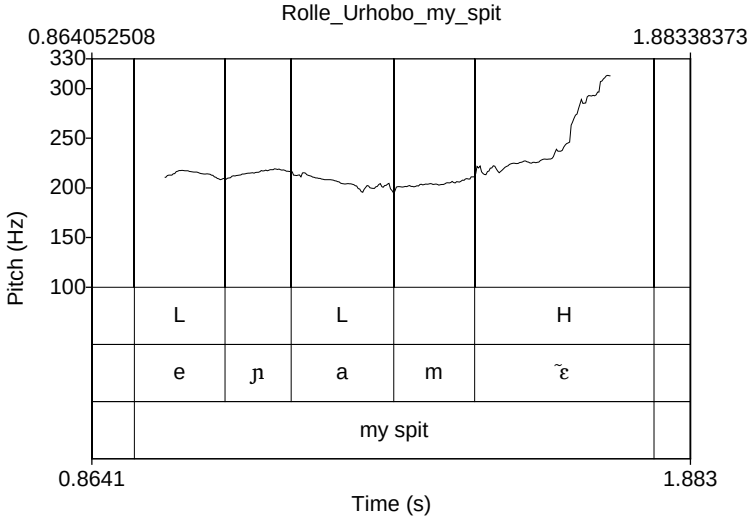
The sequence LL and HH are level tones which do not have distinct pitch targets. In isolation, it is often difficult to tell them apart, as there is no other target (L or H) which can be contrasted against. In non-level pitch sequences (HL, LH, H!H), however, it is much easier to determine the tone[11].

Phonetically, the downstepped high tone [!H] could also be rendered [M]. The reason why I posit that this is a phonemic /!H/ toneme is that (1) it only occurs after high tones (typical of downstepped highs), and (2) when it occurs before a High tone, the following High tone is not realized with a higher pitch. That is, we might expect a /HMH/ sequence to be realized as ˥˦˥, where the mid tone does not lower the following High. However, the Urhobo data show that a !H "resets" the High tone target level, and consequently, a following high tone is realized (close to) that new target level, i.e. ˥˦˦.

[11] I do not attempt to draw any conclusions as to the specific pitch associated with these tonal patterns, as this will change depending on numerous factors (speaker, place in utterance, rate of speech, emphasis, intonation, etc.).

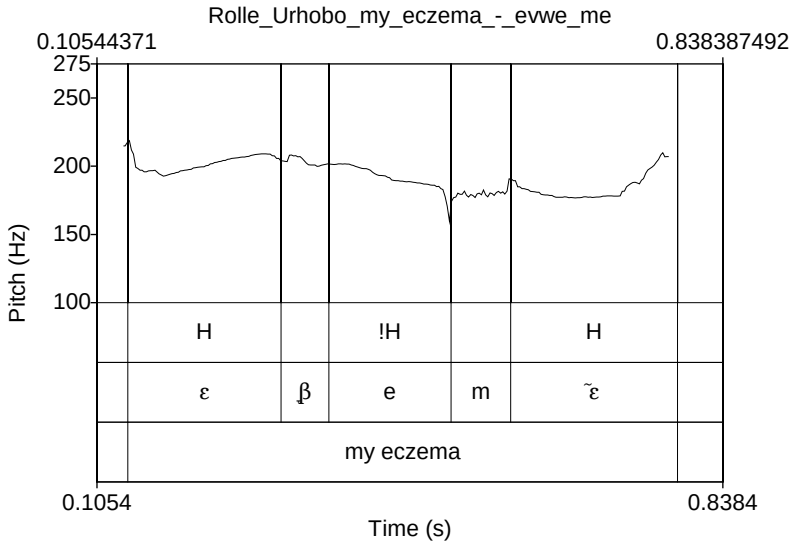
I show this in an example below, involving the possessive pronoun /mɛ́/ “my”. This pronoun bears a high tone, and follows the noun which it modifies. This is shown below, occurring with the LL noun . / ènà / “spittle”

24. / ènà mɛ́/ “my spittle”



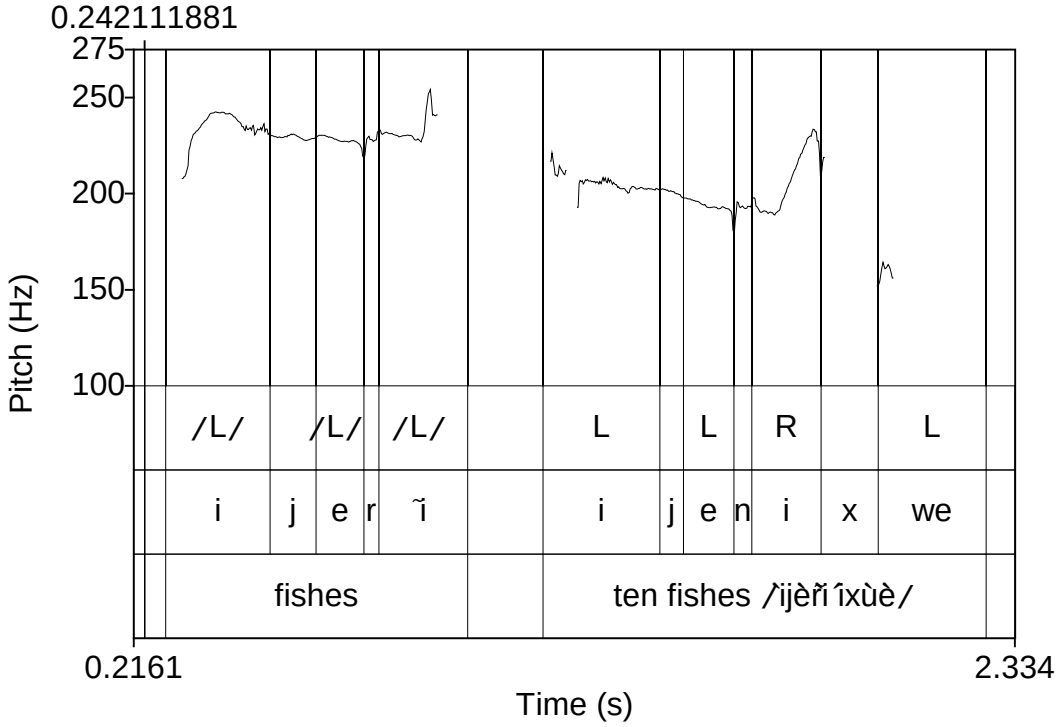
When a H!H sequence such as the noun /ɛ́ꜜβ̩é/ “eczema” precedes /mɛ́/ “my”, the !H tone of the noun resets the H target of the phrase. Therefore, this phrase is realized as a H!HH sequence (and not a falling rising sequence). This is shown in the pitch track below.

25. /ɛ́ꜜβ̩é mɛ́/ “my eczema”



As stated above, words which contain only level tones are difficult to determine their tone out of context. Depending on the level of carefulness (and other individual differences), an all Low sequence may sound like an all High sequence, and vice versa. For example, the word for “fish” (plural) is /ìjèrì̀/ [ḭ̀j̰ḛ̀r̰ḭ̀]. In the token “Rolle_Urhobo_fishes - iyerin - sounds all H.wav”, the pitch

is concentrated between 222Hz and 242 Hz, typically a common range for High tones (e.g. example 25 just above). However, when this word /ìjèrȉ/ “fishes” occurs in context with the post-nominal numeral word /íxùè/ “ten” with a HL pattern, the vowels of “fishes” are realized lower than the high-pitch target of “ten”. This is shown below:



Therefore, putting words into sentences with surrounding, different level tonemes is the only accurate way to determine the phonological tone specification of lexical items in Urhobo.

The following tone patterns involving L, H, and !H have been attested thus far.

Tone pattern	**Example**	**Translation**	**Number of tokens collected with this pattern**
L	nà	the	2
H	kʲá	will	7
LL	ɔ̀kè	time	48
LH	ã̀ŋmã́	cloth	12
HL	ɔ̃́ŋɔ̃̀	bee	18
HH	ókpɛ́	Okpe group	14
H!H	ɔ́˗ré	native chalk	6
LLL	òfòβ̰̀	war	25
LLH	òkùkú	darkness	5
LHL	òɸáɹò	face	11
LHH	èkã́ĩ́kã́ĩ́	local gin	2
LH!H	ùgbú˗kó	back	3
HLL	íjòrɪ̀	five	2
HLH	ódìbó	banana	2
HHL	íɹóbà	rubber	9
HHH	ódódó	flower	1
HH!H[12]	óré˗ré	village	3
H!HL	-	-	-
H!HH	-	-	-
H!H!H	á˗gbá˗ɹó[13]	Agbaro Town	1

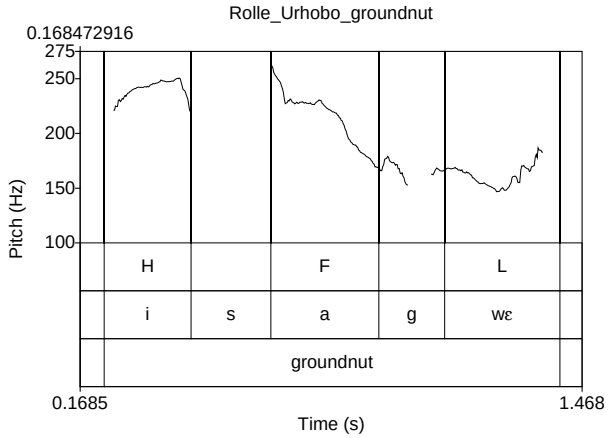
Contour tones also exist (as apparent from some of the spectrograms and pitch traces already given). These have not been incorporated into the above chart. It is not known if these are (1) contrastive toneme units (e.g. [Raising]), (2) combinations of a tone sequence (e.g. [HL]) over a single tone-bearing unit, or (3) allophonic variations of a level tone. Much more research is required to resolve this issue. Some examples of contour tones are below, including pitch tracks.

[12] The distinction between /HH!H/ and /HHL/ sequences at this point is merely impressionistic. Further research is required.

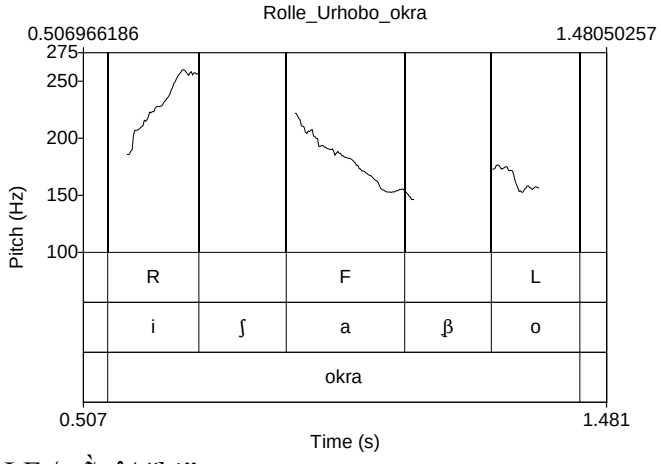
[13] I am not confident with my transcription of the tone on this token. Therefore, this H!H!H sequence may be unattested as well.

26. Contour tones

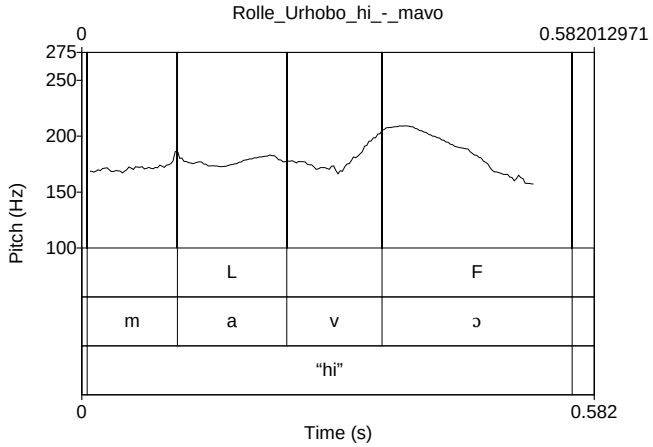
a. HFL /ísâgwɛ̀/ “groundnut”



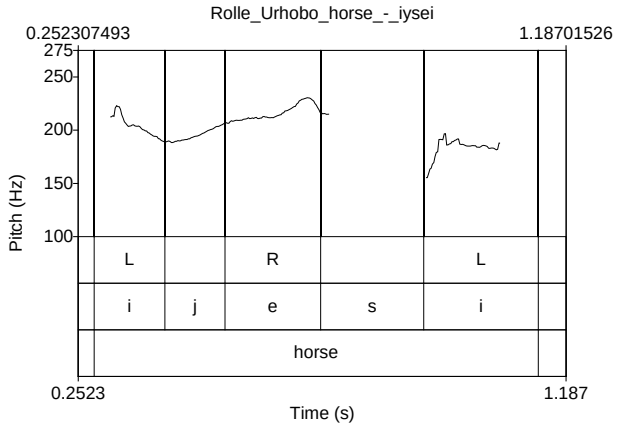
b. RFL /ǐʃâβò̩/ “okra”



c. LF /mə̀vɔ̂/ “hi”



d. LRL / ìjěsì/ “horse”



4.1.2. Grammatical Tone

Use of pitch to distinction non-lexical meaning is grammatical tone. I will discuss a few grammatical tone processes which I have found in the language.

4.1.2.1. Associative construction – H floating tone

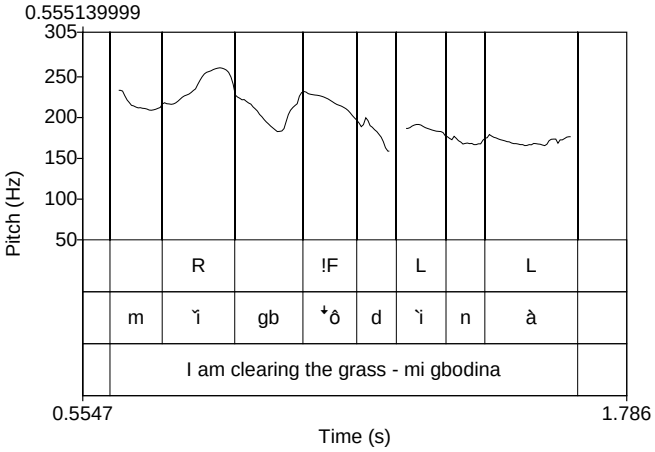
In certain cases, grammatical tone occurs which alters the lexical tone of the individual words/morphemes. One such example is an associative marker used in noun noun compound/sequences. This is realized as a High tone which falls between these nouns, e.g.:

27. /ɔ̀kè/ “time” + /òsìò/ “rain” = [ɔ̀kʲʰíósìò] “rainy season”
    LL LL(L) LHL
28. /ùdì/ “a drink, wine” + /àmɛ̃̀/ “water” = [ùdĭámɛ̃̀] “palm wine”
    LL LL LHL

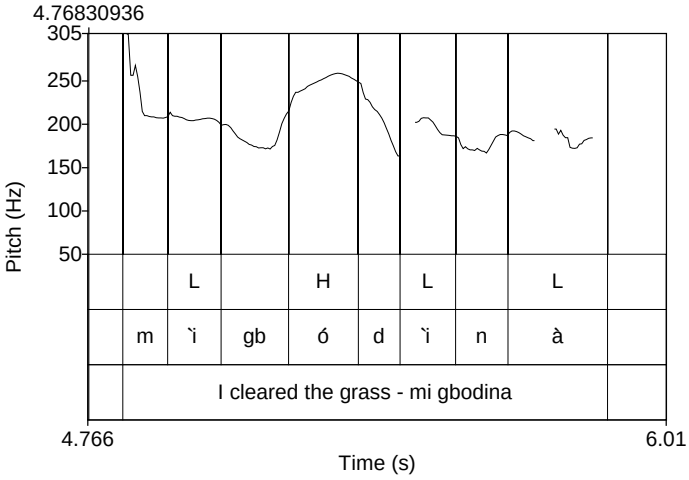
4.1.2.2. Temporal/aspectual distinctions

Tone is used to express temporal/aspectual distinctions. The following minimal pair is provided below:

Present imperfective:
[mǐ ˈgbôdìnà]
mi gbe òdì nà
I clear grass the
“I am clearing the grass”



Past perfective:
[mì gbódìnà]
mi gbe òdì nà
I clear grass the
“I cleared the grass”

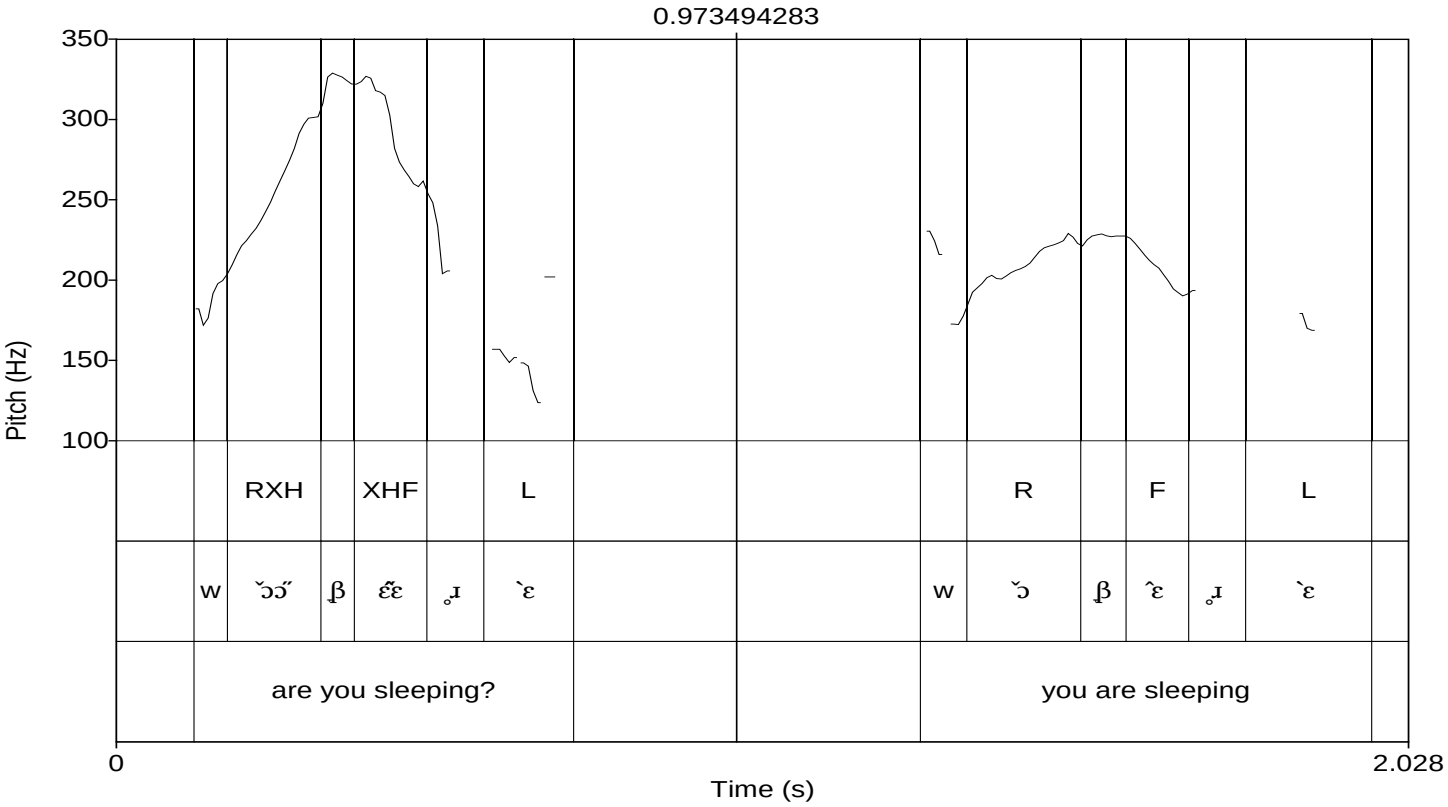


Here, the distinct tonal patterns on first part of the phrase signals a temporal/aspectual distinction. Tentatively, we can understand a [R!F] pattern to be associated with present imperfective, while a LH pattern is associated with a past perfective. Future research is required to further expand on this statement.

4.2. Intonation and Tone

I collected very few suprasegmental features of the language besides tone. One pair which I was able to capture was yes/no question intonation. In this case, the high tones become extra-high, with the low tones not being affected. This is shown in the minimal pair below. In this token, the consultant goes quite high in her pitch range, approaching 350 Herz.

29. Yes/no question intonation
    a. [wɔ̌ɔ̋ βᵩ̋ɛ̂ᵩ̀ɛ̀] “are you sleeping?” vs. [wɔ̌ βᵩ̂ᵩ̀ɛ̀] “you are sleeping”



5. Section 5 - Phonological process – Nasal spread

Urhobo has a number of phonological processes. These include nasal spread, vowel elision/glide formation, affrication, and final vowel devoicing, among others. I will only discuss nasal spread below.

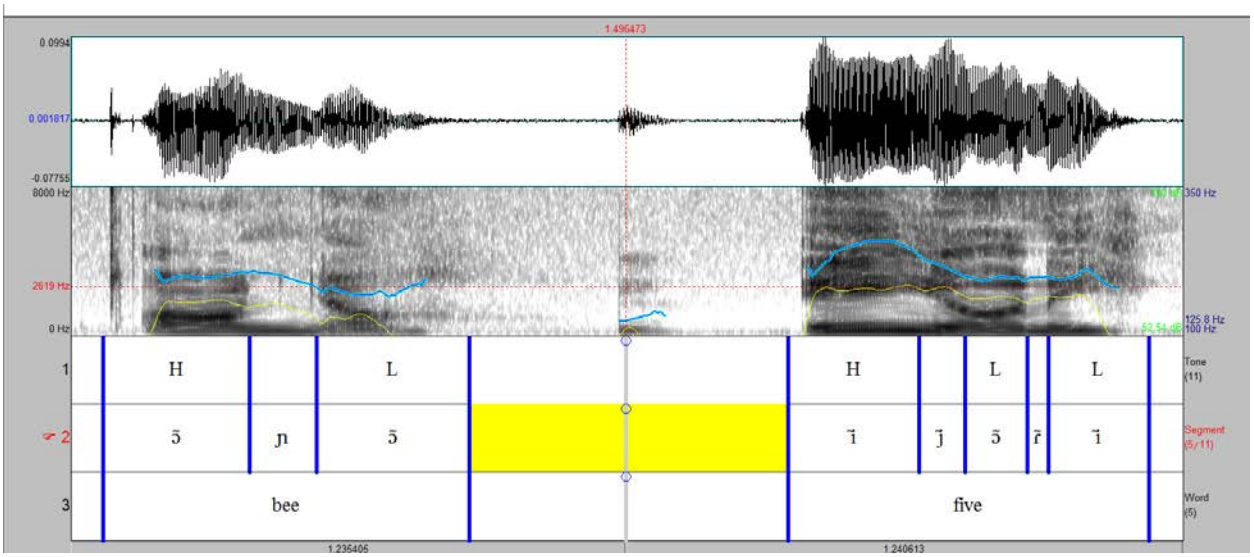
Before nasal vowels, the following phonemes become nasalized:

30. **Nasal spread**
    /βᵩ/ → [β̃ᵩ̃]
    /j/ → [j̃]
    /r/ → [r̃] ~ [ɹ̃] ~ [ɻ̃]
    /w/ → [w̃]
    (/l/ → [n]) : This is not yet confirmed as a real phonological process

Examples illustrating this process are below. We can see in the example in (31) that rightward nasal spread feeds further nasalization of vowels and consonants until it hits a consonant which cannot be nasalized (which are most). Thus, the sequence /ɛ̀rɛ̀βᵩ̀ɛ̀/ “tongue” nasalizes all segments in this word, realized as [ɛ̀ɾ̃ɛ̃ɛ̀β̃ᵩ̃ɛ̀].

31. Bilabial
    a. /òfòβ̞ì̞/ [òfõ̞β̃ì̞] “war”
    b. /ùjɔ̀β̞ì̞/ [ùj̃ɔ̃β̃ì̞] “head”
    c. /ɛ̀rèβ̞ɛ̞̀/ [ɛ̃ɹ̃ɛ̃β̃ɛ̞̃] “tongue”
32. Palatal
    a. /ìjèrì̞/ [ĩj̃ɛ̃ɾ̃ĩ̞] “fish”
    b. /íjòrì̞/ [ĩj̃ɔ̃ɾ̃ĩ̞] “five”
    c. /èɻ̊ù rɔ́jì̞/ [èɻ̊ù ɹɔ́j̃ì̞] “his cap”
33. Labial-velar
    a. /ùwèβ̞ì̞/ [ů̃w̃ɛ̃β̃ì̞] “house/;
    b. /òdì̞ wɛ́/ [òdì̞ w̃ɛ́] “your grass”
    c. /ɔɻ̊ɛ̀rùwèβ̞ì̞/ [ɔɻ̊ɛ̃ɹ̃ů̃w̃ɛ̃β̃ì̞] “gecko”
34. Rhotic
    a. /èrì̞/ [ɛ̃ːɾ̃ĩ̞] “fish”
    b. /íɻ̊íˬrí̞/ [íɻ̊ĩ́ˬɾ̃í̞] “nine”

A spectrogram is presented which compares the nasalized approximant allophone [j̃] with the nasal stop /ɲ/. One can see from this example that the nasal stop on the left has faint bands of energy, especially a low band around 250 Hz. If we compare this to [j̃], this appears more like a approximant, with energy distributed at different frequency ranges. The same distinctions holds for the other pairs (i.e. [w̃] vs. /n͡m/; [ɾ̃] vs. /n/; [β̞̃] vs. /m/).



The distribution of nasal spread shows that the following segments act as a phonological class: /w j β̞ ɾ/ and possibly /l/. Not included in this class (at least with the current set of data), are the voiceless rhotic /ɻ̊/, and the velar fricatives /x ɣ/. We can posit a rule as follows:

35. [+voice] [+sonorant]
    [+sonorant] → [+nasal] / ___ [+ syllabic]
    [+ nasal]

Within this rule, we must posit that /β̞/ is [+sonorant], but /ɣ̞/ is [-sonorant] (or any other voiced fricative which we may encounter).

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Appendices

Appendix 1

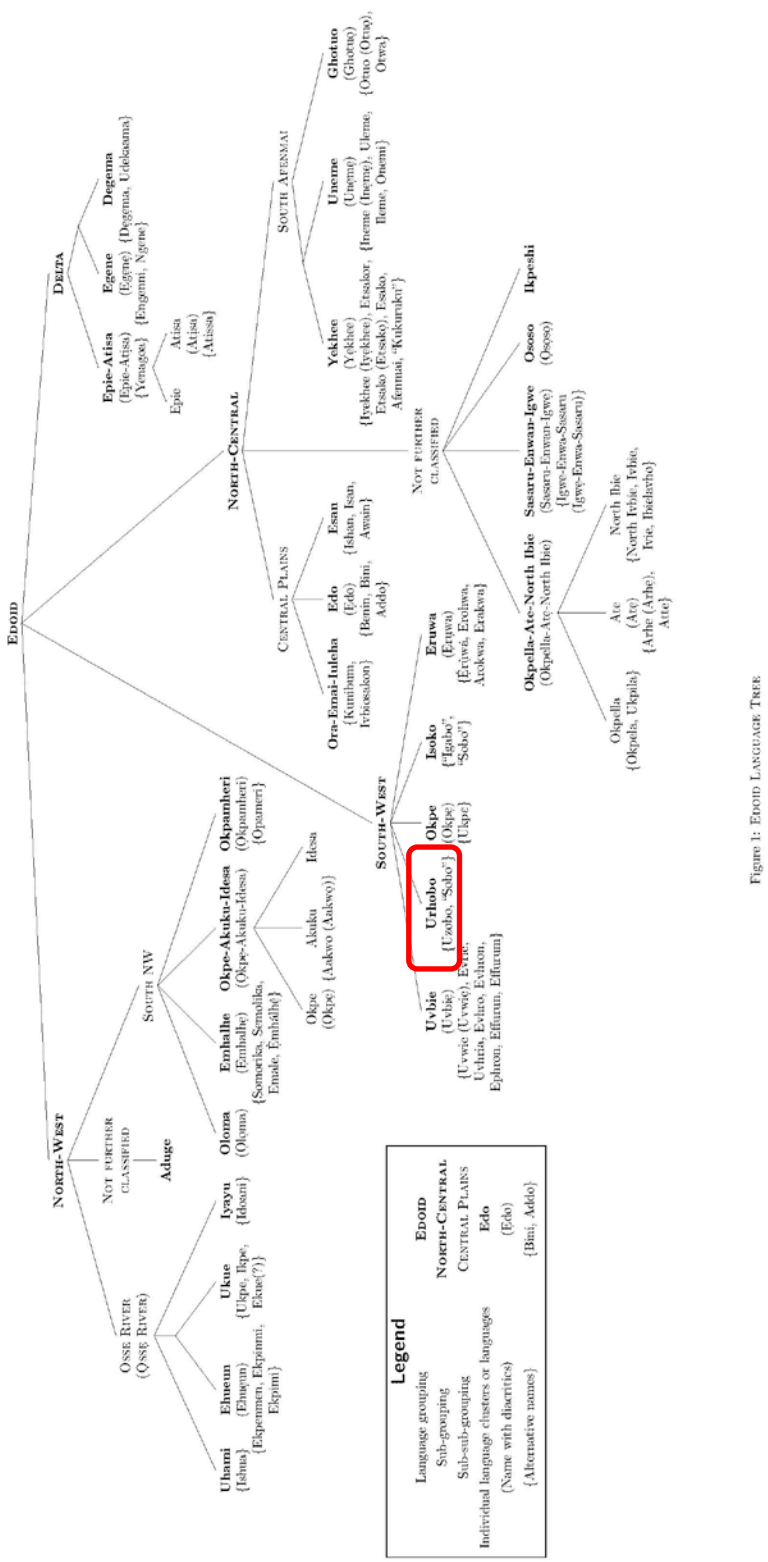

Figure 1: Edoid Language Tree

Appendix 2

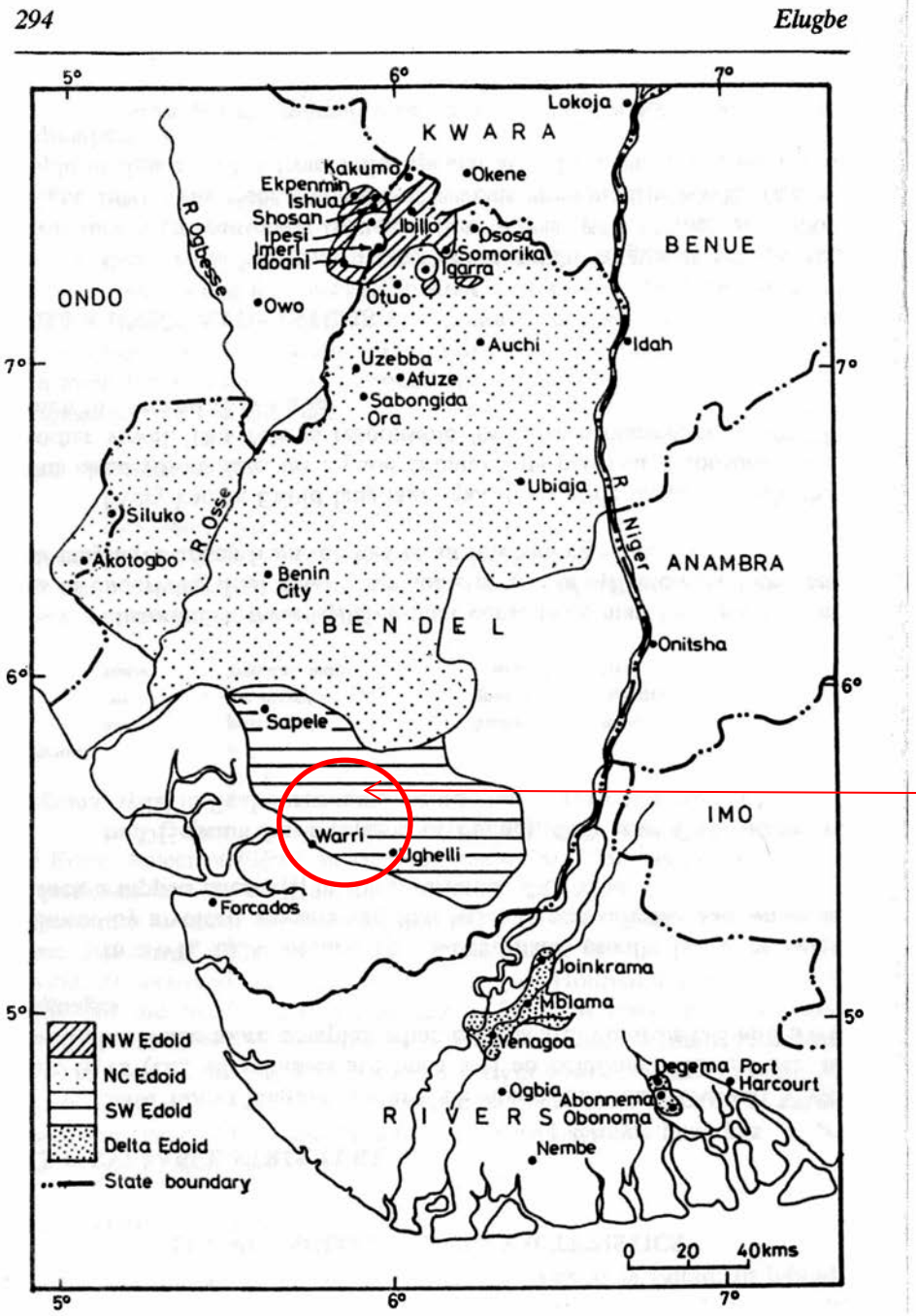

PLATE 13 Edoid languages

Urhobo Area circled. Map from Elugbe (1989a:294)