IOSR Journal of Humanities And Social Science (IOSR-JHSS)
Volume 25, Issue 9, Series 4 (September. 2020) 01-10
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

A Phonetic Description of Etulo Vowels

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ABSTRACT: Etulo belongs to the Idomoid group of the West Benue Congo family of Languages spoken by the Etulo people in the (Middle Belt) Central Nigerian States of Benue and Taraba. A descriptive survey using the One Thousand Seven Hundred SIL Comparative African Wordlist (SILCAWL) administered on Etulo informants who were born and bred within Etulo locality was made. Nine simple phonetic oral vowels [i ɪ e ɛ a o ɔ ʊ u] and their nasal counterparts alongside sixteen complex phonetic vowel sequences (phonetic diphthongs) [aɪaiauaʊaieoeueiouoiɛuɛʊɛɪɔɪʊʊɔ] were identified. Using articulatory, auditory and acoustic parameters, the phonetic description of Etulo vowels were made. In describing the vowels of Etulo, the nine simple oral vowels of Etulo were classified using articulatory and auditory parameters. For authenticity, these nine oral phonetic vowels were further subjected to instrumental (acoustic) analysis. In other words, a spectrographic analysis using the audacity and Praat software was made to reveal the vowel quality. In general, the auditory (figure 4.1) and acoustic (figure 4.6) vowel charts correspond with little discrepancies with the vowel [a] which is represented as a central vowel but analysed as back using the acoustic parameter. Furthermore, while the vowel chart plotted in figure 4.1 using the auditory parameter revealed the back and the front vowels; it did not reveal the degree of backness or frontness of these vowels, a situation evident using the acoustic parameter as seen in the formant chart of table 4.1.Etulo nine nasal vowels and the complex phonetic sequences are considered as doubtful segments and so further studiesanalysing these doubtful segments would reveal their phonological status.

KEY WORDS: Etulo; Vowels; Phonetic; Articulatory; auditory; acoustic.

Date of Submission: 28-08-2020 Date of Acceptance: 11-09-2020

I. INTRODUCTION

There are many languages with neither written literatures, nor grammars nor dictionaries and in most cases, no established orthographies. For Tsumba (1999:116), "Among the 19 languages of Benue State, Etulo and some others fit into what Bloomfield (1993) describes as "Speech Island". In his view, these groups should be subjected to proper research with a view to making them viable for educational purposes. Dixon (1997:5-6), has rightly argued that if most linguistic researches in Africa are based on marginalized or endangered languages, then more linguistic materials would be globally available for analysis and would contribute considerably to the world stock of linguistic knowledge.

The Etulo language coexists with 'Tiv', a predator language with many speakers; almost all the Etulo people are at least bilingual in Etulo and Tiv. The few texts written in the language are written with the Tiv Orthography (Ezenwafor 2016).Since the knowledge of Phonetics and phonology is very important in the construction of the alphabetic systems of languages, in other words, the orthography of languages (Yul-Ifode 2008: xxi), this research therefore, gives a phonetic description of Etulo vowels which will help to check the orthography of the language.

Speech is usually transmitted as sound waves and so the properties of sound waves can be investigated, analysed and interpreted by the listener. Phonetics therefore engages in a scientific study of speech sounds which encompasses: articulatory, acoustics and auditory or perceptual aspects of speech sound analysis (Clarks, Yallop and Fletcher, 2017:1). For proper description of speech sounds therefore, speculations on sound quality would not suffice. According to Clarks, Yallop and Fletcher, (2017:4),"we stress that any scientific or theoretical investigation of any aspect of speech must be empirical. In other words,must be properly based on observation". According to them, "empirical standards are perhaps more obvious in respect of articulation and acoustics, where guesswork and speculation defer to the results of properly conducted observation. No speech produced would telepathically pass from the speaker's mind to the hearer, but rather would be conveyed by articulated speech. Since articulated speech rests on articulatory and acoustic functioning within a linguistic system,phonetic study, analysis and description becomes necessary. However, such phonetic study yields a background for a phonological investigation and analysis.

Vowels are language universal speech sounds with varying numbers and degrees. In other words, they have language specific characteristics or qualities. These varying numbers of vowels, varying characteristics or qualities of vowels found in a language, are determined when subjected to a phonetic analysisusing the articulatory, auditory and acoustic parameters. In order to determine the quality of the vowels existing in the Etulo language, this study applied these parameters which enabled a description of the Etulo vowels based on the analysis made.

II. ETHNOLINGUISTIC INFORMATION

Etulo belongs to the Idomoid group of the West Benue Congo family of Languages (Armstrong 1989:323-325). It is a language spoken by the Etulo people in the (Middle Belt)Central Nigerian States of Benue and Taraba. The Etulo speakers of Benue state which are about one hundred thousand form the population of this study. This population projection was based upon the records of tax assessment from his royal highness' palace for a period of seventy years at the growth rate of 2.5% (Tabe 2007:3). Meanwhile, Etulo speakers in Benue State are found in Adi town, Buruku Local Government Area and Katsina-Ala town in Katsina-Ala Local Government Area.

III. METHODOLOGY

This work adopted a descriptive survey. Using the One Thousand Seven Hundred SILComparative African Wordlist (SILCAWL) (Sider & Roberts 2006), data were collected from Etulo informants who were born and bred within Etulo locality. Forquality sound production that would enhance the auditory and acoustic analysis of data, Edirolby Roland (24bit 96 KHz/MP3) Digital Recorder R-09HR set at sample rate: 44.1 KHz, Record Mode: WAV 24bit was used. Furthermore, the Audacity and the Praat Software were used for spectrographic analysis of the vowels.

IV. ANALYSIS OF FINDINGS

Based on the articulatory, auditory and acoustic parameters, the Etulovowels are described.

The Phonetic Description of EtuloVowels

Etulo has nine oral vowel sounds [i ɪ e ɛ a o ɔ ʊ u]. Most of these vowels have nasal and long counterparts. The nasal counterparts occur in the environment of nasal consonants, while the long counterparts occur at the word final position. It is also observed from the data that Etulo has sixteen phonetic vowel sequences which at this stage shall be called phonetic diphthongs. Such sequences include: [aɪaiauaʊaieoeueiouoiɛuɛʊɛɪɔɪʊʊɔ]. In the presentation of these different phonetic forms of vowels in Etulo, we shall be considering first, the single or simple phonetic vowels and afterwards, the complex phonetic vowels.

Simple Phonetic Vowels of Etulo

Etulo has nine oral vowels [i ɪ e ɛ a o ɔ ʊ u]. These nine oral vowels are the single or simple phonetic vowels of the language. These vowels are presented in the vowel chart below based on the articulatory and auditory parameters.

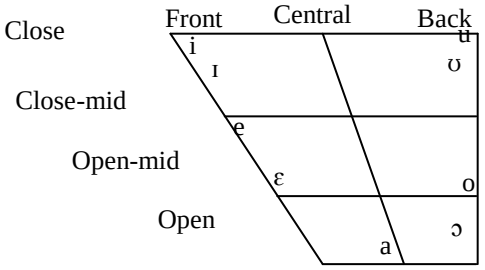


Figure 4.1: Etulo Phonetic Vowel Chart

The vowel chart in figure 4.1 reflects the vowels along a vertical and a horizontal scale. Along the vertical axis is the vowel height. At the horizontal axis, we have the backness and frontness of the vowels. The vowel height and backness form a basic two dimensional vowel space that is required for almost all languages of the world (Lindau 1975:2).

This Etulo phonetic vowel chart reveals that the vowels [i ɪ e ɛ] are close, close-mid and open-mid, unrounded vowels. The vowels [i e ɛ] can be approximated to the cardinal vowel(s) (1) [i], (2) [e], (3) [ɛ] respectively. However, the vowel [ɪ] on height dimension is lower than [i] but higher than [e] and [ɛ] and [a].

Furthermore, the vowels [u ʊ o ɔ] are close, open-mid, and open back rounded vowels. The vowels [ɔ o u] can be approximated to the cardinal vowels (6) [ɔ], (7) [o], and (8) [u] respectively, the Etulo vowel [ʊ] on height dimension is a bit lower than cardinal vowel (8) [u], but higher than [o] and [ɔ]. The vowel [a] is an open central vowel about midway between cardinal vowel number (4) [a] and (5) [ɑ]. Note also that the vowels [ɪ ɛ a] and [ʊ ɔ] are produced with the tongue retracted unlike the tongue position during the production of [i e] and [o u].

We shall further make a presentation of Etulo vowels based on acoustic or instrumental evidence. This acoustic nature of Etulo vowels is considered using a spectrographic approach. This will serve as a check on the excesses of subjectivity by our observation and consequently confirm, negate or modify our auditory presentation (cf. Yul-Ifode 2008:98).

A set of data used for the instrumental analysis of these nine simple phonetic Etulo vowels is as follows:

Data Set 1

i.	[ìbú]	‘well (water)
ii.	[ìbâ]	‘sore’
iii.	[èbâ]	‘marriage’
iv.	[èbìɔ̀]	‘jaw’
v.	[àbɔ̂]	‘hand’
vi.	[ɔ̀bàǹté]	‘pant’
vii.	[ɔ̀bɔ̂]	‘arm’
viii.	[ɔ̀bá]	‘barn’
ix.	[úbú]	‘fog’

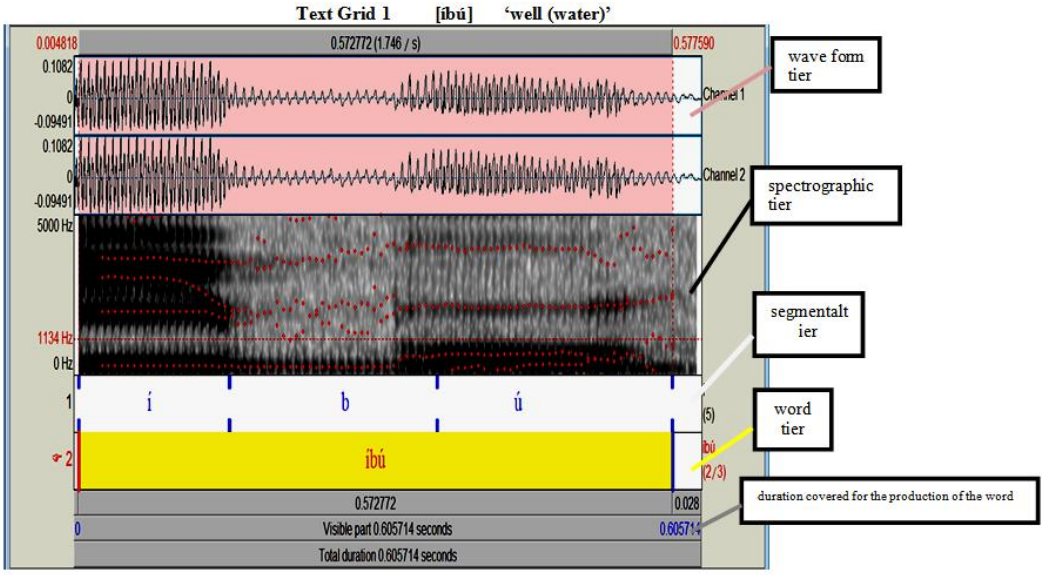
The simple vowels in the initial position are chosen because they tend to be pronounced distinctly by the informants. This is in line with reports got from some other languages. Furthermore, the initial vowels in Etulo language always bear level tones. Simple vowels preceding a voiced bilabial plosive /b/ are used in data set 1.

Spectographic Representation of Etulo Vowels

Spectographic representation is one of the most important means of acoustic investigation of speech sounds. The schematic representations of the Etulo vowels made below were got using the Audacity and the Praat Software. Each text grid has about four tiers: the first tier labeled channels 1 and 2 represents the wave forms of the speech sounds produced, the second tier represents the spectrogram with the formants (which are indicated by the red dots), the third tier represents the segmentation of the individual segments, where the first segment is of paramount concern for our analysis. The fourth tier represents the entire word. The total duration covered for the production of the word is also represented after the fourth tier. For a better understanding of the textgrids, the tiers in‘textgrid 1’ are labeled; this labeling is applicable to all the textgrids in figure 4.2.

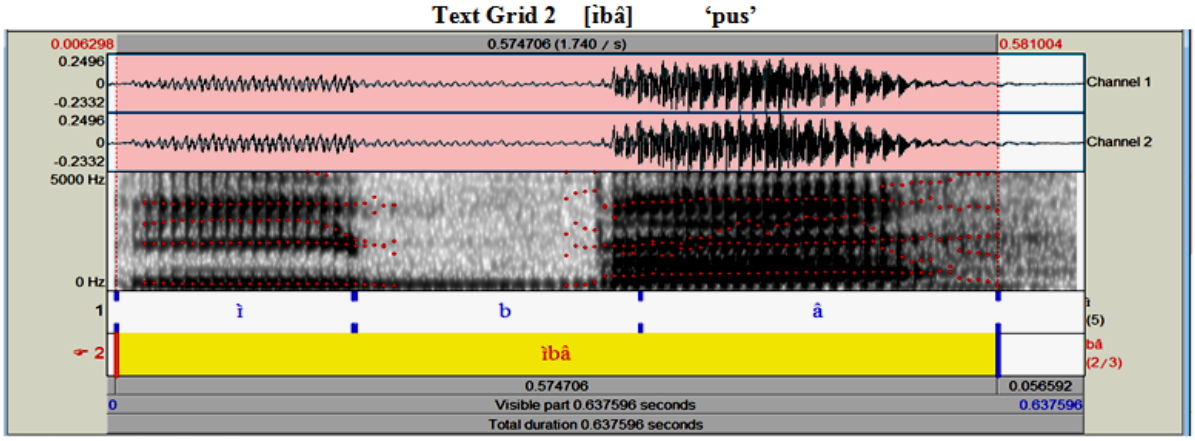
Text Grid Annotations of Data Set 1

Text grids 1-9 are the spectrographic presentation of the items in data set 1. They are generally labeled as figure 4.2.



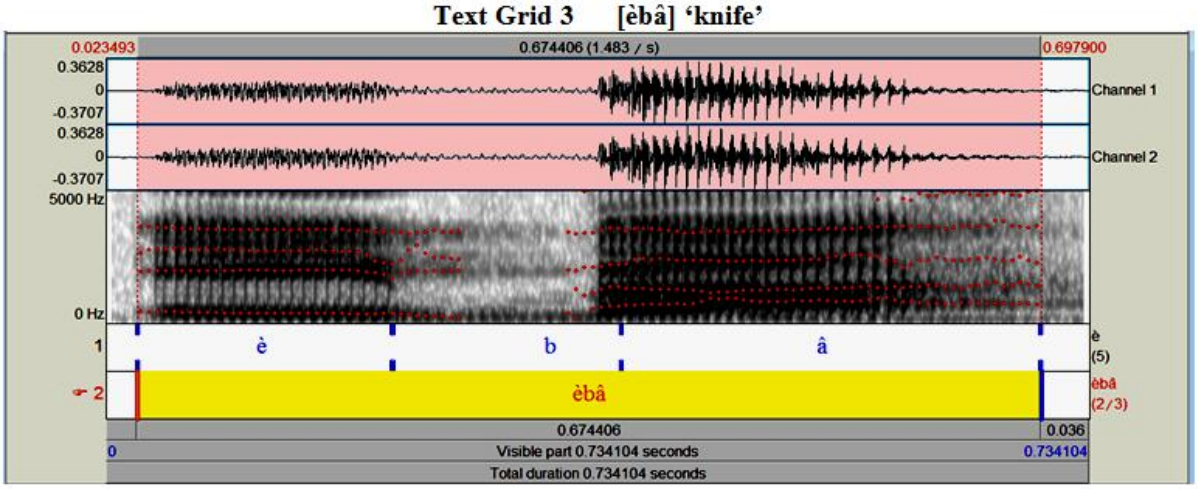
[ɪ]

Text Grid 2 [ìbâ] 'pus'



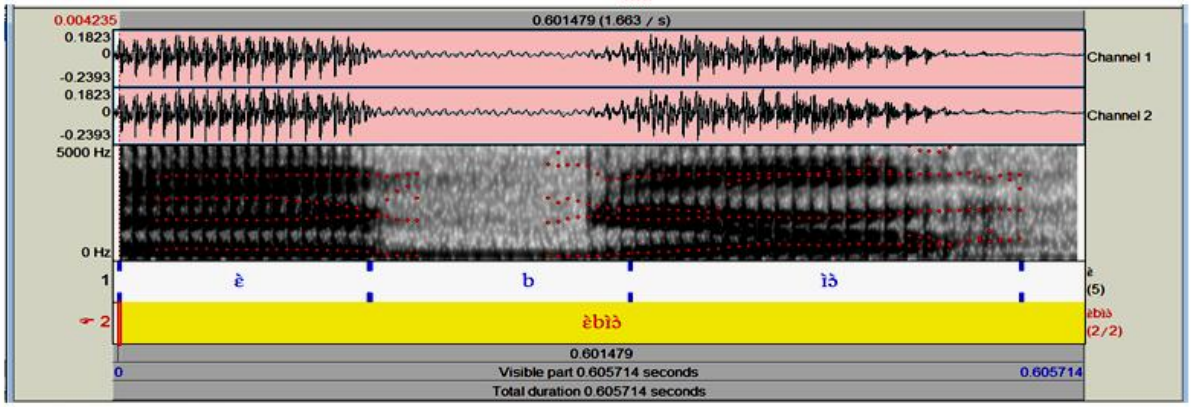
[e]

Text Grid 3 [èbâ] 'knife'



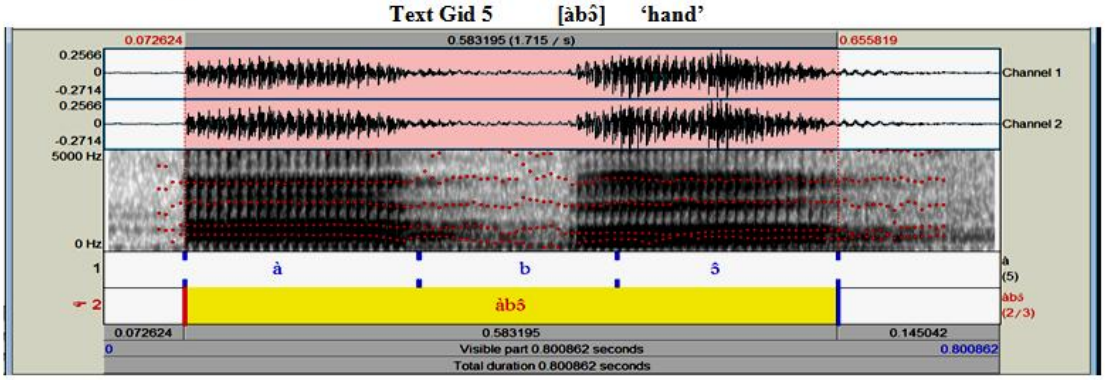
[ɛ]

Text Grid 4 [ɛ̀bìɔ̀] 'jaw'



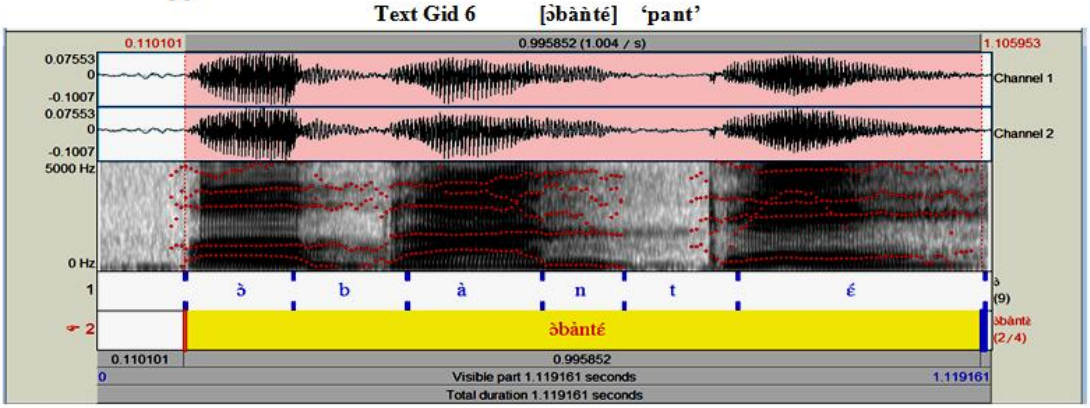
[a]

Text Gid 5 [àbɔ̀] 'hand'



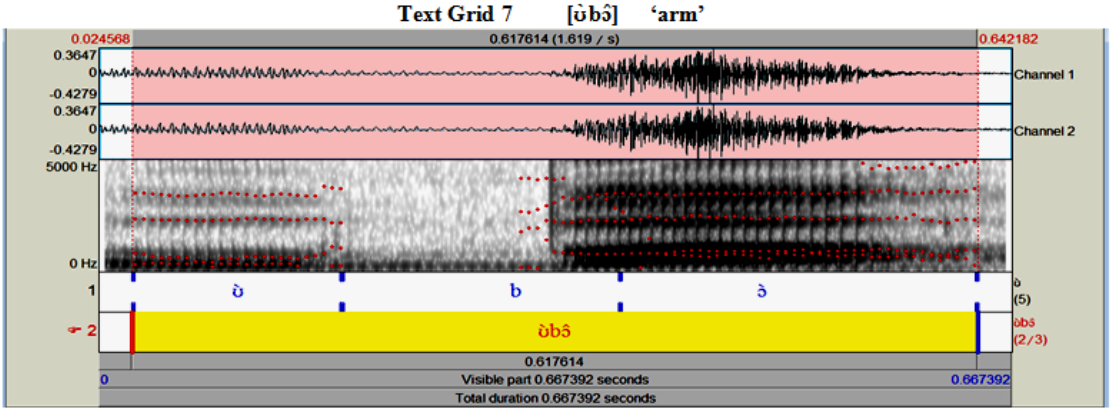
[ɔ]

Text Gid 6 [ɔ̀bàntέ] 'pant'



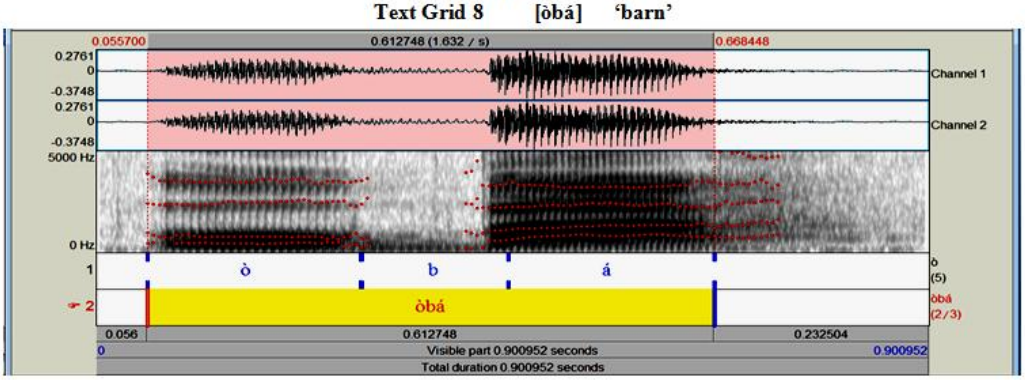
[ʊ]

Text Grid 7 [ʊ̀bɔ̀] 'arm'



[o]

Text Grid 8 [ò bá] 'barn'



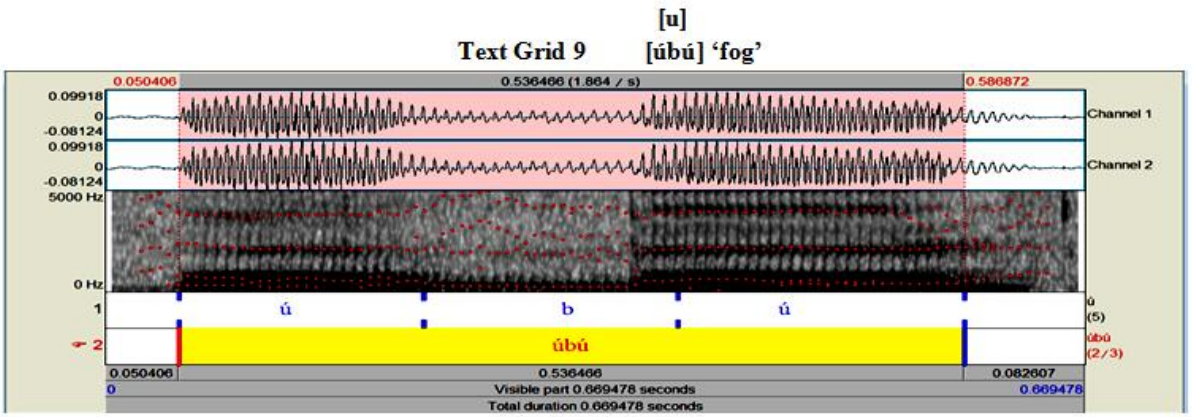


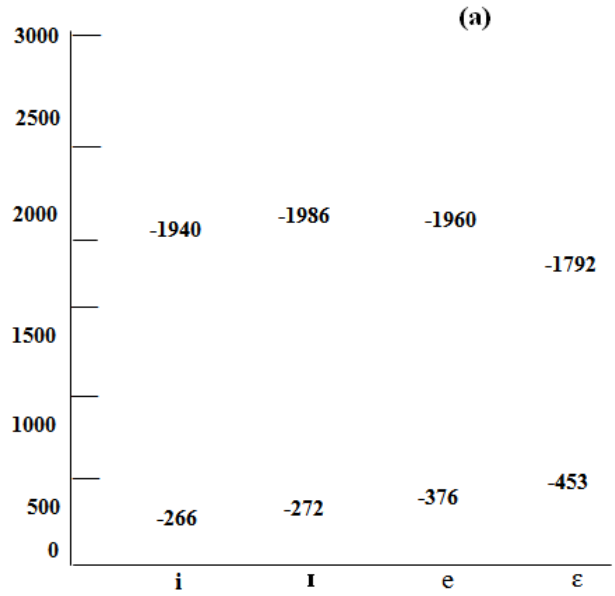
Figure 4.2: Schematic representations of the text grids of the nine vowels [i ɪ e ɛ a ɔ ʊ u]intheEtuloselected words in data set 1

According to Fant (in Lindau 1975:93), the acoustic aspects of vowel quality may be defined in terms of the frequencies of the first two formants. Formants may be designated with reference to each other as high or low and thus specified in terms of specific frequencies. Vowel height is related in a straight forward way to the frequency of the first formant (F_1). High vowels have relatively low F_1, and low vowels have relatively high F_1 (cf. Lindau 1975:8, Yul-Ifode 2008:110, Kohlberger, 2013:23). The first formant (F_1), which is the lowest is said to be low, for instance, if it is between 200Hzand 500Hz, and said to be high if it is above 500Hz. The second formant (F_2) is said to be low if it is between 700 and 1,200Hzand high if it is at 1,800Hz or above (Yul-Ifode 2008:110).

The outputs of the textgrids are translated into the following formant charts and formant graph.

Table 4.1: A formant chart showing the relation between F_2 and F_1 in the nine vowels of Etulo represented in data set 1

Vowels	**i**	**ɪ**	**e**	**ɛ**	**a**	**ɔ**	**o**	**ʊ**	**u**
F_2	1940	1986	1960	1792	1257	1136	903	995	1036
F_1	266	272	376	453	769	656	465	373	356
F_2-F_1	1674	1714	1584	1519	488	480	438	622	680



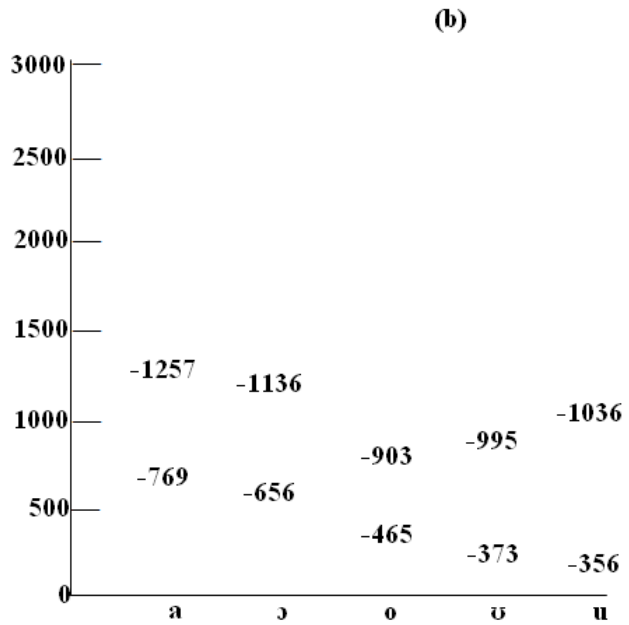


Figure 4.3: A schematic display of the frequencies of the first two formants in each of the nine vowels presented in data set 1. The upper frequencies are F_2, while the lower ones are F_1.

The first formant frequency increases as the speaker moves from the high vowel to low vowel. Again, the first formant frequency goes up as the vowel height goes down. In other words, the high/close vowels have low F_1 while the low/open vowels have high F_1.

The second formant (F_2) frequency is relatively low for back vowels, relatively high for front vowels and in between for central vowels, but the correlation between the F_2 frequency and the degree of backness of a vowel is not as good as between the first formant frequency and the vowel height (Lindau 1975:11). The F_2 frequency is considerably affected by the degree of the lips, the degree of rounding as well as by vowel height. In addition, there is a correlation between backness and the distance between the frequencies of the first and second formant (F_2-F_1). The greater the distance between the two formants, the more front the vowels.

Etulo Vowel Height Analysis

Notice from the representations in table 4.1, the F_1 increases as the speaker moves from the high vowel [i] to the vowel [a]. On the other hand, it decreases as the speaker moves from the low vowel [ɔ] to the vowel [u].

The formant chart confirms that while the vowel [i] is closer or higher than [ɪ], the vowel [ɪ] is closer or higher than the vowels [e] and [ɛ]. On the other hand, the vowel [u] is closer or higher than the vowel [ʊ] while [ʊ] is closer or higher than [o] and [ɔ]. These vowel heights tally with the result got using the auditory parameter.

Tongue Height Position Analysis of the Etulo Vowels

Table 4.1shows that F_2-F_1 is greater in the front vowels where [i] and [ɪ] are the most fronted vowels. While [ɪ] has the highest degree of frontness, [i] follows then [e] and then [ɛ]. The F_2-F_1 decreases as one goes from [ɪ i e ɛ] to [u ʊ a ɔ o]. The F_2-F_1 of [a] shows that it is neither quite a front nor a central vowel. Therefore, it is a back vowel. However, in data set 2, F_2-F_1 shows that [a] is a central vowel. The [a] in data set 1 runs contrary to the auditory assumption which represented [a] as a central vowel. In terms of backness, [o] has the highest degree followed by [ɔ] then [a], [u] and [ʊ].

Generally, all front vowels in this language are unrounded. The relationships discussed thus far can further be made explicit when the formant frequencies given in table 4.1 are plotted in the formant graph that follows.

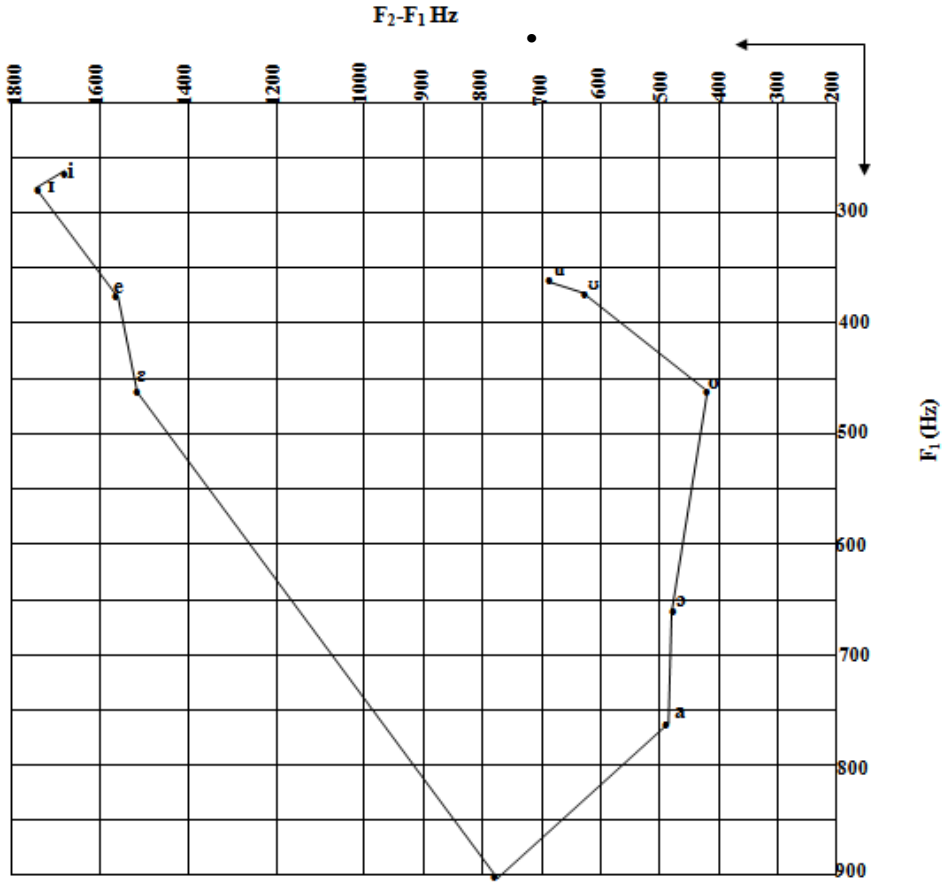


Fig 4.4: A formant graph showing the frequency of the F_1 on the vertical axis plotted against the distance between frequencies of F_1 and F_2 on the horizontal axis for the nine vowels in table 4.1.

Finally, these acoustic results are represented in the traditional vowel chart following the cardinal positions.

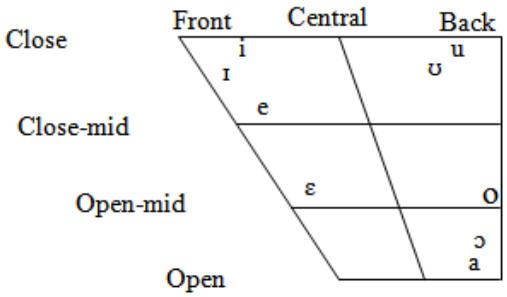


Fig 4.5: The nine vowels of Etulo (as reflected in table 4.1) plotted on a traditional vowel chart following the cardinal positions.

In general, the auditory and acoustic vowel charts as represented in figure 4.1 and 4.6 respectively, correspond with little discrepancies. These discrepancies are found with the vowel [a] which is represented as a central vowel but represented as back using the acoustic parameter. Furthermore, while the vowel chart plotted in figure 4.1 using the auditory parameter revealed the back and the front vowels; it did not reveal the degree of backness or frontness of these vowels, a situation evident using the acoustic parameter.

Complex Phonetic Vowels

Most of these nine simple oral vowels of Etulo [i ɪ e ɛ a o ɔ ʊ u] discussed above, have nasal and long counterparts. The nasal counterparts [ĩ ɪ̃ ẽ ɛ̃ ã õ ɔ̃ ʊ̃ ũ] occur in the environment of nasal consonants, while the long counterparts [i: ɪ: e: ɛ: a: o: ɔ: ʊ: u:] occur at the word final position. These nasal, long and phonetic diphthongs are the complex phonetic vowels in Etulo and are further illustrated in the following tables.

Table 4.3: Etulo Phonetic Long Vowels

Long Vowels	Words	Gloss
iː		-
ɪː		-
eː	òʤéː	'conversation'
ɛː	àbóbɛ̄ː	'left' (direction)
aː	òjáː	'bread'
oː		-
ɔː	ɔ̀dɔ́ː	'soup'
uː	dúː	'whole'
ʊː		-

Table 4.4 Etulo Phonetic Nasal Vowels

Nasal Vowels	Words	Gloss
ĩ	èmĩ́mĩ̀	'theif'
ĩ	áníńĩ́'vein'	
ẽ	ìnẽ̂	'face'
ɛ̃	nɛ́nɛ̃́	'this'
ã	ŋã́	'stick'
õ	mmɬé	'where ?'
ɔ̃	ɔ́nɔ̃̂	'mother'
ũ	nn	'give'
ʊ̃	m̀mʊ̃̀à	'salt'

Table 4.5: Etulo Phonetic Diphthong

Phonetic Diphthong	Words	Gloss
aɪ	kpáīˉ	'learn'
ɪa	òŋgìà	'woman'
Ia	óbíá	'cousin'
Ua	àlóbūà	'shoulder'
ʊa	ìmbʊ̀à	'hunger'
Ie	ìkíé	'head'
Oe	kwóēˉ	'drag'
Ue	ógbúé	'vagina'
Io	ìŋgìògà	'visitor'
Uo	kwúó	'stab'
iɛ	mímíɛ̄ˉ	'breathe'
uɛ	m̀mùè	'respect'
ʊɛ	èfʊ̀è	'intestine'
ɪɔ	èbìɔ̀	'jaw'
ɪʊ	míʊ̀	'scar'
ʊɔ	ìkúkʊ́ɔ̀	'corpse'

Table 4.3, 4.4 and 4.5 represent the complex phonetic vowels in Etulo. Analysis of these doubtful segments would reveal their phonologicalstatus.

V. CONCLUSION

In describing the vowels of Etulo, a spectrographic analysis using the audacity and Praat software was made to reveal the vowel quality. In general, the auditory (figure 4.1) and acoustic (figure 4.6) vowel charts correspond with little discrepancies with the vowel [a] which is represented as a central vowel but analysed as back using the acoustic parameter. Furthermore, while the vowel chart plotted in figure 4.1 using the auditory parameter revealed the back and the front vowels; it did not reveal the degree of backness or frontness of these vowels, a situation evident using the acoustic parameter as seen in the formant chart of table 4.1. However, Etulo nine phonetic nasal vowels and the complex phonetic sequences are considered as doubtful segments. It is therefore of paramount importance that further studies on these doubtful segments be carried out to ascertain their phonological status.

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Chibunma Amara Bright-Ajoku. "A Phonetic Description of Etulo Vowels." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(9), 2020, pp. 01-10.