

## **PITCH GLIDING AND DECLINATION IN ESAN**

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### **Abstract**

This paper examines the phenomena of pitch glide and tone declination in Esan phonology. It investigates fundamental frequencies ( $F_0$ ) in Esan speech tokens and presents insight into the nature of these two tonal alternations in the language. The study adopts a descriptive approach and presents an acoustic perspective to studying tonal interactions in Esan. The data for the study comprised words that were extracted from recorded speeches of several Esan native speakers, which were loaded into a spectrograph and carefully observed. The study finds, amongst others, that Esan exhibits the phenomena of pitch gliding resulting in the derivation of contour tones and tonal declination. Furthermore, this paper proposed generalisations in the form of Tone Gliding Rules (TGRs) that help to account for these observed processes in the language and concludes that synchronic Esan data show that these processes are very productive in the language.

**Keywords:** *Esan, Phonology, Tone, Glide, Declination*

### **Introduction**

This paper presents an acoustic analysis of pitch gliding and declination in the Esan speech system. The goal of the study is to investigate the effects of one pitch on the other when they interact in the language. Although some works examine the tonal system of Esan, this work presents an acoustic perspective on the interaction of one tone with the other. This is made possible by a careful observation of the fundamental frequency ( $F_0$ ) of synchronic speech tokens in the language.

Tone refers to variation in pitch that affects meaning. It performs lexical and grammatical functions in a language. A language in which tone causes meaning to be distinctive is known as a tone language (Pike, 1948). In speech, the "pitch of a speaker's voice is determined by the rate of vocal fold vibration" (Gut, 2009: 170). Pitch glide (also pitch contour) may be described as the rising and falling of the pitch or fundamental frequency ( $F_0$ ) during speech (Ejele, 1996; Inanoglu, 2003; Arvaniti, 2019). Tone is the perception of relative pitch, i.e., while pitch is an acoustic consideration of the  $F_0$  in speech, tone is its perceptual correlate.  $F_0$  of speech is measured acoustically employing observable spectrograms that display such features for visibility (Omozuwa, 1989).

Esan (also known as Ishan) is the native language of the Esan people. They occupy five of the eighteen local government areas of the Edo State, Nigeria, which are Igueben, Esan South East, Esan West, Esan North and Esan Central. The language belongs to the Proto-North Central Edoid group of the Edoid language family (Elugbe, 1989) and the Benue Congo (Williamson, 1989). The language is tonal, like other Nigerian languages such as Edo, Uvbie, Urhobo, Isekiri, and others (Evbuomwan 2018, Edionhon 2020, Ekiugbo 2022, Osewa & Evbuomwan 2022).

### **Previous Studies on Esan Tones**

Some studies exist on the Esan tonal system. The earliest works seem to be those of Ejele (1982) and Okojie & Ejele (1987), where it was posited that Esan has five significantly distinctive tones:

1.    a)    High [ ´ ]  
      b)    Mid [ ˘ ]  
      c)    Low [ ˋ ]  
      d)    Rising [ ˊ ]  
      e)    Falling [ ˆ ]

They maintained that only the high and low tones participate in distinguishing lexical items that are identical in form, the mid being an "allophone" of the low, while the rising and falling tones are derived forms in the language that result from phonological processes such as segment (usually vowel) deletion.

Osiruemu (2005, 2010), on her part, claimed that Esan has only four tones:

2.    a)    High [H]  
      b)    Low [L]  
      c)    Rising [LH]  
      d)    Falling [HL]

She argued that the mid-tone observed earlier (i.e. by Ejele 1982, Okojie & Ejele 1987) "is in reality an L (low) tone" (Osiruemu, 2005: xxiii) that becomes obvious when it occurs in a sequence in which it is preceded by a high tone.

Following Osiruemu (2005, 2010), Ikoyo-Eweto (2013, 2016, 2017) recognised only four tones as what the language exhibits. She argued further that the use of the terms "distinctive" and "contrastive" by Ejele (1982) and Okojie & Ejele (1987) in describing the level tones in Esan is misleading. In her opinion, "the situation in Esan as revealed by current research is that the language exhibits the high (H), low (L), rising (LH) and falling (HL) tones at the systematic phonetic level" (Ikoyo-Eweto, 2013:105). She observed also that the four tones in Esan can be combined differently in bi-syllabic words to give any of the following patterns:

3.    a)    H.L  
      b)    L.L  
      c)    H.HL  
      d)    L.HL

and in tri-syllabic words to give:

4.    a)    H.H.L  
      b)    H.L.L

- c) L.L.L
- d) L.H.L
- e) H.L.H
- f) H.L.HL

Furthermore, she explained that there is no lexical item in Esan with an all-high tone, and that "all H (high) tone in final position drops to an L" (Ikoyo-Eweto, 2017:76).

Osiruemu (2005) and Rolle (2012) also examined post-nominal pronoun structures in Esan, observed that "tones falling on verbs and nouns are highly prevalent in Esan" (p.82), even though they did not indicate tones in their data. He, thus, acknowledged that tone plays a very important role in the Esan language.

Another study that is worthy of note, here, is that of Ejodamen, Ekong, Ekpenyong and Urua (2018), which sought to examine the acoustic properties of tones in Esan. Using Praat, they analysed the expression:

5. *Édè nè èlèna eghoghò nọ* 'Today is a day of joy!' (p.893)

This was done across different speakers: two females (65 – 80 years and 25 – 40 years) and two males (65 – 80 years and 25 – 40 years). They compared the average  $F_0$  of the entire utterance for each speaker and reported their findings in a table as shown below.

6. Average  $F_0$  of *Édè nè èlèna eghoghò nọ* for each speaker (Ejodamen, Ekong, Ekpenyong & Urua, 2018:895)

S/N	Gender	Age range	Average $F_0$
1	Male	65 – 80 years	131.2245179
2	Female	65 – 80 years	213.2205241
3	Female	25 – 40years	213.6387685
4	Male	25 – 40years	174.0636741

The values in 6, above, suggest that the  $F_0$  values are lower for the average male speakers of the language than they are for the females. The study concluded that, in addition to duration and intensity, the  $F_0$  of speech conveys paralinguistic information about the Esan speakers. Such information may include whether a speaker is happy or sad, and other information.

## Methodology

Data for this study were gathered from Esan native speakers comprising four (04) males and seven (07) females who cut across different ages (between 30 to 73 years) and are adjudged to be competent in the everyday use of the language. Three of these informants (one male and two

females) are formally educated to tertiary levels, five informants attained secondary education, one informant attained primary education, while the remaining two participants had no formal education at all. Two methods were adopted in eliciting the data from the informants. The first involved the use of a word list (i.e. the University of Ibadan word list of 400 basic lexical items) in which the respondents were asked to produce each of the listed words as they would in Esan. A total of five informants (two males and three females) participated in this exercise, and all items provided by the participants were available for analysis. The second was to engage the other six speakers in interviews and group discussions on varied issues that do not necessarily relate to the study. The recording was done mainly through a Dictaphone Audio Digital Recorder in .wav format, to ensure that the utterances were captured in real-time, devoid of interferences and delays that would have been the case if recordings were to be done manually using pen and paper. The recorder was powered by two Lithium batteries.

The words from the recordings were later extracted and organised for analysis. The organisation of the data was guided by the observed effect of one tone on the other, in a word. The tool employed in the analysis is Praat 6.1.09 (Boersma & Weenink, 2017). This spectrograph helped in making the  $F_0$  of the utterances visible for measurement. The results of these were examined carefully, and observations were reported as the findings of the study.

### **Pitch Glide/Contour**

The data available in the present study, however, shows that only three tone levels can be contrasted in lexical items, as illustrated below.

- 7a) H. L /éǵǵ/ 'rat', /éǵǵ/ 'elephant'
- b) L. L /èǵǵ/ 'edge', /èǵǵ/ 'there'
- c) M. M /ǵǵǵ/ 'cock'
- d) L. H /ǵǵǵ/ 'one'

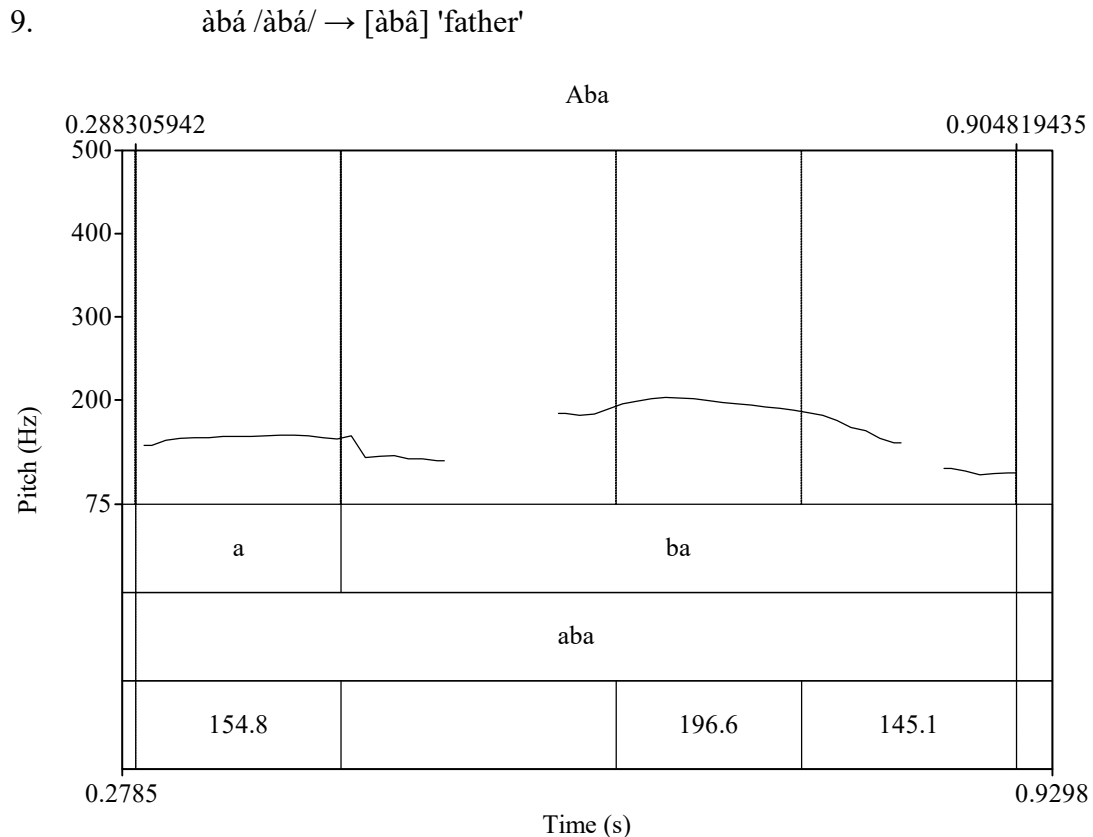
In 7, the low, high and mid tones are contrasted. The falling and rising tones are, therefore, considered to be derived forms in the language, given that each is a combination of the High and Low tones. An example of such derivation occurs when a vowel is deleted at a word boundary. In Esan, the form V1 # V2 usually results in the elision of V1. When this happens, the tone on the retained V1 changes to a contour due to the influence of the tone on the elided vowel (which usually remains and floats onto the next tone-bearing unit) as shown in the following.

- 8. Low tone → Falling tone
  - a) /ǵǵǵ # ǵǵǵ/ → [ǵǵǵǵǵǵ] 'one by one'  
'one' 'one'
  - b) /èǵǵ # èǵǵ/ → [èǵǵèǵǵ] 'in twos'  
'two' 'two'

High tone → Rising tone

- c) /úḍò # úḍò/ → [úḍúḍò] 'all stones'  
'stone' 'stone'
- d) /óḃò # óḃò/ → [óḃóḃò] 'all hands'  
'hand' 'hand'

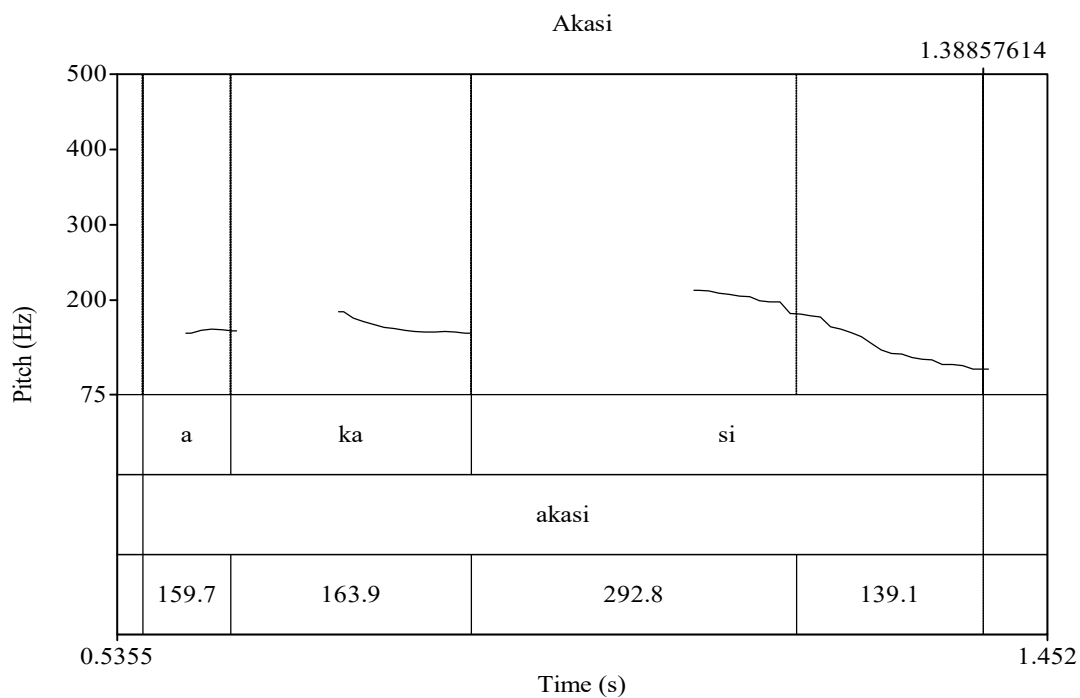
In addition to the above, this study observes that there are phenomena of level pitch becoming a glide (or contoured) pitch in fast speech situations and as a result of the environment in which it occurs. Consider the following spectrogram that shows the realisation of the final tone in the word *àbá* 'father'.



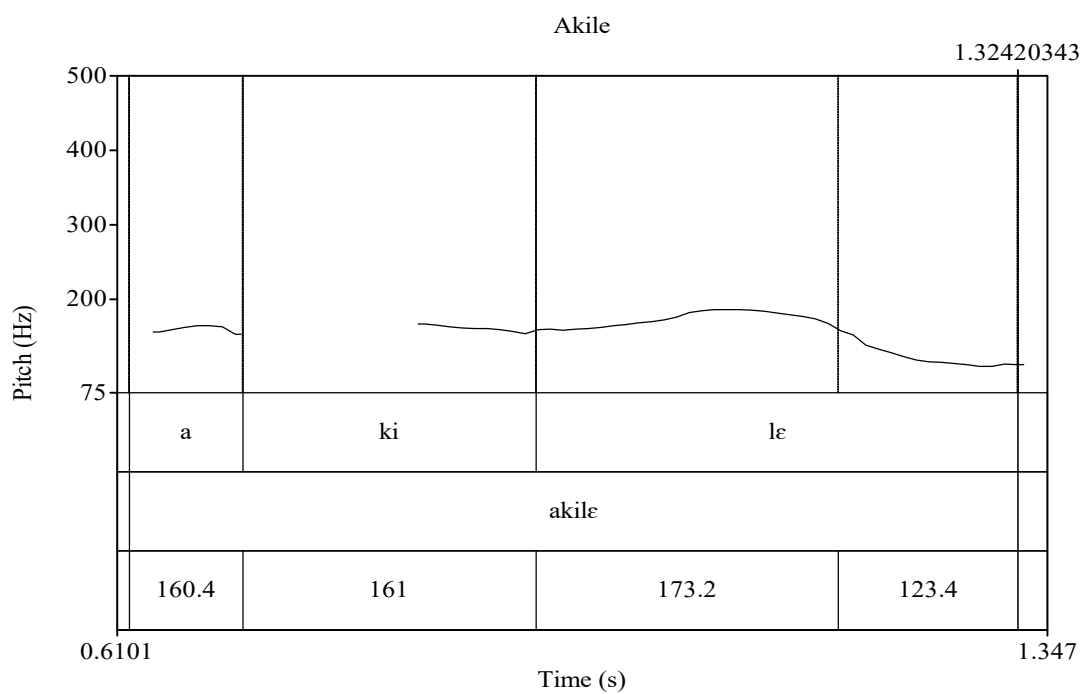
Pitch gliding, such as in 9, where a word has an underlying L.H pitch pattern, but is realized by the Esan speaker as L.F (L.H̃L), is common in the language. This is similar to pitch gliding occurrences in a very close language, such as Edo, where an H.L pitch pattern is realized as an H.F (H.H̃F) (Omozuwa, 2010). In the case of the [àbâ] in 9, it is observed that the pitch of the first syllable is 154.8Hz. The pitch of the second syllable, which is high in its underlying form becomes a glide. The glide is observed to drop gradually from an average of 196.6Hz to 145.1Hz on that second syllable. The contoured tone on the final syllable in 9 is therefore a derived form (not an inherent one) and is, in the opinion of the present study, conditioned by the environment (i.e. the word-final position). To further examine this observation, the following tri-syllabic forms were examined.

# Pitch Gliding and Declination in Esan

10. a) àkàsí /àkàsí/ → [àkàsî] 'horse'



b) àkílẹ̀ /àkílẹ̀/ → [àkílê] 'frog'



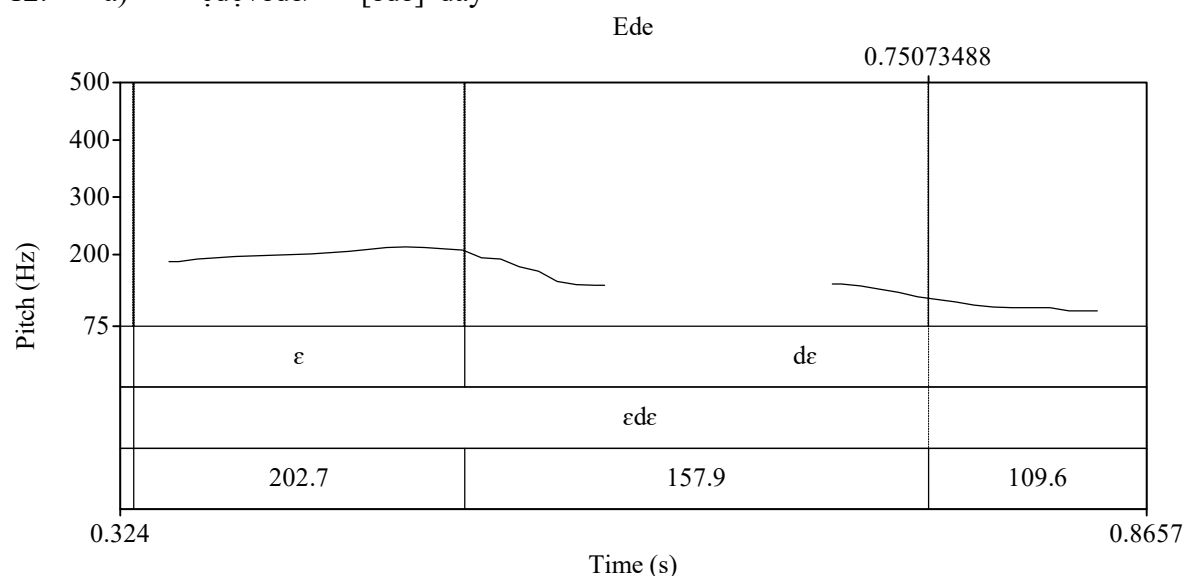
In 10a, the word *Àkàsí* 'horse' is displayed. The syllable is produced with a low pitch of 159.7Hz. On the second syllable, the low pitch is observed to have minimally increased to 163.9Hz. This is, in the opinion of this work, in anticipation of the next (high) pitch. The pitch of the final syllable of the word is observed to glide from an average of 292.8Hz to 139.1Hz, thereby resulting in a contoured pitch. In 10b, our observation is similar to that in 10a. Here (in 8b), the word *Àkìlẹ̀* is displayed. The pitch of the first syllable is 160.4Hz, that of the second syllable is 161.0Hz, while the third syllable forms a high-low (HL) glide from 173.2Hz to 123.4Hz. It is also observed that the final syllable has the lowest pitch in all cases of the examined data. This is, however, expected, given the reduction in breadth as one reaches the end of an utterance. From the above, we can propose a Tone Gliding Rule (TGR) for Esan, as follows.

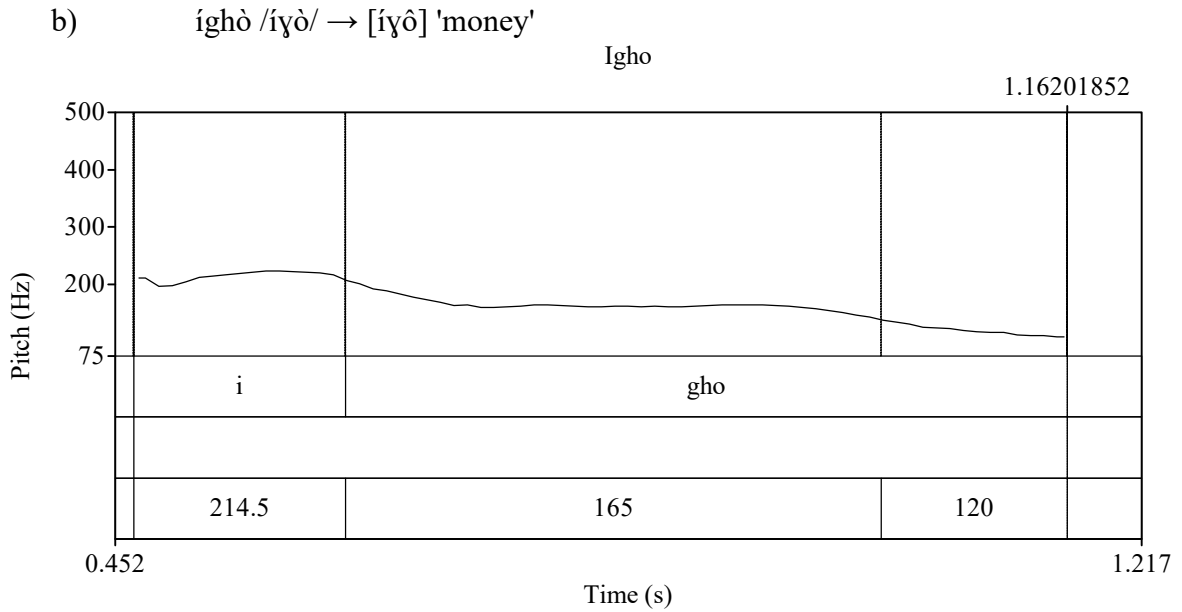
#### 11. TGR<sub>1</sub> for Esan

A high pitch (H) at word-final position is realised as a falling pitch when it occurs after a low pitch (L).

In furtherance of the above, we shall proceed to examine cases in which a word ends in a low-pitched syllable, whereas the penultimate syllable has a high pitch. Consider the following, for example.

#### 12. a) *édè* /édè/ → [édê] 'day'





In 12a, the word *Édè* 'day' has a high pitch [H] on the first syllable and a low pitch [L] on the final syllable. While the pitch of the first syllable is 202.7Hz, that of the final syllable glides from an average of 157.9Hz to 109.6Hz. The same pitch gliding process is observed in 12b, where the final syllable pitch glides from 165.0Hz to 120.0Hz. Given that our PGR<sub>1</sub>, above, cannot account for these later occurrences, a new rule would be necessary to do so. We shall propose a TGR<sub>2</sub> in this case, as 13.

13.      **TGR<sub>2</sub> for Esan**

A low pitch [L] at the word final position is realised as a falling pitch [F] when it occurs after a high pitch [H].

Observe that TGR<sub>1</sub> and TGR<sub>2</sub> are similar, given that they both account for the realisation of level pitches as contoured ones at word-final position, irrespective of whether the underlying pitch at that position is high or low. Hence, both rules may be collapsed into one general rule for pitch gliding at that position in Esan, as TGR<sub>3</sub>.

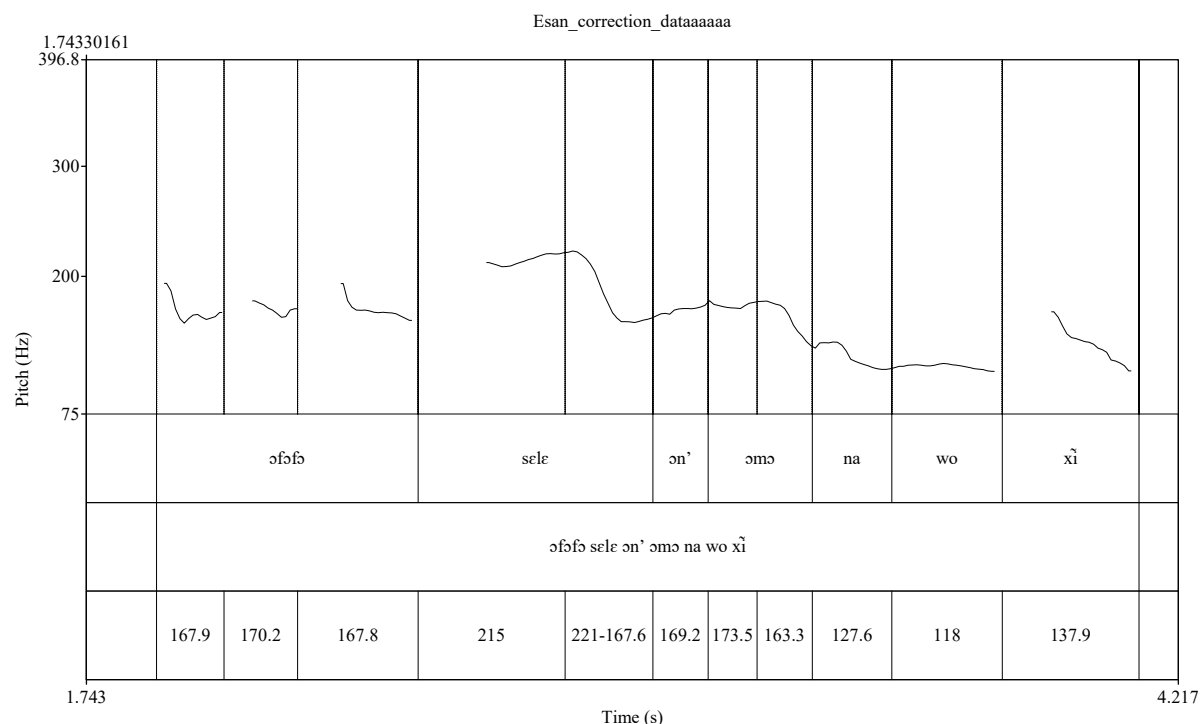
14.      **TGR<sub>3</sub> for Esan**

A level pitch at the word-final position is realised as a falling pitch [f] when it occurs after another level pitch that is of a different height.



What TGR<sub>3</sub> explains is that a word-final high [H] or low [L] pitch is realised as a falling [F] pitch when it occurs after a low [L] or a high [H] pitch, respectively. Worthy of mention, here, is the obvious word-final syllable lengthening occasioned by the change from level to contoured pitch in each case. For further illustration, consider the tonal gliding in the sentence below.

15. Ọ̀fọ̀fọ̀-ṣẹ̀lẹ̀n ọ̀nì ọ̀mọ̀ nà wo`khìnn  
[òfòfò-sɛlɛ́.ón' ómô nà wo` xî]  
apathetic this child this definite be  
'This child is definitely apathetic'



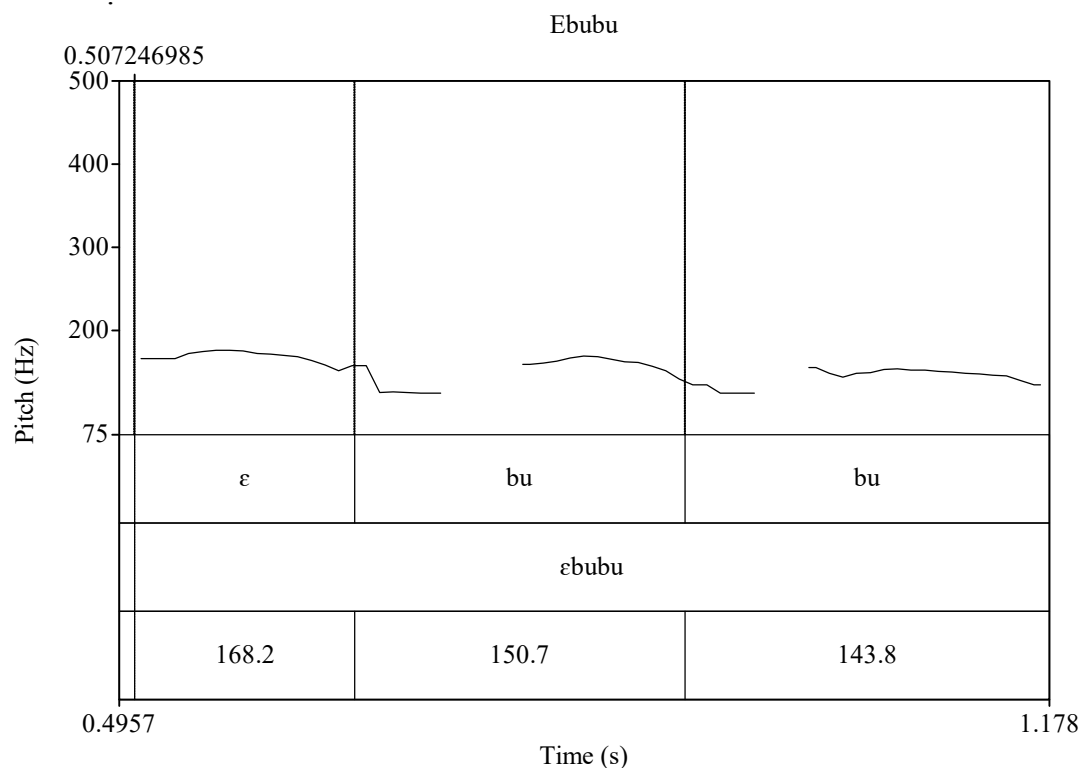
It is observed that the Low tone in the word ọ̀fọ̀fọ̀ in Ọ̀fọ̀fọ̀-ṣẹ̀lẹ̀n 'apathetic' does not manifest the final gliding phenomenon, given that there is no intervention of a preceding High tone. However, in the word ṣẹ̀lẹ̀, the last syllable glides from 221Hz to 167.6Hz. The same glide in pitch is observed in ọ̀mọ̀ 'child', where the preceding tone is also different. In the final syllable of the sentence, there is also a pitch glide after the intervention of a High tone. The TGRs above apply in both lexical and post-lexical forms. The pitch gliding process shows consistency in its occurrence in the data analysed. Our findings here are corroborated by the earlier observation of Ikoyo-Eweto (2017) that word-final high tones usually drop too low. However, observations have revealed that the process affects word-final low tones as much as it affects high tones in that position, leading to the derivation of falling tones.

### Pitch Declination in Esan

In the previous section, it was mentioned that a low pitch may be higher than a preceding low pitch if it is, itself, followed by a high pitch. This, as already noted, is due to the anticipated

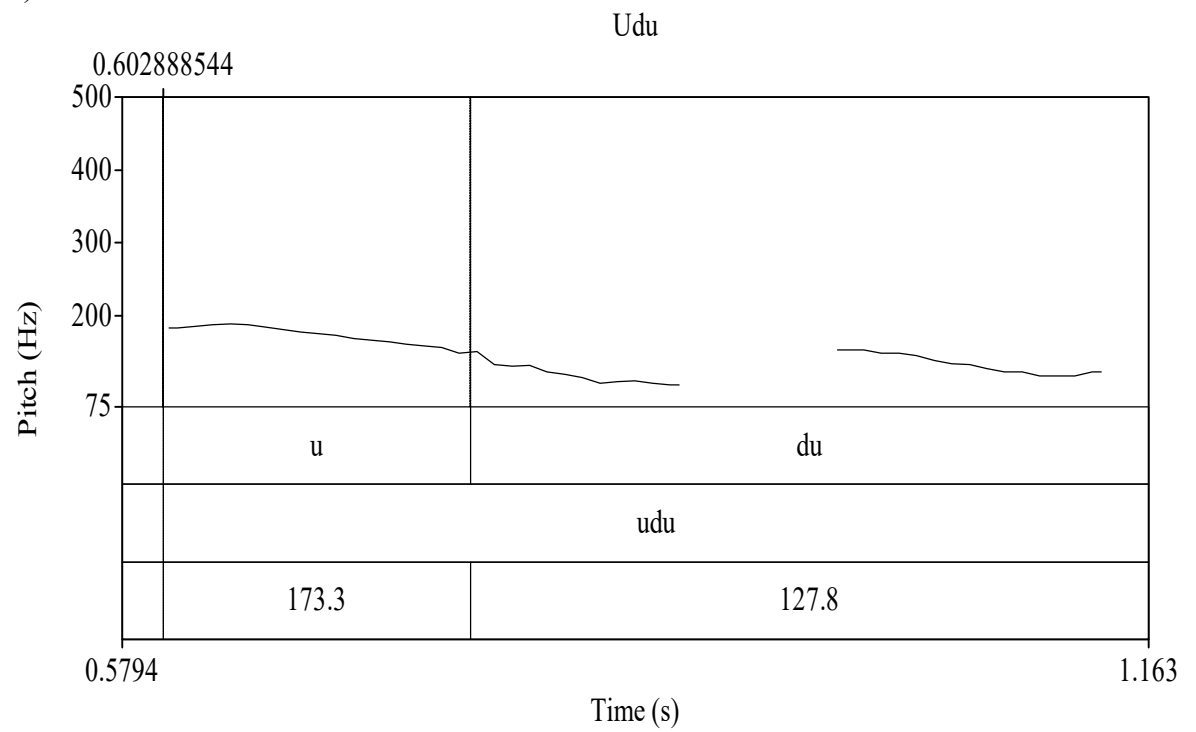
succeeding high pitch. The data available in this study show that such an increase in  $F_0$  does not occur when there is no succeeding high pitch. Instead, there is a systematic lowering of tones. Consider the following examples.

16.            èbùbù /èbùbù/ 'dust'



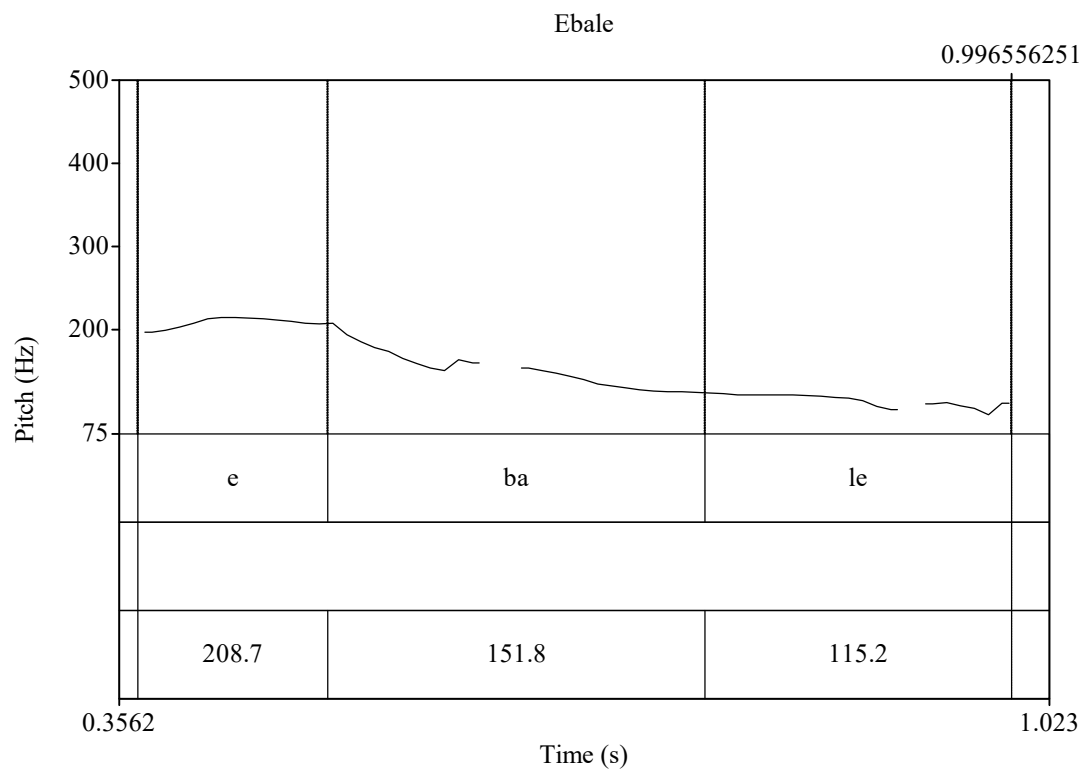
The utterance in 16 is low-pitched –168.2Hz, 150.7Hz and 143.8Hz in its first, second and third (final) syllables, respectively. It is, however, observed from the  $F_0$  values that the second syllable is lower than the first, while the third is lower than the second, in pitch. This demonstrates a case of declination in successive low tones in Esan. What this means is that a low tone that follows another low tone in the language is realised as being a step lower. We shall consider the following to further illustrate this.

17. a) ùdù /ùdù/ 'heart'

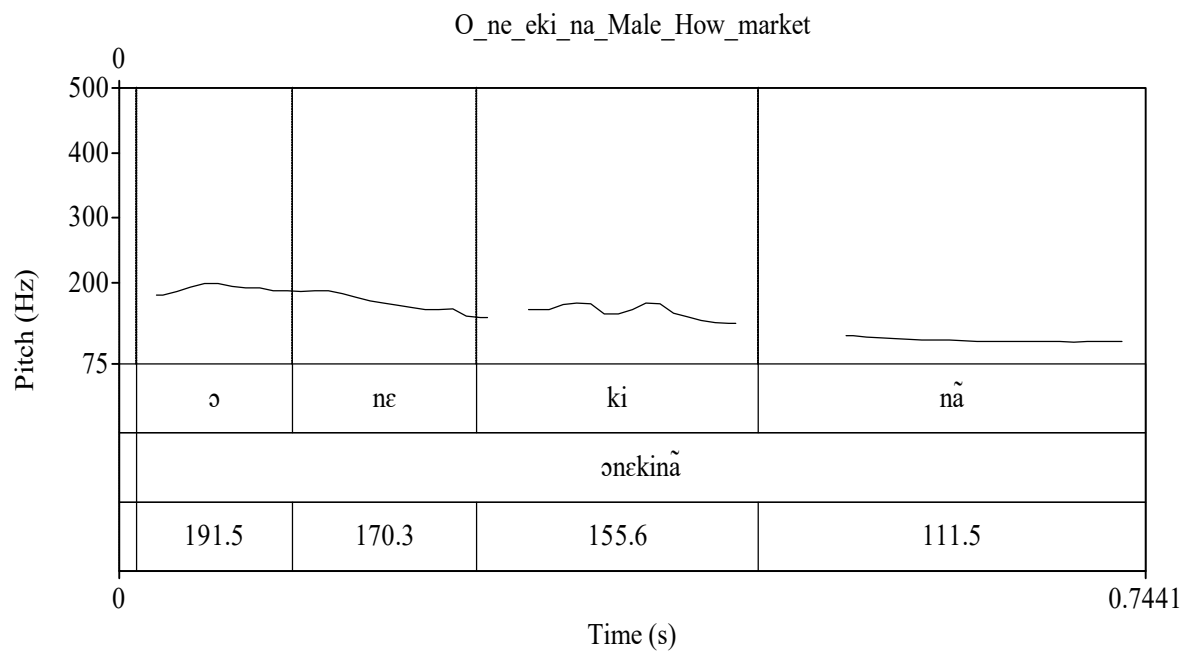


b) Spectrogram: ébàlè /ébàlè/ 'food'

# *Pitch Gliding and Declination in Esan*



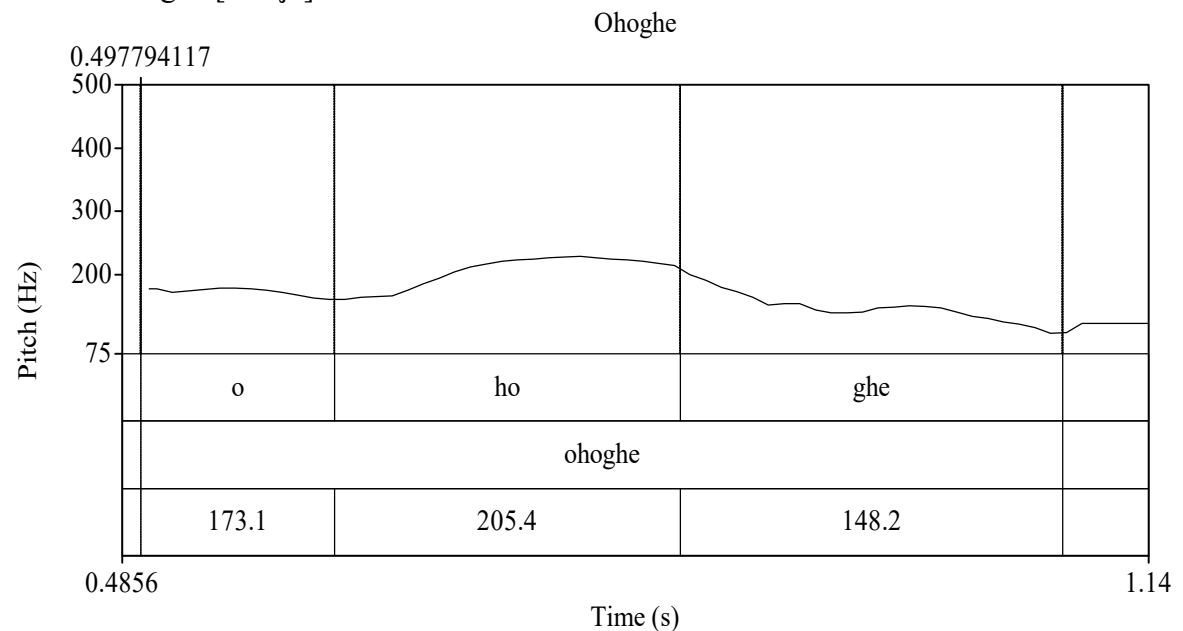
c) ọn'ẹ̀kìnà /ónèkìnà/ 'How is business/trade'



In 14a, the first syllable of the word *ùdù* 'heart' is 173.3Hz while the second syllable is 127.8Hz. This shows a drastic drift in pitch between the second low and the previous low pitch, with a variation of 45.5Hz. In 14b, the final pitch, which is also low, declines following another low pitch on the preceding syllable that is also low. The pitch of the last syllable drops at 115.2Hz compared to the low pitch (151.8Hz) of the penultimate. The declination in this case of 17b is irrespective of the high pitch (208.7Hz) of the word's initial syllable. In 14c, the utterance *Ó nè èkì* is not a single word. Despite the length of the utterance, the succeeding low pitches are observed to participate in the declination process. In this case, the first low pitch is on the second syllable of the word, and all the following pitches are low. Hence, there is a systematic drop from 170.3Hz in the second syllable to a lower 155.6Hz on the third syllable and to an even lower 111.5Hz on the final syllable.

When there is an intersection by a high-pitched syllable, it is observed that a low pitch would drop, irrespective of that intersection. Consider 18, below.

18. Òhóghè [òhóyè] 'lie'



This spectrogram shows the word *Òhóghè* 'lie' in which the first syllable is low-pitched, and the second and third (final) ones are high and low, respectively – a case of two low-pitched syllables with an intervening high-pitched one. The  $F_0$  values show that the first (low-pitched) syllable is 173.1Hz, the second (high-pitched) syllable is 205.4Hz, and the third (second low-pitched) syllable is 148.2Hz. The  $F_0$  variation between the two low-pitched notes is 24.9Hz. This suggests that a series of low tones is realised at a lower pitch, irrespective of the intervention of a high tone in between the two low tones.

## **Conclusion**

This paper observed pitch (or tone) gliding resulting in the formation of contoured pitch and tonal declination phenomena in Esan. The study used acoustic analysis to provide visual pitch track evidence to demonstrate its observations. The study finds that (1) the low pitch at the word-final syllable is realized as a high-low glide (or contour) when it occurs immediately after a high tone, (2) the high tone at word-final position is realised as a high-low glide (or contour) when it is preceded by a low tone, and (3) the low tone that follows another low tone is realized with a systematic pitch declination, irrespective of the intervention of a high tone in-between. This work brings to the fore the productive nature of the effects of a tone on others that occur in its environment, in the language, as synchronic Esan data have shown, therefore, bringing the Esan linguists a step closer to an enhanced understanding of the Esan tone system. It also serves as an invitation to linguists who are interested in the language to examine other aspects of tonal interactions in associated constructions.

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