

Sound System Sketch of a Gengbe Speaker from Batonou

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KEYWORDS

Gengbe; Togo;
Ghana; ultrasound

ABSTRACT

Gengbe is the under-resourced lingua franca to much of Southern Togo as well as southeastern Ghana and southwestern Benin. This study presents a basic description of the Gengbe sound system starting with the inventory of consonants and vowels with particular attention paid to the Voice Onset Time (Lisker & Abramson, 1964) of stops and ultrasound images of the two-way voiced coronal distinction (/d/ vs. /d̥/) with data from our Gengbe language assistant, a male speaker in his 50s from Batonou, Togo. Special attention is also afforded to syllable structure, focusing on co-occurrence restrictions on CV syllables and a description of Gengbe's typologically uncommon maximal CCV syllable. This description concludes with a brief discussion of tone and a transcribed story excerpt. It is intended as a basic overview of Gengbe's phonetics and phonology with highlights of relevant topics for study, meant to serve as a jumping-off point for future phonetic and phonological research on Gengbe.

1. INTRODUCTION

Gengbe--also called Gen, Gɛ, Mina, or Anecho-Ewe—is part of the Gbe group of languages and is spoken as a language of wider communication by over 300,000 people in Southern Togo (including the capital city of Lomé), Benin, and Ghana. Gengbe as well as other Gbe varieties are part of the Left Bank Kwa group of languages within the Niger-Congo family (Eberhard, Simons, & Fennig, 2020). Capo (1991) describes the Gbe languages as forming a continuum along the West African coast from Eastern Ghana to Western Nigeria which he divides into five major families: Vhe (including Ewe and Waci), Fon, Aja, Phla-Pherá, and Gen. Capo further sub-divides the Gen group into three dialects according to the three major cities in the region: Anéxo (or Aného, Togo), Agóí (or Agoué, Benin), and Glijí (or Glidji, Togo); Capo's phonological study reports that there are no significant differences between these regional varieties. The data for this study were gathered at Indiana University from 2014 to 2016 with the assistance of a 50-year-old

native Gengbe speaker from Batonou, a village near Glidji, Togo. Our language assistant for this project also speaks or is familiar with French, Russian, Akan, Ga, and a number of Gbe languages including Ewe, Waci (which, according to him, is the most widely spoken Gbe language in Batonou), Fon, and Aja. Due to close contact with other languages in the region, including many Gbe varieties, multilingualism is commonplace and the variety of Gengbe reported in this paper is likely influenced by Waci; our language assistant often notes Waci and Gengbe patterns in free variation among speakers in his village. Variation between Gbe varieties is expected, so the need for descriptions and analysis of varied Gbe sound systems--even from individual speakers--across the region contribute to a broader understanding of the larger Gbe continuum.

Aside from basic grammatical descriptions (Johnson, 1967; Ako & de Barros, 1969), previous work on Gengbe has focused on syntax (Kangni, 1989), semantics (Lewis, 1992), and phonology (Bole-Richard, 1983), but the Gengbe literature lacks phonetic description with instrumental analysis. For this type of treatment, we must turn to Ewe, a Gbe language spoken primarily in Ghana, of which Ladefoged and Maddieson include some description in *The Sounds of the World's Languages* (1996) based on previous studies by each of the two authors (Ladefoged, 1968; Maddieson, 1993). The overview presented here expands on previous descriptions of the Gengbe sound system by summarizing its basic processes and adding illustrative phonetic data. Since phonetic analysis here is based on a single speaker, it is not generalizable to the larger population; however, the patterns of one speaker can be considered typical of at least some portion of the Gengbe-speaking population, a largely multi-lingual population where inter- and intra-speaker variation is commonplace. So, despite its restricted scope, a description such as this is useful in informing future study on Gbe. Consonants are discussed in Section 2; vowels in Section 3; nasality in Section 4, syllable structure in Section 5, and tone in Section 6. Section 7 presents a brief summary and Section 8 offers transcription of a recorded passage.

2. CONSONANTS

Our discussion of Gengbe consonants begins with an overview of the phonological and phonetic inventory in (1a) and (1b), respectively, followed by a discussion of Gengbe fricatives and data on differences in Voice Onset Time between places of articulation for Gengbe stops. Nearly all of the consonants in Table (1b) can appear as single onsets. Exceptions include [r], [r̄], [j], and [ũ] (which are conditioned by syllable position and nasality, discussed in Section 5), [ŋ̄m] (a product of nasal place assimilation, discussed in Section 5), and [ʒ] (conditioned by a following palatal glide, discussed later in this section.)

(1a) Phonological consonant inventory

| | Bilabial | Labio-dental | Dental | Alveolar | Alveo-Palatal | Retro-flex | Palatal | Velar | Glottal |
|------------|----------|--------------|--------|----------|---------------|------------|---------|-------|---------|
| Stops | p b | | t d | | | ɖ | | k g | |
| Fricatives | ɸ β | f v | | s z | | | | x | h |
| Affricates | | | tʃ dʒ | | | | | | |
| Nasals | | | | | | | | | |
| Laterals | | | l | | | | | | |
| Flap | | | | | | | | | |
| Glides | | | | | | | j | | |

Double articulations: k̠p̠ g̠b̠ w

(1b) Phonetic consonant inventory

| | Bilabial | Labio-dental | Dental | Alveolar | Alveo-Palatal | Retro-flex | Palatal | Velar | Glottal |
|------------|----------|--------------|--------|----------|---------------|------------|---------|------------------|---------|
| Stops | p b | | t d | | | ɖ | | k ^h k | |
| Fricatives | ɸ β | f v | | s z | ʒ | | ɲ | x | h fi |
| Affricates | | | tʃ dʒ | | | | | | |
| Nasals | m | | | n | | | | ŋ | |
| Laterals | | | | l ɭ | | | | | |
| Flaps | | | | r ɾ | | | | | |
| Glides | | | | | | | j ʝ | | |

Double articulations: k̠p̠ g̠b̠ ŋ̠m̠ w ɰ̠ q̠ ũ̠

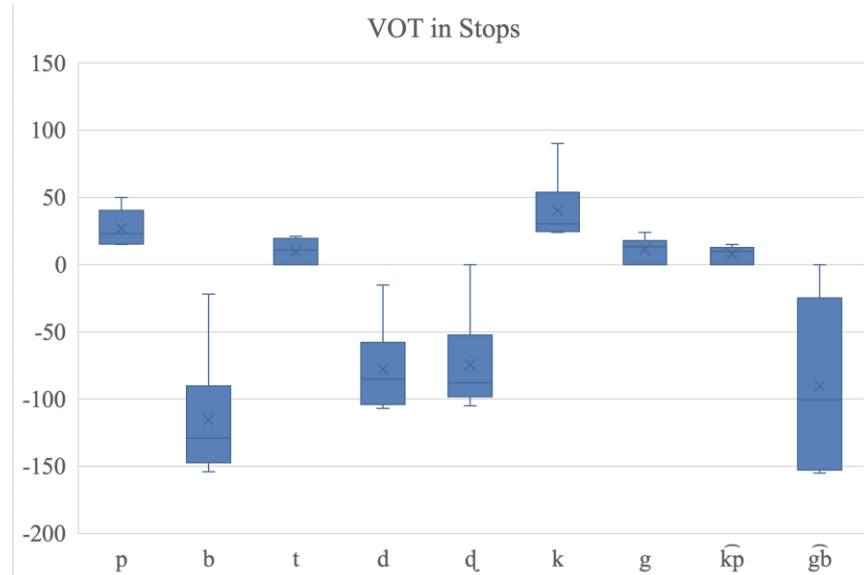
Fricatives. Gengbe's fricative series distinguishes the bilabial voiceless /ɸ/, as in *èφǎ* 'belch,' and the voiced /β/, as in *àβà* 'war,' from the labiodental voiceless /f/, as in *àfɔ* 'leg,' and voiced /v/, as in *àvà* 'barn,' each of which may also occur in word-initial position since the nominal prefix *à-* or *è-* is often omitted. The contrast between bilabial and labiodental fricatives is rare, and apart from Gbe languages are also noted in other neighboring languages Avatime (Schuh 1995) and Logba (Ladefoged 1968). Maddieson (2005) reports articulatory and acoustic differences between these sounds in Kpando Ewe. Apart from involvement of the upper lip in bilabials, bilabial fricatives also rely on a lower lip motion which curls inward to create the constriction while labio-dental fricatives rely largely on jaw raising rather than lip movement. In addition, aiding perception of this contrast, Maddieson describes a lower F1 following bilabials. In Gengbe, the voiceless bilabial stop and fricative are in free variation for some lexical items, as in *àφá/àpá* 'shout.'¹ Also in free variation are [fi] and [β] before /ũ/, as in *èβũ/èhũ* 'vehicle.' [z] and [ʒ] are in an allophonic relationship where [ʒ] only surfaces before a palatal glide (labialized or not) as in *àʒĩĩ* 'rabbit' and *àʒĩĩví* 'fiancé.' Before leaving this description of

¹ According to Capo (1991), Gengbe innovated [p] from [χ^w], which is retained in Ajá, Fon, and Phla-Pherá varieties. From [χ^v], Vhe languages (like Ewe and Waci) innovated [ɸ], so it is possible that [ɸ] was borrowed into Gengbe from the neighboring Vhe languages. Not all words with [ɸ] may variably use [p], as in *φèè/*pèè* 'sew it (a seed)' and *φǎ/*pǎ* 'to become stale'; and vice versa such as *tìpó/*tìfó* 'jump'.

fricatives, it is worth addressing the distribution of the voiceless velar fricative [x] and the glottal fricative [ħ]. While /x/ and /ħ/ are distinguished in the minimal pair *àxà* ‘dam’ and *àħà* ‘drink,’ such minimal pairs are rare and, as shown in the attested CV combinations table in (12), the only vowels that may follow both [x] and [ħ] are /ĩ/, /a/, and /e/. In some cases, it was observed that /ħ/ may surface as [h], though evidence presented in Table (19) in Section 6 suggests that the glottal fricative is underlyingly voiced, since it patterns with other voiced obstruents in acting as a depressor consonant and triggering rising tone, thus examples of [h] may be considered instances of devoicing.²

Stops. Within Gengbe’s stop series, as has been noted for many other languages (Lisker & Abrahamson, 1964), the laryngeal distinction varies in its phonetic realization between places of articulation. Despite surface phonetic differences, Table (19) in Section 6 reveals that /b d g ġb/ pattern as depressor consonants while /p t k kp/ do not, suggesting the same phonological feature distinguishes each pair. Figure (2) is included to exemplify the observed phonetic differences. As illustrated in Figure (2), the alveolar and labiovelar series show a distinction between voiceless unaspirated [t kp] and pre-voiced [d ġb], while the velars are differentiated phonetically by aspiration [k^h] vs. [k].³ The bilabial series divides aspirated [p^h] and prevoiced [b]. Both [d] and [d̥] are pre-voiced. Boxes represent average VOT values; vertical lines represent the range of values attained.

(2) VOT in Gengbe stops



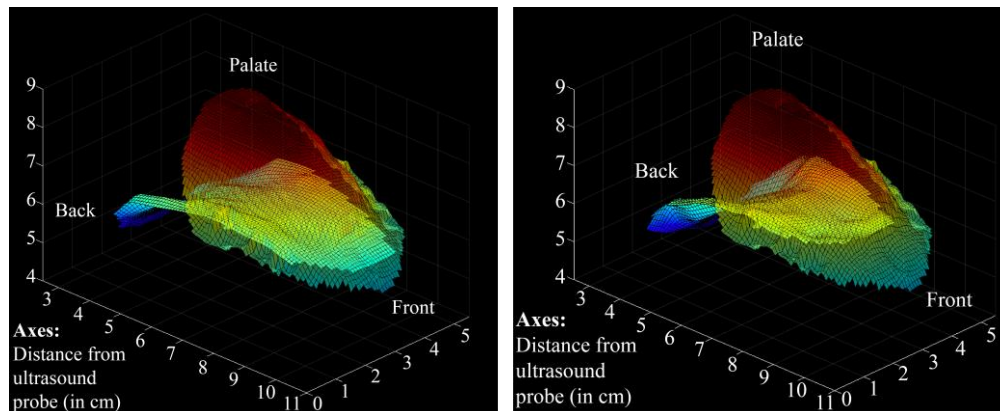
² Although not included in (1), two other fricatives were elicited each in a single item: [ʃ] in *ʃĩ* ‘to sneeze’ and [ɛ] in the ideophone *eyim*, which expresses the motion of quickly rising like a bird or of quickly moving by like a car.

³ Data presented in Table 2 was collected from our language assistant using a randomized word list of stop stimuli. Each word had the target stop in word-initial position followed by a low vowel [a] or [ã] and each word appeared on the list 6 times for a total of 54 tokens, 2 of which were thrown out due to speech errors. Each word was recorded in the frame sentence *mù bé* ____ ‘I said ____.’

[d] and [ɖ]. The distinction between /d/ and /ɖ/ has been described by Ladefoged and Maddieson (1996) in Ewe as voiced laminal dental /d/ vs. voiced apical alveolar /ɖ/. The apical alveolar stop is often referred to (and is transcribed here) as retroflex, although Ladefoged (1968) notes that it is not a subapical retroflex like those of Hindi. To collect data on this type of distinction, Ladefoged and Maddieson (1996) performed palatographic and acoustic analyses on six speakers of Kpando and Peki—both Vhe branch languages—as well as “some neighboring Central Togo languages (26)” that all showed this distinction in a low vowel context. Since Gengbe is spoken in the area, it is possible that Gengbe speakers were included in the study. To investigate the articulation of these two sounds, we performed a 4D ultrasound study targeting word-initial /d/ and /ɖ/ (Lotven & Berkson, 2017).⁴ The following models are of the surface of our language assistant’s tongue during the closure of a single token superimposed on a 3D scanned model of his palate. His front teeth are positioned in the front right of the diagram and the back of his palate in the back left. The image in (3a) shows the constriction made in the production of /d/ (in *dà* ‘throw’) where the tongue tip is extended forward and the tongue blade is pressed against the teeth. (3b) shows in the production of /ɖ/ (in *ɖà* ‘cook’) where the tongue tip is more retracted and pointed up to meet the alveolar ridge.

(3a) /dà/ ultrasound with palate

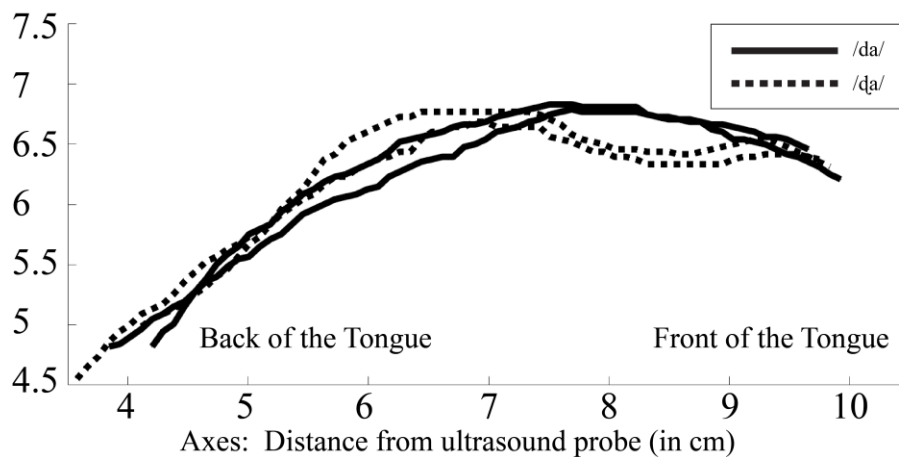
(3b) /ɖà/ ultrasound with palate



⁴ 4D ultrasound data were collected using a Philips EpiQ 7G system made available in the Indiana University Speech Production Lab. The procedure for data collection and analysis included using an Articulate Instruments ultrasound stabilization headset to secure an xMatrix x6-1 digital 3D transducer stationary against the bottom of the speaker’s lower jaw while he produced short utterances (in this case target words embedded in the frame sentence *mù bé ____ kèà* ‘I said ____ again.’). The technology used takes a series of sagittal and coronal images while simultaneously recording audio. For each image, the outline of the surface of the tongue is manually traced at each relevant time point on each 2D image and a 3D model of the tongue is produced from a compilation of those images. A 3D image of the speaker’s palate (taken using dental alginate and modeled using a 3D scanner) is then transposed on the model of the tongue to generate the 3D images presented here. Special thanks for the production of 3D images goes to Steven Lulich, Kelly Berkson, and Max Nelson.

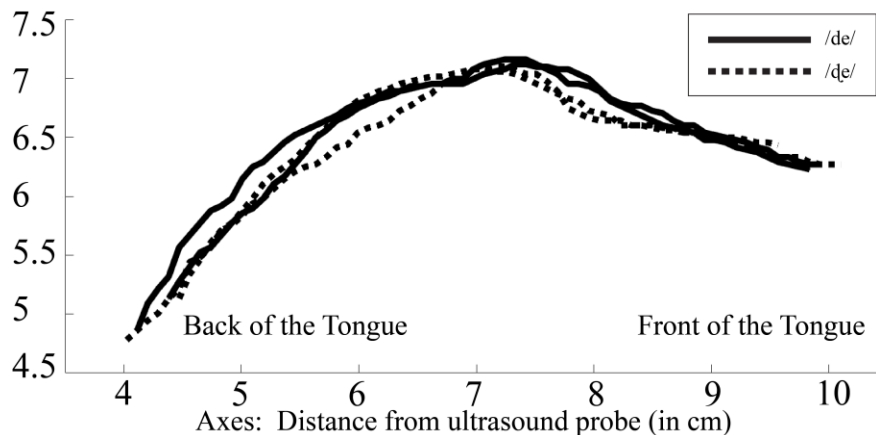
(3c) shows a sagittal slice comparing two tokens of /da/ (indicated with solid lines) with two tokens of /ɖa/ (indicated with dashed lines). In the traces of /ɖa/, the blade of the tongue behind the constriction is lowered and the tongue tip raises, while in the traces of /da/, the tongue tip extends forward. These images support the articulatory description of this distinction in low vowel contexts put forward in Ladefoged and Maddieson (1996). Note that the axis numbers in these figures refer to distance from the ultrasound probe (in cm). Since the probe did not move during the experiment, the usefulness of the axis numbers to this study is only in comparing across tokens from a single speaker in a single session, as in (3c).

(3c) Mid sagittal traces /ɖa/ and /da/

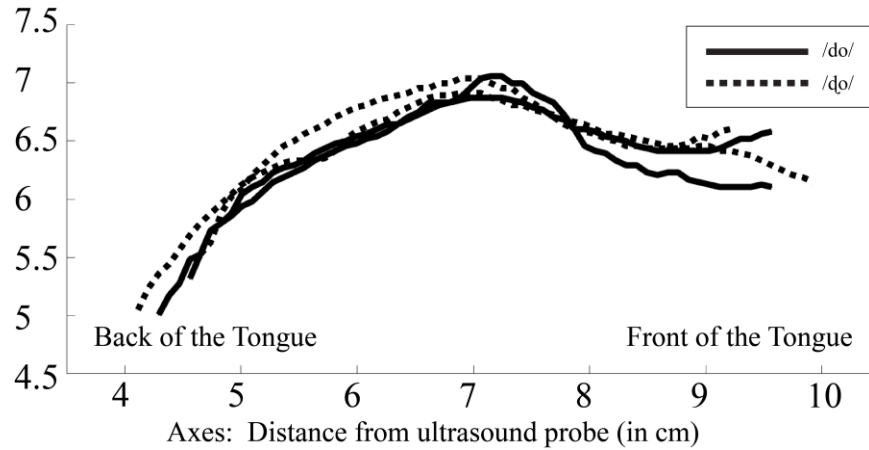


Mid vowel comparisons in (4a) and (4b) show similar lowering behind the closure is present preceding /e/ but not /o/. (4a) shows two traces of *dè* ‘to be enough’ (solid line) and two traces of the word *ɖè* ‘to remove’ (dashed line) lowering of the tongue blade can only be observed in the latter. (4b) shows that preceding /o/ in the words *dòdòsé* ‘to forbid’ and *ɖó* ‘to be forming,’ there is no clear tongue blade position comparison to be made.

(4a) Mid sagittal traces /ɖe/ and /de/

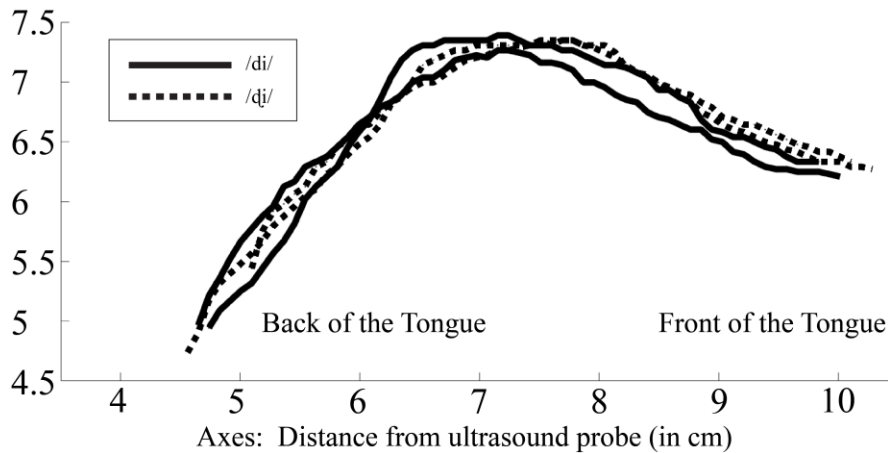


(4b) Mid sagittal traces /d_o/ and /do/

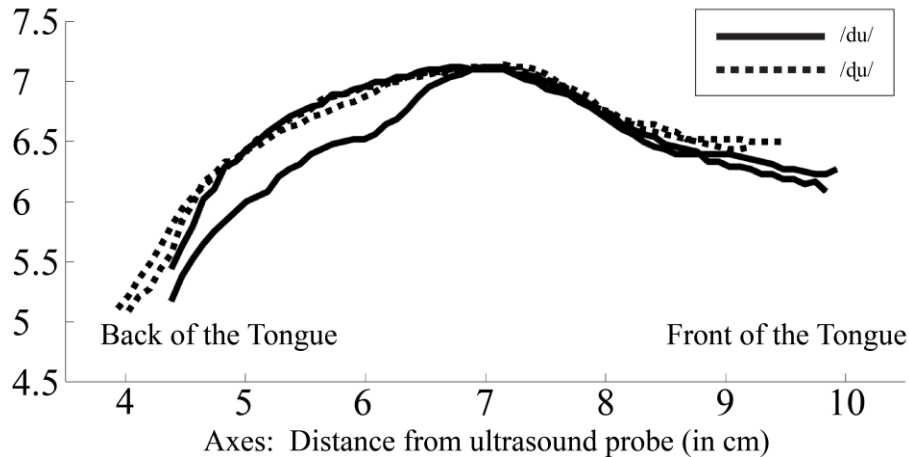


High vowel comparison figures present two tokens each of *dì* ‘resemble’ and *dì* ‘be ripe’ in (5a) as well as two tokens each of *èdù* ‘country’ and *dù* ‘eat’ in (5b). While preceding /i/ in (5a), there are again no clear differences shown between the two contrasting sounds, but preceding /u/ in (5b), /d/ shows the tongue tip raising towards the palate posterior to the closure in /d/.

(5a) Mid sagittal traces /d_i/ and /di/



(5b) Mid sagittal traces /du/ and /d̥u/



The consonants /d/ and /d̥/ preceding /a, e, u/ in (3a-c), (4a), and (5b) indicate /d̥/ makes use of a more posterior constriction with a lowered tongue blade, which likely facilitates the more vertical position of the tongue tip. Preceding /o/ and /i/ in (4b) and (5a), no clear articulatory difference showed up in the data collected for this study. However, the data being limited to two tokens from a single speaker, this description maintains the existence of a contrast between /d/ and /d̥/ preceding all oral vowels according to our language assistant's intuition. Further acoustic research is necessary to determine if and how speakers and listeners are differentiating these sounds. Since (2) shows overlap in VOT measures for these two sounds, future research will focus on other factors such as spectral measurements that have been useful in describing acoustic differences between other minor coronal place contrasts, as in Pitjantjatjara (Tabain & Butcher 2015).

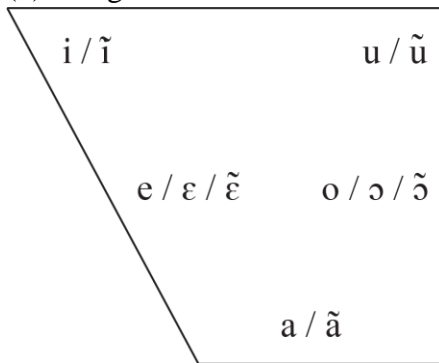
Liquids and Glides. Gengbe makes use of the liquids [l], [l̃], [r], and [r̃] as well as the glides [j], [j̃], [w], [w̃], [ɥ], and [ɥ̃]. Only a subset ([l], [l̃], [j], [w], [w̃], and [ɥ]) can appear as single onset, with [ɥ] (an allophone of /w/) only surfacing before a high front vowel as in *èyĩ* 'cutlass' and *àbyĩ* 'needle'. The lack of CV syllables in our data with onset [j̃] and [ɥ̃] is systematic and discussed further in Section 4. The appearance of glides as single onsets (not only conditioned by syllable position) as well as the range of consonants that glides can follow in CCV syllables, as shown in (14) below, suggests that glides are treated phonologically as consonants rather than as secondary articulations with distribution limited to the onsets that contrast in those features. The flap [r] was elicited as a single onset only in loanwords such as *àměrikà* 'America' and *rǒfjà* 'Russia' and is thus not included in further discussion of CV syllables. Nasality in liquids and glides is discussed in Section 4 and their distribution in CV and CCV syllables is discussed in Section 5.

3. VOWELS

This section begins with an overview of contrastive Gengbe vowels and a graphical representation of our language assistant’s phonological vowel space in (6). Gengbe has a system of 12 vowels with 7 oral vowels ([i], [e], [ɛ], [u], [o], [ɔ], and [a]) and 5 nasal vowels ([ĩ], [ẽ], [ũ], [õ], and [ã]). This system shows an oral-nasal distinction in all vowel heights; mid vowels have an additional tense/lax distinction, leading to a three-way contrast in front and back mid vowels, exemplified in (7). The mid front lax vowel [ɛ] is found almost exclusively as a result of morphophonological vowel coalescence--examples of that process are given in (6). Though vowel length is not contrastive in lexical items, long vowels do appear as the result of morphological processes such as reduplication and 3rd person object pronoun cliticization.

Phonological vowel space. The chart in (6) presents a schematized diagram of our language assistant’s phonological vowel space.

(6) Gengbe Vowel Chart



Oral and Nasal Vowels. The phonemic status of nasal vowels is instantiated by the minimal and near minimal pairs in (7).

(7) Oral and nasal vowels

| | Oral | Nasal |
|-----|--|----------------|
| (a) | /a, ã/ àtá (thigh) | ètá (saliva) |
| (b) | /i, ã/ sî (cut, paint) | sĩ (grow old) |
| (c) | /u, ù/ àgùto (mushroom) | ègũ (hole) |
| (d) | /e, ɛ, ẽ/ èkpé (rock); èqè (incantation) | èkpè (whistle) |
| (e) | /o, ɔ, õ/ ètò (buffalo); ètò (river) | ètõ ‘three’ |

always a back vowel. Second, VV sequences are often the result of vocalic phrase-final enclitics, five of which have been identified in the course of this study. As shown in Table (8), the 3PSA marker is realized as a front vowel and exhibits height agreement whereas the other four such enclitics, *-ò/-ó* (negation/plurality) and *-a/-à* (definiteness/question particle), are non-front vowels that show no such height agreement.⁶

4. NASALITY

Nasality in Gengbe is fruitfully analyzed as a phonemic property of the vowel rather than the onset consonant. I first illustrate this point with a presentation of onset consonants that can appear before either oral or nasal vowels, including a number of minimal pairs. Then I show, following Bole-Richard (1983), that onset nasality can be analyzed as allophonic.

Distribution of Nasal Vowels. It is useful to describe Gengbe vowels in terms of phonemic nasality, and most onset consonants may appear before either oral or nasal vowels, as shown in (9), none of which are nasal consonants. This list includes all stops other than [b], [d], and [p] in (9a-f), all fricatives in (9g-n), and all affricates in (9o-p).⁷

(9) Consonants preceding either oral or nasal vowels

| | Consonant | Consonant +Oral Vowel | Consonant +Nasal Vowel |
|----|-----------|-----------------------|------------------------|
| a) | /k/ | èkà (forty) | kà (to concern) |
| b) | /g/ | ègà (metal) | gá (big) |
| c) | /t/ | ètò (river) | ètò (three) |
| d) | /d/ | èdò (sickness) | èdò (gutter) |
| e) | /gb/ | ègbòó (goat) | gbògbò (spirit) |
| f) | /kp/ | kpó (to see) | èkpò (tiger) |
| g) | /f/ | àfá (shout) | èfá (belch) |
| h) | /β/ | àβà (war) | èβáá (spear) |
| i) | /f/ | fá (to cool) | fá (to appeal) |
| j) | /v/ | vá (to come) | vó (to be scared) |
| k) | /s/ | só (to take) | sí (to grow old) |
| l) | /z/ | èzò (fire) | zò (to walk) |
| m) | /h/ | èhà (song) | èhá (pig) |
| n) | /x/ | èxò (house) | èxó (tick) |
| o) | /dʒ/ | dʒè (buy liquid) | dʒé (red) |
| p) | /tʃ/ | tʃá (to join) | tʃá (also) |

⁶ Tone and nasality are invariant in the negative and plural clitics, but the definiteness and question clitics both borrow nasality from the preceding vowel. The definiteness clitic also borrows tone from the preceding vowel and is thus marked here as toneless.

⁷ The absence of examples of [p] followed by a nasal vowel may be an accidental gap or a gap in the data collected, though [p] is an innovation in Gengbe (see footnote 1) and further investigation may reveal synchronic or diachronic reasons for this gap.

Distribution of Nasal Consonants. Onset nasal consonants [m, n, Ì, ɲ, ŋ] are limited to syllables containing nasal vowels. As described by Bole-Richard (1983), there is also a set of consonants [b, d, l, j, w] limited to syllables containing oral vowels and similarities in the places of articulation between these two sets suggest the 5 allophonic relationships described in (10): [b]/[m], [d]/[n], [l]/[Ì], [j]/[ɲ], and [w]/[ŋ].

(10) Nasal-Oral Correspondences

| | Oral Consonant | Example | Nasal Consonant | Example |
|----|----------------|----------------|-----------------|---------------------|
| a) | [b] | bù (respect) | [m] | mù (to fell a tree) |
| b) | [d] | dàdà (cooking) | [n] | nàná (grandmother) |
| c) | [l] | àlò (hand) | [Ì] | àlǎ (sleep) |
| d) | [j] | jǎ (call) | [ɲ] | ɲǎ (good) |
| e) | [w] | wò (do) | [ŋ] | ŋǎtí (nose) |

This analysis is not without complications. For the oral-nasal alternation between [w] and [ŋ], the nasalization process does not appear to be synchronic for our language assistant, given the presence of [w̃] as a single onset; although it is limited to certain function words such as *w̃á* ‘there’ and *něńw̃áké* ‘in like manner.’ Despite these apparent exceptions, this distribution suggests that onset consonant nasality is parasitic on nasality of the following vowel and can be analyzed as a phonemic property of vowels rather than consonants. The distribution of [j] and [r̃] is limited to C₂ of a C₁C₂V and is discussed in the following section. Further analysis of Gengbe nasality and its interaction with syllable structure can be found in Lotven & Obeng (2018).

5. SYLLABLE STRUCTURE

Gengbe allows syllables with a nucleus only (V or N), those with a single nucleus and a single or complex onset (CV or CCV), and those with a complex nucleus and a single or complex onset (CVV or CCVV). Complex onsets come in two types: consonant-liquid (CL) and consonant-glide (CG).⁸ Each syllable type is treated in turn, omitting VV sequences which are addressed in Section 3 above.

Nucleus-only syllables. Nucleus-only syllables never appear as free morphemes. Examples of common vowel-only nuclei are the nominal prefixes *è-* and *à-* as in *èdù* ‘city’ and *àglǎ* ‘chin’. Nuclei consisting of a nasal only may appear as enclitics, such as the 1st person singular accusative clitic *-m̃*, as in *kpó-m̃* ‘see me’, or as initial syllabic nasals which

⁸ A single example of a CCCV syllable was elicited during this study: *klwé* ‘almost.’

surface as homorganic to the following stop. Examples of all such combinations of nasal-stop sequences are given in (11), dentals in (11a-c), velars in (11d-e), and labial-velars in (11f-g).

(11) Initial Syllabic Nasals

| | Word | Gloss |
|----|-------------|-----------|
| a) | ̀̀ńt́ | orange |
| b) | ́ńt́ | reason |
| c) | ̀̀nd̀ | afternoon |
| d) | ̀̀ɲ́kú | eye |
| e) | ̀̀ɲ́gó | forehead |
| f) | ̀̀ɲ́m̀kp̀ɛ̀ | shame |
| g) | ̀̀ɲ́m̀gbé | back |

The labial and retroflex series does not participate in NC combinations—[*mb], [*mp], [*nd] is, not surprisingly, absent from the lexicon since [m], as shown in Section 4, is an allophone of /b/. However, in some recordings of the frame sentence used for the ultrasound study in Section 2, our language assistant pronounces *m̀̀ bé* ‘I said’ as [m̀̀bé].⁹ The lack of [p] in NC combinations may betray its historical roots as the fricative [χ^w], according to Capo (1991). It is also worth noting that syllabic nasals in NC sequences are tone bearing and such tone is not dependent on that of the following vowel, as evidenced by the minimal pair in (11a) and (11b)—lexical items distinguished only by the tone of the initial syllabic nasal.

Attested CV Combinations. For the purpose of further illuminating the restrictions on CV sequences found in this study, (12) presents all attested (white) and unattested (gray) CV combinations. These data come from a larger word list elicited with the help of our language assistant. Gaps in syllable shapes were discussed with our language assistant and are reflective of his intuitions as well as gaps in the word list data. (12) presents nasal consonants in (12a-e), followed by their previously-discussed oral correspondences in (12f-w), the remaining stops in (12k-q), fricatives in (12r-y), affricates in (12z-aa), and the remaining glide [ɥ] in (12bb). Specific examples of each attested combination are found in the Appendix. Some sequences are marked unattested with an (*) and were found only in loanwords and ideophones.

⁹ Our Baguida language assistant, who lacks the /d/ vs. /d̥/ distinction, produced /ǹ̀d̀d̀d̀/ ‘food’ as [ǹ̀d̀d̀] while our Batonou language assistant did not.

(12) Attested and unattested CV combinations

| | | [ã] | [ĩ] | [ũ] | [ê] | [õ] | [a] | [i] | [u] | [e] | [o] | [ɔ] |
|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| a) | [m] | | | | | | | | | | | |
| b) | [n] | | * | | | | | | | | | |
| c) | [ŋ] | | | | | | | | | | | |
| d) | [ɲ] | | | * | | | | | | | | |
| e) | [ɳ] | | | | | | | | | | | |
| f) | [b] | | | | | | | | | | | |
| g) | [d] | | | | | | | | | | | |
| h) | [l] | | | | | | | | | | | |
| i) | [j] | | | | | | | | | | | |
| j) | [w] | | | | | | | | | | | |
| k) | [p] | | | | | | | * | | | | |
| l) | [t] | | | | | | | | | | | |
| m) | [d] | | | | | | | | | | | |
| n) | [k] | | | | | | | * | | | | |
| o) | [g] | | | | | | | * | | | | |
| p) | [kp] | | | | | | | | | | | |
| q) | [gb] | | | | | | | | | | | |
| r) | [ɸ] | | | | | | | * | | | | |
| s) | [β] | | * | | | | | | | | | |
| t) | [f] | | | | | | | | | | | |
| u) | [v] | | | | | | | | | | | |
| v) | [s] | | | | | | | | | | | |
| w) | [z] | | | | | | | | | | | |
| x) | [x] | | | | | | | | | | | |
| y) | [h] | | | | | | | | | | | |
| z) | [tʃ] | | | | | | | | | | * | |
| aa) | [dʒ] | | | | | | | | | | | |
| bb) | [ɥ] | | | | | | | | | | | |

Two combinations marked unattested in (12) are noted only in CCV syllables. [ŋ] can be followed by high and front vowels only in CCV syllables as in *mĩ* ‘to roll’ and *vũ* ‘to unfold,’ and *kĩ* ‘to shine.’ The sequence [wẽ] is also only attested in CCV syllables such as *ɲwẽ* ‘well’ and *vũ* ‘poorly.’ Also, the only example of the sequence [fi] was found in a CVV syllable in the word *dõhĩ* ‘maybe.’

Consonant Liquid Sequences. In Consonant-Liquid (CL) sequences, the identity of the liquid is dependent both on the place of articulation of the preceding consonant and on the nasality of the following vowel. In this manner, [l] and [l̃] follow non-coronal consonants, as shown in (13a-m), while [r] and [r̃] follow coronal consonants, as in (13n-u). Examples of liquids nasalized by the following vowel include (13e-f, h, j-l, p). This type of predictable distribution suggests these four liquids are all allophones of the same phoneme which can be analyzed as /l/ since it appears in the least restricted environments—after non-coronal consonants and before non-nasal vowels. [x] and [p] are both unattested in CCV syllables.

(13) Consonant-liquid Clusters

| | Initial Consonant | Example | Gloss |
|----|-------------------|---------|--------------------|
| a) | b | blè | to convince |
| b) | ɸ | ɸlè | to buy |
| c) | β | βlì | to wrestle |
| d) | f | flù | to be foolish |
| e) | v | vľũ | to unfold |
| f) | g | gľǎ | to bend |
| g) | k | klǒ | to fade |
| h) | gb̃ | gbľě | to spoil |
| i) | kp̃ | kplǎ | to hang |
| j) | h̃ | hľě | to read |
| k) | m | mľĩ | to roll in |
| l) | ŋ | ŋľǒ | to fold |
| m) | w | wľǎ | to hide |
| n) | t | tró | to turn |
| o) | d | dró | to carry (on head) |
| p) | s | sřǒ | to study |
| q) | z | zrò | to fly |
| r) | tř̃ | třri | to hate |
| s) | dʒ | dʒrǎdó | to ready or repair |
| t) | ɲ | ɲřě | to sharpen |
| u) | j | jrǎ | to bless |

Consonant-Glide Sequences. The six glides found in CG sequences ([j], [j̃], [w], [w̃], [ɥ], and [ɥ̃]) can be analyzed as allophones of two phonemes /j/ in (14a-h) and /w/ in (14i-r). Like liquids in CL sequences, the nasality of glides in CG sequences is dependent on the nasality of the following vowel, as evidenced by pairs like (14e-f) showing [j] and [j̃], (14l-m) showing [w] and [w̃], and (14q-r) showing [ɥ] and [ɥ̃]. [ɥ] and [ɥ̃] can be further reduced to allophones of /w/, since [ɥ] and [ɥ̃] precede high front vowels, as in (14n-r), while [w]/[w̃] is found elsewhere, as in (14i-m). This distribution is also found in single onsets,

as noted in Section 2, and while *[wi] is unattested, [ji] as in the word *ji* ‘go’ is a possible combination, ruling out an analysis where [ɥ] is an allophone of /j/.

(14) Consonant-glide clusters

| | Onset Cluster | Example | Gloss |
|----|---------------|--------------------|--------------|
| a) | bj | bjǒ | to ask |
| b) | m̃j | m̃jǒ | to germinate |
| c) | fj | fjò | to itch |
| d) | f̃j | f̃jǒ | to teach |
| e) | sj | sjá | to dry |
| f) | s̃j | s̃jǒ | to filter |
| g) | h̃j | h̃jě | to need |
| h) | lj | ljǎ | to climb |
| i) | ṽw | ṽwě | poorly |
| j) | ɲ̃w | ɲ̃wě | well |
| k) | kw | kòkwè | clean |
| l) | xw | àxwé | house |
| m) | h̃w | h̃wě | stink |
| n) | bɥ | àbɥí | needle |
| o) | ʒ̃ɥ | àʒ̃ɥí | rabbit |
| p) | ɲ̃ɥ | àɲ̃ɥí | low tide |
| q) | kɥ | àkɥí ¹⁰ | whistle |
| r) | g̃ɥ | èg̃ɥí | buttocks |

6. TONE

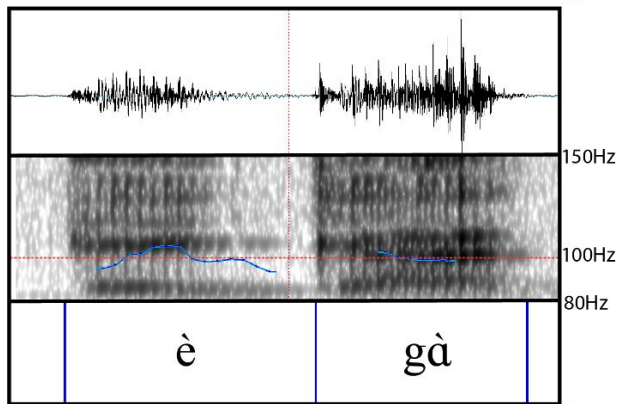
Tone in Ewe has been the subject of several studies (Ansre, 1961; Smith, 1968; Stahlke, 1971), but tone in Gengbe has received little attention outside of Bole-Richard (1983). Gengbe has three lexically contrastive tones: Low (L), High (H), and Falling (HL) with HL occurring only in loanwords, interjections, and ideophones. In addition, morphological and phonological processes derive Rising (LH) as well as HL tone. Both LH and HL tone are noticeably longer in duration than L or H. This section presents an overview of Gengbe’s register tones and their realization, followed by some of the processes that derive contour tones. I also pay specific attention to the occurrence of lexical HL tone and the importance of initial consonants in determining tonal identity.

Low tone. Ansre’s (1961) description of Ewe tone presents both L and Mid tone as possible realizations of the Non-High toneme; the realization of which is dependent on the identity of the onset consonant—Mid tone follows voiceless obstruents, Low tone is found elsewhere. This basic description is also applicable to Gengbe. As expanded on in Lotven & Berkson (2019), a L tone syllable with an initial voiceless obstruent has an approximately 20Hz higher f0 across the entire vowel than a L tone syllable with an initial

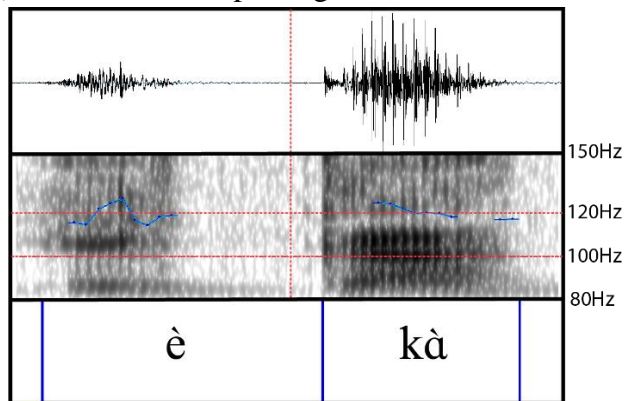
¹⁰ The word *àkɥí* ‘whistle’ was also elicited variably as [àkwí]—the only example of [wi] found in this study.

voiced obstruent.¹¹ The cross-linguistic link between voicing and pitch lowering is discussed in, for example, Bradshaw (2000), Tang (2008), and Oglesbee (2008). This situation is exemplified in (15) where the voiced obstruent [g] is followed by a vowel with an approximate f0 of 100Hz and (16) where the voiceless obstruent [k] is followed by a vowel with an approximate f0 of 120Hz (f0 traces are marked in blue). It is worth noting here that it is not only the L tone vowel following the voiceless consonant that displays higher f0 in (16), but also the preceding L tone nominal prefix *è-*. This observation suggests that speakers may raise f0 in anticipation of voiceless obstruents, although systematic investigation is necessary to determine whether obstruent voicing regularly effects the f0 of preceding vowels. Further research is also necessary to determine how sonorants and onset-less syllables interact with f0.

(15) Waveform and spectrogram with f0 trace of *ègà* ‘metal’



(16) Waveform and spectrogram with f0 trace of *èkà* ‘rope’

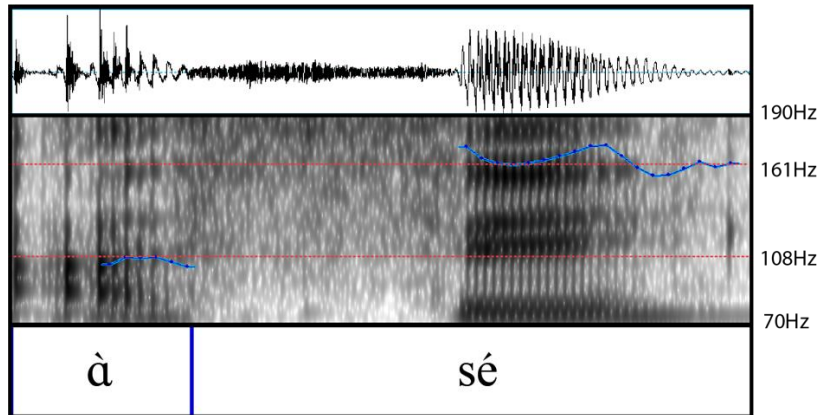


In some environments, notably following H tone, L tone is realized as a falling pitch movement, as exemplified in (20c, e) below, utterance final L tone is realized as HL as well.

¹¹ Lotven & Berkson (2019) reports this average difference across 264 tokens recorded with the help of the same language assistant consulted for this study.

High and Rising tone. The realization of H tone is also dependent on the identity of the onset consonant. In certain morphological and syntactic contexts, such as following a L tone nominal prefix (*è-* or *à-*), H tone syllables with voiced obstruent onsets manifest as LH. Evidence for this relationship comes from tonal minimal pairs where voiceless obstruent onset consonants offer a contrast between L and H tone, as in *èkò* ‘neck’ and *èkó* ‘sand.’ In contrast, voiced obstruent onsets offer a contrast between L and LH, as in *ègà* ‘metal’ and *ègǎ* ‘chief.’ To illustrate, (17) shows an example f₀ trace of the H tone noun *àsé* ‘cat’ and (18) shows an example f₀ trace of the LH tone noun *àbǒ* ‘arm’ where the rise in f₀ takes place only after the closure release. Unlike in (15) and (16), the low tone nominal prefix *à-* in (17) and (18) does not show a substantial f₀ difference based on onset voicing. Note that the scale used to show H tone for (17-18, 20-21) is not identical to that used for L tone only in (15) and (16).

(17) Waveform and spectrogram with f₀ trace of *àsé* ‘cat’



(18) Waveform and spectrogram with f₀ trace of *àbǒ* ‘arm’

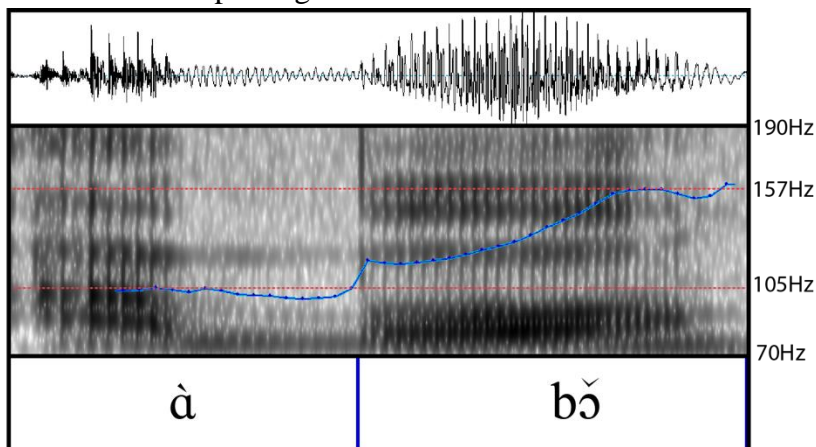


Table (19) presents H tone syllables with L tone nominal prefixes; (19a-j) shows that voiced obstruents (including [h] and [d]) trigger LH tone in this context, while (19k-w) show onsets triggering H tone include voiceless obstruents (19k-q) and sonorants (19r-w).

(19) High tone monosyllabic nouns with L nominal prefixes

| | Consonant | Noun | Gloss |
|----|-----------|---------|------------|
| a) | [b] | àbǒ | arm |
| b) | [d] | èdǒ | work |
| c) | [g] | ègǎ | bigness |
| d) | [gb̃] | ègbǐ | buttocks |
| e) | [dʒ] | èdʒǎ | bow |
| f) | [v] | ávǒ | cloth |
| g) | [z] | èzǎ | night |
| h) | [β]/[h̃] | èβǔ/èhǔ | vehicle |
| i) | [h] | èhǎ | group |
| j) | [d] | èdǐ | dirt |
| k) | [t] | átí | tree |
| l) | [k] | èkú | death |
| m) | [kp̃] | èkpá | fence |
| n) | [φ]/[p] | àφá/àpá | shout |
| o) | [f] | àfí | here |
| p) | [s] | èsǒ | horse |
| q) | [x] | èxá | broom |
| r) | [m] | èmú | mosquito |
| s) | [n] | ànǎ | bridge |
| t) | [ɲ] | èɲí | bee |
| u) | [l] | èló | crocodile |
| v) | [w] | èwó | corn flour |
| w) | [j] | àjá | comb |

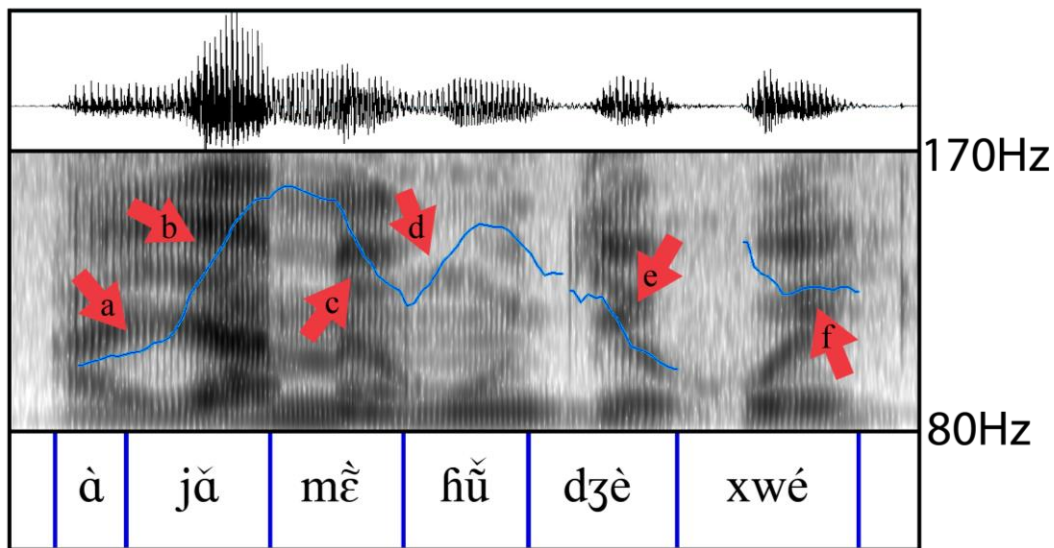
It is also worth noting that in this environment, the realization of H tone in C₁C₂V syllables is dependent on C₁ regardless of C₂ for both liquids as in *àkló* ‘flatboat’ and *àglǒ* ‘joy,’ and glides, as in *èfjǒ* ‘monkey’ and *èhǐǐ* ‘need.’ This system holds for other nominal morphology, such as compounding, but verbs in phrase-initial position display another pattern where LH tone occurs in H tone syllables beginning in voiced obstruents as in *gǒ* ‘to brag,’ sonorants as in *mǎ* ‘to divide,’ and voiceless obstruent-liquid sequences as in *klǒ* ‘to fade.’¹²

¹² See Lotven & Berkson (2019) for a more detailed treatment of LH tone in Gengbe

It is worth pointing out that there are some odd exceptions where a noun does not show a contrast between L and H and instead has two variant pronunciations: one with L tone and one with LH tone. Two examples include *ètà/ètǎ* ‘head’ and *àjà/àjá* ‘air’. In addition to our language assistant offering both as options, further credence to the claim of two different pitch patterns for the same lexical items comes from compounds where such pitch patterns are fossilized with the L tone version, as in *ètátó* ‘leader’ (lit. head-AGENTIVE) and *àjàfònǔ* ‘fan’ (lit. air-beat-thing), or with the LH version, as in *ètǎdžíblánu* ‘turban’ (lit. head-on-tie-thing) and *àjǎmèhǔ* ‘airplane’ (lit. air-in-vehicle).

In the interest of further exemplification, (20) presents an f0 trace of the compound word *àjǎmèhǔdžèxwé* ‘airport’. Of the L tones (20a, c, e), the initial L (20a) rises slightly into the following LH tone (20b), while (20c,e) are realized with falling pitch patterns due to preceding LH tone syllables. Of the LH tones, (20b) shows the sort of lexically determined LH tone described above for *àjà/àjá* ‘air’ while (20d) shows LH tone resulting from an underlying H tone noun with a voiced obstruent onset preceded by a L tone syllable. (20f) shows the more-or-less level realization of H tone following a voiceless obstruent onset. The brief initial fall in (20f) may be linked to pitch raising associated with a voiceless obstruent onset as well.

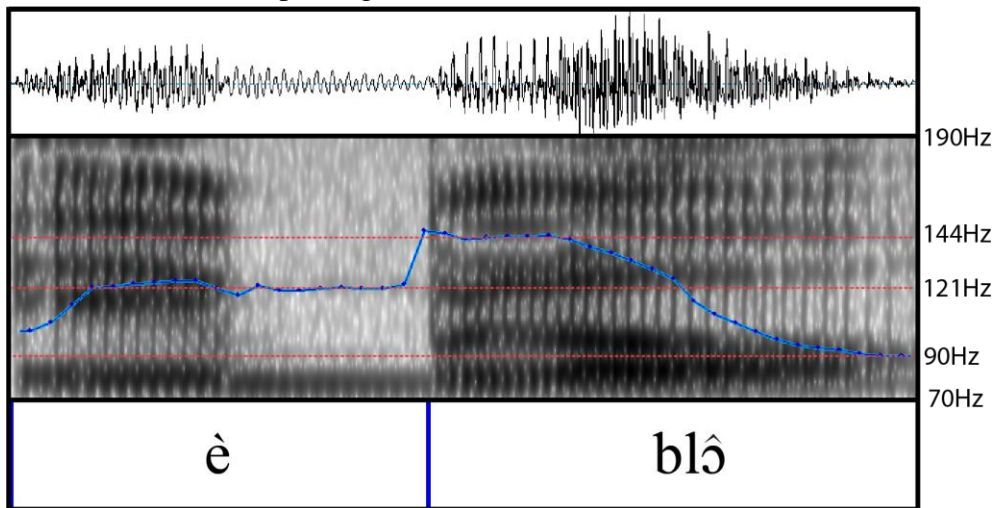
(20) Waveform and spectrogram with f0 trace of *àjǎmèhǔdžèxwé* ‘airport’



Falling tone. HL tone is rare in the Gengbe lexicon, but may be derived through morphophonological processes. In general, HL tone can be found in ideophones such as *pó* (the sound of a cupped hand slapping someone’s buttocks), interjections as in *tǎfô*

(expressing surprise)¹³, and loanwords. Loanwords from French, where final stress is common, have been borrowed with final falling tone as in *vidèò* ‘video’ and *glàsô* ‘ice cubes’ (from the French ‘glaçon’). Also, words borrowed from other West African languages, such as *àglâ* ‘crab’ from the Ewe *àgálâ* may hold intrinsic HL tone.¹⁴ HL tone occurs in monosyllabic English loanwords such as *tí* ‘tea,’ (borrowed from the English [ti] rather than the French [te]). Morphophonological processes that derive HL tone include attachment of the 3PSA clitic as shown in (7k) *fê* ‘cool it’ (transcribed in (7) as *fě̀* to highlight the addition of the clitic to a verbal root). Other morphophonological processes such as reduplication with the word *sía* ‘every’ (in this case of the word *ènú* ‘thing’) can also trigger HL tone, as in *ènúsiánú* ‘everything’. (21) shows an example f0 trace of the loanword *èblô* ‘blue’ where HL tone shows a falling pitch pattern following the burst release.

(21) Waveform and spectrogram with f0 trace of *èblô* ‘blue’



7. SUMMARY

This paper contains an overview of the consonants and vowels of Gengbe as well as discussions of syllable structure, nasality, and tone based on the notes, recordings, and acoustic data collected from our Gengbe language assistant during our two years of elicitation at Indiana University. The goal of this paper has been to offer the information we have collected to other Gbe researchers and to highlight idiosyncrasies of the language that merit further investigation. By means of illustration, Section 8 presents a transcription from a folktale about *jěvíjòkòtè* (Yevi, the spider).

¹³ Our language assistant suggests that this interjection was borrowed from Ewe

¹⁴ This process is noted in Bole-Richard (1983) for French and Ewe loanwords.

8. TRANSCRIPTION OF A RECORDED PASSAGE

èdřũ zò kákákáká é d̄zè jěvíjòkòtè kúdó é l̄xó-á d̄zì.
story walk very.REDUP 3PSN land Yevi with 3PSG MIL-3PSG on.

gbè dèká-á jěví bé jǎ kpédé èl̄xó ntí jì¹⁵ àgb̄lè n̄é jǎ
day one-DEF Yevi say LOG.FUT give.help MIL reason go farm in.order.to LOG.FUT

wò dǎ n̄é-è. ékè wó jì àgb̄lè-à m̄è-à l̄xó-á d̄à n̄ú n̄é-è¹⁶
do work give-3PSA when they go farm-DEF in-PART MIN-3PSG cook thing give-3PSA

jé b̄ě d̄ù. kè b̄ě d̄ù n̄ú-á vò-à é j̄řé èq̄ĩ
and 3PSN.FOC eat. when 3PSN.FOC eat thing-DEF PERF-PART 3PSN sharpen cutlass

kè b̄ě tó èd̄.á d̄zì. é wò d̄-á kákákákákákáká kè
and.when 3PSN.FOC start work.DEF on 3PSN do work-DEF very.REDUP WH

gà wóèvè f̄ò-à é vá bé jǎ d̄ù n̄ú ná jǎ j̄řé
time 12 strike-PART 3PSN come COMP LOG.FUT eat thing and LOG.FUT sharpen

èq̄ĩ ná jǎ gb̄à jì wò d̄-á kè
cutlass and LOG.FUT again go do work-DEF again¹⁷

Free Translation. Thank you all. The story walked far far far far far and landed on Yevi and his mother in law. One day, Yevi said he would accompany his mother-in-law to her farm to do work for her. When they went to the farm, his mother-in-law cooked something for him and then he ate. When he had eaten, he sharpened his cutlass and he started working. He worked for a long time and when the clock struck 12, he came to eat and sharpen his cutlass and went back to work again.

¹⁵ The combination *ntí jì* sees the deletion of the first vowel and the palatalization of the [t], leaving the pronunciation [nt̪í].

¹⁶ The word *n̄ú* ‘thing’ in *d̄à n̄ú n̄é* loses its [u] vowel and is left with a H tone syllabic [n], pronounced as [d̄án̄é].

¹⁷ Gloss conventions: 3PSA-3rd person singular accusative, 3PSG-3rd person singular genitive, 3PSN-3rd person singular nominative, BEN-benefactive, COMP-complementizer, DEF-definite, FOC-focus, FUT-future, LOG-Logophoric pronoun, MIL-mother-in-law, PART-particle, PERF-perfective, PL-plural, REDUP-reduplication, WH-wh determiner

Appendix. Examples of Attested CV sequences

Examples marked with () reflect loanwords or ideophones

[ã]

mãmã-(noun) grandmother [reference]

nãñã (noun)-grandmother [address]

éĩã (noun)-animal

ɲã (verb)-to know

wá (demonstrative)-there

ètã (noun)-saliva

dã (verb)-to doubt; to wonder

kã (verb)-to take a bit of

gã (adjective)-big

àkápã (noun)-a type of food made from corn

àgbã (noun)-load

ɸã (verb)-to become stale

èβã (noun)-spear

fã (verb)-to lament; to mash

èzã (noun)-night

sã (verb)-to tie [a knot]

èhã (noun)-pig

tjã (adverb)-also

dʒã (verb)-to entangle; to be busy

[i]

mí (pronoun)-3rd person plural

*mãĩniqó (noun)-clockwork

èɲí (noun)-bee

ègbĩ (noun)-buttocks

*βí:βí: (ideophone)-thin man going quickly

fí (verb)-to steal

sí (verb)-to grow [as in a child]

zì (verb)-to crack a nut

[ũ]

mũ (verb)-to pull down

ènú (noun)-thing

*ɲãñũñãñũ (ideophone)-person chewing

ègũ (noun)-hole

èβũ (noun)-blood (also èhũ)

vũ (verb)-to comb [one's hair]

zũ (verb)-insult

hũ (verb)-to open (also βũ)

[ẽ]

àmẽ (noun)-person

ènẽ (noun)-palm kernel

ɲẽ (1st person possessive pronoun)-my

ɲẽ (verb)-to break

tẽ (verb)-to swell

èdẽ (noun)-snake

kéklẽ (adjective)-shiny

ègẽ (noun)-beard

èkápẽ (noun)-to cough

gbẽ (verb)-to pick [fruit from a tree]

βẽ (verb)-to be smelly

fẽ (à)vĩ (verb)-to cry

sẽ (verb)-to worship

zẽ (verb)-to use

hẽ (verb)-to bring

dʒẽ (adjective)-red

[õ]

èmõ (noun)-way

nõ (verb)-to exist

lõ (verb)-to love

ɲónũ (noun)-woman

ɲõtí (noun)-nose

átõ (noun)-apple

èdõ (noun)-gutter

èkõ (noun)-fist

gõ (verb)-to be discolored

èkápõ (noun)-tiger

gb̂ò (verb)-to breathe
èβ̂ò (noun)-python
f̂ó (verb)-to awaken
v̂ó (verb)-to be afraid [of]
èŝó (noun)-horse
ẑó (verb)-to walk
èx̂ó (noun)-tick
èĥó (noun)-eagle
t̂ĵó (verb)-to cover

[a]

bà (verb)-to cheat
èd̂à (noun)-hair
lá (modal verb)-possibility/future
àjà (noun)-comb
wáwó (pronoun)-3rd person singular
emphatic
pàpá (noun)-father
àtá (noun)-thigh
dàdà (noun)-mother [form of address]
èkà (noun)-muscle
ègà (noun)-money
èk̂pá (noun)-fence
àgb̂àgbá (noun)-ability
f̂à (verb)-to sew [seed]
àβ̂à (noun)-war
fá (verb)-to be wet
v̂à (verb)-to come
sà (verb)-to sell
èxá (noun)-broom
ĥà (verb)-to scrape
t̂ĵá (verb)-to join
d̂ẑá (verb)-to chop

[i]

bí (verb)-to be smart
d̂ì (verb)-to be ripe
lì (verb)-to grate
jì (verb)-to go
*pípípí (ideophone)-car horn honking

àtí (noun)-stick
kèdì (verb)-hurry
*b̂ìkì (noun)-pen (from Bic)
*ĝìd̂ìĝìd̂ì (ideophone)-squirring
àgb̂ìŝé (noun)-eggplant
*f̂ím (ideophone)-walking quickly
β̂ìβ̂lì (noun)-wrestling
àfí (noun)-place
víví (adjective)-sweet
sì (verb)-to mature
àzìk̂p̂é (noun)-chair
xíxé (noun)-world
t̂ĵí (verb)-to remain
d̂ẑí (verb)-to want
èq̂í (noun)-cutlass

[u]

bù (verb)-to respect
d̂ù (verb)-to eat
mólú (noun)-rice
àwù (noun)-dress
púdù [also f̂údù] (verb)-run
tú (verb)-to close
èdù (noun)-country
kú (verb)-to be dead
àgùtó (noun)-mushroom
f̂ú (verb)-to be dry
àβ̂ù (noun)-dew
èfù (noun)-grudge
úsù (noun)-man
àĵm̂èx̂ú (noun)-airplane

[e]

b̂ě (verb)-say
d̂è (verb)-to harvest
l̂è (v)-to exist
ĵěĵé (adjective)-new
èwè (noun)-sun
èpè [also èf̂è] (noun)-year
tè (verb)-to drag

dèkú (noun)-palm nut
kè (verb)-to be large
ḍ́íǵě (verb)-tease
k̀pédéú (noun)-addition
èǵbè (noun)-language
tèφé [also t̀pé] (noun)-place
èβè (noun)-high tide [also Ewe]
èfè (noun)-debt
èvè (numeral)-two
sè (verb)-to listen
àzě (noun)-witchcraft
xèví (noun)-bird
fiě (adjective)-white
tàflátǵé (interjection)-excuse me
ḍ́zè (verb)-to buy [liquid]

[o]

blíbó (adjective)-entire
ḍ́ó (verb)-to enter
lòlò (adjective)-fat
jòvóqé (noun)-abroad
wò (pronoun)-2nd person singular
tipó (verb)-to jump
tó (verb)-to pound
dò wlí (verb)-to shout
kó (verb)-to shave
gǒgó (verb)-to near
àk̀pò (noun)-sack
ǵbǒ (verb)-to yell
φò nǵ́φó (verb)-to talk
fó (verb)-to escape
vòvò (noun)-freedom
só (verb)-to come from
èzò (noun)-fire
xóxó (adjective)-old
*tǵ́ò (interjection) expressing surprise
ḍ́zǒ (verb)-to leave

[ɔ]

bòbò (adjective)-soft
èḍ̀ò (noun)-net
lǒ (verb)-to carry away
jǒ (verb)-to call
wò (verb)-to do
ètò (noun)-body of water
èḍ̀ò (noun)-sickness
kó (verb)-to lift up
ǵódó (postposition)-outside of/in back of
k̀pó (verb)-to see
ǵbò (verb)-to arrive
àfò (noun)-leg
àvǒ (noun)-cloth
sókè (verb)-to forgive
xò (verb)-to cost
ḍ́zò (verb)-to happen

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