

CHAPTER 4

THE PHONOLOGY OF GEBa 2

4.1 Introduction

There are two major Geba groups in this study: Geba 1 and Geba 2. Geba 2 is a western Central Karenic language which is spoken in Taungoo township, as is Geba 1. The total number of speakers of Geba 2 is unknown but altogether there are 36 known Geba villages where Geba 1 and Geba 2 are spoken.

In this chapter, the phonological description of Geba 2 will be presented including consonants, vowels, tones, and syllable structure.

4.2 Phonemes

4.2.1 Geba 2 Consonant Phonemes

Saw Lar Baa produced a phonological description of Geba (which he spells 'Gebah'). There are 32 consonant phonemes in his data.

In this study, Geba 2 has three series of stops: voiceless aspirated, voiceless unaspirated, and voiced. Geba 2 has three nasals, three types of fricatives (voiceless aspirated, voiceless unaspirated and voiced unaspirated), two liquids, two glides, two types of affricates (voiceless aspirated, and voiceless unaspirated), and a voiced velar labialized sibilant. The inventory of Geba 2 consonants is shown in the following table.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveolo Palatal	Palatal	Uvular	Velar Labialized	Velar	Glotta ʔ
Plosive	Asp.	p ^h (40)			t ^h (29)						k ^h (42)	
	Vl.	p(63)			t(64)			c(13)			k(61)	ʔ(32)
	Vd.	b(30)			d(42)							
Fricative	Asp.			θ ^h (1)	s ^h (29)	f ^h (13)						
	Vl.		ɱ(10)	θ(58)	s(10)	f(3)						h(20)
	Vd.						z(8)					
Affricate	Asp.						tɕ ^h (16)					
	Vl.						tɕ(15)					
Nasal	Vd.	m(57)			n(34)			ɲ(2)				
Liquid												
Lateral approximant					l(99)							
Trill					r(8)							
Glide			w(47)				j(19)					
Sibilant	Vd.									ɣ ^w (3)		

Table 63: Raw consonant phone chart in Geba 2 and frequency counts

The table above shows the raw data phones which occur in the Geba 2 word list.

From table 63, there are 29 consonant phones. The raw data in this study differs at several points from Saw Lar Baa's consonant inventory. Saw Lar Baa has /t̥, g, ɓ, d̥, x, tʃ, dʒ, ɣ, ɗ, m̥, n̥, fi / in his inventory which this study doesn't have. Bennett's word list has /tɕ, f^h, ɱ, θ, θ^h, f^h, tɕ^h, z, ɲ, ɣ^w/, but Saw Lar Baa's wordlist lacks them.

From Bennett's word list (1991), the initial and medial elements of a Geba 2 word can be summarized as follows:

1. There are 25 consonant phones /p^h, t^h, k^h, p, t, c, k, ʔ, b, d, s^h, f^h, s, ɱ, θ, h, m, n, l, w, j, z, tɕ, tɕ^h, ɣ^w/ and 8 consonant clusters /pl, pw, kl, p^hl, lw, t^hw, k^hl, k^hw/ that may occur both initially and medially in the words.

2. There is one consonant phone /ʃ/ and 7 consonant clusters /pj, tɕw, kw, θw, tr, tɕ^hw, cw/ that may occur only word initially.
3. There are three consonant phones /r, θ^h, ɲ/ and 1 consonant cluster /p^hj/ that occur only medially in words.
4. There is only one consonant phone /h/ that occurs word finally.

The following table lists the initial elements and the medial elements of the words which occur in the Geba 2 word list including the consonant clusters. The numbers in the table show the frequency of the consonant phones which occur in the word list.

	Initial	Medial	Final	Total
p ^h	13	22		35
t ^h	15	12		27
k ^h	19	14		33
p	16	17		33
t	28	35		63
c	9	2		11
k	30	15		45
ʔ	16	16		32
b	14	16		30
d	20	22		42
s ^h	15	14		29
ʃ ^h	7	6		13
tɕ	10	3		13
tɕ ^h	6	9		15
s	5	5		10
ʃ	3			3

Table 64: The frequency of consonants in Geba 2 words

	Initial	Medial	Final	Total
z	5	3		8
ʌ	7	3		10
θ	35	22		57
θ ^h		1		1
h	12	7	1	20
m	22	35		57
n	7	27		34
ɲ		2		2
l	31	33		64
r		7		7
w	5	10		15
j	3	9		12
Y ^w	1	2		3
pj	6			6
pl	6	3		9
pw	3	12		15
tɕw	2			2
kw	2			2
k ^h w	3	1		4
k ^h l	3	2		5
kl	4	10		14
θw	1			1
lw	2	1		3
tr	1			1
p ^h j		1		1
p ^h l	2	2		4
t ^h w	1	1		2
tɕ ^h w	1			1
cw	2			2

Table 64: The frequency of consonants in Geba 2 words

4.2.1.1 Consonant Phoneme Contrasts

Selected contrasts between phonetically similar segments are illustrated in analogous environments or minimal pairs in the following section.

a) [p ^h] – [p]	s ^h ɔ̃l 'flower'	pɔ̃l 'to vomit'
[t ^h] – [t]	tɛ̃l.s ^h il.t ^h il 'mist'	til 'comb'
[k ^h] – [k]	k ^h ɛ̃t 'to shoot'	kɛ̃t 'to burn'
b) [p] – [b]	pũl 'to be thin'	bũl.lãl 'to bury (a corpse)'
[t] – [d]	tĩl 'comb'	ʔõl.dĩl 'coconut (fruit)'
c) [p ^h] – [b]	p ^h ũt 'belly'	bũt 'paddy rice'
[t ^h] – [d]	t ^h ũt 'to be heavy'	dũt 'to be big'
d) [ʔ] – [h]	ʔõt 'bark'	hõt 'firewood'
	ʔãt 'to eat'	ãt.θãt.θĩl 'thorn'
e) [k] – [h]	kɛ̃t 'to burn'	hẽt 'to be spicy, hot'
f) [m] – [n]	mĩl.k ^h ũt 'smoke'	nĩl.jãt 'sarong'
g) [m] – [w]	tɛ̃ãt.m̃ãt 'son in law'	w̃ãt 'to scratch'
h) [s] – [s ^h]	pjãt.sãt 'to dance'	s ^h ãt 'to push'
i) [ʃ] – [ʃ ^h]	ʃĩt 'house'	ʃ ^h ĩt 'bow, crossbow'
j) [s ^h] – [ʃ ^h]	s ^h ɔ̃t.mĩl 'to sleep'	ʃ ^h ɔ̃t 'to be swell'
k) [θ] – [t]	θĩl 'to die'	tĩl 'comb'
[θ] – [d]	θũt 'porcupine'	dũt 'to be big'
l) [c] – [k]	cõl.klõt 'to tie'	kõl.s ^h ɛ̃l 'to sneeze'
m) [w] – [j]	w̃ãt 'to scratch'	kãt.jãt 'to play'
n) [w] – [k]	w̃ɛ̃t 'cane/rattan'	ʔĩt.kɛ̃t 'to pay'
o) [tɕ] – [tɕ ^h]	tɕ̃l.tɕĩl 'night'	θãt.ʔõl.tɕ ^h ĩl 'to be thirsty'
p) [l] – [r]	lĩl 'to be bright'	sãt.tĩl.r̃ĩt 'ring (finger)'

(a-p) illustrate major phonological contrasts of manner. (a) demonstrates a contrast between aspirated voiceless plosives and voiceless plosives. (b) between voiceless plosives and voiced plosives. (c) between aspirated voiceless plosives and voiced plosives. (d) between a voiceless glottal plosive and a voiceless glottal fricative. (e) between a voiceless velar plosive and a voiceless glottal fricative. (f) between a voiced bilabial nasal and a voiced alveolar nasal. (g) between a bilabial nasal and a labial-velar glide. (h) between a voiceless alveolar fricative and an aspirated voiceless alveolar fricative. (i) between a voiceless post-alveolar fricative and an aspirated voiceless post-alveolar fricative. (j) between an aspirated voiceless alveolar fricative and an aspirated voiceless post-alveolar fricative. (k) between voiceless dental fricatives and alveolar plosives. (l) between a voiceless palatal plosive and a voiceless velar plosive. (m) between a labial-velar glide and an alveo-palatal glide. (n) between a labial-velar glide and a voiceless velar plosive. (o) between a voiceless alveolo-palatal affricate and an aspirated voiceless alveolo-palatal affricate. (p) between an alveolar lateral approximant and an alveolar trill.

No predictable patterns of consonant were observed.. From table 63, /ɣ^w/, /θ^h/, /ɲ/ and /ʃ/ are very low frequency and have been assigned to residue. The following table shows the inventory of consonant phonemes which occur in Geba 2.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveolo Palatal	Palatal	Uvular	Velar	Glottal
Plosive	Asp.	p ^h (40)			t ^h (29)					k ^h (42)	
	Vl.	p(63)			t(64)			c(13)		k(61)	ʔ(32)
	Vd.	b(30)			d(42)						
Fricative	Asp.				s ^h (29)	ʃ ^h (13)					
	Vl.		w(10)	θ(58)	s(10)						h(20)
	Vd.						z(8)				
Affricate	Asp.						tʃ ^h (15)				
	Vl.						tʃ(13)				
Nasal	Vd.	m(57)			n(34)						
Liquid											
Lateral approximant					l(99)						
Trill					r(8)						
Glide			w(47)				j(19)				

Table 65: Consonant phoneme chart in Geba 2 and frequency counts

The following examples show the occurrence of consonants in Geba 2.

/p/, a voiceless bilabial stop, occurs in syllable initial position.

Examples:

p εt.lɛt 'sea'
 p aɪ 'father'
 ʔuɪ. p εt 'duck'

/p^h/, a aspirated voiceless bilabial stop, occurs in syllable initial position.

Examples:

p^h aɪ.dɪl 'to pound(rice)'
 p^h εt 'skin'
 ʃ^hiɪ. p^h uɪ 'to be small'

/t/, a voiceless alveolar stop, occurs in syllable initial position.

Examples:

	t	aɪ.pɔɪ	'to lie, fib'
	t	ɹɪ	'to be thick'
lɑɪ.	t	aɪ	'to be tired'

/tʰ/, an aspirated voiceless alveolar stop, occurs in syllable initial position.

Examples:

	tʰ	ɛɪ	'gold'
	tʰ	oɪ	'smoke'
buɪ.	tʰ	ɛɪ	'clothing'

/k/, a voiceless velar stop, occurs in syllable initial position.

Examples:

	k	ɛɪ	'to boil(sth.)'
	k	ɑɪ.tʰoɪ	'buttocks'
ʔiɪ.	k	ɛɪ	'to exchange'

/kʰ/, an aspirated voiceless velar stop, occurs in syllable initial position.

Examples:

	kʰ	ɛɪ	'to dance'
	kʰ	uɪ	'to plant'
θɛɪ.	kʰ	ɛɪ	'to yawn'

/ʔ/, a voiceless glottal stop, occurs in syllable initial position.

Examples:

	ʔ	ɪɹ	'excrement'
	ʔ	aɪ	'to weep'
θɛɪ.	ʔ	eɪ	'red pepper'

/b/, a voiced bilabial stop, occurs in syllable initial position.

Examples:

	b	ɪɹ.juɪ	'this'
	b	aɪ	'yellow'
kʰɔɪ.	b	iɪ	'cockroach'

/d/, a voiced alveolar stop, occurs in syllable initial position.

Examples:

	d	eɪ	'wing'
	d	iɪ	'egg'
θaɪ.	d	ɔɪ	'to be slow'

/tʃ/, a voiceless palatal stop, occurs in syllable initial position.

Examples:

	c	uɪ	'to be cold'
	c	oɪ.kloʊ	'to give'
tiɪ.	c	iɪ	'left side'

/s^h/, an aspirated voiceless alveolar fricative, occurs in syllable initial position.

Examples:

	s ^h	aɪ.naɪ	'ghost'
	s ^h	oʊ	'feather'
ʔɔɪ.	s ^h	ɔɪ	'to hate'

/ʃ^h/, an aspirated voiceless post-alveolar fricative, occurs in syllable initial position.

Examples:

	ʃ ^h	iɪ.p ^h uɪ	'to be small'
	ʃ ^h	oɪ.niɪ	'to eat'
p ^h ɛɪ.	ʃ ^h	ɛɪ	'fire'

/ʌ/, a voiceless labial-velar fricative, occurs in syllable initial position.

Examples:

	ʌ	eɪ	'to kick'
	ʌ	iɪ	'fly'
ʉɪ.	ʌ	iɪ	'to hurt'

/θ/, a voiceless dental fricative, occurs in syllable initial position.

Examples:

	θ	aɪ	'medicine'
	θ	iɪ	'to shiver'
diɪ.	θ	ɛɪ	'salt'

/s/, a voiceless alveolar fricative, occurs in syllable initial position.

Examples:

s	aɪ.liɪ.rɪɪ	'comb'
s	iɪ.saɪ	'to count'

/h/, a voiceless glottal fricative, occurs in syllable initial position. It is noted that there is only one word where /h/ occurs in the final position of the syllable. It may be a loan word.

Examples:

h	eɪ	'flesh'	
h	oɪ	'silver'	
θɪɪ.	h	ɛɪ	'knife'

/tʃ/, a voiceless alveo-palatal affricate, occurs in syllable initial position.

Examples:

t	ʃ	aɪ	'to smell (sth.)'	
t	ʃ	ʊɪ	'mushroom'	
tʃɪɪ.	t	ʃ	iɪ	'night'

/tʃʰ/, an aspirated voiceless alveo-palatal affricate, occurs in syllable initial position.

Examples:

t	ʃʰ	iɪ	'water'	
ʔoɪ.	t	ʃʰ	iɪ	'to be thirsty'

/m/, a voiced bilabial nasal, occurs in syllable initial position.

Examples:

m	eɪ	'brother'	
m	ɪɪ.tʰaɪ	'forehead'	
tʃɪɪ.	m	eɪ	'crocodile'

/n/, a voiced alveolar nasal, occurs in syllable initial position.

Examples:

n	ɪɪ.kʊɪɪ	'ear'	
n	ɪɪ.tʃʰeɪ	'cheek'	
kɪɪ.	n	iɪ	'bee'

/l/, an alveolar lateral approximant, occurs in first and second position of the syllable.

Examples:

	l	ɛl	'moon'
	l	ɹl	'red'
baɹ.k	l	ɛl	'to sell'

/r/, an alveolar trill, occurs in first and second position of the syllable.

Examples:

pi.j.	r	ɛj	'to stab'
saɹ.ti.l.	r	ɹl	'comb'
t	r	uɹ.laɹ	'to weave(cloth)'

/w/, a labial-velar glide, occurs in first and second position of the syllable.

Examples:

	w	ɹl	'to itch'
θaɹ.l.	w	ɹl	'to swallow'
θ	w	ɹl	'blood'

/j/, an alveo-palatal glide, occurs in first and second position of the syllable.

Examples:

	j	uɹ.p ^h œ	'rat'
p	j	uɹ	'to cook (rice)'
t ^h ɔɹ.p ^h	j	ɛl	'pounded rice'

4.2.1.2 Consonant cluster

In Geba 2 consonant clusters always occur only in the major syllables. The co-occurrence of C₁ and C₂ consonant cluster is restricted to four patterns as follows:

a) -w- cluster (C₁w)

When C₂ is /w/, the C₁ must be /t^h, p, θ, tɕ^h, c, k, k^h, tɕ, l/.

C₁ and C₂ make nine -w- clusters /t^hw, pw, θw, tɕ^hw, cw, kw, k^hw, tɕw, lw/.

Examples:

t ^h	wɹl	'dog'
p	wɹj	'intestines'
θ	wɹl	'blood'
t	ɕ ^h wɹl.t ^h aɹl	'sweat'

b) -l- cluster (C_{1l})

When C_2 is /l/, the C_1 must be /p^h, p, k, k^h/.

C_1 and C_2 make four -l- clusters /p^hl, pl, kl, k^hl/.

Examples:

kə̌t.dǔl.p ^h l ǒt	'eye'
k ^h ǎt.dǔl.p l ǒt	'to be blind'
cǒl.k l ǒt	'to give'
dǎt.k ^h l ěl.mǔt	'sugarcane'

c) -j- cluster (C_{1j})

When C_2 is /j/, the C_1 must be /p^h, p/.

C_1 and C_2 make two -j- clusters /p^hj, pj/.

Examples:

p j ǔl	'to cook (rice)'
t ^h ǒt.p ^h j ěl	'pounded rice'

d) -r- cluster (C_{1r})

When C_2 is /r/, the C_1 must be /t/.

C_1 and C_2 make one -r- cluster /tr/.

Examples:

t r ǔt.lə̌t	'to weave (cloth)'
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	/w/	/l/	/j/	/r/
p ^h		4	1	
t				1
t ^h	2			
p	15	9	6	
k	2	14		
k ^h	4	5		
θ	1			
tʃ ^h	1			
tʃ	2			
c	2			
l	3			

Table 66: Co-occurrence of the first consonant (C₁), and second consonants (C₂) in consonant cluster in Geba 2

The co-occurrence of the first consonant (C₁) and the second consonant (C₂) in Table 29 shows that:

1. There are four consonant phones /l, j, w, r/ that may occur as the second member of a consonant cluster.
2. In a – w – cluster, only an aspirated voiceless alveolar plosive, a voiceless bilabial plosive, a voiceless velar plosive, an aspirated voiceless velar plosive, a voiceless dental fricative, an alveolo-palatal affricate, a voiceless palatal plosive and an alveolar lateral approximant occur as the first member of this cluster.
3. In a – l – cluster, only an aspirated voiceless bilabial plosive, a voiceless bilabial plosive, an aspirated voiceless velar plosive and a voiceless velar plosive may occur as the first member of this cluster.
4. In a – j – cluster, only an aspirated voiceless bilabial plosive, and a voiceless bilabial plosive may occur as the first member of this cluster.
5. In a – r – cluster, only a voiceless alveolar plosive occurs as the first member of this cluster.

4.2.2 Geba 2 Vowel Phonemes

Geba 2 vowel phones function as the syllable nucleus. There are 27 vowel phones including one diphthong. All vowels can be breathy. There are two single vowels which occur with nasalization as follows /ĩ/, and /ã/. Two single vowels occur with both breathiness and nasalization: /ĩ̃/ and /ã̃/. In this study one diphthong was found /iɛ/ as in the word dɪɛɭ.p^hɔɭ 'to split'. The vowel phones are shown in the table below.

	Front				Central		Back			
	breathy	unrounded	breathy	rounded	breathy	unrounded	breathy	unrounded	breathy	rounded
Close	ɨ(23)	i(96)					ɯ̃(1)	ɯ(1)	ɯ̃(38)	u(58)
Near-close	ɨ̃(13)	ɨ(23)								
Close-mid	ɛ̃(18)	e(23)							ɔ̃(12)	o(63)
Mid					ə̃(1)	ə(8)				
Open-Mid	ɛ̃(53)	ɛ(93)	œ̃(4)	œ(14)					ɔ̃(16)	ɔ(66)
Open	ɑ̃(49)	a(98)								

	Front		Back
	Nasalized+breathy	Nasalized	Nasalized+Breathy
close		ĩ̃(1)	ĩ̃̃(5)
Open	ã̃(1)	ã(4)	

Diphthong	iɛ(1)
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Table 67: Raw vowel phones chart in Geba 2 and frequency counts

4.2.2.1 Co-occurrence Charts

The following tables illustrate the vowel phones which occur with initial and medial elements.

	i	i	ī	ɪ	ɪ̄	u	u	ū	e	e	o	o	uɪ	ɛ	ɛ	œ	œ	ə	ɔ	ɔ	a	ã	ã	ã	ɛ
b	2			1		3					2			2					1		3				
d	2			4		1			2		1	1		2		2			2		2				1
c						6					1								1						
θ	3	1		1		2			1		11		1	4		1			2		8				
ʌ	4								3					1											
ʔ	3			1		2			1		4			1					3		1				
h						1			1		3			3							2	2			
p	4	1				1				2	2	2		1	1					1	1	1			
p ^h	1					4			1					1						1		1			
k		2			1		4				1			2	3	1	2			1	2			11	
k ^h	2					2								3		1				3		8			
t	2	1			1									3	11		1	2		1	2			5	
t ^h						2					3			1						6		2	1		
s	1					1								1							2				
s ^h				2							2			3						4		4			
ʒ							2					1			2										
ʃ	3																								
ʃ ^h	4			2							1									1					
tʃ		1					1							2	2			1			1		2		
tʃ ^h	4													1											
m	5	3	1		1	1						2			5				1	2			1	1	
n	1	1			2				1						1						1				
l		1		1	1		9	1		4	1			3							1			10	
j						1	1																	1	
w						1			1						1									2	
ɣ ^w						1																			

Table 68: The initial elements and vowels in Geba 2

	i	i	ĩ	ɪ	ɪ̃	u	u	ũ	e	e	o	o	u	ɛ	ɛ	œ	œ	ə	ɔ	ɔ	a	ã	ã	ã	ie	
pl	2					1				1				1									1			
l ^h w	1																									
k ^h l	2																			1						
kw																						1				
cw		1								1																
p ^h l											2															
lw		2																								
lcw	2																									
tr							1																			
kl										1				1									2			
pj						1																		6		
tɕ ^h w	1																									
θw	1																									
k ^h w	1													1												
pw	1	1				1																				
kw																									1	

Table 68: The initial elements and vowels in Geba 2

	i	i	ĩ	ɪ	ɪ̃	u	u	ũ	e	e	o	o	u	ɛ	ɛ	œ	œ	ə	ɔ	ɔ	a	ã	ã	ã	ie	
b	1					2					2			2						1		8				
d	1			2		8			3		1			4		1				2		1				
θ	5			1		2			1					11						1		3				
ʔ	1								1		2			3		1					6		2			
h						1			1					4							1		1			
p	2	1					1		1	1	1	2		2	1						2	1	2		1	
p ^h	2			1		6			2		7						2				2		1			
k						3	1			2	1		1	2							2		3			
k ^h						4			1		1			3		1					4		1			
t	2	1							1	8				2	5				5	1	4		5		2	
t ^h	1									2				4								4				
s														1								4				
s ^h	2			1						3				2							1		5			

Table 69: The medial elements and vowels in Geba 2

	i	i	ĩ	ɪ	ɪ	u	u	ũ	e	ɛ	o	o	u	ɛ	ɛ	ɔ	ɔ	ɔ	ɔ	a	ã	a	ã
ʌ	2								1														
z					1							1			1								
ʃ ^h	3								1		2			1									
tɕ	1			1							1												
c	1										1										1		
θ ^h																					1		
tɕ ^h	8			1										1									
m	5				2	3	11	4				1		2	4		1			1	1	2	1
n	2	1				1	3							1	5	3				5	2	1	3
ɲ										2													
l	1	1		1	2		1		1					4	4	1				1	4	4	9
w		3								1					3								3
j				1		1									1						2	3	1
r	2			1						1	1									1		1	
Y ^w												2											
t ^h w														1									
lw		1																					
pw															12								
p ^h l											1												
pl	1																				2		
p ^h j									1														
k ^h w	1													1									
k ^h l											1			1									
kl				1							2			4						1		2	
p ^h l																					1		

Table 69: The medial elements and vowels in Geba 2

In major syllables, the nucleus of the syllable can occur without consonantal margins. The following table illustrate the frequency counts of a V pattern that occur in the major syllables of Bwe words.

	Frequency counts
a	4
i	2
ã	1

Table 70: Vowels in major syllables with no onset in Geba 2 and frequency counts

4.2.2.2 Vowel Phoneme Contrasts

Selected contrasts between phonetically similar segments are illustrated in analogous environments or minimal pairs in the following section.

- a) [i] – [ī] miɬ.kʰoɫ 'man' miɬ 'grass'
 [ɪ] – [ɪ̄] deɫ.ɪɬ 'house lizard' ɪɬ 'red'
- b) [e] – [ē] kaɦɬ.leɬ.miɬ 'knee' leɬ 'to enter'
- c) [ɛ] – [ɛ̄] keɬ 'to burn' keɬ.leɬ 'shadow'
- d) [a] – [ā] ɫaɬ.taɬ 'to be tired' taɬ.pʰoɬ 'fish'
- e) [u] – [ū] seɫ.kuɬ 'paper' kuɬ 'to be hot'
- f) [o] – [ō] poɬ.ʔoɬ 'termite' poɬ 'cow'
- g) [ɔ] – [ɔ̄] ʃʰɪɬ.nɛɬ.toɬ.boɬ 'pestle' ɬɔɬ 'to pound rice'
- h) [i] – [e] diɬ 'egg' deɬ 'wing'
- i) [ī] – [ɛ̄] kʰiɬ 'to be dark' kʰeɬ 'to shoot'
- j) [ɪ] – [e] diɬ 'to cut (hair)' deɬ 'year'
- k) [ɪ̄] – [ɛ̄] teɬ.sʰɪɬ.teɬ.nɛɬ 'ghost' sʰeɬ 'star'
- l) [u] – [o] θuɬ 'porcupine' θoɬ 'tree'
- m) [ə] – [o] təɬ.ɫaɬ.nɔɬ 'to be different' ɫaɬ.toɬ 'naked'
- n) [o] – [ɔ] θoɬ 'louse (head)' θoɬ 'friend'
- o) [a] – [ɔ] θaɬ 'heart' θoɬ 'friend'

(a-o) illustrate major phonological contrasts of manner. (a) demonstrates a contrast between a high front unrounded vowel and a breathy high front unrounded vowel. (b) between a close-mid front unrounded vowel and a breathy close-mid front unrounded vowel. (c) between an open-mid front unrounded vowel and a breathy open-mid front unrounded vowel. (d) between an open front unrounded vowel and a breathy open front unrounded vowel. (e) between a close back rounded vowel and a breathy close back rounded vowel. (f) between a close-mid back rounded vowel and a breathy close-mid back rounded vowel. (g) between an open-mid back rounded vowel and a breathy open-mid back rounded vowel. (h) between a close front unrounded vowel and a close-mid front unrounded vowel. (i) between a close front unrounded vowel and an open-mid front unrounded vowel. (j) between a near-close front unrounded vowel and a close-mid front unrounded vowel. (k) between a near-close front unrounded vowel and an open-mid front unrounded vowel. (l) between a close back rounded vowel and a close-mid back rounded vowel. (m) between a mid central unrounded vowel and a close-mid back rounded vowel. (n) between a close-mid back rounded vowel and an open-mid back rounded vowel. (o) between an open front unrounded vowel and an open-mid back rounded vowel.

Table 30, /tu, ã, ã, ã, ã, ã, ã / are very low in frequency and have been assigned to residue. So the following table shows the inventory of the vowel phonemes which occur in Geba 2.

	Front				Central		Back	
	breathy	unrounded	breathy	rounded	breathy	rounded	breathy	rounded
Close	ɨ(23)	i(96)					ɯ(38)	u(58)
Near-close	ɨ(13)	ɪ(23)						
Close-mid	ɛ(18)	e(23)					ɔ(12)	o(63)
Mid					ɘ(1)	ə(8)		
Open-Mid	ɛ(53)	ɛ(93)	œ(4)	œ(14)			ɔ(16)	ɔ(66)
Open	ɑ(49)	a(98)						

Table 71: Vowel phoneme chart in Geba 2 and frequency counts

The following examples show the occurrence of vowels in Geba 2.

/i/, a close unrounded front clear vowel.

Examples:

diɭ 'frog'

/i̥/, a close unrounded front breathy vowel.

Examples:

m̥iɭ 'grass'

/ɪ/, a near-close unrounded front clear vowel.

Examples:

ʃ^hɪɭ 'sour'

/ɪ̥/, a near-close unrounded front breathy vowel.

Examples:

l̥ɪɭ 'red'

/u/, a close back rounded clear vowel.

Examples:

cuɭ 'to be cold'

/u̥/, a close back rounded breathy vowel.

Examples:

ku̥ɭ 'to be hot'

/e/, a close-mid front unrounded clear vowel.

Examples:

meɭ 'to throw'

/eɪ/, a close-mid front unrounded breathy vowel.

Examples:

piːl.rɛɪ 'to grind'

/oʊ/, a close-mid back rounded clear vowel.

Examples:

θriː 'tree'

/oʊ/, a close-mid back rounded breathy vowel.

Examples:

paʊ 'cow'

/eɪ/, an open-mid front unrounded clear vowel.

Examples:

reɪ.n 'rain'

/eɪ/, an open-mid front unrounded breathy vowel.

Examples:

keɪ.tʃə 'to shout'

/œ/, an open-mid front rounded clear vowel.

Examples:

mɑː.kœ 'sky'

/œ/, an open-mid front rounded breathy vowel.

Examples:

kœt.pœ 'pot (cooking)'

/ə/, a mid central unrounded vowel, occurs with breathiness and non-breathiness. It mostly occurs in minor syllables.

Examples:

tə.t.klɔ.t.θɛt 'garlic'
lɔ.wj.t.to.t.pwɛt 'nine (persons)'

/ɐ/, a mid central unrounded breathy vowel,

Examples:

ã.t.ɛ.t.ʔɔ.t.nɔt 'to be weak'

/ɔ/, an open-mid back round clear vowel.

Examples:

t^hɔt 'to be long'

/ɔ̃/, an open-mid back round breathy vowel.

Examples:

lɔ̃.t.jɔɭ 'to be deep'

/a/, an open front unrounded clear vowel.

Examples:

θat 'heart'

/ã/, an open front unrounded clear breathy vowel.

Examples:

kã.t.t^hoɭ 'buttocks'

4.2.3 Geba 2 Tones

The linguist who recorded this data found 7 tones. The following table illustrates the frequency counts of all tones.

Phonemic Notation	Frequency counts
[11]	52
[22]	2
[33]	555
[44]	8
[55]	187
[43]	1
[45]	1

Table 72: Raw tone chart in Geba 2 and frequency counts

4.2.3.1 Co-occurrence Charts

The following table shows the co-occurrence of consonant phones and vowels. The number in the table illustrates the frequency counts of the co-occurrence of consonant phones and vowels which occur in the list.

	ɹ	ɹ̄	ɹ̂	ɹ̃	ɹ̄̂	ɹ̄̃
m	4		44		10	
k ^h	1		25		7	
l	13		44		6	1
s ^h			16		11	
t	6		43	2	8	
b			18		10	
t ^h			15		13	
ʌ			5		5	
p	6		20	1	6	
w	4		11			
k	5		33		7	
tɕ			10		3	
h			14		4	
d	3		22	1	14	1
tɕ ^h			4		11	
ʔ	2		20		11	

Table 73: The co-occurrence of initial/medial consonants and tones in Geba 2

	ɔ	ɛ	ɛ̄	ɛ̄	ɛ̄	ɛ̄	ɛ̄
p ^h			20	2	9		
θ			37		22		
r	1		5				
j	2		10				
n	4		21		8		
z	1		7				
θ ^h			1				
ɲ			2				
c			10		1		
ʃ ^h			10		5		
ɣ ^v			3				
s			10		4		
ʃ			3				
p ^h l			3		1		
kl			14				
cw			2				
k ^h l			2	1	1		
kw			2				
k ^h w		1	3				
p ^h j					1		
t ^h w			2				
lw			3				
pl			7		2		
pw	1		13		1		
θw			1				
tɕ ^h w			1				
pj	1		1		1		
k ^h l					1		
tr			1				
tɕw			1		1		

Table 73: The co-occurrence of initial/medial consonants and tones in Geba 2

All vowels occur with tones excepts /ə , u, æ, i, a/ in minor syllables. The following table illustrates the co-occurrence of vowels and tones which occur in the word list.

	1	2	3	4	5	6	7
ɔ	1		47	3	17		
œ			7		5		
u	7		29	1			
ü	1		1				
ε	1	1	63		26		1
ɛ	6		53	2	1		
o			42		29		
u			40		15		
i	1		50		47		
a	10		46				
a	1		79	1	23		
i	7		16	1			
ɔ	4		12			1	
e	2		16				
e	1		12		11		
ã			2				
ɪ	1		12		11		
ə			5				
o	4		8				
ɪ	1		11				
u			1				
œ	2		2				
ɛ	1						

Table 74: The co-occurrence of vowels and tones in Geba 2

	J	↓	↑	↑	↑	↑↓	↑↑
ā	1				1		
u					1		
ã			1				
ə			1				

Table 74: The co-occurrence of vowels and tones in Geba 2

Seven phonetic tones were transcribed in this word list, but this study would posit only four phonemic tones depending on the phonetic similarity and the frequency count of the tones which occur in the list. Table 72 shows that only mid and high tones have a very high frequency count, and low tone has a medium occurrence. In this study, the half-high rising tone will be retained since it maintains the symmetry of similarity to other languages. Thus it appears that the other three tones are very low frequency and have been assigned to residue. For the phonetic similarity, [↑] may be a high tone, [↑↓] may be a mid tone, and [↓] may be a low tone. If the assumption is true, two words with the same tones may be homophones. The following table illustrates the frequency counts of all tones. It has been concluded in this study that there are 4 tones in Geba 2. The following table illustrates Geba 2 tones

Phonemic Notation	Description	Tone stick	Frequency counts
/11/	Low tone	J	52
/33/	Mid tone	↓	555
/55/	High tone	↑	187
/45/	Half-high rising tone	↑↓	1

Table 75: Phonemic tone chart in Geba 2 and frequency counts

/11/ represents [J], a low-level tone. The pitch pattern of this tone starts at low-level pitch and goes on the same range.

Examples:

tɛ̃˩.tɕi˩	'night'
cwɿ˩.t̪m̪˩	'kapok'
di˩	'frog'
ta˩.pɔ̃˩	'to sing'
ʔe˩	'bite'

/33/ represents [˥˥], a mid-level tone. The pitch pattern of this tone starts at mid-level pitch and continues at the same range.

Examples:

ʃi˩.lɛ̃˩	'area under house'
θo˩	'louse (head)'
m̪i˩	'grass'
ho˩	'bamboo'
ba˩	'bamboo shoot'

/55/ represents [˨˨], a high-level tone. The pitch pattern of this tone starts at high-level pitch and continues at the same range.

Examples:

dœ˩	'village'
ba˩	'yellow'
θe˩	'to be new'
θu˩	'rotten'
me˩	'to be dry'

/45/ represents [˥˨], a half-high rising tone. The pitch pattern of this tone starts at half high-level pitch and rises to a high level pitch.

Examples:

dɛ̃˩˥.θe˩	'rabbit'
-----------	----------

4.2.3.2 Tone Contrasts

Selected contrasts between phonetically similar segments are illustrated in analogous environments or minimal pairs in following section.

(a) [ɬ] – [ʈ]	baɬ ‘bamboo shoot’	baʈ ‘yellow’
	diɬ ‘to cut (hair)’	diʈ ‘cooked rice’
	θoɬ ‘louse (head)’	θoʈ ‘tooth’
(b) [ɬ] – [ʃ]	diɬ ‘egg’	diʃ ‘frog’
(c) [ʃ] – [ʈ]	diʃ ‘frog’	ʔoʈ.diʃ ‘coconut (fruit)’

(a-c) illustrates major phonological contrasts of manner. (a) demonstrates a contrast between a mid-level tone and a high-level tone. (b) between a low tone and a mid-level tone. (c) between a mid-level tone and a high tone.

No predictable patterns of tone were observed.

4.3 Syllable Structure

The syllable is the basis of the Geba 2 word structure. Geba 2 distinguishes between MAJOR SYLLABLES and MINOR SYLLABLES. 4.3.1 describes the structure of major syllables and 4.3.2 discusses minor syllables.

4.3.1 Major Syllables

Geba 2 syllables are generally open, without any coda. Onsets are not required. Only one word in the list was found with a closed syllable. The schematic structure is CVC as in the word kahɬ.leɬ.mɪɬ ‘knee’ and has been assigned to residue. The initial consonant may be followed by one medial consonant. Therefore, syllables have the schematic structure of CV, CCV, or V. There are seven words with the V pattern.

The schematic structure of a major syllable is (C₁)(C₂) V T

C₁ is any consonant

C₂ is an alveo-palatal fricative, nasal, a liquid, or a glide

V is a vowel, T is a tone

	i	j	ī	ɪ	ɪ̄	u	ū	ū	e	ɛ	o	ɔ	ʊ	ʊ̄	ɛ	ɛ̄	œ	œ̄	ə	ə̄	ɔ	ɔ̄	a	ā	ɑ	ã	ɛ̄
p	5	3				1	1		1	3	2	4			3	1					2	2	3		1		
t	4	2			1				1	8					5	16		1	4	1	4	1	6		6		
k		2			1	3	5		2	2			1	4	3	1	2			2	1	5		11			
ʔ	4			1	2			2	4					4		1				9		3					
b	3			1	5				4					4						2		11					
d	3			6	8			5	5	1				6		3				4						1	
h					2			2	3					6						1		4	1				
c	1				6				2											2							
p ^h	2			1	10			3	7					1		2				3		2					
t ^h	1				2				5					5						6		7	1				
k ^h	2				5			1	1					6		2				7		9					
tc	1	1		1					1					2	1				1			1		2			
tc ^h	10			1										2													
ʌ	5							4						1													
θ	9	1		2	4			2	11	1	1		15			1				3		11					
θ ^h																				1							
s	1				1									2								6					
s ^h	2			3					5					5						5		9					
ʃ	3																										
ʃ ^h	7			2				1	3					1						1							
z					1		2			2					3												
m	10	4	1		3	4	10	1			2			2	9		1			2	3	2		2	1		
n	3	2			2	1		3	1					1	6	3				5	2	2		3			
ɲ									2																		
l	1	2		2	3		10	1	1	4	1			7	4	1				1	5	4		20			
r	2			1					1	1										1		1					
j				1		1	2								1						2	3		2			
w		3					1		2						4										5		
Y ^w							1				2																

Table 76: The co-occurrence of consonants and vowels of major syllables in Geba 2

	i	ī	ĩ	ɪ	ɪ̄	u	ū	ũ	e	ē	o	ō	ɔ	ɔ̄	ɛ	ɛ̄	œ	œ̄	ə	ə̄	ɔ̄	ɔ̄	a	ã	ɶ	ã̄	ɛ̄
p ^h l											3												ɪ				
kl				1							3				5						1		4				
cw		1								1																	
k ^h l	2										1				1							1					
kw																							2				
k ^h w															2												
p ^h j									1																		
t ^h w	1														1												
pl	3			1						1					1							2		1			
pw	1	1			1											12											
k ^h w	2																										
θw	1																										
t ^h w	1																										
pj						1																			6		
tr						1																					
t ^h w	1																										
lw		3																									

Table 76: The co-occurrence of consonants and vowels of major syllables in Geba 2

Examples of the schematic structure are shown using the following data.

- (a) VT aɪ.θaɪ.θiɪ 'thorn'
 iɪ.nyɪ 'brain'
 s^hoɪ.aɪ.mɪɪ 'to plant'
 hɛɪ.k^hɛɪ.aɪ.tɛɪ 'to hunt'
 iɪ.huɪ 'to steal'
 aɪ.pwɛɪ.θaɪ.toɪ 'six (persons)'
 ãɪ.tɛɪ.ʔɔɪ.noɪ 'to be weak'
- (b) CVT
 baɪ 'yellow'
 θiɪ 'to die'
 pɔɪ 'cow'

		p ^h uɪ	'belly'
		θaɪ.buɪ	'liver'
(c)	CCVT	kɪɪ.k ^h toɪ	'back'
		cwɛɪ	'spoon'
		tɔwiɪ.pɛɪ.tɔ ^h iɪ	'to split'
		θwiɪ	'blood'

(a) illustrates the V words; (b) the words with simple onsets with a single vowel; and (c) cites several examples of words with complex onsets.

4.3.2 Minor Syllables

Minor syllables have a reduced set of possible onsets and vowels. In addition, minor syllables never bear a distinctive tone. Minor syllables with onsets have generally an /ə/ nucleus, though /u/, /æ/, and /i/ are also found. Onsetless minor syllables always have an /a/ nucleus.

The shape of a minor syllable, therefore, consists of an optional initial consonant (most commonly a plosive stop). The nucleus is composed of a vowel. Paradigmatically, minor syllables generally occur before a major syllable. The schematic structure of a minor syllable is shown below (C₁)V.

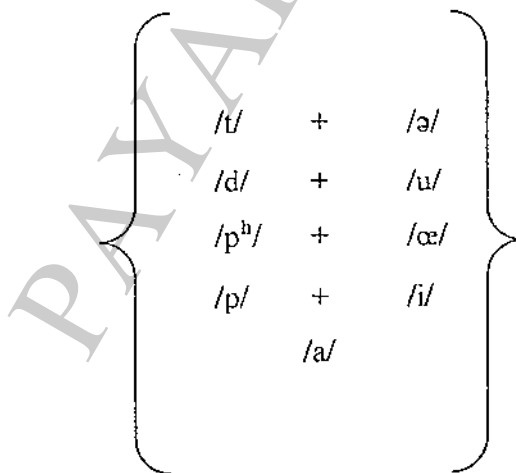
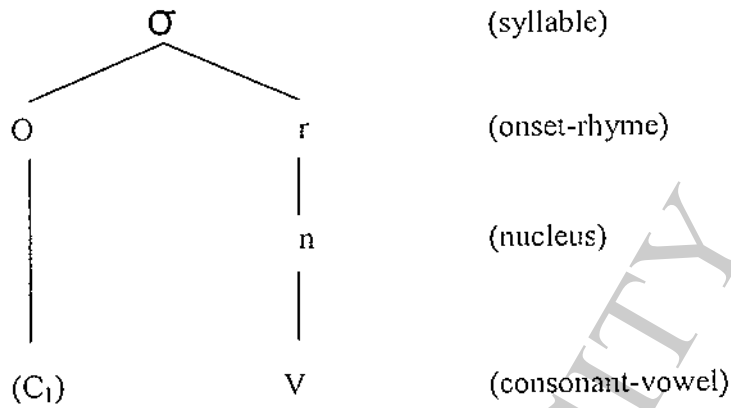


Figure 15: The structure of minor syllables in Geba 2

The syllable structure of the Geba 2 minor syllable can be expressed as follows:



For example,

(a)	CV	tɛɪ.du.tʰɛɪ	'bear'
		juɪ.pʰœ	'rat'
		cuɪ.muɪ.pi	'fingernail'
		θaɪ.toɪ.tə.pwɛɪ	'seven (persons)'
		lwɪɪ.toɪ.tə.pwɛɪ	'nine (persons)'
		mɪɪ.pɔɪ.tə.klaɪ	'bald'
(b)	V	a.pwɛɪ.lwɪɪ.toɪ	'eight (persons)'
		a.pwɛɪ.ʃʰiɪ	'ten (persons)'
		a.pwɛɪ.tɛɪ.keɪ.jɛɪ	'hundred (persons)'

The examples in (a) illustrate CV- minor syllables, on all possible nucleiuses; (b) illustrates /V-/ minor syllables.

4.4 Conclusion

The phonological description of the Geba 2 language includes the phonemes and the syllable. The phonemes are divided up into three sections: consonant phonemes, vowel phonemes and tone.

4.4.1 Phonemes

Consonants: There are 25 consonant phonemes in Geba 2. The following table shows the Geba 2 consonant phonemes.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveolo Palatal	Palatal	Uvular	Velar Labialized	Velar	Glottal
Plosive	Asp.	p ^h (40)			t ^h (29)						k ^h (42)	
	VI.	p(63)			t(64)			c(13)			k(61)	ʔ(32)
	Vd.	b(30)			d(42)							
Fricative	Asp.				s ^h (29)	f ^h (13)						
	VI.		m(10)	θ(58)	s(10)							h(20)
	Vd.						z(8)					
Affricate	Asp.						tc ^h (16)					
	VI.						tc(15)					
Nasal	Vd.	m(57)			n(34)							
Liquid												
Lateral approximant					l(99)							
Trill					r(8)							
Glide			w(47)				j(19)					

Table 77: Consonant phoneme chart in Geba 2 and frequency counts

Vowels: There are 10 clear vowel phonemes and 10 breathy vowel phonemes in Geba 2. The following table shows Geba 2 vowel phonemes.

	Front				Central		Back	
	breathy	unrounded	breathy	rounded	breathy	rounded	breathy	rounded
Close	i(23)	i(96)					u(38)	u(58)
Near-close	ɨ(13)	ɪ(23)						
Close-mid	e(18)	e(23)					ɔ(12)	o(63)
Mid					ə(1)	ɚ(8)		
Open-Mid	ɛ(53)	ɛ(93)	œ(4)	œ(14)			ɔ(16)	ɔ(66)
Open	ɶ(49)	a(98)						

Table 78: Vowel phoneme chart in Geba 2 and frequency counts

Tones: There are 4 tones in Geba 2: low tone, mid tone, high tone, and half-high rising tone.

Phonemic Notation	Description	Tone stick
/11/	Low tone	┘
/33/	mid tone	┘
/55/	High tone	┘
/45/	Half-high rising tone	┘

Table 79: Phonemic tone chart in Geba 2

4.4.2 Syllable Structure

There are two types of syllables: major syllables and minor syllables. The major syllable consists of all vowel phones. In addition, the major syllable bears a distinctive tone or voice quality. There are three syllable types in Geba 2: V, CV, and CCV. A closed syllable is found only in one word and has been assigned to residue. The CV syllable pattern is by far the most common.

Minor syllables are composed of an optional initial consonant. The nucleus is composed of a vowel. Minor syllables with onsets generally have a /ə/ nucleus, though /u/, /œ/, and /i/ are also found. Onsetless minor syllables always have an /a/ nucleus.