CHAPTER 2

THE PHONOLOGY OF BWE

2.1 Introduction

Bwe is a Western Central Karenic language which is spoken on the east and west banks of Daylo stream in Thandaungyi township. This language does not yet have an orthography and is therefore at risk of dying out because of the strong influence of the surrounding languages; Sgaw Karen and Burmese. Therefore a phonological description of Bwe is necessary to help the Karen people to increase their understanding of their own language.

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

2.2 Phonemes

2.2.1 Bwe Consonant Phonemes

Saw Lar Baa analyzed the phonology of West and East Bwe. He noted that there are 32 consonant phonemes in East Bwe, and 28 consonant phonemes in West Bwe. The phonemes /m̥, z, n̥, r, x, ɣ, ŋ/ rarely occur in East Bwe. There are 4 consonant phonemes, /s, z, r, ŋ/, which rarely occur in West Bwe.

In Bennett's word list, Bwe has three series of stops: voiceless aspirated, voiceless unaspirated, and voiced. In addition, Bwe has two nasals, two types of fricatives (voiceless aspirated and voiceless unaspirated), three liquids, and two glides. The table below shows the raw data of phones which occur in the Bwe word list.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveo-Palatal	Palatal	Velar	Glottal
Plosive	Asp.	p^h(28)			t^h(45)				k^h(56)	
	Vl.	p(74)			t(66)			c(21)	k(66)	ʔ(42)
	Vd.	b(39)			d(41)			ɟ (4)		
Fricative	Asp.				s^h(1)	$ʃ^h$(50)				
	Vl.		ʍ(5)	θ(81)		ʃ(1)			x(1)	h(23)
Affricate							tɕ(18)			
Nasal	Vd.	m(83)			n(37)					
Liquid Lateral fricative					ɮ(1)					
Lateral approximant					l(112)					
Trill					r(6)					
Glide			w(70)				j(27)			

Table 24: Raw consonant phone chart in Bwe and frequency counts

From table 24, there are 26 consonant phones. The raw data in this study differs at several points from Saw Lar Baa's consonant inventory. Saw Lar baa has /t̪, g, ɓ, ɗ̪, tʃ, d̪ʒ, s, ˌsʲ, z, ɤ, ŋ, m̪, n̪ / in Eastern Bwe consonant phones, /t̪, ɓ, ɗ̪, tʃ, d̪ʒ, s, ˌsʲ, z, ɤ, ŋ/ in Western Bwe consonant phones which this study doesn't. While this study has /c, ɟ, s^h, $ʃ^h$, ʃ, tɕ, ʍ, ɵ/, but he doesn't.

From Bennett's word list, the initial and medial elements of Bwe can be summarized as follows:

1. There are twenty consonant phones /p^h, t^h, k^h, p, t, c, k, ʔ, b, d, $ʃ^h$, ʍ, ɵ, h, m, n, l, w, j, tɕ/ and nine consonant clusters /pl, pw, kw, kl, θr, lw, t^hw, k^hl, k^hw/ that occur both initially and medially in words.
2. There are three consonant phones /ɟ, x, ɬ/ and 6 consonant clusters /pj, tɕw, mj, θ w, p^hr, $ʃ^h$j/ that occur only word initially.

3. There are two consonant phones /s^h, r/ and 3 consonant clusters /plj, p^hj, p^hl/ that occur only medially in words.

The following table lists the initial and medial elements of words which are found in the Bwe word list. (including consonant clusters) The numbers in the table show the frequency of the consonant phones which occur in the word list.

	Initial	Medial	Total
p^h	8	16	24
t^h	17	24	41
k^h	22	25	47
p	21	14	35
t	27	39	66
c	12	9	21
k	27	26	53
ʔ	23	19	42
b	12	27	39
d	19	22	41
ɟ	4	-	4
s^h	-	1	1
$ʃ^h$	25	25	50
ʍ	4	1	5
θ	43	32	75
x	1	-	1
h	17	6	23
m	40	42	82
n	9	28	37
ɬ	1	-	1
l	33	44	77

Table 25: The frequency of consonants in Bwe words

	Initial	Medial	Total
r	-	1	1
w	12	9	21
j	7	10	17
tɕ	12	5	17
pj	4	-	4
pl	6	4	10
pw	6	18	24
plj	-	1	1
tɕw	1	-	1
kw	1	1	2
kl	3	8	11
mj	1	-	1
θr	2	2	4
θw	2	-	2
ʃw	-	1	1
jw	-	1	1
lw	3	1	4
p^hr	1	-	1
p^hj	-	1	1
p^hl	-	2	2
t^hw	2	2	4
k^hl	5	2	7
k^hw	2	7	9
$ʃ^hj$	1	-	1
jw	-	1	1

Table 25: The frequency of consonants in Bwe words

2.2.1.1 Consonant Phoneme Contrasts

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

a) [pʰ] – [p]	pʰu˥ *'belly'*	pu˥ *'to be thin'*	
[tʰ] – [t]	tʰɔ˧ *'pig'*	ʔa˥.tɔ˧.buˀ *'to pound (rice)'*	
[kʰ] – [k]	kʰa˧ *'foot'*	ka˧ *'to dance'*	
b) [p] – [b]	pa˧ *'father'*	ba˧ *'bamboo shoot'*	
[t] – [d]	tɯ˥.cɪ˧ *'black'*	pʰa˥.dɪ˥ *'to cook (rice)'*	
[c] – [ɟ]	θə.du˥.cɛ̰˧.lɛ̰˧ *'water leech'*	ɟɛ̰˧ *'to laugh'*	
c) [pʰ] – [b]	pʰa˥.dɪ˥ *'to cook (rice)'*	ba˥ *'yellow'*	
[tʰ] – [d]	tʰo˧ *'to be heavy'*	do˧ *'to be big'*	
d) [ʔ] – [h]	ʔo˥ *'rotten'*	ho˥ *'silver'*	
[ʔ] – [ø]	ʔa˧.pwɛ̰˩.tɛ̰˩ *'to buy'*	a˧.pɔ̰˩.tɛ̰˩ *'to speak'*	
e) [x] – [h]	xa˧ *'to weep'*	ha˧.pʰi˥.mṵ˧ *'dust'*	
[k] – [h]	ko˧ *'head'*	ho˧ *'bamboo'*	
f) [m] – [n]	mɛ̰˧ *'wife'*	nɛ̰˧ *'thou 2s)'*	
g) [m] – [w]	mɛ̰˧ *'to do / Make'*	wɛ̰˧ *'to be skinny'*	
h) [d] – [n]	da˧ *'to be short (length)'*	na˧ *'grass'*	
[b] – [m]	bo˧ *'to be fat'*	mo˧ *'mother'*	
i) [j] – [c]	la˧.jɔ˧ *'to be deep'*	kʰa˧.cɔ˧ *'spider'*	
[j] – [ɟ]	ʔa.pwɛ̰˧.tə.kə.jɛ̰˧ *'hundred (persons)'*	ɟɛ̰˧ *'to laugh'*	
j) [θ] – [t]	θo˧ *'fat'*	jaˀ˥.to˧.to˧ *'to be the same'*	
[θ] - [d]	θa˧ *'heart'*	da˧ *'to be short (length)'*	
k) [l] – [n]	lɛ̰˧ *'wet rice field'*	nɛ̰˧ *'thou 2s'*	
l) [w] – [j]	wɛ̰˧.cṵ˧ *'rain'*	ʔa.pwɛ̰˧.tə.kə.jɛ̰˧ *'hundred (persons)'*	
m) [w] – [k]	wɛ̰˧ *'to be skinny'*	kɛ̰˧ *'we 1p)'*	

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

In this study /tɕ/ is analyzed as an affricate rather than two obstruents because of the syllable structure and because it is the only case of 2 obstruents in a cluster. From the table 24, /x/ and /ʃ/ are very low frequency. There is one example of each which contains these symbols and has been assigned to residue. For /ɬ/, /s^{h}/ there is only one example of each in the data, however this study will retain it since it is part of a pattern that Geba has /ɬ/, and Geba 1 and Geba 2 both have /s^{h}/. So the following table shows the inventory of consonant phonemes which occur in Bwe.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveo-Palatal	Palatal	Velar	Glottal
Plosive	Asp.	p^h(28)			t^h(45)				k^h(56)	
	Vl.	p(74)			t(66)			c(21)	k(66)	ʔ(42)
	Vd.	b(39)			d(41)			ɟ(4)		
Fricative	Asp.				s^h(1)	$ʃ^h$(51)				
	Vl.		ʍ(5)	θ(81)						h(23)
Affricate							tɕ(18)			
Nasal	Vd.	m(83)			n(37)					
Liquid										
Lateral fricative					ɬ(1)					
Lateral approximant					l(112)					
Trill					r(6)					
Glide			w(70)				ɟ(27)			

Table 26: Consonant phoneme Chart in Bwe and frequency counts

The following examples show the occurrence of consonants in Bwe.

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

Examples:

paꜜ	*'father'*
pọ̀	*'cow'*
θaꜜ.pọ̀	*'to sing'*

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

Examples:

p^h uꜜ.ba˥	*'fly'*
p^h ɔ˥	*'flower'*
$ʃ^h$ɪꜜ. p^h oꜜ	*'to be small'*

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

Examples:

	t ɛ̤.ʃʰi˧	*'urine'*
	t ɛ̤.nɛ̤˧	*'ghost'*
mɛ̤˧.	t ɛ.mɛ̤˧	*'to work'*

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

Examples:

	tʰ a˥	*'to be sharp'*
	tʰ i˥	*'water'*
ʃʰɪ˥.	tʰ i˥	*'sweat'*

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

Examples:

	c o˧	*'to be cold'*
kʰa˧.	c o˧	*'spider'*

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

Examples:

	k o˧	*'head'*
	k ɔ̤˩	*'naked'*
de˧.	k ṳ˧	*'wing'*

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

Examples:

	kʰ ɛ˧	*'to shoot'*
	kʰ ɪ˥	*'tiger'*
θu˥.	kʰ u˧	*'to cough'*

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

Examples:

	ʔ ɪ˧.θɛ˧	*'salt'*
	ʔ ɔ˧.jɛ̤˩	*'to be far'*
ʔɔ˧.	ʔ ɛ˧	*'to be many'*

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

Examples:

	b o˧	*'to be fat'*
	b u˧	*'paddy rice'*
ʔo˩.	b ɛ˧	*'duck'*

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

Examples:

	d ɪ˩.mo˩	*'navel'*
	d i˧	*'egg'*
θa˧.	d ɔ˩	*'to be slow'*

/ɟ/, a voiced palatal plosive occurs in syllable initial position.

Examples:

	ɟ e̤˧	*'to laugh'*
	ɟ e̤˧	*'I Is'*
	ɟ ɔ̤˩	*'to suck'*

/ʃʰ/, an aspirated voiceless post-alveolar fricative occurs in syllable initial position.

Examples:

	ʃʰ ɛ˩	*'to hurt'*
	ʃʰ ɛ˧	*'star'*
ʔa˧.	ʃʰ ɛ˩.tɛ̤˩	*'to sell'*

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

Examples:

	ʍ ɛ˧.mo˧	*'bee'*
	ʍ i˧	*'fly'*
mɛ̤˧.	ʍ e˩.bu˧	*'to dry (sth.)'*

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

Examples:

	θ ɔ˧.wɔ̤˧	*'village'*
	θ ə.ʔo˩	*'lungs'*
ʔɪ˧.	θ ɛ˧	*'salt'*

/h/, a voiceless glottal fricative occurs in syllable initial position.

Examples:

	h	ul	*'cooked rice'*
	h	ɔɬ	*'firewood'*
ʔal.	h	uɬ	*'to steal'*

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

Examples:

	m	oɬ	*'mother'*
	m	ọɬ	*'gong'*
ʃʰɔl.	m	ɪl	*'to sleep'*

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

Examples:

	n	aɬ	*'grass'*
	n	ɛ̣ɬ	*'thou (2s)'*
ʃʰɪl.	n	al	*'to sit'*

/ɬ/, an alveolar lateral fricative occurs in syllable initial position It was noted this pattern occurred with only one word in the list.

Examples:

ɬɛl		*'moon'*

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

Examples:

	l	ɛ̣ɬ	*'wet rice field'*
ʃʰɔl.	l	uɬ	*'to play'*
θol.k	l	ɔɬ	*'green'*
buɬ.p	l	ɔɬ	*'rice seedling'*
dal.kʰ	l	ɛl	*'sugarcane'*
lal.pʰ	l	aɹ	*'thunder'*

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

Examples:

baɬ.tə.	r	i̪ɬ	*'to grind'*
θ	r	eɬ.laɬ	*'to plant'*
pʰ	r	ɔl.nu̪ɬ	*'to stab'*

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

Examples:

	w	ɛ̪ɬ.cu̪ɬ	*'rain'*
ʃʰɔɬ.p	w	il	*'to sneeze'*
θ	w	iɬ	*'blood'*
θul.kʰ	w	ɛɻ	*'corn'*
tɕ	w	iɬ	*'to pull'*

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

Examples:

	j	a̪ɬ.θɛɬ	*'banana (fruit)'*
ʔɔɬ.	j	ɛ̪ɻ	*'to be far'*
ʃʰ	j	aɬ	*'to sew'*
kal.pl	j	eɬ	*'buttocks'*

2.2.1.2 Consonant cluster

Consonant clusters occur only in major syllables. The co-occurrence of consonants C_1 and C_2 is restricted to five patterns with consonant clusters detailed as follows:

a) - j - cluster (C_1j)

When C_2 is /j/, the C_1 must be /p, pʰ, m, ʃʰ/.

C_1 and C_2 can make four -j- clusters /pj, pʰj, mj, ʃʰj/.

Examples: pja̪ɻ.po̪ɻ.kʰoɬ *'man'*

mjeɬ.bɛl *'peanut'*

tʰɔɬ.pʰjelɬ *'pounded rice'*

ʃʰjaɬ *'to sew'*

b) - r - cluster (C_1r)

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

C_1 and C_2 can make two -r- clusters /θr, p^hr/.

Examples:	θre˧.la˧	*'to plant'*
	p^hrɔ˥.nu̱˧	*'to stab'*

c) – l – cluster (C_1l)

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

C_1 and C_2 can make three -l- clusters /pl, kl, k^hl/.

Examples:	plɪ˥	*'to be smooth'*
	klɛ˧	*'road, path'*
	k^hli˧	*'turtle'*

d) – w – cluster (C_1w)

When C_2 is /w/, the C_1 must be /t^h, k^h, p, l, k, θ, ʃ, j/.

C_1 and C_2 can make eight -w- clusters /t^hw, k^hw, pw, jw, lw, kw, θw, ʃw/.

Examples:	t^hwi˧	*'dog'*
	θu˥.k^hwɛ˩	*'corn'*
	cɔ˧.pwe˧	*'to be wet'*
	lwe̱˧.mi˧.ʔu˥	*'to burn'*
	le̱˧.kɔ̱˧.kwe̱˧	*'red'*
	θwi˧	*'blood'*
	pwe˥.na˧.θa˧.jwe̱˧	*'to choose'*

The co-occurrence of C_1, C_2 and C_3 rarely occurs in the Bwe word list. Howevers there is one pattern of consonant cluster as follows:

a) – j – cluster (C_1 C_2 C_3j)

When C_2 is /l/ and C_3 is /j/, the C_1 must be /p/.

C_1, C_2 and C_3 can make one - j- clusters /plj/.

Examples:	ka˥.plje˧	*'buttocks'*

	/j/	/r/	/l/	/w/
/p/	4		11	24
/p^h/	1	1	2	
/t^h/				4
/k/			11	2
/k^h/			7	8
/θ/		4		2
/m/	1			
/ʃ/				1
/$ʃ^h$/	1			
/l/				4
/j/				1
/tɕ/				1
/pl/	1			

Table 27: Co-occurrence of the first consonant (C_1), second consonant (C_2) and third consonant (C_3) in the consonant cluster of Bwe

The co-occurrence of the first consonants (C_1) and the second consonants (C_2) in Table 29 shows that:

1. There are five consonant phones /l, r, j, w, ɕ/ that can occur as the second member of a consonant cluster.
2. There are two consonant phones /j, w/ that can occur as the third member of a consonant cluster.
3. In the – j – cluster, only an aspirated voiceless bilabial plosive, a voiceless bilabial plosive, a bilabial nasal, and an aspirated voiceless post-alveolar can occur as the first member of this cluster.
4. In the – r – cluster, only an aspirated voiceless bilabial plosive, and a voiceless dental fricative can occur as the first member of this cluster.

5. In the – l – cluster, only plosives /p, k, k^h/ occur as the first member of this cluster.
6. In the – w – cluster, plosives /p, t^h, k, k^h/, fricatives /θ, ʃ/ and an alveolar lateral approximant occur as the first member of this cluster.

2.2.2 Bwe Vowel Phonemes

Saw Lar Baa described 9 vowel phones in East Bwe and 10 vowel phones in West Bwe. The inventory of eastern Bwe vowels is shown in the following table.

	Front	Central	Back
	Unrounded	Unrounded	Rounded
Close	i	ɯ	u
Mid	e	ə	o
	ɛ		ɔ
Open		a	

Table 28: East Bwe vowel inventory (Saw Lar Baa 2001: 42)

The western Bwe vowel inventory is shown in Table 10.

	Front	Central	Back
	Unrounded	Unrounded	Rounded
High	i		u
			ʊ
Mid	e	ə	o
	ɛ		ɔ
Low		a	

Table 29: West Bwe vowel inventory (Saw Lar Baa 2001: 47)

In this study the author found 22 single vowel phones and 1 diphthong. Bwe vowel phones function as the syllable nucleus. All vowels can also be breathy except /ɯ/, and /œ/. There are two single vowels and one diphthong that occur with nasalization as follows /ẽ/, /o̰͂/, and /a̰͂i/. Two of them also occur with a breathy vowel. The Bwe vowel phones are shown in the table below.

	Front				Central		Back			
	breathy	Unrounded	Nasalized	rounded	breathy	rounded	unrounded	Breathy+ Nasalized	breathy	rounded
Close	ḭ(9)	i(79)					ɯ(2)		ṵ(39)	u(68)
Near-close	ɪ̰(2)	ɪ(29)								
Close-mid	ḛ(23)	e(30)	ẽ(2)						o̰(22)	o(86)
Mid					ə̰(2)	ə(44)				
Open-Mid	ɛ̰(89)	ɛ(94)		œ (2)				õ̰(1)	ɔ̰(21)	ɔ(83)
Open	a̰(38)	a(140)								

Diphthong	a̰͂i(1)

Table 30: Raw vowel phone chart in Bwe and frequency counts

All vowel phones may occur in the word initial position except ɯ, and o̰͂. All vowel phones may also occur medially in words. The following table illustrates the vowel phones which occur as word initial and word medial in Bwe words.

2.2.2.1 Co-occurrence Charts

	i	i̤	ɪ	ɪ̤	u	ṳ	e	e̤	ẽ	o	o̤	ɛ	ɛ̤	œ	ə	ə̤	ɔ	ɔ̤	a	a̤	ãi̤
p					1	2			1	2	2		1		4	1	3		1	2	
t			1						1				13		11					1	
k	1		1					2		2	3		2		6		1	2	5	2	
ʔ	2		1		2		1			4							4		9		
b					3					3		1							5		
d	2		2				3			3		1					3		5		
c					4	1				2		2		1	1		1				
ƭ								1					1					2			
p^h					2		2			1		1					1		1		
t^h	2				2					6		2			1		2		2		
k^h	1		1		1							3			1		6		9		
$ʃ^h$	3		7							4		2					7		2		
ʍ	1						2					1									
θ	2				8		2			8		7			3		3		10		
x																			1		
h	4				2		2			3		3					1		2		
m	7	1		1	2	1		3		1			10				1	2	5	7	
n										1			6								
ɬ												1									
l	1			1	1	10		3			2		3			1		1	5	5	
w		1				1		2			1		5							1	1
j						1				1	1		1				1		1	1	
pl			1				1	1				1	1						1		

Table 31: The initial element and vowel in Bwe

	i	i̤	ɪ	ɪ̤	u	ṳ	e	e̤	ẽ	o	o̤	ɛ	ɛ̤	œ	ɵ	ə̤	ɔ	ɔ̤	a	a̤	ãi
kl												1	1						1		
k^hl	1									1							1				
tɕ	1				7	1						2							1		
t^hw	2																				
k^hw	2																				
pw							3	1					1							1	
lw	1	1											1								
kw																			1		
ʃ^{h}j																			1		
θw	2																				
θr					1		1														
tɕw	1																				
p^hr																	1				
mj							1														
pj																				4	

Table 31: The initial element and vowel in Bwe

	i	i̤	ɪ	ɯ	u	ṳ	e	e̤	o	o̤	ɛ	ɛ̤	œ	ə	ɔ	ɔ̤	ɔ̄	a	a̤
p	1						1			5	1	1			2	3			
t		1				2	1	1	3		1	10		14	1	1		1	3
k	1	1	1		4	4		1	2		1			1	3	2		3	2
ʔ	1		2		3		1		5		3		1		1			2	
b			1		2				3		4				3			14	
d	1		3	2	9		1		2		2				2			1	
c			2			1	1				1	1			3				

Table 32: The medial element and vowel in Bwe

	i	i̤	ɪ	ɯ	u	ṳ	e	e̤	o	o̤	ɛ	ɛ̤	œ	ɔ	ɔ	o̤	ɔ̄	a	a̤
p^h	1						2		8		1							4	
t^h	8		1						1		4				1			9	
k^h	3				2				6		5			2	6			1	
s^h															1				
$ʃ^h$	4		1		1				5		4				3			7	
ʍ							1												
θ	5				3				5		12				2			5	
h	1				2						2				1				
m	6	2	4		2	10		2	2	1	6	1			1	1		3	
n					1	3		2		3		3			6	2		5	3
l	3				2	2	1		1		8	8			5	2		9	5
r		1																	
w								2				1				1		2	1
j		1								3		2			1	1	1	1	
pl											1				2	1		1	
kl									1		4				2				
k^hl					1						1								
tɕ										1	1				1			2	
t^hw											2								
k^hw	4										2							1	
pw	1						1	1				15							
lw	1																		
kw												1							
p^hl															1			1	
θr	2																		
p^hj							1												
plj							1												
jw								1											

Table 32: The medial element and vowel in Bwe

In major syllables, the nucleus of the syllable can occur without onset. The following table illustrates the frequency counts of V patterns that occur in the major syllables of Bwe words.

	Frequency counts
a	2
i	1
u	1

Table 33: Vowels in major syllables with no onset in Bwe and frequency counts

2.2.2.2 Vowel Phoneme Contrasts

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

a) [i] – [i̤]	ka˥.mi˦	*'tail'*	mi̤˦ 'name'
[ɪ] – [ɪ̤]	tɛ̤˦.mɪ˦.nɔ˦	*'to be wrong'*	mɪ̤˦ *'to be correct'*
b) [e] – [e̤]	tʰa˦.le˦	*'Earthworm'*	le̤˦.nṳ˦ *'to enter'*
c) [ɛ] – [ɛ̤]	plɛ˦	*'to lie, fib'*	plɛ̤˦ *'tongue'*
d) [a] – [a̤]	bu˥.la˦	*' to bury (a corpse)'*	ke̤˦.la̤˦ *'to descend'*
e) [ə] – [ə̤]	pə.na̤˦	*'to hit'*	pə̤.ka̤˦ *'plate'*
f) [u] – [ṳ]	ʃʰɔ˥.lu˦	*'to play'*	lṳ˦ *'stone'*
g) [o] – [o̤]	ʍɛ˦.mo˦	*'bee'*	u˥.ko˦.mo̤˦ *'to think'*
h) [ɔ] – [ɔ̤]	tə.we̤˦.nɔ˦	*'to be bad'*	tə.wɛ̤˦.nɔ̤˦ *'to hate'*
i) [i] – [e]	θi˦	*'comb'*	θe˦ *'liquor'*
j) [i] – [ɛ]	θi˦	*'comb'*	θɛ˦ *'day'*
k) [ɪ] – [e]	dɪ˦	*'frog'*	de˦ *'year'*
l) [ɪ] – [ɛ]	ʃʰɪ˦.pʰo˦	*'to be small'*	ʃʰɛ˦ *'star'*
m) [i] – [ɯ]	di˦	*'egg'*	kʰa˦.dɯ˦ *'thigh'*

n) [ɪ] - [ɯ]	dɪ˧	*'frog'*	kʰa˧.dɯ˧ *'thigh'*
o) [ɯ] – [u]	kʰa˧.dɯ˧	*'thigh'*	mạ˧.du˧ *'face'*
p) [u] – [o]	bu˧	*'paddy rice'*	bo˧ *'to be fat'*
q) [ə] – [o]	cə˧.wạ˧.	*'to scratch'*	co˧ *'to be cold'*
r) [o] – [ɔ]	θo˧	*'fat'*	θɔ˧ *'friend'*
s) [a] – [ɔ]	θa˧.ʔa˧	*'to be hungry'*	ʔɔ˧ *'to drink'*

(a-s) illustrate major phonological contrasts of manner: (a) 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 mid central unrounded vowel and a breathy mid central unrounded vowel, (f) between a close back rounded vowel and a breathy close back rounded vowel, (g) between a close-mid back rounded vowel and a breathy close-mid back rounded vowel, (h) between an open-mid back rounded vowel and a breathy open-mid back rounded vowel, (i) between a close front unrounded vowel and a close-mid front unrounded vowel, (j) between a close front unrounded vowel and a open-mid front unrounded vowel, (k) between a near-close front unrounded vowel and a close-mid front unrounded vowel, (l) between a near-close front unrounded vowel and an open-mid front unrounded vowel, (m) between a close front unrounded vowel and a close back unrounded vowel, (n) between a near-close front unrounded vowel and a close back unrounded vowel, (o) between a close back unrounded vowel and close back rounded vowel, (p) between a close back rounded vowel and a close-mid back rounded vowel, (q) between a mid central unrounded vowel and a close-mid back rounded vowel, (r) between a close-mid back rounded vowel and an open-mid back rounded vowel, (s) between an open front unrounded vowel and an open-mid back rounded vowel.

From the table 30, /ẽ, ɔ̃, ɯ, ãi / are very low in frequency and have been assigned to residue. In this study /ə̤, œ/ will be included since they are part of a pattern because Geba 1 and Geba 2 have them. So there are 10 clear vowel phonemes and 9 breathy vowel phonemes in the Bwe word list. The following table shows the inventory of vowel phonemes which occur in Bwe.

	Front			Central		Back	
	breathy	Unrounded	Rounded	breathy	rounded	Breathy	rounded
Close	i̤(9)	i(79)				ṳ(39)	u(68)
Near-close	ɪ̤(2)	ɪ(29)					
Close-mid	e̤(23)	e(30)				o̤(22)	o(86)
Mid				ə̤(2)	ə(44)		
Open-Mid	ɛ̤(89)	ɛ(94)	œ(2)			ɔ̤(21)	ɔ(83)
Open	a̤(38)	a(140)					

Table 34: Vowel phoneme chart in Bwe and frequency counts

The following examples show the occurrence of vowels in Bwe.

/i/, an unrounded close front vowel.

Examples:

θ i˧ *'comb'*

/i̤/, a breathy unrounded close front vowel.

Examples:

m i̤˧ *'name'*

/ɪ/, an unrounded near-close front vowel.

Examples:

ʃʰ ɪ˧ *'chicken'*

/ɪ̤/, an unrounded near-close front vowel.

Examples:

l ɪ̤˧ .la̤˧	*'to be old'*

/u/, a rounded close back vowel.

Examples:

ʔ u˧ .θɛ˧	*'coconut(fruit)'*
ʔaˀ.h u˧	*'to steal'*

/ṳ/, a breathy rounded close back vowel.

Examples:

deˀ.k ṳ˧	*'wing'*

/e/, an unrounded close-mid front vowel.

Examples:

ʍ eˀ	*'to be dry'*

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

Examples:

θaˀ.w e̤˧	*'to kind to'*

/o/, a rounded close-mid back vowel.

Examples:

ʃʰ o˧	*'feather'*
d o˧	*'to be big'*

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

Examples:

θaˀ.p o̤˩	*'to sing'*

/ɛ/, an unrounded open-mid front vowel.

Examples:

ʃʰ ɛ˥	*'to hurt'*
θ ɛ˥	*'to be new'*

/ɛ̤/, a breathy unrounded open-mid front vowel.

Examples:

k ɛ̤˦	*'we (Ip)'*

/œ/, an open-mid front rounded vowel occurs in only two words in the list.

Examples:

c œ˦	*'cool'*
klɛ̤˩.ʔ œ˦	*'to be fast'*

/ə/, an unrounded mid central vowel. It mostly occurs in minor syllables. In major syllables, it occurs in only one word in the list.

Examples:

θ ə .ʔo˥	*'lungs'*
c ə˦ .wa̤˦.	*'to scratch'*

/ə̤/, a breathy unrounded mid central vowel.

Examples:

l ə̤ .mɔ̤˦	*'mouth'*

/ɔ/, a rounded open-mid back vowel.

Examples:

ʔ ɔ˦	*'to drink'*

/ɔ̤/, a breathy rounded open-mid back vowel.

Examples:

a˦.p ɔ̤˩ .tɛ̤˩	*'to speak'*

/a/, an unrounded open front vowel.

Examples:

ʔ a˧ *'to eat'*

ʃʰ a˧ *'to push'*

/a̤/, an unrounded open front vowel.

Examples:

cə˧.w a̤˧ . *'to scratch'*

2.2.3 Bwe Tones

Saw Lar Baa claims that there are five different pitches (55, 44, 33, 22, 11) and two contour tones: high falling and low falling (54, 21) which co-occur with creaky voice in his data in Bwe.

The linguist who recorded this Bwe wordlist found ten tones. The following table shows the phonetic transcription of the different pitches which occured in the data and their frequency counts.

Phonetic Notation	Frequency counts
[11]	60
[33]	547
[44]	7
[55]	203
[43]	7
[23]	2
[24]	3
[45]	15
[34]	5
[32]	5

Table 35: pitch chart in Bwe and frequency counts

Ten 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 counts of the tones which occur in the list. From table 35, only mid and high tones had a very high frequency counts, and low tone and half-high rising tone had a medium occurrence. Thus, it appears that the other six tones are very low frequency and have been assigned to residue. For the phonetic similarity, [˥] may be a high tone, [˦˥], [˧˥] and [˩˧] may be a mid tone, and [˩˥] and [˧˥] may be a half-high rising tone. If the assumption is true, two words in the same tones may be a homophone. The following table illustrates the frequency counts of all tones. Thus, it was concluded in this study that there are 4 tones in Bwe. The following table illustrates Bwe tones.

Phonemic Notation	Description	Tone stick	Frequency counts
/11/	Low tone	˩	60
/33/	mid tone	˧	547
/55/	High tone	˥	203
/45/	Half-high rising tone	˥˥	15

Table 36: Phonemic tone chart in Bwe and frequency counts

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

Examples:

θu˥.kʰw ɛ˩ *'corn'*
lu˥.do˥.l ɛ˩ *'where'*

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

Examples:

ʔ a˧ *'to eat'*
ʔ a˧ .ʃʰɛ˥.tɛ̱˩ *'to sell'*

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

Examples:

ʃʰ ɛ˥	*'to hurt'*
θ ɛ˥	*'to be new'*

/45/ represent [˦˥], 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:

tʰ ɛ˦˥	*'gold'*
tʰ ɔ˧pʰje˦˥	*'pounded rice'*

2.2.3.1 Co-occurrence Charts

The following table shows the co-occurrence of consonant phones and vowels and the frequency with which they occur in the word list.

	˩	˧	˥	˦	˩˩	˧˧	˦˦	˥˩	˥˥	˦˩
p	10	15		1						1
t	9	20		4		1				
k	4	27		10						
ʔ		19		16			2	1		
b		28		10						
d		18		17						1
c		17		2					2	
ɟ	2	2								
p^h		17		4						1
t^h		18	1	17					1	1
k^h		33	1	3						
$ʃ^h$		22		17			1		2	2
ʍ		3		2						
θ		46	4	21			1			
x		1								
h	2	15		6						
m	1	61		18						2
n	3	28		3				2		
ɬ				1						
l	9	54	1	4			1	1		1
r		1								
w	4	14			3					
j	2	11		1		1				1
pl	2	6		3						

Table 37: The co-occurrence of initial/medial consonants and tones in Bwe

	˩	˧	˦	˥	˩˦	˧˦	˦˦	˥˦	˦˥	˥˥
kl	1	7		1						1
k^hl		5		2						
tɕ	1	13		3						
t^hw		2							1	
k^hw	1	6		1						
pw	3	16		4				1		
lw		2		1						1
kw		2								
$ʃ^hj$		1								
θw		2								
θr		3		1						
tɕw		1								
mj		1								
p^hl	1	1								
ʃw									1	
p^hj										1
plj		1								
jw		1								
pj	4									

Table 37: The co-occurrence of initial/medial consonants and tones in Bwe

All vowels occur with tones excepts /ə/ , /ạ̀/, /ə̀/, /ɛ̀/, /a/ in minor syllables. The following table illustrates the co-occurrence of vowels and tones which were found in the word list.

	˩	˧	˨	˥	˩˥	˧˥	˧˧	˥˧	˥˥	˨˨
i	1	42	1	35						2
i̤	2	7								
ɪ		12		16					1	
ɪ̤		2								
ɯ		2								
u		33		30			2		1	2
ṳ	1	38		1						
e		19		6			1	1	2	2
e̤	4	18			1					
ē		1								2
o		44	4	34			1		1	
o̤	11	12								
ɛ	3	63	2	20				1	1	2
ɛ̤	11	68		2	1	1				
œ		2								
ə		1								
ə̤										
ɔ	3	49		27				2	1	
ɔ̤	10	11								
ɔ̃		1								
a	2	98		32			1			5
a̤	12	24				1		1		
ãi̤					1					

Table 38: The co-occurrence of vowels and tones in Bwe

2.2.3.2 Tone Contrasts

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

(a) [˦] – [˥]	ba˦	*'bamboo shoot'*	ba˥	*'yellow'*
	ʔi˦	*'to give'*	ʔi˥	*'to pay'*
	θɛ˦	*'day'*	θɛ˥	*'to be new'*
	ho˦	*'bamboo'*	ho˥	*'silver'*
(b) [˥˦] – [˦]	co˥˦	*'land leech'*	co˦	*'to be cold'*
(c) [˥] – [˦˦]	ʔo˥	*'rotten'*	ʔo˦˦	*'to bark'*
(d) [˥] – [˥˥]	tʰɛ˥	*'bear'*	tʰɛ˥˥	*'gold'*

(a-d) illustrate major phonological contrasts: (a) between a mid-level tone and a high-level tone, (b) between a half-high falling tone and a mid-level tone, (c) between a high-level tone and a mid tone (a mid falling tone), (d) between a high-level tone and a half-high rising tone. It is noted that these are not established as tonemes.

2.2.3.3 Allotones

There is one tone with allophonic variants. The mid tone [˦] becomes a mid-rising tone [˦˥] when it occurs with a question particle.

Examples:

pwe˥.l ɛ˦˥	*'how many(persons)'*
pw a̤˦˥ .no˦˥	*'who'*

It was noted that there were four words in the Bwe word list which occur with mid-rising tone. Three of them are question words. The other is as follows:

θɛ˦.ʔ e˦˥	*'red pepper'*

2.3 Syllable Structure

The syllable is the basis of Bwe word structure. Bwe distinguishes between MAJOR SYLLABLES and MINOR SYLLABLES. 2.3.1 describes the structure of major syllables and 2.3.2 discusses minor syllables.

2.3.1 Major Syllables

Saw Lar Baa said that there are two syllable types: CV and CCV in major syllables. The onset of a major syllable is composed of an initial consonant (C_1), an optional medial consonant (C_2). The nucleus is composed of a vowel (V). The final aspect in the syllable structure is tone, represented by the symbol T. Every major syllable carries a tone. The syllable is always open.

This study found the same syllable structure as Saw Lar Baa. The description of Bwe major syllable in this study is described as follows:

Bwe syllables are always open, without any coda. Onsets are not required. The initial consonant may be followed by one or two medial consonants. Therefore, syllables have the schematic structure of CV, CCV, or V (where V may be filled by a single vowel or diphthong, but rarely a diphthong). Only one word was found in which a vowel occupied the diphthong. The CCCV pattern was found in only one word from Bennett's Bwe word list.

The schematic structure of a major syllable is $(C_1)(C_2)$ V T

C_1	is any consonant
C_2	is an alveo-palatal fricative, a liquid, or a glide
V	is a vowel
T	is a tone

	i	i̤	ɪ	ɪ̤	ɯ	u	ṳ	e	e̤	ē	o	o̤	ɛ	ɛ̤	œ	ə	ɔ	ɔ̤	ɔ̃	a	a̤	ãi
p	1					1	2	1		1	2	7	1	2			5	3		1	2	
t		1	1				2	1	1	1	3			23			1	1		1	4	
k	2	1	2			4	4		3		4	3	1	2			4	4		8	4	
ʔ	3		3			5		2			9		3		1		5			11		
b			1			5					6		5				3			19		
d	3		5		2	9		4			5		3				5			6		
c			2			4	2	1			2		3	1	1	1	4					
ɟ									1					1				2				
p^h	1					2		4			9		2				1			5		
t^h	10		1			2					7		6				3			11		
k^h	4		1			3					6		8				12			10		
s^h																	1					
$ʃ^h$	7		8			1					9		6				10			9		
ʍ	1							3					1									
θ	7					11		2			13		19				5			15		
x																				1		
h	5					4		2			3		5				2			2		
m	12	3	4	1		4	12		5		3	1	5	12			2	3		8	7	
n						1	3		2		1	3		9			6	2		7	3	
ɬ													1									
l	7		1	1		3	12	2	4		2	2	16	13			9	3		18	10	
r		1																				
w		2				1		4				1		6				1		2	3	1
j							1	3			1	4		3			2	1	1	3	5	
pl			1					1	1				2	1			2	1		2		
kl											1		6	1			2			1		

Table 39: The co-occurrence of consonants and vowels of major syllables in Bwe

	i	i̤	ɪ	ɪ̤	ɯ	u	ṳ	e	e̤	ẽ	o	o̤	ɛ	ɛ̤	œ	ə	ɔ	ɔ̤	ɔ̤̃	a	a̤	ãi
$k^hɬ$	3					1					1		1				1					
tɕ	1					7	1					1	3				1			3		
t^hw	2																					
k^hw	6																					
pw	1							4	2					16							1	
lw	2	1												1								
kw														1						1		
p^hl																	1			1		
$ʃ^hj$																				1		
θw	2																					
θr	2					1		1														
tɕw	1																					
p^hr																	1					
p^hj								1														
plj								1														
ʃw								1														
mj								1														
pj																					4	
jw									1													

Table 39: The co-occurrence of consonants and vowels of major syllables in Bwe

In major syllables, we can summarize that the phones /p, b, t, d, c, k, ʔ, p^h, t^h, k^h, tɕ, m, n, θ, h, $ʃ^h$, ɬ, j, l, ʍ, w, r, ʃ/ may occur as the initial element of the syllable. The phoneme /j, w, l, r/ may occur as the second element in the consonant cluster. Only the consonant /j/ occurs as the third element. The following table illustrates the consonant phones which occur in the initial position, second position and third position in a major syllable of Bwe. The numbers in the table show the frequency of the consonant phones which occur in the word list.

	Initial element	Second element	Third element
p	70		
b	38		
t	34		
d	42		
c	21		
ɟ	4		
k	59		
ʔ	38		
p^h	28		
t^h	44		
k^h	60		
s^h	1		
m	83		
n	37		
θ	78		
x	1		
h	23		
$ʃ^h$	51		
ɬ	1		

Table 40: The initial, second and third elements of major syllables in Bwe

	Initial element	Second element	Third element
j	17	7	1
l	76	32	
ʍ	5		
w	20	48	
r	1	5	
ʃ	1		
tɕ		18	

Table 40: The initial, second and third elements of major syllables in Bwe

Examples are shown in the following data.

(a)	V	a˧˩.pɔ̰˩.tɛ̰˩	*'to speak'*
		mi˥̰.a˧˩.kɔ˧˩	*'cat'*
		i˥̰.nɔ̰˧˩	*'brain'*
(b)	CV	de˧˩	*'year'*
		θɛ˧˩	*'day'*
		lṵ˧˩	*'stone'*
(c)	CCV	t^{h}wi˧˩	*'dog'*
		tɕu˧˩.θi˥̰.mḭ˧˩	*'fingernail'*

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

It was noted that there is one word which follows the pattern is CCCV. The following examples illustrate the CCCV patterns in Bwe which is a possible exception.

a)	CCCV	ka˥̰.plje˧˩	*'buttocks'*

2.3.2 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 generally have a /ə/ nucleus, though /a/, /a̱/, /ə̱/, and /ɛ̱/ are also found. Minor syllables without an onset 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 general occur before a major syllable but rarely occur in two adjacent syllables as in the following example: ʔa.pwɛ̱ɬ.tə.kə.jɛ̱ɬ *'hundred (persons)'*. The schematic structure of a minor syllable is as follows: $(C_1)V$.

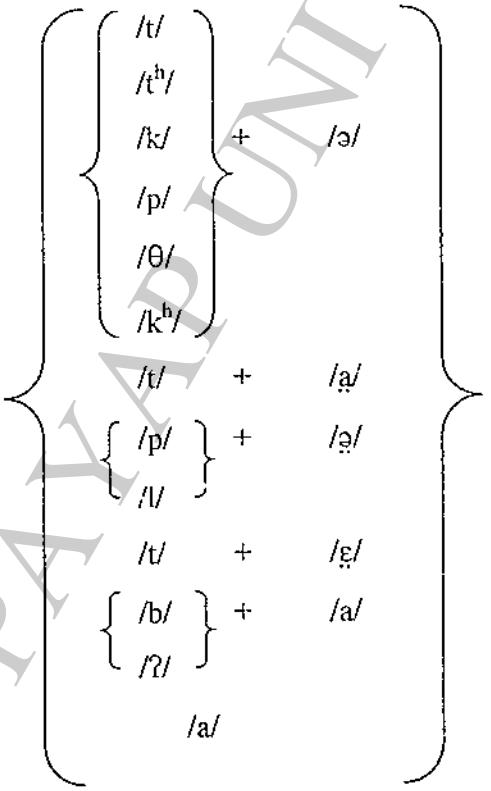


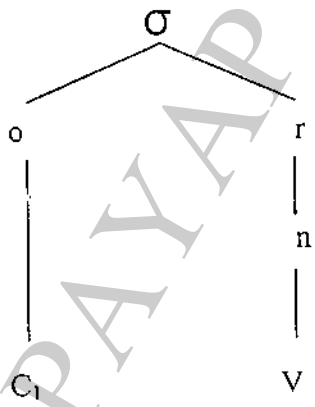
Figure 13 : The structure of minor syllables in Bwe

In minor syllables, there are 9 consonant phonemes which occur in the syllable. Only 5 vowels /ə, ə̤, a, a̤ , ɛ̤/ occur following these consonants. The following table illustrates the consonant phones which occur in the initial position. The numbers in the table show the frequency of the consonant phonemes which occur in the word list.

	Initial element
p	5
t	32
k	7
t^h	1
k^h	3
b	1
ʔ	4
θ	3
l	1

Table 41: The initial elements of minor syllables in Bwe

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



(syllable)
(onset-rhyme)
(nucleus)
(consonant-vowel)

For example,

(a)	CV	ta̤.p^ho˩	*'fish'*
		la̤.ma̤˩	*'mouth'*
		tɛ̤.$ʃ^h$i˩	*'urine'*
		ba.t^ha˩	*'to lift'*

(b) V a.pwɛ̰˧.θa˥.θo˥ *'six (persons)'*

ma˥.nɔ˩.a.ʃʰo˧.a.kʰɛ˧ *'when (past)'*

The examples in (a) illustrate CV- minor syllables, with all possible nucleuses found in the data; (b) illustrates V- minor syllables.

2.4 Conclusion

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

2.4.1 Phonemes

Consonants: There are 24 consonant phonemes in Bwe. The follwing table shows Bwe consonant phonemes.

		Bilabial	Labial-Velar	Dental	Alveolar	Postalv	Alveo-Palatal	Palatal	Velar	Glottal
Plosive	Asp.	p^h(28)			t^h(45)				k^h(56)	
	Vl.	p(74)			t(66)			c(21)	k(66)	ʔ(42)
	Vd.	b(39)			d(41)			ɟ(4)		
Fricative	Asp.				s^h(1)	$ʃ^h$(50)				
	Vl.		ʍ(5)	θ(81)						h(23)
Affricate							tɕ(18)			
Nasal	Vd.	m(83)			n(37)					
Liquid	Lateral fricative				ɬ(1)					
	Lateral approximant				l(112)					
	Trill				r(6)					
Glide			w(70)				j(27)			

Table 42: Consonant phoneme chart in Bwe and frequency counts

Vowels: There are 10 clear vowel phonemes and 9 breathy vowel phonemes in the Bwe word list. All vowels can also be breathy except /œ/. The breathy vowel is phonemic because minimal pairs and an analogous environment contrast can be found at a high rate. The following table shows Bwe vowel phonemes.

	Front			Central		Back	
	breathy	Unrounded	Rounded	breathy	Rounded	breathy	rounded
Close	i̤(9)	i(79)				ṳ(39)	u(68)
Near-close	ɪ̤(2)	ɪ(29)					
Close-mid	e̤(23)	e(30)				o̤(22)	o(86)
Mid				ə̤(2)	ə(44)		
Open-Mid	ɛ̤(89)	ɛ(94)	œ (2)			ɔ̤(21)	ɔ(83)
Open	a̤(38)	a(140)					

Table 43: Vowel Phoneme Chart in Bwe and frequency counts

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

Phonemic Notation	Description
/˩/	Low tone
/˧/	mid tone
/˥/	High tone
/˧˥/	Half-high rising tone

Table 44: Phonemic tone chart in Bwe

2.4.2 Syllable Structure

There are two types of syllables in Bwe: major syllables and minor syllables. The major syllable consists of all vowel phonemes and bears a distinctive tone. There are three syllable types in major syllables in Bwe: V, CV, and CCV. The nucleus of the syllable can occur without onset, or it can be preceded by a consonant or a consonant cluster. The CV syllable pattern is by far the most common.

The minor syllables consist of an optional initial consonant, and never bear a distinctive tone. The minor syllables with onsets have generally an /ə/ nucleus, though /a/, /a̤/, /ə̤/, and /ɛ̤/ are also found. Onsetless minor syllables always have an /a/ nucleus.