A grammar of Gaahmg, a Nilo-Saharan language of Sudan

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2 Phonology

2.1 Consonants

Gaahmg has 21 consonant phonemes as shown in table 1. There is contrastive length for fricatives, nasals, lateral, and rotic phonemes, but not for other consonant phonemes.

Table 1: Consonant Phonemes

	Labial	Dental	Alveolar	Palatal	Velar
Vl. Plosives	p	t̪	t	c	k
Vd. Plosives	b	d̪	d	ɟ	g
Fricatives	f, f:		s, s:		
Nasals	m, m:		n, n:	ɲ, ɲ:	ŋ, ŋ:
Laterals			l, l:		
Rotics			r, r:		
Approximants	w	ð[1]		y[2]	

2.1.1 Consonant articulation

Gaahmg dental and alveolar plosives are contrastive. Dental plosives are made with the tongue tip touching the back of the upper teeth. The articulation of the alveolar plosive tends to vary from person to person between alveolar and retroflex. The plosive is produced with the tongue tip or the underside of the tongue tip touching the alveolar ridge or slightly behind the alveolar ridge. The phoneme [r] is a flap, but when lengthened [r:] is realized as a trill.

The phoneme /ð/ deserves special attention. It is best described as a dental approximant since the tongue does not necessarily touch the teeth, although it can protrude out of the open mouth between the teeth. The articulation is most similar to that of the IPA [ð] but has less friction.

2.1.2 Consonant contrasts

2.1.2.1 Phonetically similar contrasts

The consonants are considered to be phonemic based on the minimal and near minimal pairs of (1) in which phonetically similar consonants are contrasted. Root-final velar consonants are written in parentheses to indicate that they do not surface.

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[1] The interdental fricative symbol {ð} is used to represent the dental approximant phoneme.
[2] The symbol *{y}* is used instead of the IPA symbol *{j}*.

(1) **Consonant contrasts**

p - b	pāḏá(g)	‘rope material’	báḏà	‘gourd bowl’
p - f	páré(g)	‘leather bag’	fárŋá(g)	‘bird type’
p - w	páásèè	‘basket type’	wáásāā	‘stone type’
b - m	bɔ̀ɔ̀l	‘ground crack’	mɔ̀ɔ̀l	*village name*
b - w	bāár	‘tribe member’	wáár	‘insect type’
m -w	mīīḏ	‘stone’	wīī-ḏ	‘breast’
m - n	māāng	‘disagreement’	nāānḏ	‘day’
f - w	fīīḏ	‘feather’	wīī-ḏ	‘breast’
ṭ - ḏ	ṭɔ̄ɔ̄r	‘larynx’	ḏɔ̀ɔ́r	‘animal fence’
ṭ - t	ṭɛ́ɛ̀r	‘carving tool’	tɛ́ɛ̀l	‘anchor’
ṭ - s	ṭálɔ̀(g)	‘tax’	sálɔ̄(g)	‘army ant’
ḏ - d	ḏɔ̀ɔ́r	‘animal fence’	dɔ̄ɔ̄r	‘hammer’
ḏ - n	ḏórsó	‘tumor’	nɔ̀rnɔ́ó	‘saliva’
ḏ - l	ḏɛ̄ɛ̀l	‘lake’	lɛ́ɛ́l	‘grass (GEN.)’
ḏ - r	ḏùù-ḏ	‘year’	rùù-ḏ	‘perennial stream’
ḏ - ð	ɛ̄ɛ̄ḏ	‘eye’	mɛ̄ɛ̄ð	‘tree type’
	cɛ̄ḏáŋ	‘illness type’	mɛ̀ðān	‘youth leader’
t - d	téɛ̀l	‘anchor’	dɛ̀ɛ̀l	‘collar bone’
t - s	téɛ̀l	‘anchor’	séɛ̀n	‘ruler’
d - n	dɔ́ɔ́lɟ	‘tree type’	nɔ̀nḏ	‘demon’
d - l	dɛ̀ɛ̀l	‘collar bone’	lɛ́ɛ́l	‘grass (GEN.)’
d - r	dɔ̀wɔ̀	‘bean type’	rɔ̀ɔ̀wɔ̀	‘net’
d - ð	dɔ̄d	‘stork’	ɟááð	‘old clothing’
s - ð	āwɛ̄ɛ̄s	‘bird type’	lɛ̄ɛ̄ð	‘planting drill’
n - l	nɔ̄nḏ	‘demon’	lɔ̀ŋḏ	‘tree type’
n - r	nāān-ḏ	‘day’	rāāɛ̄	‘quarrel’
n - ɲ	nāān-ḏ	‘day’	ɲāàŋ	‘crocodile’
n - ŋ	nāms	‘food, eating’	ŋālg	‘neck’
l - r	ḏɛ̄ɛ̀l	‘lake’	ḏɛ̀ɛ̄r	‘leech’
c - ɟ	cāà	‘cooking stone’	ɟāā	‘boy, son, person’
c - y	cāā	‘bath’	yààð	‘sister’
ɟ - ɲ	ɟāā	‘boy, son, person’	ɲāā	‘girl, daughter’
ɟ - y	ɟááð	‘ragged clothes’	yààð	‘sister’
ɲ - y	ɲāàŋ	‘crocodile’	yāàm	‘bride’
ɲ - ŋ	ɲááfàr	‘mustache’	ŋáásāā	‘tree type’
k - g	káál	‘house fence’	gāàl	‘falcon’
k - w	káár	‘stew’	wáár	‘insect type’
g - ŋ	gàrŋè	‘dung’	ŋārná(g)	‘leach’
g - w	gàà	‘pumpkin type’	wāā	‘water’

2.1.2.2 Consonant length contrasts

There is little, if any, phonetically contrastive length of plosives in any environment. The same is true for the approximants /w/, /ð/ and /y/. Although plosives and approximants have little if any contrastive length, fricatives and other sonorants are contrastive for length in intervocalic position of a few nouns, such as those in (2).

(2) **Intervocalic consonant length contrasts**

f - ff	áfáḍ	'blood'	cáffá(g)	'side (of body)'
s - ss	básár	'dried food'	bāssà-ḍ	'large intestine'
m - mm	sāmáŋ	'sorghum storehouse'	ṭámmál	'chair'
ɲ - ɲɲ	dəɲər-g	'unable to speak (ADJ.PL)'	ɲēɲɲērās	'full (ADJ.PL)'
ŋ - ŋŋ	ɟíŋ-íḍ	'louse'	ɟìŋŋər	'lyre'
r - rr	kāráábbá [kāráábá]	'troublesome (ADJ)'	pārrās	'full (ADJ)'
l - ll	wílì(g)	'stone name'	ṭīllī(g)	'tree, flower'

2.1.3 Consonant rules

Final consonants pose a challenge in Gaahmg. In (3), root-final consonants in three different verb forms sometimes surface in three different ways. Root-final consonants are word-final in the incompletive (INCP), intervocalic in the past continuous (CONT.P), and in a third environment in the deictic completive (COMP.D).

(3) **Final consonants in various environments (Presented in surface form)**

	3sN INCP	3sN CONT.P	3sN COMP.D	
(a)	àɔ̄	àw-án	àb-āgā	'sit'
(b)	káɛ́	káy-án	káɟ-ágā	'bring'
(c)	cīī	cī-ə́n	cīg-ə́gə̄	'wear'
(d)	cūḍ	cūḍ-ə́n	cūḍ-úgū	'climb'
(e)	lɔ̀f	lɔ̀f-án	lɔ̀f-ɔ̄gɔ̄	'do magic'
(f)	lās	lās-án	lās-ágā	'roll-up'
(g)	ɲām	ɲām-án	ɲām-ágā	'break'
(h)	gɔ̀n	gɔ̀n-án	gɔ̀n-ɔ̄gɔ̄	'grab'
(i)	gùŋ	gùŋ-ə́n	gùŋ-ūgū	'agree'
(j)	māl	māl-án	māl-ágā	'gather'
(k)	wēr	wēr-án	wēr-ágā	'watch'
(l)	ɲáɔ́	ɲáw-án	ɲáw-ágā	'request'
(m)	kɔ́ɛ́	kɔ́y-án	kɔ́y-ɔ́gɔ̄	'cook'
(n)	fɛ́ð	fɛ́ð-án	fɛ́ð-ágā	'release'
(o)	pāā	pā-án	pā-ḍágā	'guard'

The root-final consonants of (3a-b) surface in three different ways, and the final consonants of (c, l, m) surface in two different ways. A root with final vowel is given for comparison in (o).

In (3a-c), the root-final consonants surface differently in the two environments of the past continuous and deictic completive. To account for these differences, we propose that the root-final consonant in the deictic completive becomes underlying geminate through suffixation. The deictic completive suffix is analyzed as *-CAggA*, where *C* is a consonant with the same features as the root-final consonant[3] and *A* is a back vowel taking the [ATR] and [round] features of the root. The suffix causes the root-final consonant to be underlying doubled, but a degemination process causes the geminates to surface with little, if any, phonetically contrastive length. The past continuous form has the suffix *-An*, where *A* is an unrounded back vowel and takes the [ATR] value of the root. Thus, the root-final consonant weakens in the past continuous form with intervocalic environment, but not in the deictic completive form where it is underlying geminate through suffixation.

In (3a-c, l-m), the root-final consonants also surface differently in the word-final environment of the incompletive compared with the environment of the deictic completive. We analyze the root-final consonants in these verbs to weaken to vowels word-finally.

The verb forms of (3) are re-presented in (4) with the proposed underlying form on the left and underlying geminates represented in the deictic completives. The surface form is given in brackets to show where it differs from the underlying form.

(4) **Final consonants in various environments re-presented**

	UR	3sN INCP	3sN CONT.P	3sN COMP.D		
(a)	/ab/ L	àɔ̄	àw-án	àb-bāggā	[àbāgā]	‘sit’
(b)	/kaɟ/ H	káé	káy-án	káɟ-ɟággā	[káɟágā]	‘bring’
(c)	/cig/ M	cīī	cī-ə́n	cīg-gə́ggə̄	[cīgə́gə̄]	‘wear’
(d)	/cuḍ/ M	cūḍ	cūḍ-ə́n	cūḍ-ḍúggū	[cūḍúgū]	‘climb’
(e)	/lɔf/ L	lɔ̄f	lɔ̀f-án	lɔ̀f-fɔ̄ggɔ̄	[lɔ̀fɔ̄gɔ̄]	‘do magic’
(f)	/las/ M	lās	lās-án	lās-sággā	[lāságā]	‘roll-up’
(g)	/ɲam/ M	ɲām	ɲām-án	ɲām-mággā	[ɲāmágā]	‘break’
(h)	/gɔn/ L	gɔ̄n	gɔ̀n-án	gɔ̀n-nɔ̄ggɔ̄	[gɔ̀nɔ̄gɔ̄]	‘grab’
(i)	/guŋ/ L	gūŋ	gùŋ-ə́n	gùŋ-ŋūggū	[gùŋūgū]	‘agree’
(j)	/mal/ M	māl	māl-án	māl-lággā	[mālágā]	‘gather’
(k)	/wɛr/ M	wɛ̄r	wɛ̄r-án	wɛ̄r-rággā	[wɛ̄rágā]	‘watch’
(l)	/ɲaw/ H	ɲáɔ́	ɲáw-án	ɲáw-wággā	[ɲáwágā]	‘request’
(m)	/kɔy/ H	kɔ́é	kɔ́y-án	kɔ́y-yɔ́ggɔ̄	[kɔ́yɔ́gɔ̄]	‘cook’

[3] However, *C* becomes *ḍ* when attached to a root-final vowel as in *pā-ḍággā* ‘guard’.

	UR	3sN INCP	3sN CONT.P	3sN COMP.D		
(n)	/fɛð/ H	fɛ́ð	fɛ́ð-án	fɛ́ð-ðággā	[fɛ́ðágā]	'release'
(o)	/pa/ M	pāā	pā-án	pāḍ-ḍággā	[pāḍágā]	'guard'

The root-final plosives /b/, /ɟ/ and /g/ of (4a-c) surface in the deictic completive, but are weakened word-finally in the incompletive form, and intervocalically in the past continuous form. Similarly, the approximants /w/ and /y/ of (l-m) are weakened word-finally in the incompletive form. The bilabial and palatal plosives of (a-b) weaken to corresponding approximants intervocalically (/b/ becomes [w] in *àw-án*, /ɟ/ becomes [y] in *káy-án*). Thus we have the rule of {P1a}, where P represents a phonological rule. The plosives /b/, /ɟ/ of (a-b) and approximants /w/ and /y/ of (l-m) weaken to corresponding vowels word-finally (/b/, /w/ become [ɔ] or [u], and /ɟ/, /y/ become [ɛ] or [i], depending on the [ATR] quality of the preceding vowel). Thus we have the rule of {P1b}. The dental plosive /ḍ/ of (d) does not weaken intervocalically or word-finally, and the alveolar plosive /d/ is not attested root-finally in verbs.

{P1} Bilabial and palatal weakening
- (a) /b/, /ɟ/ are weakened intervocalically to approximants.
- (b) /b/, /ɟ/, /w/, /y/ are weakened word-finally to vowels with the same [ATR] quality as the preceding vowel.
- (c) /w/, /y/ before word-final sonorants are weakened to vowels with the same [ATR] quality as the preceding vowel.

As will be evident from the distribution of word-final consonant clusters in 2.1.4.2, all word-final consonant sequences are sonorant-obstruent in surface form. Therefore, as stated in {P1c}, /w/, /y/ are weakened before word-final sonorants. In this way, word-final sonorant-sonorant consonant sequences are avoided. For example, the *ɔ* of *càɔ̀r* 'rabbit' and the *ɛ* of *gɔ̀ɛ̄n* 'metal worker' could underlying be *w* and *y* respectively, but are weakened to vowels in the surface form.

The velar plosive /g/ of (4c) is weakened to elision as stated in {P2}.

{P2} Velar plosive elision
/g/ is elided both inter-vocalically and word-finally when following a vowel.

Since all word-final consonant sequences are sonorant-obstruent in surface form as will be discussed in 2.1.4.2, the contrast between plosives and approximants is neutralized in the first of the two consonant positions. Therefore, there is also the rule of {P3}.

{P3} Plosive weakening
Plosives are weakened to approximants when they immediately precede word-final obstruents and follow vowels.

For example, the *w* in *d̤ā̃wd̤* 'fertile soil' and *y* in *kā̃yd̤* 'cup, spoon' could underlyingly be *b* and *ɟ* respectively, but weaken to sonorants in the surface form. Rules {P1-P3} apply throughout the language in roots and when abound morphemes are attached.

2.1.3.1 Underlying and surface representations of plosives

In this section, we discuss the neutralization of plosives in various environments. The chart of (5) summarizes the plosive changes mentioned in this section, which are illustrated with examples in the following sections. The environments are as follows: word-initial B, intervocalic V, either consonant in a consonant sequence -C_1C_2-, word-final before an obstruent $\underline{C}C_{[-son]}$#, word-final E. A dash indicates the underlying phoneme has not been attested to surface in the environment. An empty slot indicates the phoneme cannot be confirmed to surface in the environment.

(5) **Plosive realizations in various environments**

UR		B	V	-C_1C_2-	$\underline{C}C_{[-son]}$#	E
p	→	p				
t̤	→	t̤				
t	→	t				
c	→	c				
k	→	k				
b	→	b	w	-	w	ɔ, u
d̤	→	d̤	d̤	d̤	ð	d̤
d	→	d	d	d	-	d
ɟ	→	ɟ	y	ɟ	y	ɛ, i
g	→	g	Ø	g	-	Ø
b:	→		b			b̥˺
d̤:	→		d̤			d̤˚˺
d:	→		d			-
ɟ:	→		ɟ			ɟ˚˺
g:	→		g			g˚˺

Voiced and voiceless plosives

Voiced and voiceless plosives surface word-initially. Voiceless plosives do not surface in any other environment. There is neutralization between voiced and voiceless plosives in consonant sequences, as plosives are always voiced in this environment—either in word-medial or word-final consonant sequences.

Voiced plosives and approximants

As the bilabial and palatal weakening rule of {P1} indicates, there is neutralization between the plosives /b/, /ɟ/ and approximants /w/, /y/ intervocalically {P1a}. There is neutralization between the plosives /b/, /ɟ/ and vowels /ɔ, u/, /ɛ, i/ word-finally {P1b}. The velar plosive /g/ is elided intervocalically and word-finally {P2}, but otherwise surfaces. As the plosive weakening rule of {P3} indicates, there is neutralization between plosives and corresponding approximants for the first consonant of a word-final consonant sequence. The dental and alveolar plosives /d̪/, /d/ surface the same as their underlying forms in all other environments.

Geminate plosives /b:/, /ɟ:/, and /g:/

There is no phonetic contrast of length for any plosive in any environment. As will be discussed in section 2.1.3.2, the underlying geminate plosives /b:/, /ɟ:/, and /g:/ are realized as single, devoiced unreleased plosives word-finally, and are realized with little or no lengthening intervocalically. Since the non-geminate plosives /b/, /ɟ/, and /g/ surface as weakened in the same environments that their geminate equivalents surface as single plosives, they are never in contrast.

Geminate plosives /d̪:/ and /d:/

The plosives /d̪/ and /d/ are not weakened intervocalically or word-finally, but also never surface with contrastive length. Intervocalically, the underlying geminate equivalents /d̪:/ and /d:/ surface with little or no length. Word finally, the dental geminate /d̪:/ surfaces the same as for the other geminate plosives—as a single devoiced unreleased plosive, but is released elsewhere. The alveolar geminate plosive /d:/ is not attested word-finally.

Voiceless plosives and voiced geminate plosives

Voiceless plosives are not attested anywhere except word-initially and are in complementary distribution with voiced geminate plosives which cannot be confirmed word-initially. Thus, voiceless plosives could possibly be analyzed as underlying geminate plosives in word-initial position. In this analysis, there would be no underlying voicing contrast in plosives, but only a length contrast[4].

In this thesis, word-initial plosives are written as voiceless plosives since they surface as such. Underlying geminate plosives in word-final and intervocalic

[4] Or, since consonant clusters are not attested word-initially, an alternative analysis would be that geminate plosives are fortis ('strong') consonants and non-geminate plosives are lenis ('weak') consonants.

position are written as voiced geminate plosives, and the reader should assume that all such voiced geminate plosives surface with little or no contrastive length.

2.1.3.2 Plosive distribution

Voiceless plosives surface at the beginnings of words, but not in other environments.

(6) **Voiceless plosive distribution**

	Beginning	
p	púr	'flower'
ṭ	ṭɛ̄ɛ̄-ḍ	'road, path'
t	tɛ̄ɛ̄nḍ	'riddle'
c	céɛ́ɔ̄	'lame person'
k	kābbàr [kābàr]	'wing, armpit'

Voiced plosives surface at the beginnings of words and in consonant sequences. The phonemes /ɟ/ and /g/ occur as the first or second segment of consonant sequences, /ḍ/ and /d/ only occur as the second segment of sequences, and /b/ is not attested in any consonant sequence.

(7) **Voiced plosive distribution**

	Beginning		Consonant sequence	
b	bààɔ	'father'	----	
ḍ	ḍìì	'rat'	mɔ́fḍɛ̄ɛ̄	'snake type'
d	dɔ̄ɔ́làfàà	'wolf'	kágdàr	'food type'
ɟ	ɟìḍ	'husband'	bàɟwáár	'bird type'
			ḍɔ́ggɔ̀lɟā [ḍɔ́gɔ̀lɟā]	'ankle'
g	gəmūūr	'dove'	bāgḍàrs	'lizard type'
			ɟɔ́rgāāl	'bird type'

When the plosives [b], [ɟ] and [g] surface in intervocalic and word-final position, they are underlyingly geminate even though they surface with little or no contrastive length. If they were not geminate, they would be weakened to approximants and vowels in these environments. They are realized as single, devoiced unreleased plosives word-finally, and are realized with little or no length intervocalically.

(8) **Geminate voiced plosive distribution**

	Intervocalic		Final	
bb	lɔbbù(g) [lɔbù]	'navel'	ɟílɔbb [ɟílɔb̚]	'water spring'
ɟɟ	cīɟɟí [cīɟí]	'diarrhea'	bìmìríɟɟ [bìmìriɟ̚]	'bird type'
gg	dāggár [dāgár]	'tortoise'	gàágg [gàág̚]	'bird type'
ḍ	fááḍàr	'nostril'	ḍɔ̀ìḍ [ḍɔ̀ìḍ̚]	'scorpion'

	Intervocalic		Final	
d	cɛ̄dáŋ[5]	'illness type'	dɔ̄d [dɔ̄d̰ˀ]	'bird type'

The voiced plosives /d̰/ and /d/ never surface with contrastive length and are not weakened intervocalically or word-finally. Therefore there is no evidence for the voiced plosives /d̰/ and /d/ to be geminate underlyingly, except for the dental plosive in root-final position of certain verb forms through morphology. As seen in the verb *cūd̰-d̰úggū [cūd̰úgū]* 'climb-COMP.D' of (4), the geminate plosive *d̰:* surfaces in verb forms with little or no contrastive length.

For the remaining data of this thesis, underlying geminate plosives are written without a phonetic realization, but can be assumed to surface with little or no contrastive length.

2.1.3.3 Underlying and surface representations of other consonants

Fricatives and sonorants surface word-initially, intervocalically, word-finally, and in consonant sequences, with the exception of the dental approximant /ð/, which does not surface word-initially, and the approximants /w/ and /y/ which do not surface word-finally. As the rule of {P1c} indicates, the contrast between the approximants /w/, /y/ and vowels /ɔ, u/, /ɛ, i/ is neutralized before a word-final sonorant. This is because only sonorant-obstruent consonant sequences are allowed to surface word-finally, as will be discussed in section 2.1.4.2. As was shown in section 2.1.2.2, length is contrastive for fricatives, nasals, lateral, and rotic phonemes intervocalically in a handful of nouns. These surface forms are summarized in the chart of (9) and examples are given in the following section.

(9) **Fricative and sonorant realizations in various environments**

UR		B	V	$-C_1C_2-$	$\underline{C}C_{[-son]\#}$	$\underline{C}C_{[+son]\#}$	E
f	→	f	f	f	-		f
s	→	s	s	s	-		s
m	→	m	m	m	m		m
n	→	n	n	n	n		n
ɲ	→	ɲ	ɲ	ɲ	ɲ		ɲ
ŋ	→	ŋ	ŋ	ŋ	ŋ		ŋ
l	→	l	l	l	l		l
r	→	r	r	r	r		r
w	→	w	w	w	w	ɔ, u	ɔ, u
ð	→	-	ð	ð	ð		ð
y	→	y	y	y	y	ɛ, i	ɛ, i

[5] Or *cɛ̄d̰áŋ*

UR		B	V	-C_1C_2-	$\underline{C}C_{[-son]}\#$	$\underline{C}C_{[+son]}\#$	E
f:	→		f:				
s:	→		s:				
m:	→		m:				
n:	→		n:				
ɲ:	→		ɲ:				
ŋ:	→		ŋ:				
l:	→		l:				
r:	→		r:				

2.1.3.4 Fricative and sonorant distribution

Fricatives and sonorants are attested in five word positions with few exceptions: /y/ and /ð/ are not attested as the second of a consonant sequence, /ð/ is not attested at the beginnings of words, and /y/ and /w/ do not surface word-finally. The sonorants *w* and *y* in *lēwḍá* 'animal (gen.)' and *kàymà* 'lucky stone' can also be interpreted as the vowels *ɔ* and *ɛ*. In section 2.3.5, it is discussed how there is no strong evidence for these phonemes being analyzed as vowels or glides in this environment.

(10) **Fricative and sonorant distribution**

f	B	fɛ̄gg	'water'	s	B	sîìnḍ	'guest'
	C_1	mófḍɛ̄ɛ̄	'snake type'		C_1	rəslūúmàà	'praying mantis'
	C_2	sáárfāā	'rat'		C_2	dɛ́rsá	'sweat'
	V	áfáḍ	'blood'		V	kāsá	'boy'
	E	gàf	'give INCP'		E	kəs	'chair'
m	B	málɔ	'beeswax'	n	B	nərnɔ́ɔ́	'saliva'
	C_1	sīmḍàgg	'salve (N.PL)'		C_1	ɔnsɔ	'plate'
	C_2	gərmù-ḍ	'insect type'		C_2	nərnɔ́ɔ́	'saliva'
	V	lāmāɲ	'knot'		V	gəbbənīḍ	'tribal name'
	E	áám	'bone'		E	sɛ́ɛ̀n	'ruler'
ɲ	B	ɲāàŋ	'crocodile'	ŋ	B	ŋárèmàà	'spirit type'
	C_1	ṭùggùùɲfàà	'tree type'		C_1	bɔ̀ɔ̀ŋmà	'insect type'
	C_2	bɛ̀rɲáɔ	'tomato'		C_2	ṭílŋɔ́(g)	'seed, chain'
	V	kāɲāàḍ	'bowl'		V	áŋɛ́(g)	'elephant'
	E	lúɲ	'boomerang'		E	ḍàŋ	'courtyard'
r	B	rəəwə	'net'	l	B	lōfɔ	'magic'
	C_1	ərŋə-ḍ	'insect type'		C_1	wîilmāā	'ant type'
	C_2	ṭɛ̄grɛ̄lfàà	'bird type'		C_2	kúūrlúúgg	'rodent'
	V	kūūrī	'circle		V	búlíɟɟ	'worm'
	E	ḍáár	'throne'		E	bāàl	'instrument'

Fricative and sonorant distribution (continued)

w	B	wɛ́ɛ́(s)	'house'	y	B	yāàm	'bride'
	C_1	lɛ̄wn̰á	'animal'		C_1	kàymà	'lucky stone'
	C_2	bàɟwáár	'bird type'		C_2	-----	
	V	rəəwə	'net'		V	íyɔ́ɔ́	'oil, fat'
	E	-----			E	-----	
ð	B	-----					
	C_1	gə̄əðg[6]	'thief'				
	C_2	-----					
	V	áðá	'dog'				
	E	t̪ààð	'door'				

2.1.4 Consonant distribution in consonant sequences

2.1.4.1 Consonant sequences across syllable boundaries

There are few restrictions on non-geminate consonant sequences across syllable boundaries (-C_1.C_2-). The coda of a previous syllable (C_1) may be an obstruent or sonorant, nasal or oral, voiced or voiceless. The same is true of the onset of the following syllable (C_2). Additionally, consonants may be both obstruent or both sonorant, both nasal or both oral, and both may be voiced. Further, the consonants may have opposite corresponding values (C_1 = obstruent, C_2 = sonorant; C_1 = nasal, C_2 = oral; C_1 = voiceless, C_2 = voiced; opposite orders of each values as well). However, only fricatives can be voiceless in consonant sequences, and there are no attested voiceless-voiceless sequences except in compound words such as *fɛ́ɛ̄t̪-fā* 'person name (person.name-place)'.

All attested consonant sequences across syllable boundaries are listed in (11), which is divided into sequences with and without nasal consonants. The sonorants *w* and *y* in *kāwn̰á* 'ear wax' and *kàymà* 'lucky stone' can also be interpreted as the vowels *ɔ* and *ɛ*.

(11) **Sequences with nasal consonants**

nn̰	tɛ̄nn̰ás	'bird type'	ɲn̰	sárà̰ɲn̰ā	'tree type'
nd	kándāl	'tree type'	ɲɟ	ɟīɲɟíl	'bird name'
ns	t̪īns-ə̄gg	'asking'	ɲf	tùggùùɲfàà	'tree type'
nf	ráánfàà	'covering (n)'	ŋm	bɔ̀ɔ̀ŋmà	'insect type'
ms	ámsá-n̰	'dryness'	lm	kɔ́ɔ̀lmàà	'tree type'
rn	ŋārná(g)	'leach'	lŋ	bɔ̀lŋè(g)	'medical tool'
rm	gərmūù-n̰	'tree type'	rŋ	kārŋə̄l	'grass type'
rɲ	gàrɲè	'dung'	ym	kàymà	'lucky stone'

[6] With some speakers, the underlying approximant */ð/* of *gə̄əðg* 'thief' only surfaces in the plural form *gəəðə̄ə̄gg*; with other speakers, it also surfaces in the singular form.

Other sequences

sl	rəslūúmàà	'preying mantis'	lḏ	cɛ̄lḏá	'charcoal'
fḏ	mɔ́fḏɛ̄ɛ̄	'snake type'	lɟ	bámàlɟā	'morning star'
rḏ	órḏàà	'army'	lg	ḏə̀lgə̄	'drum'
rs	ḏórsɔ́	'tumor'	lf	kə̂lfə̄	'jaw'
rl	kúūrlúúgg	'rodent'	rɟ	kə́ùrɟə̄	'tree type'
ɟw	bàɟwáár	'bird type'	rg	ṭírgə̀(g)	'nature'
gḏ	bāgḏàrs	'lizard type'	rf	sáárfāā	'rat'
gd	kágdàr	'food type'	wḏ	kāwḏá	'ear wax'
gr	ṭɛ̄grɛ̆lfàà	'bird type'	yḏ	ṭāyḏá(g)	'strainer'

2.1.4.2 Consonant sequences word-finally

In word-final non-geminate consonant clusters (C_1C_2#), C_1 is always sonorant and C_2 is always obstruent. Only the obstruents *ḏ, ɟ, g,* and *s* are attested in the C_2 position. There is partial word-final nasal assimilation in that only homorganic nasals surface before the obstruents *ɟ* and *g*. However, heterorganic nasals surface before the obstruents *ḏ* and *s*.

(12)

Sequences with nasal consonants			**Other sequences**		
ms	nāms	'food, eating'	rḏ	bə̀rḏ	'lion'
nḏ	fānḏ	'cheek'	rs	ɟɛ̀ɛ̀rs	'hippopotamus'
ng	úng[7] [úŋg]	'tear'	lḏ	lɔ́lḏ	'facial blemish'
ns	wīlə̀ns	'hunting'	lɟ	fə̀lɟ	'tree type'
ɲḏ	rə̄ɲḏ	'mud'	ðg	gə̄ə̀ðg [gə̄ə̀g˳˺]	'thief'
ɲɟ	bɛ̀ɲɟ	'upper hip'	wḏ	ḏə̂wḏ	'fertile soil'
ŋḏ	lə̀ŋḏ	'tree type'	yḏ	kə̂́yḏ	'cup, spoon'

The sonorants *w* and *y* in *ḏə̂wḏ* 'fertile soil' and *kə̂́yḏ* 'cup, spoon' can also be interpreted as the vowels *ɔ* and *ɛ*. In section 2.3.5, it is discussed how there is no strong evidence for these phonemes being analyzed as vowels or glides in this environment.

Since no sonorant-sonorant consonant sequences are attested word-finally in (12), we assume that these sequences are not allowed. The bilabial and palatal weakening rule of {P1c} in 2.1.3 is based on this constraint. Since no word-final sonorant-sonorant consonant sequences are allowed, /w/ and /y/ before word-final sonorants must be weakened to vowels with the same [ATR] quality as the preceding vowel. The *ɔ* of *cə̀ə̀r* 'rabbit' and the *ɛ* of *gɔ̀ɛ̄n* 'metal worker' could underlying be *w* and *y* respectively, but weaken to vowels in the surface form.

[7]The underlying nasal *n* of *úng* 'tear' surfaces as *ŋ* in the singular form *úŋg* but surfaces as *n* in the plural form *únígg*.

The plosive weakening rule of {P3} in 2.1.3 is based on the same constraint. Since no word-final sonorant-sonorant consonant sequences are allowed, plosives must be weakened to approximants when they immediately precede root-final obstruents and follow vowels. The *w* in *ḍ̄āwḍ̄* 'fertile soil' and *y* in *kā̄yḍ̄* 'cup, spoon' could underlyingly be *b* and *ɟ* respectively, but weaken to sonorants in the surface form.

2.2 Vowels

Gaahmg has six vowel phonemes as shown in table 2. The vowel /ə/ [ɐ] is phonetically low, made in the same place in the mouth as [a], but with advanced tongue root. The phonemes /ɛ/ and /ɔ/ vary somewhat in phonetic value, becoming closer to the values [e] and [o] respectively in long vowels. To a lesser extent, the phonemes /i/ and /u/ also vary in phonetic value, realized closer to [ɪ] and [ʊ] respectively in short vowels. Vowel length is common and can be analyzed as a vowel sequence in the same syllable or as a lengthened version of a short vowel.

Table 2: Vowel Phonemes

	[-round]		[+round]
	[-back]	[+back]	
[+ATR]	i	ə	u
[-ATR]	ɛ	a	ɔ

The two [ATR] sets of phonemes determine the vowel harmony in the language. Only vowels with the same [ATR] value occur together in the same root. Across morpheme boundaries in the same word, [+ATR] quality spreads to all vowels unspecified for [ATR], either from root to bound morpheme or from bound morpheme to root, whereas [-ATR] quality never spreads. In 3.2, [ATR] quality across morpheme boundaries is further discussed.

2.2.1 Vowel contrasts

2.2.1.1 Phonetically similar contrasts

The six vowels are considered to be phonemic based on the minimal and near minimal pairs of (13). The following symbols refer to the specified positions taken by vowels: B is word-initial, M is word-medial, and E is word-final.

(13) **Vowel contrasts**

i - ɛ	B	īīgg	'milk'	ɛ̄ɛ̄ḍ̄	'eye'
	M	cíl	'spine'	cɛ́l	'dream'
	E	mīī	'goat'	ɲɛ̄ɛ̄	'drawing, colour'

Vowel contrasts (continued)

ɛ - a	B	ɛ̄ɛ̄ŋ	‘back’	áám	‘bone’
	M	ḍɛ̀ɛ̄r	‘leach’	ḍáár	‘throne’
	E	ŋɛ̄ɛ̄	‘drawing, colour’	ŋāā	‘girl, daughter’
a - ɔ	B	áál	‘calf fence/pen’	ɔ́ɔ́l	‘head’
	M	ḍáár	‘throne’	ḍɔ̀ɔ́r	‘animal fence’
	E	máà	‘house’	mɔ̄ɔ̄	‘gunfire’
ɔ - u	B	ɔ́ɔ́l	‘head’	úū-ḍ	‘wasp’
	M	kɔ́ɔ́l	‘snake type’	kùùl	‘*Kulag* clan member’
	E	mɔ̄ɔ̄	‘gunfire’	mūū	‘forehead, face’
ə - i	B	ə̄yúú	‘local tooth brush’	íyɔ́ɔ́	‘oil, fat’
	M	gə̀ə̀l	‘shield’	ɟííl	‘cricket’
	E	wə̄ə̄	‘shade, help’	mīī	‘goat’
ə - ɛ	B	ə̄ə̄ð	‘tree type’	ɛ̄ɛ̄ð	‘water-carrying net’
	M	ḍə̄ə̀r	‘snake type’	ḍɛ̀ɛ̄r	‘leach’
	E	wə̄ə̄	‘shade, help’	rɛ̄ɛ̄	‘cotton, thread’
ə - a	B	ə̀ə̀l	‘hyena’	áál	‘calf fence/pen’
	M	ḍə̄ə̀r	‘snake type’	ḍàà̀r	‘eagle’
	E	wə̄ə̄	‘shade, help’	wāā	‘pond’
ə - ɔ	B	ə̀ə̀l	‘hyena’	ɔ́ɔ́l	‘head’
	M	ḍə̄ə̀r	‘snake type’	ḍɔ̀ɔ́r	‘animal fence’
	E	wə̄ə̄	‘shade, help’	mɔ̄ɔ̄	‘gunfire’
ə - u	B	ə̄ə̄ð	‘tree type’	úū-ḍ	‘wasp’
	M	ŋə̄ə̄m	‘chin’	múùm	*village name*
	E	wə̄ə̄	‘shade, help’	mūū	‘forehead, face’

2.2.1.2 Vowel length contrasts

Short and long vowels occur contrastively in word-initial, word-medial, and word-final positions. However, the short vowel *ɛ* is only attested in word-initial position in pronouns such as *ɛ̄ggà* ‘they (3pN)’ and *ɛ̄gg* ‘their (3pPs, 3pPp)’.

(14) **Vowel length contrasts**

i - ii	B	îlɟ	‘beeswax’	īīgg	‘milk’
	M	cîl	‘instrument’	ṭīīl	‘tree type’
	E	kūūrī	‘circle’	cùùrìì	‘sheave’
ɛ - ɛɛ	M	sɛ̀n	‘skin illness’	sɛ́ɛ̀n	‘ruler’
	E	mɔ́ɔ́sɛ̄	*village name*	māāsɛ̄ɛ̄	‘root type’
ə - əə	B	ə́mīī	‘ant type’	ə̀ə̀mə̄ə̄	‘liver’
	M	səm	‘medicine’	sə́ə́m	‘hunter’
	E	kúsə́	‘grass type’	būūsə̀ə̀	‘stone name’

Vowel length contrasts (continued)

a - aa	B	ārāà-ḍ̈	'lake'	áàrɛ̄ɛ̄	'grass type'
	M	sāɔ̄	'shoe'	sáàɔ̀	'grass-cutter'
	E	cɛ̄lḍ́á	'charcoal'	ālḍ́áá	'earth, dust'
u - uu	B	úlḍ̈	'grinding stone'	úū-ḍ̈	'wasp'
	M	lúŋ	'boomerang'	lúúŋ	'water pot'
	E	gəyù	'grass type'	əyúú	'local tooth brush'
ɔ - ɔɔ	B	ɔ̄ŋ	'meat'	ɔ́ɔ́l	'head'
	M	kɔ̄r	'word, speech'	kɔ́ɔ́l	'snake name'
	E	málɔ̀	'beeswax'	mɛ́lɔ̄ɔ̄	'sugar cane'

2.2.2 Vowel distribution

2.2.2.1 Distribution in word positions

As shown by the contrasts in (14), six short and six long vowels are attested in word-initial, word-medial, and word-final position. In monosyllabic nouns, phonetically short vowels are not common word-medially; only four are attested word-initially—*îl* 'horn', *úlḍ̈* 'grinding stone', *ɔ̄ŋ* 'meat', *ālḍ̈* 'fox', and *ɔ̄ḍ̈* 'wife'; and do not surface word-finally. However, phonetically long vowels are common in monosyllabic nouns: they are most frequent word-medially, then word-finally, and a few occur word-initially. Although vowel length is phonemic, there is neutralization of vowel length word-finally in monosyllabic nouns and verbs. As will be discussed in 2.3.3, vowels are only realized as long in that position. In polysyllabic nouns, short vowels are common in all three word positions, and long vowels are rare word-initially and word-finally.

2.2.2.2 Distribution in noun roots

The distribution of vowels in disyllabic noun roots is given in (15). The [-ATR] vowels (*ɛ, ɔ*, and *a*) and the [+ATR] vowels (*i, u*, and *ə*) function as distinct sets in roots; the vowels of the [-ATR] set never occur with vowels of the [+ATR] set in the same root.[8] Within each set, all possible vowel combinations are attested in roots except *i-u*. The word *ɟììgg-úúl* 'afternoon' is a compound and literally means 'evening-up'.

[8] The following nouns are believed to be compounds because of mixed sets of [ATR] vowels: *fùùlmāā* 'insect type always in houses (*máà* 'house') ', *gāālmɔ́sí* 'tree type (lit. eagle's claws)', *wíîlmàà* 'ant type (*màà* 'mother')', *tùggùùŋfâà* 'tree type (*fâà* 'release'), *rɔ̄slūúmàà* 'bird type (lit. apostle of house)', *tīrímāā* 'bird type (*tírí(g)* 'tree type')', *ʈúúlîîfâà* 'grass type (*fâà* 'release')', *tààsàmīī* 'sorhgum type (*tààsà* 'ducked', *mīí* 'chicken')', *nààḍ̀ì* 'those (*ḍ́í* 'also').'

(15) **Vowel distribution in disyllabic nouns roots**

[-ATR]			[+ATR]		
ɛ - ɛ	wèlɛ̀ŋ	'sour taste'	i - i	fíḍ̪ìn	'perfume'
ɛ - a	cēdán	'illness type'	i - ə	ɟíləbb	'water spring'
ɛ - ɔ	mélɔ̄ɔ̄	'sugar cane'	i - u	ɟìigg-úúl	'afternoon'
a - ɛ	kàà̤ḍ̪ɛ̄l	'bull'	ə - i	màŋìl	'rainbow, spirit'
a - a	ṭ̪álàm	'malnutrition'	ə - ə	gàməl	'forest'
a - ɔ	páɟɟɔ̄ɔ̄	'star'	ə - u	gəmūùr	'dove'
ɔ - ɛ	bórɛ̄-ḍ̪	'eye matter'	u - i	búlíɟɟ	'worm'
ɔ - a	mɔ̀rāā	'governor'	u - ə	būūsə̀ə̀	'stone type'
ɔ - ɔ	fɔ̀ḍ̪ɔ̀r	'nose'	u - u	būŋúr	'youth'

2.2.2.3 Distribution in vowel sequences

Vowel sequences may occur in the same syllable (CV_1V_2, CV_1V_2C, or CV_1V_2CC). Only vowels of the same [ATR] set are paired in sequences, as shown in the list of (16). All possible vowel sequences are attesting in roots except *ɛa*.

(16) **Vowel sequences**

	[-ATR]			[+ATR]	
ɛa	--		iə	ḍ̪íə́rmə̀	'centipede'
ɛɔ	ḍ̪éɔ́l[9]	'jackal'	iu	díū-sū[10]	'planted (V)'
aɛ	bàɛ̀l	'perfume'	əi	ṭ̪ə̀il	'tree type'
aɔ	càɔ̀r	'rabbit'	əu	gəūlḍ̪ə̀ə̀	'fish'
ɔɛ	gɔ̀ɛ̄n	'metal worker'	ui	bùīl	'moisture'
ɔa	gɔ̀à-ḍ̪	'excrement'	uə	būə̀	'tree type'

Vowel sequences may not exceed two vowels, and long vowels do not occur in underlying vowel sequences. However, long vowels do occur in surface form vowel sequences such as in *ɲūūì* 'leopard', where the underlying final-approximant *y* surfaces as a vowel, in accordance with {P1b} in 2.1.3.

2.3 Syllable structure

2.3.1 Syllable types

The syllable structure may be represented as (C)N(C)(C), where the vowel nucleus

[9] In *ḍ̪éɔ́l, bàɛ̀l* and other examples of (16), the vowels *ɔ, ɛ*, and *i* in V_2 position could be analyzed as the glides *w* or *y* if it were not for the fact that sonorant-sonorant sequences are not allowed in word-final consonant clusters.

[10] The root verb is */díw/* 'plant', but in the completive *díū-sū*, *w* becomes *u,* evidenced by the fact that the [+round] quality of *u* is spread to the suffix vowel, which would otherwise be *ə*.

N is the only obligatory constituent of the syllable. The CC codas are only found word-finally and onset-less syllables only word-initially. The nucleus N may be short, long, or a vowel sequence, where long vowels can be analysed as vowel sequences of two short vowels or as lengthened versions of short vowels. The most common syllable types are CN and CNC. The syllable type CNCC commonly occurs in monosyllabic words and word-finally in disyllabic words. Less common syllable types, which only occur word-initially, are N and NC. The syllable type NCC only occurs in monosyllabic words.

In the list of syllable types in table 3, all words are monomorphemic except those with hyphens. The syllable type NCC is not attested with a long vowel except across morpheme boundaries as in *éél-g* 'stomach', and the syllable type CNCC is not attested with a vowel sequence except across morpheme boundaries as in *gəūr-ḍ* 'stomach'.

Table 3: Syllable types (N = syllable nucleus)

	Short		Long		Vowel Sequence	
N	ú	'you 2sN'	ùù	'air'	āɔ̄[11]	'tree type'
NC	îl	'horn'	áám	'bone'	àɔl[12]	'brother'
NCC	ālḍ	'fox'	éél-g	'stomach'	ɔ́ílḍ	'cold'
CN	wā	'no'	wāā	'pond'	būə	'tree type'
CNC	fɔ́l	'hole'	ḍèēr	'leach'	bàèl	'perfume'
CNCC	cúlḍ	'birth sack'	ɟèèrs	'hippo'	gəūr-ḍ	'stomach'

As will be seen in 2.4.3, tone assignment in some disyllabic nouns depends on syllable weight. For this reason, each syllable type is classified according to one of three different weights: light, mid or heavy.

Table 4: Syllable weight of syllable types

Light	Mid	Heavy
V	VC	VVC
CV	VCC	VVCC
	CVC	CVVC
	CVCC	CVVCC
	VV	
	CVV	

[11] As discussed in 2.3.6, the word-final vowel *ɔ* in *āɔ̄* 'tree type' *ɔ* could be interpreted as the glide *w* if it were not for the fact that the definite clitic *=n* for stem-final vowels attaches to this noun (*āɔ̄=n*) instead of the definite clitic for stem-final consonants *=Á*.

[12] In *àɔ̀l, bàèl*, the vowels *ɔ, ɛ* could be analyzed as the glides *w* or *y* if it were not for the fact that sonorant-sonorant sequences are not allowed in word-final consonant clusters.

Open syllables with short vowels (V and CV) have light weight, closed syllables with short vowels (VC, VCC, CVC, CVCC) and open syllables with long vowels or vowel sequences (VV and CVV) have mid weight, and closed syllables with long vowels or vowel sequences (VVC, VVCC, CVVC, CVVCC) have heavy weight. Although tone assignment in some nouns depends on syllable weight, there are no meaningful restrictions on distribution of syllables in words based on syllable weight.

2.3.2 Syllable structure of polysyllabic words

There are 12 disyllabic syllable structures as shown in (17), including light-light, light-mid, light-heavy, mid-light, mid-mid, and mid-heavy syllable structures. There are no heavy syllables in word-initial position. Consonant clusters do not exceed 2 consonants—either word finally (*-CCC#) or across syllable boundaries (*-CC.C-).

(17) **Disyllabic short vowel syllable structures**

light-light	V.CV	ūfú	‘tree type’
light-mid	V.CVC	ɔ́sə̀r	‘army’
light-heavy	V.CVCC	ɔ́rɔ́nn̰	‘fermented milk’
mid-light	VC.CV	ə̀nsɔ̀	‘cooking plate’
mid-mid	VC.CVC	ámsáɖ̰	‘dryness’
mid-heavy	VC.CVCC	àɳɖ̰àrs	‘insect type’
light-light	CV.CV	kúsɔ́	‘grass type’
light-mid	CV.CVC	ṯ́álàm	‘malnutrition’
light-heavy	CV.CVCC	ɖ̰ùfūrɖ̰	‘dust’
mid-light	CVC.CV	cēlɖ́á	‘charcoal’
mid-mid	CVC.CVC	kágdàr	‘food type’
mid-heavy	CVC.CVCC	bāgɖ̰àrs	‘lizard’

Long vowels are common in both first and second syllables of disyllabic words as seen from (18).

(18) **Disyllabic long vowel syllable structures**

VV.CV	ààsà	‘basket type’
V.CVV	íyɔ́ɔ́	‘oil, fat’
VV.CVV	áàrēē	‘grass type’
VV.CVC	ɔ̄ɔ̄mɔ̄ŋ	‘yawning’
V.CVVC	āwɛ̄ɛ̄s	‘bird type’
VVC.CV	āāmsá	‘dry, tired (ADJ)’
VC.CVV	àlɖ́áá	‘earth, dust’
VC.CVVC	ənɖ́ɔ́ɔ́r	‘tree type’
CVV.CV	ṯ́ɛ́ɛ́fá	‘leaf, liver sickness’

Disyllabic long vowel syllable structures

CV.CVV	gəmɔ̀ɔ̀	'ant type'
CVV.CVV	mɑ̄ɑ̄sɛ̄ɛ̄	'root type'
CVV.CVC	pɛ́ɛ́ràm	'flag'
CV.CVVC	márɔ̄ɔ̄s	'spider'
CVV.CVVC	ṭīīfɔ́ɔ́ŋ	'bird type'
CVV.CVCC	bɑ̄ɑ̄làn̪d̪	'stripe'
CV.CVVCC	búlūūrs	'bird type'
CVVC.CV	bɔ̀ɔ̀ŋmà	'insect type'
CVC.CVV	mɔ́fd̪ɛ̄ɛ̄	'snake type'
CVVC.CVV	ɟííld̪ɔ̀ɔ̀	'tree type'
CVC.CVVC	ɟɔ́rgɑ̄ɑ̄l	'bird type'

Vowel sequences may not exceed two vowels, and long vowels do not occur in underlying vowel sequences. Vowel sequences are rare in polysyllabic lexemes. The only three attested are listed in (19). In all of these, they occur in an initial CVVC syllable type.

(19) **Polysyllabic vowel sequence structures**

CVVC.CVV	gɔ̄ūld̪ɔ̀ɔ̀	'fish'
CVVC.CV	d̪īɔ́rmɔ̀	'centipede'
	kɔ́ùrɟɔ̄	'tree type'

Three-syllable words are not common—about 5% of monomorphemic nouns. Only the syllable types CN, CNC, and occasionally N occur in three-syllable words. The syllable types CN and CNC may occur in any position of the word.

(20) **Three-syllable short vowel syllable structures**

CV.CV.CV	ṭāsāmé(g)	'grass'
CV.CV.CVC	kàŋàrâɲ	'jackal'
CV.CVC.CV	sáràŋd̪ā	'tree type'
CVC.CV.CV	ṭúnd̪úlì(g)	'elbow'
CVC.CV.CVC	sànd̪àlàɲ	'tree type'

Long vowels may occur in any syllable of three-syllable words. No more than three syllables in a root have been attested.

(21) **Three-syllable long vowel syllable structures**

V.CV.CVV	ūŋúrɔ̀ɔ̀	'pumpkin'
CVV.CV.CV	mɑ́ɔ́nìmɔ̄	'vegetable type'
CV.CV.CVV	kūsūmíí	'knee'
CV.CVV.CVV	kūd̪úúd̪īī	'bird type'

The verb root also has the syllable structure (C)N(C)(C), where the vowel nucleus is

the only obligatory constituent of the syllable and can be short, long, or a vowel sequence. However, at least 90% of verb roots consist of the syllable CVC with short vowel. The other syllable types are rare.

(22) **Root verb syllable types**

VC	/ab/ L	'sit'
CV	/ba/ M	'throw'
CVC	/bɛl/ L	'beat'
CVVC	/maar/ M	'buy'
	/kɔɛɟ/ L	'welcome'
CVCC	/gams/ MH	'find'
CVCVC	/kɔŋɔr/ L	'snore'

2.3.3 Monosyllabic vowel lengthening

The surface syllable structure of Gaahmg requires that all monosyllabic, open-syllable nouns and verbs have long vowels as stated in the rule of {P4}.

{P4} Monosyllabic vowel lengthening
Vowels are realized as long in monosyllabic, opened-syllable nouns and verbs.

Normally, the underlying root vowel of monosyllabic, open-syllable nouns is long. But in nouns such as *ṭɔ́ɔ́ / ṭɔ́-gg* 'cow' which have a short root vowel, the vowel is realized as long in the singular form. In the plural form with final consonant, the vowel remains short.

In verbs such as *nág-gā / nág-ḍā* 'sleep.SBJV1sN/.1pN' with root-final velar plosive, the velar plosive is elided in word-final position of incompletive forms {P2}, as will be discussed in 9.6. The resulting monosyllabic open-syllable verb with underlying short vowel surfaces with a long vowel *nāā* 'sleep.INCP'.

The lengthening rule of {P4} requires that the minimal surface word for nouns and verbs have at least mid syllable weight. The process does not apply to other parts of speech such as the negative *wá* 'no, not' or the adverb *ṭu* 'towards, upward'. These adverbs, which are separate words, are discussed in chapter 13.

2.3.4 Nasal clusters and prenasalization

Nasal-obstruent sequences such as in *ànḍàrs* 'insect type' and *ṭīns-ōgg* 'asking' are common in the language. They are interpreted as consonant sequences instead of prenasalized obstruents for the following reasons: several unambiguous consonant sequences are attested in 2.1.4.1 including nasal-obstruent sequences, there are no

words beginning with a nasal-obstruent sequence that must count as one unit, there are no three-consonant sequences across syllable boundaries in which a nasal-obstruent sequence must count as one unit, and all word-final nasal-obstruent sequences fit into the proposed syllable type CVCC.

2.3.5 Ambiguous vowel sequences

Vowel sequences before word-medial or word-final consonant sequences such as in the words of (23) are interpreted as vowel sequences in the surface form. The vowels in V_2 position of the sequences cannot be analyzed as glides, since three consonants in a sequence are not allowed.

(23) **$V_1V_2C.C-$ or $V_1V_2CC\#$**

ḍīə́rmə̀	'centipede'
kə́ùrɟə̄	'tree type'
àə̀r-g	'priest, chief'
ə́ílḍ	'cold (n)'
gə̀ūr-ḍ	'stomach'

Vowel sequences before root-final sonorants such as in the words of (24) are interpreted as vowel sequences in the surface form. As shown in the distribution of word-final consonant sequences of (12), only sonorant-obstruent sequences are allowed, as in *bə̀rḍ* 'lion'; word-final sonorant-sonorant consonant sequences (**càwr* 'rabbit', **gə̀yn* 'metal worker') are not allowed. However, unambiguous vowel sequences such as in *ḍīə́rmə̀* 'centipede' and *būə̀* 'tree type' of (16) are attested. Thus, the vowels in V_2 position of the sequences in (24) are analyzed as vowels.

(24) **$V_1V_2C_{[+son]}\#$**

càə̀r	'rabbit'
gə̀ɛ̄n	'metal worker'
ṭə̀ìl	'tree type'

Vowel sequences before root-final obstruents such as in the words of (25) are ambiguous. The vowels in V_2 position of the sequences can be analyzed as glides in the surface form since all other sonorants (*m, n, ɲ, ŋ, l, r, ð*) are unambiguously attested in word-final sonorant-obstruent constructions as shown in (12). They can also be analyzed as vowels in the surface form since all relevant vowel sequences (*aɔ, ɛɔ, aɛ, ɔɛ, əu, iu, əi, ui*) are unambiguously attested in (16). Although there is no strong evidence for one interpretation over the other, such words are listed with vowel sequences in this thesis[13].

[13] In (12), the glides are written instead of vowels in order to show the full range of sonorant possibilities in word-final sonorant-obstruent position. Otherwise, vowels are written for this

(25) **$V_1V_2C_{[-son]}$#**
ḍ̈āɔ̀ḍ̈ ‘fertile soil’
káɛ̄ḍ̈ ‘serving spoon’
ḍ̈ɔ̀ìḍ̈ ‘scorpion’

Vowel sequences before root-medial consonants such as in the words of (26) are also ambiguous. The vowels in V_2 position of the sequences can be analyzed as glides in the surface form since all other sonorants are unambiguously attested in word-medial, syllable-final position as shown in (11). They can also be analyzed as vowels in the surface form since all relevant vowel sequences are unambiguously attested in (16). Although there is no strong evidence for one interpretation over the other, such words are listed with vowel sequences in this thesis.

(26) **V_1V_2C-**
kàèmà ‘lucky stone’
kāɔ̄ḍ́á ‘ear wax’
fɔ̄ɛ̄ḍ́á ‘planting seed’

2.3.6 Ambiguous final vowels

Word-final vowel sequences such as in *māāɔ̀* ‘gazelle’ are underlying vowel-plosive or vowel-approximant constructions which surface as vowel-vowel sequences. The bilabial and palatal weakening rule of {P1b} states that the underlying plosives /b/, /ɟ/ and approximants /w/, /y/ are weakened word-finally to vowels with the same [ATR] quality as the preceding vowel. Unambiguous word-final vowel sequences such as in *būɔ̀* ‘tree type’ support this analysis, as does the fact that different allomorphs of the accompaniment and definite clitics attach to stem-final vowels rather than to stem-final consonants.

In (27), singular nouns and their accompaniment and definite forms are given. Accompaniment singular nouns take the clitic $=\tilde{E}$ for surface-final consonant stems as in (a) and the clitic $=n\bar{E}$ for surface-final vowel stems as in (b-d). The language treats (b-p) as having vowel-final stems and attaches the clitic $=n\bar{E}$. Similarly, the definite clitic $=A$ for surface-final consonant stems attaches in (a), but definite clitics having final *n* for surface-final vowel stems attach in (b-p).

There are no noun suffixes with initial consonant which attach to both underlying-final consonants and underlying-final vowels. Therefore, the root-final plosives /b/, /ɟ/, and /g/ never surface as plosives as they do in verbs (/*cág*/, *cáá* ‘bathe.INCP.3sN’, *cág-gággā* ‘bathe-COMP.D’). In nouns, there is no way to verify whether the root-final segments are underlyingly /w/ or /b/, /ɟ/ or /y/. However, although the definite

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position.

(27) **V_1V_2# in noun forms**

	UR	N SG	ACM	DEF	
(a)	/kaam/ L	kààm	kààm = ɛ̄	kààm = ā	‘nyala’
(b)	/waayaa/ H	wááyáá	wááyáá = nɛ̄	wááyáá = n	‘bird type’
(c)	/aŋɛ(g)/ H	áŋé	áŋé = nɛ̄	áŋé = n	‘elephant’
(d)	/buə/ ML	būə̀	būə̀ = nī	būə̀ = n	‘tree type’
(e)	/kaw/ HL	káɔ̀	káɔ̀ = nɛ̄	káw = àn	‘hyena, root’
(f)	/maaw/ ML	māāɔ̀	māāɔ̀ = nɛ̄	māāw = àn	‘gazelle’
(g)	/bɛw/ ML	bɛ̄ɔ̀	bɛ̄ɔ̀ = nɛ̄	bɛ̄w = àn	‘tree type’
(h)	/cɛɛw/ HM	cɛ́ɛ́ɔ̄	cɛ́ɛ́ɔ̄ = nɛ̄	cɛ́ɛ́w = ān	‘lame person’
(i)	/t̪ay/ ML	t̪āè	t̪āè = nɛ̄	t̪āy = àn	‘giraffe’
(j)	/kaay/ M	kāāɛ̄	kāāɛ̄ = nɛ̄	kāāy = ān	‘witch doctor’
(k)	/muy/ M	mūī	mūī = nī	mūy = ɔ̄n	‘wildebeest’
(l)	/ɲuuy/ ML	ɲūūì	ɲūūì = nī	ɲūūy = ɔ̀n	‘leopard’
(m)	/buu/ L	bùù	bùù = nī	bùù. = ùn	‘chicken coop roof’
(n)	/rɛɛ/ M	rɛ̄ɛ̄	rɛ̄ɛ̄ = nɛ̄	rɛ̄ɛ̄. = ɛ̄n	‘cotton’
(o)	/t̪ɔɔ/ H	t̪ɔ́ɔ́	t̪ɔ́ɔ́ = nɛ̄	t̪ɔ́ɔ́. = ɔ́n	‘cow’
(p)	/ɟīì/ ML	ɟīì	ɟīì = nī	ɟīī. = ìn	‘turkey’

clitic distinguishes surface-final vowel stems from surface-final consonant stems, it also distinguishes underlying-final approximant (or plosive) stems from underlying-final vowel stems. The definite clitic *=An* attaches to stems with underlying-final approximants in (e-l), and the definite clitic *= Vn* with copied vowel from the stem attaches to stems with underlying-final vowels in (m-p). Thus, the singular nouns of (e-l) have underlying-final approximants or plosives, but surface-final vowels.

2.4 Tone

There are three underlying level tones in Gaahmg illustrated by the words of table 5.

Table 5: Contrastive H, M, and L tones

H	ɔ́ɔ́r	‘tree bark’
M	əər	‘anger’
L	ə̀ə̀r	‘sheep’

Rising and falling tone is analyzed as a sequence of two level tones. The level tones combine and result in nine tone melodies which are all contrastive in the same monosyllabic syllable type—three level, three falling, and three rising. The same, as well as additional tone melodies, are contrastive in disyllabic syllable patterns.

Unlike some African tone languages, tone is not affected by consonants, tone is stable—it does not shift from one syllable to another, and tone does not down-step or down-drift. The functional load of tone is very high, both in the distinction of words and in the expression of grammatical functions.

The tone bearing unit is the syllable. In roots with fewer tones than the number of syllables, such as in three-syllable nouns with two tones, tone is assigned right-to-left, regardless of syllable weight. However, when there are more tones than syllables, such as in disyllabic roots with three-tone melodies, two tones are assigned to the heaviest syllable, and the remaining tone is assigned to the other syllable.

In roots, no more than one tone may be assigned on light syllables and generally no more than two tones may be assigned on mid or heavy syllables. However, as will be seen in 7.6.2, two tones (HM) are assigned to the accompaniment clitic *=É* which is a light syllable. And as will be seen in 9.8.6, three tones (MHM) are assigned to the continuous past suffix *–Á̰n* which is a mid syllable. Nevertheless, no more than three tones are ever allowed on any one syllable.

2.4.1 Tonal contrasts in the same syllable structure

The words in (28) have contrastive tone melodies for the specified syllable structures. Three level, three falling, and three rising tone melodies are attested in the CVVC syllable type. There is also one attested monosyllabic root with three tones (*ḍùûl* 'instrument'). The same tone melodies and additional tone melodies are attested in disyllabic syllable patterns, although not all in the same syllable pattern. The singular suffix *-ḍ* of *ɲíī-ḍ* 'tooth' and of several other nouns in (28) does not add tone, as will be discussed in section 6.3.1. The contrasts support the claim of there being minimally three underlying tones in the language.

(28) **Tonal contrasts in the same syllable structures**

	CVVC		CVCVVC		CVCVC	
H	póór	'boat'	wéráá-ḍ	'clan member'	básár	'dried food'
M	bāāl	'cave'	kālāā-ḍ	'tongue'	ṭ̄ḗḍ̄ēl	'bird type'
L	dèèl	'collar bone'	sèŋàà-ḍ	'instrument'	ḍ̄ìrìm	'tree type'
HL	séèn	'ruler'	---		fíḍ̄ìn	'perfume'
HM	ɲíī-ḍ	'tooth'	---		bórē-ḍ	'eye matter'
ML	bēèl	'metal'	gəmūùr	'dove'	məsòr	'horse'
LH	ḍ̄òór	'fence'	mòḍ̄áál	'hatred'	---	
LM	ḍ̄èēr	'leach'	bàrəəl	'cistern'	gə̀məl	'forest'
MH	būúl	'bread'	sēwéél	'tree type'	cēyám	'tobacco'
HLH	---		rúŋùú-ḍ	'bird type'	---	
HLM	---		móðùūl	*village name*	---	
HMH	---		lúlīíḍ	'snake type'	---	
LHL	ḍ̄ùûl	'instrument'	bàsáàr	'lie'	bə̀ðə̂l	'job-less person'

Although there are at least nine contrastive tone melodies in noun roots, verb roots may only have the seven underlying tone melodies of (29). The only verb roots

attested to have HM melody are *bɛ́l-l* 'name, call' and *lɛ́ɛ̄* 'come, arrive', and the only verbs attested to have ML melody are *dɔ̄ɔ̀s-s* 'stand', *bṵ̄n-d̰* 'make big'. The infinitive verb form is analyzed to reveal the underlying root tone.

(29) **Tonal contrasts in infinitive verb forms**

	Root tone	INF	
(a)	H	fír-r	'smell, pray'
(b)	M	cɔ̄r-r	'help'
(c)	L	d̰ùr-r	'bury'
(d)	HL	pə̂r-r	'attach'
(e)	HM (rare)	bɛ́l-l	'name, call'
(f)	ML (rare)	dɔ̄ɔ̀s-s	'stand'
(g)	MH	kə́ð-ð	'strike, ram'

2.4.2 Tone distribution

Level tone

Level tone appears in syllable types regardless of syllable weight. In (30), syllable types are grouped together according to light, mid, or heavy syllable weight. High, Mid, and Low tone occur on each of the six syllable types with both long and short vowels, with the exception of High on the syllable type VV. The singular suffixes

(30) **Level tone distribution in six syllable types with both short and long vowels**

	V- (light)		VC- (mid)		VCC (mid)	
H	íyə́ə́	'oil, fat'	ɔ́rd̰àà	'army'	úld̰	'grinding stone'
M	ūrīī	'ostrich'	ālḍ̰áá	'earth'	ālḍ̰	'fox'
L	ɔsáà	'pillow'	ɔ̀rŋ̀ə-d̰	'insect'	àrs	'tree type'
	CV- (light)		CVC (mid)		CVCC (mid)	
H	d̰ínì	'world'	cíl	'spine'	cɛ́ld̰	'local broom'
M	kāsá	'boy'	mɛ̄l	'tree type'	kɔ̄rd̰	'bird type'
L	fə̀rì	*hill name*	d̰àl	'pot'	fàlƒ	'tree type'
	VV- (mid)		VVC (heavy)		VVCC (heavy)	
H	---		áám	'bone'	ɛ́ɛ́l-g	'stomach'
M	əərī	'angry person'	ɛ̄ɛ̄ð	'net type'	īīgg	'milk'
L	ààsà	'basket'	ə̀ə̀l	'hyena'	àɔr-g[14]	'priest, chief'
	CVV- (mid)		CVVC (heavy)		CVVCC (heavy)	
H	wááyáá	'bird type'	póór	'boat'	də́ə́lƒ	'tree type'
M	lɛ̄ɛ̄rɔ̄ɔ̄	'reed'	bāāl	'cave'	bāār-d̰	'abdomen'
L	fààŋɔ̀ɔ̀	'sorghum type'	dɛ̀ɛ̀l	'collar bone'	ƒɛ̀ɛ̀rs	'hippopotamus'

[14] There are two singular forms *àɔ̀r, àɔ̀rg* and the plural form is *àɔ̀rɛ̄ɛ̄g.*

-ḍ, -g of *ərŋə-ḍ* ‘insect’, *éél-g* ‘stomach’ and of other roots of (30) do not add tone, as will be discussed in section 6.3.1.

Falling and rising tone

Falling and rising tone only appear in roots on syllable types with mid and heavy weight. As shown in (31), falling and rising tone does not occur on the open syllable types V and CV with light weight. It has not been attested on VVCC syllables. Falling and rising tone is common on CVVC, CVVCC, CVC and CVV syllables, and rare in VC, VCC, VV, VVC and CVCC syllables. Other than in the word *ḍ̈ùûl* ‘instrument’, three tones on the same syllable in monomorphemic roots is not attested.

(31) **Falling/rising tone distribution in various syllable types**

	V- (light)	VC (mid)	VCC (mid)
HL	---	îl ‘horn’	îlɟ ‘beeswax’
	CV- (light)	CVC- (mid)	CVCC (mid)
HL	---	kə̂lfə ‘jaw’	---
ML	---	ɟə̌r ‘sorghum type’	rɔ̌ŋḍ̈ ‘mud’
LH	---	ḍ̈ə̌lgə ‘drum’	---
LM	---	gɔ̃n ‘responsibility’	---
MH	---	dɔ̃d ‘stork’	---
	VV- (mid)	VVC (heavy)	VVCC (heavy)
HL	áàrɛ̄ɛ̄ ‘grass type’	áɔ̀s[15] ‘dried food’	---
HM	---	úū-ḍ̈ ‘wasp’	---
	CVV- (mid)	CVVC (heavy)	CVVCC (heavy)
HL	máà ‘house’	séɛ̀n ‘ruler’	gúùrḍ̈ ‘energy’
HM	múū ‘mosquito’	ɲíī-ḍ̈ ‘tooth’	káān-ḍ̈ ‘fly’
ML	ṭ̈ī ‘cassava’	bɛ̄ɛ̀l ‘metal’	kāànḍ̈ ‘carrying stick’
LH	---	ḍ̈ɔ̀ór ‘fence’	gàágg ‘bird’
LM	---	ḍ̈ɛ̀ɛ̄r ‘leach’	gəūr-ḍ̈ ‘stomach’
MH	mīí ‘chicken’	būúl ‘bread’	---
LHL	---	ḍ̈ùûl ‘instrument’	---

2.4.3 Tone assignment

In three-syllable words

Tone is stable in that it does not shift or spread from one syllable to another. Thus, it is not possible to determine the tone bearing unit (TBU) by observing shifting or spreading. Rather, tone assignment is used as support of the syllable being the TBU.

[15] Can also be interpreted as having a glide *âws*

All attested three-syllable monomorphemic words are presented in (32). Tone assignment is as expected for one and three-tone melodies for the syllable being the TBU. These have one tone per syllable, with the exception of *kàŋàrâɲ* 'jackal'. Two-tone melodies are assigned right-to-left in that the final tone of the melody surfaces on the final syllable, and the first tone of the melody surfaces on the first two syllables.

(32) **Tone assignment in three-syllable monomorphemic words**

	Melodies with one or two tones			Melodies with three tones	
M	ɲɛ̄ŋŋɛ̄rās	'fully (ADJ.PL)'	HLM	mɔ́ɔ́nìmɔ̄	'vegetable type'
L	kàmàlɔ̀gg	'woman'		bámàlɟā	'morning star'
	sànḓàlàɲ	'living alone'		ḓɔ́ggɔ̀lɟā	'ankle'
HL	mɔ́ggɔ́lɛ̀ɛ̀	'maize'	MHM	kūḓúúrīī	'bird type'
	ṭúnḓúlì(g)	'elbow'		cɛ̄ggɛ́llūū	'root name'
ML	būḓīrìɲ	'sunset'	MHL	ūŋúrɔ̀ɔ̀	'pumpkin type'
LH	bìmìríɟɟ	'bird type'		kɔ̄ggɔ́lìgg	'cock'
LM	càŋàlḓā	'upper arm'	LHL	kàŋàrâɲ	'jackal'
	gɔ̀bbɔ̀nīḓ	*area name*			
	mùggùrīī	'hatred'			
	kūsūmíí	'knee'			
	ṭāsāmé(g)	'grass type'			
	fɔ̄ŋɔ̄lḓé	'leave for child rearing'			

In disyllabic words

Nearly all disyllabic roots with one or two-tone melodies are assigned tone as expected with one tone per syllable. However, there are five attested exceptions, all of which involve the ML tone melody. The word *ārāàḓ* 'lake' of (33) and four words listed below it are exceptions.

All attested disyllabic monomorphemic words with three-tone melodies are also shown in (33). In these words, the syllable with the heaviest syllable weight is assigned two tones and the other syllable is assigned one. If there is the same weight in both syllables, two tones are usually assigned to the first syllable, but in two out of six of such words, tone is assigned to the second syllable (*kɔ̀ɔ̀fɔ̃̄r* 'weakness' and *bɛ̀ɪŋáɔ̀* 'tomato'). In (33), syllable weight is listed before each word with three tones, where l = light, m = mid, and h = heavy, and the letters for the first and second syllables are divided by a period. It is the underlying syllable structure that determines the syllable weight rather than the surface form. For example, since *mūggúùì* 'burning wood' has an underlying final /y/ or /ɟ/, the second syllable is underlying CVVC instead of CVVV.

(33) **Tone assignment in two-syllable monomorphemic words**

	Melodies with one or two tones			Weight	Melodies with three tones	
H	fádɔ́ɔ́l	‘farmland’	HLH	l.h	rúŋùú-d̰	‘bird type’
M	bārɔ̄ɔ̄l	‘cistern’	HLM	m.m	áàrɛ̄ɛ̄	‘grass type’
L	sɛ̀ŋàà-d̰	‘instrument’		m.l	kə̂lfə̄	‘jaw’
HL	fíd̰ìn	‘perfume’		m.l	kúùrī	‘sheave’
ML	mɔ̄sɔ̀r	‘horse’		l.h	mə́ðùūl	*village name*
	ārāà-d̰	‘lake’	HMH	h.h	kúūrlúúgg	‘rat type’
	gəmūùr	‘dove’		l.h	lúlīíd̰	‘snake type’
	gərmūù-d̰	‘tree type’		l.m	málɔ̌ɟɟ	‘nose mucus’
	kāŋāàd̰	‘bowel type’	MHM	m.m	bằllɛ̄ɛ̄	‘tree type’
	kāmɛ̄ɛ̀r	‘village’	MHL	m.h	mūggúùì	‘burning wood’
LH	mɔ̀d̰áál	‘hatred’	LHM	m.l	d̰ə̀lgə̄	‘drum’
LM	gə̀mīīl	‘tree type’	LHL	l.m	bə̀ðồl	‘business’
MH	sɛ̄wɛ́ɛ́l	‘tree type’		m.m	kɔ̀ɔ̀fɔ̀r	‘weakness (N.SG)’
				l.h	ɟɔ̀fɔ́ɔ̀r	‘desire’
				m.m	bɛ̀rŋáɔ̀	‘tomato’
				l.m	ɔ̀sáà	‘wooden pillow’
				l.h	gàd̰áàè	‘basket’
				l.h	kàðáàm	‘work’
				l.h	kùsúùr	‘authority’
				m.m	cĭrsə̀(g)	‘tool cleaner’

2.4.4 Lexical tone

Lexical tone described in this section has to do with roots (single non-bound morphemes) which are distinguished only be tone. Grammatical tone described in 2.4.5 has to do with bound morphemes distinguished only by tone that make a grammatical distinction, or morphemes that consist only of tones.

Gaahmg frequently uses tone for distinguishing lexical meanings, as shown in the lists of minimal pairs in (34-36).

(34) **Noun minimal pairs**

H - M	sɔ́ɔ́m	‘hunter’	sə̄ə̄m	‘medicine’
	ɔ́ɔ́r	‘tree bark’	ə̄ə̄r	‘anger’
	cáá	‘wild cat’	cāā	‘bath’
	kááɛ́	‘night’	kāāɛ̄	‘witch doctor’
H - L	d̰áár	‘throne’	d̰ààr	‘eagle’
	ɔ́ɔ́r	‘tree bark’	ə̀ə̀r	‘sheep’
H - HL	káár	‘stew’	káàr	‘male goat’
	cíl	‘spine’	cîl	‘instrument’

Noun minimal pairs (continued)

H - ML	kɔ́ðél	'natural painting'	kɔ̄ðɛ̀l	'baboon'
	ʈírí(g)	'tree type'	ʈīrì(g)	'death, dying'
M - L	ɔ̄ɔ̄r	'anger'	ɔ̀ɔ̀r	'sheep'
M - HM	mūū	'forehead, face'	múū	'mosquito'
M - ML	bāāl	'cave'	bāàl	'instrument'
	cāā	'bath'	cāà	'cooking stone'
	kāɲāā-ɖ	'back of head'	kāɲāàɖ	'bowel for hot food'
M - MH	mīī	'goat'	mīí	'chicken'
L - ML	ɖɛ̀ɛ̀l	'storage shelf'	ɖɛ̄ɛ̀l	'lake'
	ɟìì	'tree type'	ɟīì	'turkey'
L - MH	ɟɛ̀ɛ̀m	'thing, something'	ɟɛ̄ɛ́m	'sorghum sieve'
L - LM	bɔ̀ggɔ̀	'tree type'	bɔ̀ggɔ̄	'cream'
	bàrɔ̀ɔ̀l	'snake type'	bàrɔ̄ɔ̄l	'cistern'
HM - ML	káān-ɖ	'fly'	kāànɖ	'water-carrying stick'

(35) **Verb minimal pairs in infinitive form**

H-L	cág-g	'bathe, wash'	càg-g	'finish'
	pál-l	'cut'	pàl-l	'fall'
M-L	bɛ̄l-l	'possess'	bɛ̀l-l	'hit, beat'
M-HM	bɛ̄l-l	'possess'	bɛ̋l-l	'name, call'
L-HM	bɛ̀l-l	'hit, beat'	bɛ̋l-l	'name, call'

(36) **Differing word category minimal pairs**

H - M	káén	'finished (ADJ)'	kāēn	'yesterday (ADV)'
H - HL	káén	'finished (ADJ)'	káèn	'thin (V)'
H - ML	fúúí	'tree type'	fūūì	'male (ADJ)'
H - LHL	kɔ́ɔ́fɔ̀r	'thin, weak (ADJ)'	kɔ̀ɔ̀fɔ̀r	'weakness'
M - HL	kāēn	'yesterday (ADV)'	káèn	'thin (V)'
M - ML	cīīnɖ-ə̄gg	'finishing (N.SG)'	cīīnɖ-ə̀gg	'playing (N.PL)'
H - MH	báár	'weak (ADJ)'	bāár	'tribe member'
M - MHM	bāāl	'cave'	bā́āl	'striped (ADJ)'
L - LHL	ɖùùl	'difficult (ADJ)'	ɖùûl	'instrument'
HL - ML	ɲílì	'knowledgeable (ADJ)'	ɲīlì	'ignorance'
ML - LH	gāàl	'falcon'	gàál	'far (ADJ)'
ML - HMH	būùr	'pot for wine'	bū́úr	'remained (ADJ)'

As seen from (37), tone distinguishes subject and infinitive pronouns, as well as possessive pronouns of kinship terms and body parts. Tone also distinguishes the conjunction *ɔ́* 'and' with Low tone from the second singular pronouns *ɔ́* 'you' and *ɔ̄* 'your'. Pronouns are discussed in the sections indicated in (37) and the conjunction

ɔ́ 'and' is discussed in 15.2.

(37) **Pronoun minimal pairs**

5.3 Subject	9.2 Infinitive	5.2.3 Possessive kinship	5.2.2 Possessive body parts	
á	ā	á	ā	1s
ɔ́	ɔ̄	ɔ́	ɔ̄	2s
ɛ̄	ɛ̄	ɛ́	ɛ̄	3s

Tone also distinguishes singular and plural demonstrative adjectives as shown in (38) where singular demonstratives have initial High tone and plural demonstratives have initial Low tone.

(38) **Demonstratives (see 8.1.3)**

DEM ADJ SG		DEM ADJ PL		
nɛ́ɛ́	'this'	nɛ̀ɛ̀	'these'	near speaker
náá(n)	'that'	nàà(n)	'those'	near addressee
náa̰dī	'that'	nàà̰dì	'those'	away from both

Tone also distinguishes the animate accompaniment preposition *ɛ̀* 'with' from the inanimate accompaniment prepositions *ɛ̄* 'with' and the general preposition *ɛ́* (GP).

(39) **Preposition minimal pairs**

è	'with'	Animate accompaniment preposition	11.1
ē	'with'	Inanimate accompaniment preposition	11.2
é	GP	General preposition	11.3

In (40), examples of nouns with three tonal allomorphs of a plural suffix are given. The suffix of (a) has no underlying tone, allowing the plural form to surface with Low tone, the same as in the root. Whereas, the suffix of (b) has underlying Mid tone and the suffix of (c) has underlying High tone. As will be shown in section 6.3.1, there are seven other noun plural suffixes with two or three tonal allomorphs, most of which are not semantically or phonologically predictable with the root.

(40) **Tonal allomorphs of noun plural suffixes (see 6.3.1)**

	Suffix Tone	Noun SG	Noun PL	
(a)	-Agg	lə̀ŋd̰	lə̀ŋd̰-ə̀gg	'tree type'
(b)	-Āgg	bə̀ɲɟ	bə̀ɲɟ-ə̄gg	'pulp'
(c)	-Ágg	mīīd̰	mīīd̰-ɔ́gg	'stone'

2.4.5 Grammatical tone

Gaahmg also frequently uses tone to distinguish grammatical function; there are grammatical distinctions made only by tone in nouns and verbs. Grammatical tone distinguishes bound morphemes with different grammar, or is a morpheme in itself, either added to or replacing underlying stem tone.

Tone distinguishes bound morphemes, such as the copular and definite clitics of (41). The copular singular clitic *=Ā* which takes the [ATR] value of the root has underlying Mid tone, the copular plural clitic *=À* has underlying Low tone, and the definite clitic *=Á* has underlying High tone.

(41) **Copular *=Ā*, *=À* and definite *=Á* suffixes**

		7.2	7.3	
	Noun	Noun COP	Noun DEF	
SG	ḍəm	ḍəm=ə	ḍəm=ɔ́	'Arab'
PL	ḍəm-g	ḍəm-g=ə	ḍəm-g=ɔ́	'Arabs'

Similarly, the past and non-past continuous forms differ only by tone as shown by the verbs of (42). The past continuous suffix *-Á̲n* has underlying MH tone, whereas the non-past continuous suffix *-Á̲n* has underlying High tone.

(42) **Past *-Á̲n* and non-past *-Á̲n* continuous verb forms**

	9.8.6	9.8.7	
Root tone	CONT.P.3sN	CONT.N.3sN	
H	kɔ́m-ằn	kɔ́m-án	'cut, chop'
L	gàf-án	gàf-ằn	'give'
MH	kə̌ð-ə̄n	kə̌ð-ɔ́n	'strike'

Several verb clitics listed in (43-44) are also distinguished only by tone. The third singular object pronoun allomorph *=E* with no underlying tone attaches to first singular verbs as in (a) and a different allomorph *=Ē* with HM tone attaches to third singular verbs as in (b). The relative clause definite clitic *=É* with High tone attaches to singular person verb forms as in (c), and the clitic *=È* with Low tone attaches to plural person verb forms as in (d). The subordinate (SBO1) clitic *=Ē* with Mid tone attaches to first singular verbs as in (e).

(43) **Verb clitics distinguished by tone**

(a)	10.4.2	1sN/3sA	=E	pál=ɛ̄	'cut.INCP.1sN=3sA'
(b)	10.4.2	3sN/3sA	=Ē	pál=ɛ̄	'cut.INCP.3sN=3sA'
(c)	10.9	RDM.SG	=É	pâl=ɛ́	'cut.INCP.3sN=RDM'
(d)	10.9	RDM.PL	=È	pál=ɛ̀	'cut.INCP.3pN=RDM'
(e)	10.7	SBO1.1sN	=Ē	pál=ɛ̄	'cut.INCP.1sN=SBO1'

The third singular marked object pronoun allomorph *=i* with no underlying tone attaches to first singular verbs as in (a) and a different allomorph *=ì* with Low tone attaches to third singular verbs as in (b). The imperfect third singular clitic *=í* with High tone attaches to incompletive verbs as in (c), and the subordinate 'when' (SBO1) clitic *=ǐ* with LM tone attaches to third singular verbs as in (d).

(44) **Verb clitics distinguished by tone**

(a)	10.4.2	1SN/3SN	=i	pə́l=ī	'cut.INCP.1SN=3SAM'
(b)	10.4.2	3SN/3SN	=ì	pə́l=ì	'cut.INCP.3SN=3SAM'
(c)	10.6	IPF.3SN	=í	pə́l=í	'cut.INCP=IPF.3SN'
(d)	10.7	SBO1.3SN	=ǐ	pə́l=ǐ	'cut.INCP.3SN=SBO1'

Where tone is a morpheme in itself, it can be added to segmental forms or can replace the underlying tone of segmental forms. Tone is added to distinguish subject persons of verb forms and to distinguish future and non-future subject pronouns. Tone replacement is used for genitive case, plural person possession of body part nouns, antipassives, causatives, and verbal nouns.

In verbs, tone marks subject person agreement by being added to the stem-final syllable. As shown in (45), tone distinguishes third singular and third plural subject verb forms from other person forms. The verb root of (45) has underlying High tone and the completive suffix *-sA* has no underlying tone. In such verbs, high tone is assigned to the stem-final syllable of third singular forms, Low tone is assigned to the stem-final syllable of third plural forms, and Mid tone is assigned to the stem-final syllable of first and second person forms.

(45) **Paradigm of completive verb *kɔ́m-sA* 'chop-COMP' with subject pronouns (see 9.5)**

á	kɔ́m-sɔ̄	1s	āgg	kɔ́m-sɔ̄	1p
ú=kúm-sū[16]		2s	ūg=kúm-sū		2p
ɛ̄	kɔ́m-sɔ́	3s	ɛ̄, ɛ̄gg	kɔ́m-sɔ̀	3p

Tone is also added to subject pronouns to indicate future tense of the following verb form. In first and second person subject pronouns, Mid tone is assigned along with High tone on the final syllable, resulting in falling tone.

[16] As discussed in 5.3, the second person morpheme specifies [+ATR] quality on verbs forms. The [+ATR] quality spreads leftward to the second person pronoun clitics *ɔ=, ɔgg=*.

(46) **Future and non-future pronouns (see 9.8.4)**

Subject non-future	Subject future	
á	ā	1s
ɔ́	ɔ̄	2s
āggá	āggā	1p
ɔ̄ggɔ́	ɔ̄ggɔ̄	2p

Genitive case is marked by tone replacement. Nouns with Mid and MH root tone melody have HL melody in genitive forms. Nouns with all other root tone melody have ML tone melody in genitive forms.

(47) **Genitive singular and plural nouns with various root tone melodies (see 6.5)**

Root tone	GEN tone	Noun SG DEF	Noun SG DEF GEN	Noun PL	Noun PL GEN	
H	ML	ṭɔ́ɔ́=n	ṭɔ̄ɔ̀=n	ṭɔ́-gg	tɔ̄-gg	'cow'
M	HL	mīī=n	mîì=n	mīī-gg	mîì-gg	'goat'
L	ML	ḍ̈ìì=n	ḍ̈îì=n	ḍ̈ìì-gg	ḍ̈îì-gg	'rat'

A Low-Mid tone pattern is required by the plural person possessive morpheme of all body part nouns. Although the underlying tone melody of *bɔ̄ɔ̄rà / bɔ̄ɔ̄rà-gg* 'shoulder' in the paradigm of (48) is Mid-Low, the plural forms possessed by plural persons surface as Low-Mid.

(48) **Possessive paradigm for inalienable body part *bɔ̄ɔ̄rà / bɔ̄ɔ̄rà-gg* 'shoulder' (see 6.4)**

	Singular person pronouns			Plural person pronouns		
Noun SG	ā	bɔ̄ɔ̄rà	1sP	---		1pP
	ɔ̄	bɔ̄ɔ̄rà	2sP	---		2pP
	ɛ̄	bɔ̄ɔ̄rà	3sP	---		3pP
Noun PL	ā	bɔ̄ɔ̄rà-gg	1sP	āgg	bɔ̀ɔ̀rā-gg	1pP
	ɔ̄	bɔ̄ɔ̄rà-gg	2sP	ūgg	bɔ̀ɔ̀rā-gg	2pP
	ɛ̄	bɔ̄ɔ̄rà-gg	3sP	ēgg	bɔ̀ɔ̀rā-gg	3pP

In antipassive forms, root tone melodies are replaced by other tone melodies: High changes to HM, Mid changes to MH, and Low changes to LH.

(49) **Antipassive suffix *-An* on third singular completive verbs (see 9.10.2)**

Root tone	3sN COMP	ANTIP tone	3sN ANTIP-COMP	
H	fír-sɔ́	HM	fír-ɔ̄n-sɔ́	'smell'
M	cɔ̄r-sɔ́	MH	cɔ̄r-ɔ́n-sɔ́	'help'
L	ḍ̈ùr-sū	LH	ḍ̈ùr-ūn-sú	'bury'

In causative forms, root tone melodies are also replaced by other tone melodies, as shown in (50).

(50) **Third singular causative completive verbs (see 9.11.2)**

Root tone	COMP 3SN	CAUS tone	COMP CAUS 3SN	
H	fír-sə́	HM	f ˆır-sə́	‘smell’
M	cə̄r-sə́	HM	cűr-sú	‘help’
L	d̰ùr-sū	ML	d̰ûr-sū	‘bury’
MH	kə̌s-sə́	HM	kə̃s-sə́	‘strike’

Finally, in verbal nouns, root tone melodies are replaced by other tone melodies, as shown in (51).

(51) **Verbal noun plural suffixes *=Agg, =gg* (see 10.10)**

Root tone	INF	VN tone	VN SG	VN PL	
H	pál-l	M	pāl	pāl = āgg, pāl = g	‘cut’
L	f ɛ̀l-l	ML	f ɛ̂l	fɛ̄l = āgg, f ɛ̂l = g	‘tell’
HL	pîr-r	ML	p̄ır	pīr = ə̀gg, p̄ır = g	‘deceive’
HM	bɛ́l-l	M	bɛ̄l	bɛ̄l = āgg	‘name’
MH	kə̌ð-ð	M	kə̄n	kə̄ð-ə̄gg	‘strike’