Languages and Peoples of the Eastern Himalayan Region **(LPEHR) comprises an annual special issue of *Himalayan Linguistics* together with occasional special publications. Peer-reviewed and open-access, it focuses on linguistic and ethnographic documentation and description in the Eastern Himalaya.**

Languages and People of the Eastern Himalayan Region (LPEHR)

A description of Changki-Ao phonology with a note on orthography

T. Temsunungsang & I. Amenla Changkija
The English and Foreign Languages University, Shillong Campus

ABSTRACT
Changki is one of three Tibeto-Burman languages spoken by the Ao in Nagaland (India), the other two being Mongsen and Jungli, the prestige language. Though no proper research has been done, Changki has always been considered to be linguistically closer to Mongsen by the Ao people as well as scholars. With a phonemic inventory of four vowels, six diphthongs, 21 consonants, and three contrastive tones, the phonological system is similar to both Mongsen and Jungli, but closer to Mongsen. Several differences are also observed. Based on the phonological description, the present orthography is also discussed in this paper, with suggestions that will make the orthography more consistent and transparent, reducing learnability issues.

KEYWORDS
Changki, Mongsen, Jungli, Ao Phonology, Orthography, Tibeto-Burman

This is a contribution from Himalayan Linguistics Vol 24(2): 1–24.
ISSN 1544-7502

Tables of contents, abstracts, and submission guidelines are available at
escholarship.org/uc/himalayanlinguistics

A description of Changki-Ao phonology with a note on orthography[†]

T. Temsunungsang & I. Amenla Changkija
The English and Foreign Languages University, Shillong Campus

1 Introduction

The Aos of Nagaland comprise of three main groups, namely the Jungli (earlier written as Chungli), Mongsen and Changki. Jungli is the dominant group both in terms of population and number of villages. Jungli is also the prestige language of the Aos, a result of the Christian missionaries codifying the language to propagate religion and education in the late 19th century. Mongsen is the second largest group, speaking a language that is unintelligible to Jungli speakers. Changki, the smallest group of the three, is usually considered as a subgroup of Mongsen by native speakers and scholars (Mills 1926, Coupe 2007) and is closer to Mongsen in terms of intelligibility. However, there are significant differences between the two and intelligibility is perhaps a result of contact situations in recent times.

While several published and unpublished works can be found on Jungli (Gowda 1972, 1975; Temsunungsang 2009) and Mongsen (Coupe 1998, 2003, 2007) till date, no proper linguistic research has been done on Changki to our knowledge. The scant literature available on Changki has opposing views regarding its place within the Ao group of languages. Grierson (1903), which is based on Davis' Census Report of Assam, 1891, describes Ao as a central subgroup of the Naga group and claims that Jungli and Mongsen are two well-defined dialects. He considers Changki to be a variety of Mongsen. Mills (1926), on the other hand, considers Jungli, Mongsen, Changki, and Sangpur (now extinct) as dialects, and he considers only speakers of these dialects as belonging to the Ao group. According to Mills, Changki stands on a different footing from the Jungli and Mongsen groups and claims that Changki settlers arrived earlier than the Jungli and Mongsen groups. He observes that the dialect closely resembles Mongsen but differ markedly from it and from the Jungli in certain respects.

In works that are related to culture and tradition of the Ao, the focus is usually on the Jungli and Mongsen groups, and not many written literatures can be found on Changki. Longkumer's (2005) PhD thesis on Changki village is one of the very few works available.

In this paper, a phonological description of Changki-Ao, the language spoken in Changki village, is presented with respect to its phonemic inventory, syllable structure, phonotactics, and tonal patterns. Based on the description, a discussion on orthography is also presented.

In §2, a brief account of the Changki people is presented. In §3, the methodology of the study is underlined, and in §4, the phonemic inventory of Changki is described. In §5, the syllable structure is described along with phonotactic restrictions. In §6, the tonal patterns are discussed. In §7, a discussion on the present orthography is presented, and §8 concludes the paper.

[†]This paper would not have been possible without our informants, who have given their time and shared their language. Thank you to M. Changkiri, A. Amlari, and A. Aonok. We are also grateful to two anonymous reviewers for the insightful comments and suggestions, shaping this paper to its current form. However, we are solely responsible for any errors and misinterpretation of data.

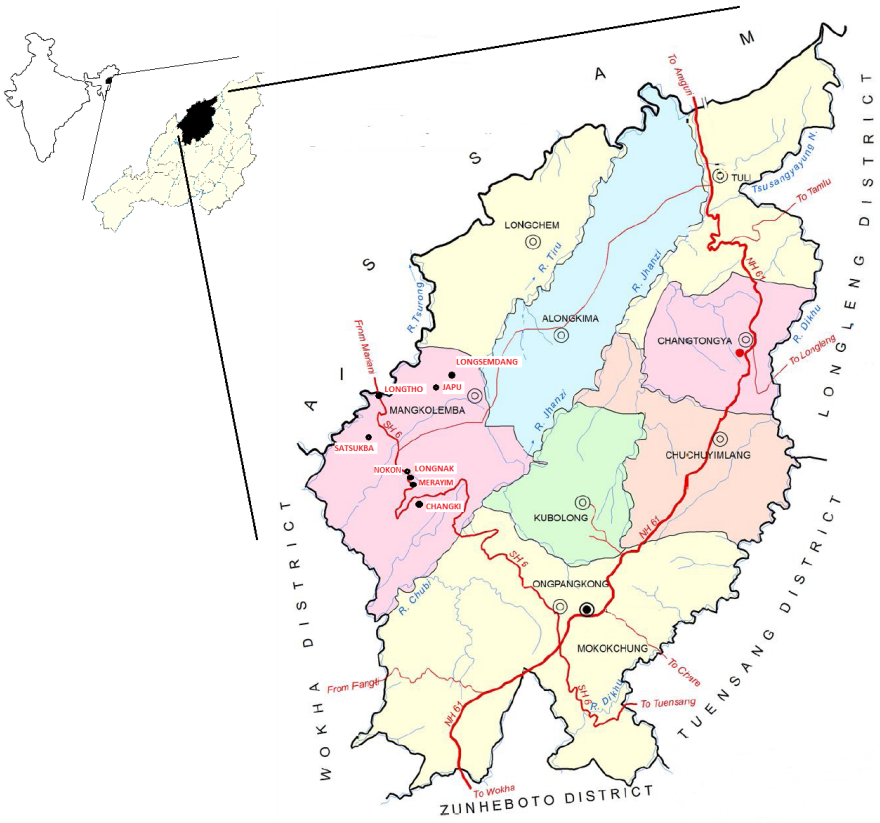

Figure 1 – Map of Mokokchung district, with approximate locations of Changki-speaking villages (adapted from District Census Handbook)

2 Changki

The term Changki refers to the village, its inhabitants, and the language spoken by them. The village is located on the Jangpetkong[1] range, one of the six mountain ranges which forms Ao region. The village is divided into two parts - *Sungdakba* or *loko* (upper area) and *Ayim Anet* or *lolang* (lower area) and the people also call themselves *Ayim Asem Changri* (People of three villages). This nomenclature is in reference to the three waves of migration to Changki and their subsequent settlement. The first was to the upper area, the second to the lower area and a third group, who settled and assimilated into the lower area. As per the Census report of India (2011), Changki village has a tribal population[2] of 1883, of which 862 are males and 1021 are females.

Changki, as a language, is spoken in five villages- Changki, Merayim, Japu, Satsükba, Longsemdang, and three hamlets- Longtho, Longnak and Nokon (see Figure 1). There are variations in the speech of each village and hence, may be considered as varieties of Changki.

The Census report of India does not give population figures based on Jungli, Mongsen, or Changki languages and dialects, rationalizing all the languages, dialects, and varieties under the tribe name Ao. Hence, as per the 2011 census, the number of Ao speakers stands at 260,008. Of the total number of speakers, the returns are 119,549 for Ao, 70,782 for Jungli, and 69,094 for Mongsen. 583 returned 'others'. In order to arrive at an approximate figure for the number of Changki speakers, we look at the population of the 8 villages and hamlets where Changki is spoken. According to the District Census Handbook of Mokokchung (2011), the

[1]Formerly Changkikong, named after the first village on the range, Changki.

[2]The total population is 2486, of which 1219 are males and 1267 are females. We assume that this figure includes the labour workforce from outside the village.

tribal population of these villages, excluding Nokon, stands at 3249 (1327 households). In addition, an estimated 6000-7000 people belonging to these villages live in the towns and cities. Thus, the population of Changki speakers (and its varieties) would be approximately 10,000-12,000.

As Jungli is the prestige language among the Ao, Changki has remained mostly in the spoken form and is used for communicating among themselves. In the church, all proceedings are in Jungli, and in schools, Jungli is taught to children. However, in church meetings, the deliberations are often in Changki. It is also observed that the Jungli textbooks in schools and sunday-schools are explained in Changki. In village council meetings, the proceedings are conducted in Changki. Hence, the use of Jungli and Changki has clear demarcated domains.

In recent years, the people have realised the importance of preserving one's culture and language, leading to rigorous attempts by different village-based organisations and societies to enrich and preserve the language. Writing in the language is encouraged and use of it in formal gatherings among the community members is becoming rampantly popular. Secular as well as religious songs are circulated widely through visual and audio media. As recent as 2022, a forum called Dimapur Changki Youth Forum organised a competition in the language. Expressions through old and new songs of different genres, recitation of rhymes and tales were the various activities through which many participated. The annual publication of the church 'Emphio' (village announcement) is a Jungli publication, but in recent times, the publication includes articles in Changki too. Likewise, it is no longer considered unusual when people speak in Changki in church proceedings.

The community is rich in myths and legends. Folktales and folksongs are passed down from generation to generation, as they are retold or sung during festivals and gatherings. However, this culture of oral transmission is slowly disappearing among the people in the village. A significant practice that is unique to the Changki among the Ao group is the practice of pottery, which is practiced only by the women folk, and is considered as taboo by the other Ao groups. Mills (1926) records this similarity with the Nokrangr, a group belonging to the Konyak tribe, who were early settlers in the Ao area. Nancham village (presently Longsemdang) of the Changki is considered to have been founded by the Nokranger. Mills, pointing out such shared similarities, was convinced that the Changki group had a larger proportion of Konyak blood. Tiasunup (2021) strongly argues against this claim by noting that tribes like Yimkhiung, Lotha, Sangtam, and Makhury, which are closely related to the Ao group, also practiced the art of pottery. A number of linguistic and cultural arguments are provided by Tiasunup (2021) to debunk the claims of Mills.

3 Methodology

The paper is based on a word list of approximately 1000 words, elicited from one male and three female informants of Changki village, but currently residing at Shillong. The age of informants ranges from 40 to 65 years. The second author of the paper is one of the informants. Changki village is divided into two sectors namely *loko* (upper) and *lolang* (lower). Hence, some variations are observed among the informants, who belong to both sectors.

A dictionary (2018) published by the literature board of the Changki Ayim Asem Senso Mongdang (Association of Changki citizens), which contains more than 4340 words, has been a good source of reference. In its preface, it is noted that the dictionary "would be the base for Changki literature", and hence a note on its orthography has been included in this paper.

Around 800 words were recorded with two of the informants, using an H4n Zoom digital recorder with a Shure SM10A head-worn unidirectional microphone at a sampling rate of 44.1

kHz. Each word was recorded in the frame sentence 'I said …….', which was preceded and followed by the word in isolation. Proper instructions were given to the informants so as to avoid list intonation effects. Praat, a speech analysis software is used to determine vowel quality and examine tonal patterns, while Phonology Assistant, a discovery tool from SIL, has helped in the analysis of phonotactic restrictions.

4 Phonemic inventory

Changki has four vowels, six diphthongs, 21 consonants, and three contrastive tones- High, Mid, and Low, as part of its phonemic inventory.

4.1. Vowels

The four-vowel system of Changki includes the vowels /i, u, a/ and /ə/, which is similar to Jungli and Mongsen.

/i/ is a high front unrounded vowel and can occur both word initially *ìfàk* 'fermented bamboo shoot' and word finally *lī* 'to buy'.

/u/ is a high back rounded vowel and can occur both word initially *ùtsə́* 'story' and word finally *tʃʰù* 'to cook'.

/a/ is a low back vowel with neutral lip position and can occur both word initially *àtsə̀* 'water' and word finally *rā* 'to come'.

/ə/ is a central vowel with neutral lip position and can occur both word initially *ə̄ntʰə̄n* 'to gather' and word finally *àsə́* 'cloth'.

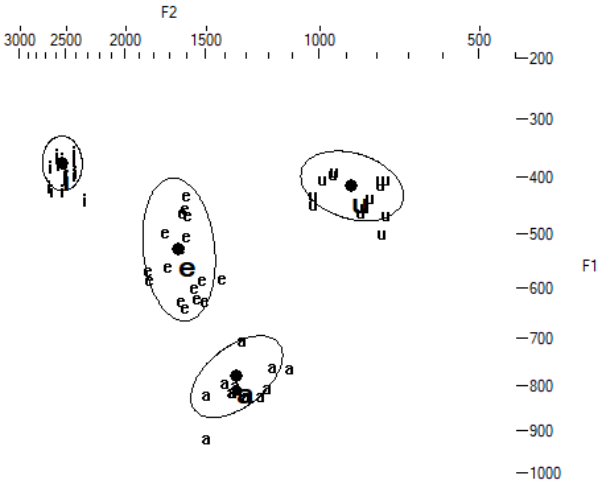

Figure 2 – Vowel plot

The vowel plot in Figure 2 gives us an idea of the vowel space of one female informant. About 15 words for each vowel were analysed by recording the F1 and F2 formant readings. The formant readings were then plotted using PlotFormant, a software programme developed at UCLA Phonetics Lab. The four vowels are quite distinct in maintaining its vowel space, though one can see the schwa (shown as 'e' in the plot) to be dispersed over a much more larger area.

While [e] and [o] are not considered as phonemic, there are a few instances of the vowels [e] and [o] in our data which are treated as allophonic free variants of the vowel phonemes /i/ and /u/ respectively. 1(a) exemplifies the [e~i] variation and 1(b) exemplifies the variation of [o~u].

(1a)	*tààlēʔ*	~	*tààlīʔ*	'why'
	àléʔ	~	*àlíʔ*	'then'
(1b)	*əmtòŋ*	~	*əmtùŋ*	'street'
	tʰəɹòk	~	*tʰəɹùk*	'six'

A regular occurrence of [e] is also seen in the derivation of numbers, as a result of vowel raising. For example, in teen formations, the conjunctive morpheme *-ɹi* is suffixed to the base, giving the meaning 'ten and five' for fifteen (2).

(2) *tʰə́.ɹà-ɹì + pʰáŋà > tʰə́.ɹé.ɹì.pʰáŋà* 'fifteen'

This results from a phonological process of raising /a/ to [e] due to the high vowel /i/ in the suffix. In Figure 3, the F1 for /a/ is around 810 Hz, whereas in Figure 4, the F1 for /e/ stands at around 450 Hz, clearly showing a height difference in the vowels.

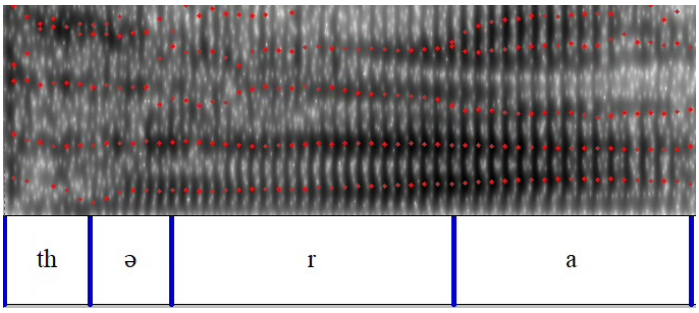

Figure 3 – Spectogram for *tʰə́.ɹà* 'ten'

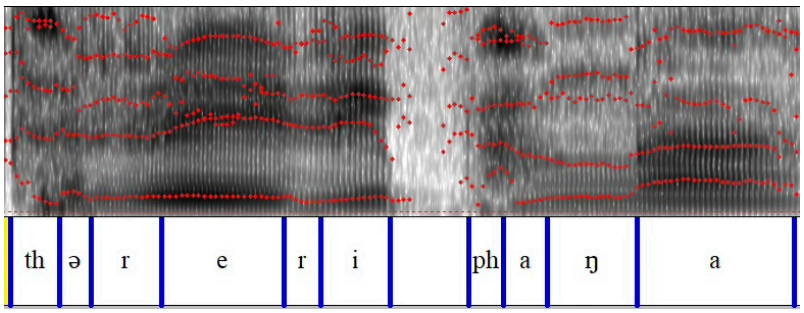

Figure 4 – Spectogram for *tʰə́.ɹé.ɹì.pʰàŋà* 'fifteen'

Likewise, the occurrence of [o] in suffixes and in function words is quite regular across speakers (see §6 for examples with tense markers).

(3)	[ànóʔ]	'and'
	[nùŋòʔ]	'not'
	[-kò]	'locative suffix'
	[-ōŋ]	'imperative suffix'

In terms of distribution, while all vowels can occur word initially, the vowels /i/, /u/ and /ə/ have limited occurrence. These three vowels occurring in the initial position, together accounts for less than 80 words. On the other hand, /a/ has maximum occurrence word initially and is found to occur in more than 140 words. However, this can be attributed to the relational and

non-relational prefix a-, which is common in many Tibeto-Burman languages. The following minimal pairs are evidence of the vowels being contrastive in Changki.

(4) Vowel contrasts

/i/ vs. /u/	lī	'to buy'	:	lū	'to remain'
	mīŋ	'curry'	:	mūŋ	'to stay'
/u/ vs. /a/	àsə́	'cloth'	:	ùsə́	'tone'
	pʰà	'to peel'	:	pʰù	'to blow'
/a/ vs. /ə/	ázà	'grandmother'	:	ázə̀	'fermented bamboo shoot'
/u/ vs. /ə/	tùlí	'to poke'	:	təlí	'vein'
	kūɹā	'ninety'	:	kəɹā	'to come up'

4.2. Diphthongs

According to Spencer (1996: 30), 'the definition of 'diphthong' is not entirely straightforward'. It may be considered to be two vowels pronounced as one single vowel. Such diphthongs occur in tautosyllabic positions and are differentiated from vowel sequences, which may occur across syllables.

Diphthongs are not very common in the Central Naga languages. For instance, in Mangmetong Mongsen (Coupe, 2007), no phonemic diphthongs are observed though diphthongisation can be seen as a result of morpheme concatenation. In Jungli (self-notes), only three diphthongs (/au/, /ui/ and /iu/) are attested. In Lotha, Acharya (1983) reports of only vowel clusters or sequences of vowels.

However, unlike other central Naga languages, several diphthongs are observed in Changki. There are three closing diphthongs /au, ai, əi/ (5), one opening diphthong /ua/ (6), and two height-harmonic diphthongs /ui, iu/ (7), in which there is no change in tongue height.

(5) táùtə̀ 'how'
nāī 'to tie'
tʃʰə́ì 'to play'
(6) tùà 'leaf'
(7) kʰúì 'betel nut'
kīūŋ 'locality'

The diphthongs /ui/ and /əi/ are comparatively more restricted in its occurrence. It is also common for high vowels to become phonetic glides resulting in forms like [twà], [kjūŋ] and [nāj]. While it is possible to consider such glides to be phonemic, this alternate analysis is not favored for two reasons. Firstly, doing so would require postulating very specific consonant clusters in the language. As §5 shows, Changki has a simple CVC syllable structure. Secondly, the duration of diphthongs (> 0.20 ms) is longer than monophthongs (< 12 ms), behaving like two vowels.

4.3. Consonant inventory

Maddieson (2013), in his study of 563 languages reports that the number of consonants in languages can range from 6 consonants (Rotokas, spoken in Papua New Guinea) to 122 consonants (!Xóõ spoken in Botswana). As per Maddieson's categorization scale, Changki has an average (19-25) consonantal inventory of 21 consonants, which is smaller than Mangmetong Mongsen (27 consonants) and larger than standard Jungli (14 consonants).

	Bilabial	Dental	Post-alveolar	Palato-alveolar/Palatal	Velar	Glottal
Plosives						
Unaspirated	p	t			k	ʔ
Aspirated	p^h	t^h			k^h	
Nasals	m	n			ŋ	
Fricatives		s z				h
Affricates						
Unaspirated		ts		tʃ		
Aspirated		ts^h		$tʃ^h$		
Laterals			l			
Approximants			ɻ ɹ	j		

Table 1 – Consonantal inventory of Changki

The 21 consonants are found at six distinct places of articulation and six distinct manners of articulation.

4.3.1. Plosives

There are seven plosives contrasting at four places of articulation: bilabial, dental, velar, and glottal. The bilabial, dental, and velar plosives show a two-way VOT contrast: aspirated and unaspirated, but no voicing contrast, which is similar to the other Central Naga languages.

The unaspirated voiceless bilabial plosive /p/ can occur syllable initially *pìŋzà* ‘ant’, and finally *tàsáp* ‘nest’. Its aspirated counterpart /p^h/ can only occur syllable initially *p^hálì* ‘four’.

The unaspirated voiceless dental plosive /t/ can occur syllable initially *tànìk* ‘eye’ and finally *àŋàt* ‘small fish’. Its aspirated counterpart /t^h/ can only occur syllable initially *t^hání* ‘today’.

The unaspirated voiceless velar plosive /k/ can occur syllable initially *kīpūŋ* ‘family’ and finally *ānūk* ‘machete’. Its aspirated counterpart /k^h/ can only occur syllable initially *k^háɹù* ‘shelf above the fire place’.

The glottal stop /ʔ/ does not occur syllable initially and can be found only in the coda position *náʔpúŋ* ‘goat’, *tīíʔ* ‘unripe’.

The following minimal pairs show the contrastive status of the seven plosives:

(8) Plosive contrasts

/p/ vs /t/ vs. /k/:	pùŋ ‘to cure’	:	tùŋ ‘to pound’	:	kùŋ ‘to dry’
/p/ vs /p^h/:	àpàk ‘to flatten’	:	àp^hák ‘mat’[3]		
	tə́pì ‘surface’	:	təp^hí ‘thigh’		
/t/ vs. /t^h/:	tāŋ ‘to break’	:	t^hāŋ ‘to block’		
	tə́ɹà ‘root’	:	t^hə́ɹà ‘ten’		
/k/ vs. /k^h/:	kā ‘open (mouth)’	:	k^hā ‘to have’		
	kūŋ ‘to dry’	:	k^hūŋ ‘to crow’		
Ø vs. /ʔ/:	àmìʔ ‘human’	:	āmī ‘taro’		
	māsə̄ ‘charming’	:	māsə̄ʔ ‘cow’		

Though not regular, there is a tendency across speakers for unaspirated stops to become

[3] In cases where no minimal pairs are found, near minimal pairs which differ in tone patterns are given.

voiced in intervocalic positions [mábàŋ] ‘time’ and after nasals [ə́mdùŋ] ‘streets’, or are spirantized in intervocalic positions [məɸùŋ] ‘wind’.

4.3.2. Nasals

Three nasals are attested at three distinct places of articulation: the bilabial nasal /m/, the dental nasal /n/, and the velar nasal /ŋ/. Unlike many varieties of Mongsen which exhibit voiceless sonorants, Changki has lost this contrast in the nasals and approximants, retaining the contrast only in the rhotic approximant (§4.3.5). The bilabial nasal /m/ can occur syllable initially *māsə̄* ‘charm’ and finally *ɨ̀ə̀m* ‘bear’. The dental nasal /n/ can occur syllable initially *ní* ‘I’ and finally *ə́mpə̀n* ‘needle’. The velar nasal /ŋ/ can occur syllable initially *àŋáʔ* ‘fish’ and finally *míŋ* ‘curry’. However, in word initial positions, the velar nasal is neutralised to a dental nasal /n/.

(9a) nà-ts^{h}ə́ʔ ‘fermented fish’
(9b) nālā ‘to listen’

In (9a), the first component of the compound word is *à-ŋáʔ* ‘fish’, which undergoes prefixal deletion as a result of compounding. Neutralisation then applies, where /ŋ/ > /n/. For (9b), the corresponding Mongsen and Jungli forms are *ŋā ~ŋ̊ā* and *ā-ŋā* respectively, which suggests a change of /ŋ/ > /n/ in Changki. The following minimal pairs show the contrastive status of the three nasals.

(10) Nasal contrasts

/m/ vs. /n/ vs. /ŋ/:	*tʃ^{h}àmá* ‘to lose’	:	*tʃ^{h}àŋá* ‘to bark’	:	*tʃ^{h}ānā* ‘to be sick’
/m/ vs. /n/:	*nīŋ* ‘to ripen’	:	*mīŋ* ‘curry’		
/n/ vs. /ŋ/:	*ànáʔ* ‘near’	:	*áŋà* ‘brother’		
/m/ vs. /ŋ/	*māmi* ‘housefly’	:	*māŋī* ‘headache’		

4.3.3. Fricatives

Three fricatives are attested at two places of articulation. The dental fricative, which involves a constriction of the blade of the tongue against the upper teeth, has a two-way contrast in terms of voicing /s, z/.

The voiceless dental fricative /s/ can only occur syllable initially *sə́ŋtʃáŋ* ‘fruit’, *àsə́ŋ* ‘stick’ The voiced dental fricative /z/ can only occur syllable initially *zə̀p* ‘a kind of bamboo shoot dish’, *ázə̀* ‘alcohol’.

Unlike Jungli and Mongsen, where /s/ has an allophone [ʃ] in the environment of /i/, in Changki, this allophonic distribution is not seen (see §5.1 (24)).

The glottal fricative /h/ has very limited occurrence in Changki. Most occurrences are in expressions like [hàwàʔ] ‘yes’, [hàm] ‘yes’, and [háíjò] ‘exclamation’ and less than ten lexical words are attested from the data list. It is possible that /h/ as a phoneme is disappearing from the language.

(11) hùú ‘stage (age group)’
hīʔlī ‘in a rush’
hīlī ‘green pigeon’

Note that apart from its restricted distribution, it can occur only syllable initially in word

initial positions. The following minimal pairs show the contrastive status of the fricatives /s/, /z/, and /h/.

(12) Fricative contrasts

sāʔ	'to measure'	:	zāʔ	'to hear'
sūɹā	'to sprout'	:	zūɹā	'come in'
hìkú	'game'	:	ĩkū	'here'
hùú	'stage '	:	sū	'to be born'

4.3.4. Affricates

Four affricates are attested, and like plosives, have a two-way contrast in terms of aspiration and are attested at two distinct places of articulation: dental and palato-alveolar.

The unaspirated dental affricate /ts/ can only occur syllable initially *tsəpá* 'well', *ātsəŋ* 'rain'.

The aspirated dental affricate /ts^{h}/can only occur syllable initially *ts^{h}əlāʔ* 'earthworm', *ītsʰə* 'dried bamboo shoot'.

The unaspirated palato-alveolar affricate can only occur syllable initially *ʧūmī* 'butterfly', *ātʃāŋ* 'rice'.

The aspirated palato-alveolar affricate can only occur syllable initially *ʧʰàŋúk* 'grasshopper', *təʧʰū* 'throat'. The following minimal pairs show the contrastive status of the four affricates.

(13) Affricate contrasts

/ts/ vs. /ts^{h}/:	tsəʔ	'to attend'	:	ts^{h}əʔ	'to wash'
	ītsə	'to look'	:	ītsʰə	'bamboo shoot (dry)'
/tʃ/ vs. /tʃ^{h}/:	tʃā	'to eat'	:	tʃʰā	'to do'
	tʃù	'slide'	:	tʃʰù	'cook'

Despite the distinctiveness of the dental affricates /ts/ and /ts^{h}/, its distribution is highly restricted and can occur only with the schwa (see §5.1).

4.3.5. Laterals and approximants

Four approximants at two distinct places of articulation are observed: post-alveolar and palatal. The post-alveolar lateral /l/ can only occur syllable initially *láŋpàŋ* 'low wooden stool', *ālāp* 'grave'.

The post-alveolar approximant /ɹ/ is the only sonorant sound in Changki which has a voicing contrast, commonly found in many Mongsen varieties. The voiced post-alveolar approximant /ɹ/ only occurs syllable initially *ɹàɹáʔ* 'war', *āɹūʔ* 'dirt/boundary'. The voiceless post-alveolar approximant /ɻ̥/ also occurs syllable initially *ɻ̥u* 'stitch', *àɻ̥á* 'rash'.

As seen in Figure 5, though /ɻ̥/ is phonologically treated as a voiceless approximant, phonetically, it is accompanied by a lot of noise, and hence sounds more like a fricative. This phonetic characteristic is not observed in the voiced approximant /ɹ/ that follows.

The palatal approximant /j/ occurs syllable initially *jàmáŋ* 'cloud', *ájú* 'snake'. The following minimal pairs show the contrastive status of the lateral and approximant sounds.

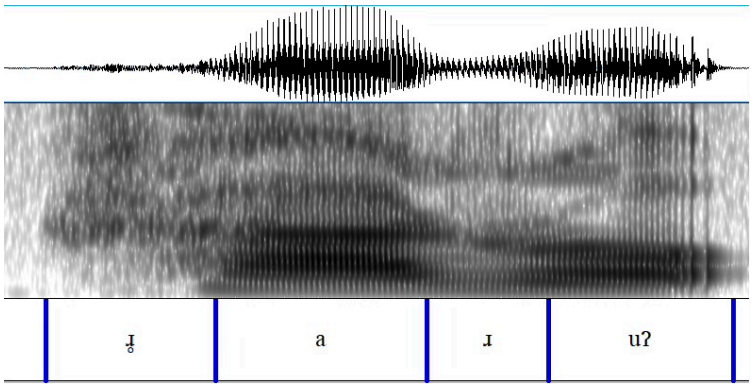

Figure 5 – Waveform and Spectogram for *ɻāɹūʔ* 'to weave'

(14) Lateral and approximant contrasts

/ɹ/ vs. /l/:	*īɹā*	'come in'	:	*īlā*	'we (excl)'			
/ɹ/ vs. /ɻ/	*ɹā*	'to come'	:	*ɻā*	'to spin (weave)'			
/ɹ/ vs. /ɻ/ vs. /l/	*ɹūk*	'to bite'	:	*ɻūk*	'to drown'	:	*lūk*	'to wash (hair)'
/l/ vs /ɻ/ vs /j/:	*àlú*	'field'	:	*àɻú*	'cane'	:	*ājū*	'snake'

A labio-velar approximant [w] is not considered phonemic as it occurs only in the environment of /a/ and may be considered as a phonetic variant of the diphthong /ua/.

(15) /uáɹù/ > [wáɹù] 'crow'
/uàk/ > [wàk] 'to swell'

The occurrence of [w] is restricted and occurs in around 10 words in the data list. Though it is not mentioned in previous works (Gowda 1975; Coupe 2003, 2007; Temsunungsang 2008), it is seen that /w/ rarely occurs with the other vowels in Jungli and Mongsen as well. This brings to question the phonemic status of /w/ in Changki (as well as in the Ao group of languages). Given its restricted occurrence with /a/, it is analysed as part of the diphthong /ua/, which is phonetically realized as [wa]. (Note that in §4.2, /ua/ is one of of the five diphthongs postulated for Changki). This is supported by comparative data from Jungli in (16), showing a correspondence between Changki [w] and Jungli /u/.

(16)

/tuà/	>	[twà] ~[tùwà]	'leaf'	(*tu* in Jungli)
/kuà/	>	[kwà] ~[kù.wà]	'hair'	(*ku* in Jungli)
/uā/	>	[wā]	'to go'	(*a-u* in Jungli)
/uā.zāʔ/	>	[wā.zāʔ]	'bird'	(*u.zəʔ* in Jungli)

5 Syllable Structure

The syllable canon for Changki is (C1)V(C2)T, where a vowel and tone are the obligatory constituents. All consonants except the glottal stop can occur in C1. While it is observed that /ŋ/ does not occur word initially, it is attested in the onset position word medially. In C2, only plosives and nasals are allowed. However, with some urban speakers, there are instances of /ɹ/ occurring in the coda position as a result of vowel deletion and resyllabification.

(17a) mə.ɹī.tsə > məɹ.tsə 'chilli'
(b) $t^hə́$.ɹà + ɹi + $p^hə̀$lì > $t^hə́əɹ.p^hə̀$lì 'fourteen' (also for numbers 11 to 19)

In (17a), vowel deletion results in /ɹ/ occurring in the coda. In (17b), along with the vowels /a/ and /i/, an entire syllable is deleted. This speaker variation is perhaps an indication of an independent phonological change in Changki, or a change influenced by Mongsen/Jungli, which allows /ɹ/ in the coda position.

The Mongsen and Jungli forms for 'chilli' is *māɹ.tsə̄* and *māɹ.sə̄* respectively. The conjunctive marker *-ɹi* (17b) corresponds to *-əɹ* in Jungli and many varieties of Mongsen.[4] Hence, the forms are *tə̌əɹ-pə̀.zə̄* in Jungli and *tʰə́.ɹə́ər-pʰə̄.lī* in Mongsen.

Clusters are not found in Changki, though there are some occurrence of plosive + /ɹ/ sequences (5 words). While such sequences are found in natural speech, in slow speech, the sequences are heterosyllabic, and hence are not treated as consonant clusters.

(18) *ʧʰāk.ɹāŋ* > [tʃʰā.kɹāŋ] 'cliff'
pʰə̀.ɹàŋ.sá > [pʰɹàŋ.sá] 'sparkling'
ʧʰə̄p.ɹū > [tʃʰə̄.pɹū] 'wart'
ʧə̄p.ɹā > [tʃə̄.pʰɹā] 'snail'
jìp.ɹú > [jì.pɹú] 'storm'

The word *ʧʰāk.ɹāŋ* is a compound word, composed of *ātʃʰāk* 'steep' and *kàɹàŋɹùŋ* 'topsy-turvy'. As it is morphologically complex, the resultant [kɹ] sequence is considered to be phonetic, rather than phonological. Likewise, *pʰə̀.ɹàŋ.sá* corresponds to *pʰə́.ɹàŋ* in Jungli and Mongsen.

5.1. Phonotactic restrictions

Generally, restrictions are observed in the Central Naga languages. In Jungli, Temsunungsang (2009) reports a number of restrictions within the rhyme, and also of the restricted distribution of the affricates. The restricted occurrence of the dental affricate with the schwa is also reported for Mongsen by Coupe (2007). In Changki, within the rhyme, the schwa /ə/ is the only vowel which can occur with all possible coda consonants as shown in Table 2. In the table, '✓' stands for occurrence, '*' stands for restricted occurrence and '-' stand for no occurrence.

V↓ C2→	p	t	k	ʔ	m	n	ŋ
ə	✓	✓	✓	✓	✓	✓	✓
i	*	*	✓	✓	*	*	✓
u	-	-	✓	✓	-	-	✓
a	-	-	✓	✓	-	-	✓

Table 2 – Rhyme patterns in Changki

The vowel /i/ also occurs with all coda consonants, but differs from the schwa as its occurrence with /p, t, m, n/ is highly restricted. With /p/, only two instances (*jìpɹú* 'storm' and *mìíp* 'return') are observed. With /t/, only one word is attested (*ìít* 'hug'). With /m/, two words are found (*tīmtə̄m* 'trouble', *tìm* 'correct') and with /n/, three words are attested (*kīn* 'tribe', *íìn* 'hang', *mìín* 'accompany'). Such restrictions with the vowel /i/ are not seen in Mongsen or Jungli. One possible reason could be the reduction of /i/ in certain contexts. For instance, in Jungli,

[4]Mangmetong Mongsen is an exception with *-rə* (Coupe 2007).

(19) /ī̀m/ > [jə̄m] ‘village’

This is evident from compound words like *īm.pāŋ* ‘upper village’ and *īm.lāŋ* ‘lower village’, where the underlying /i/ surfaces. However, in Changki, /i/ has been completely neutralized or reduced in such contexts. Hence, the word for ‘villager’ in Changki is *ə̄m-ɹī*, as opposed to *ím-ə́ɹ* in Mongsen. Likewise, the word for ‘flow’ is *ə̄m* and *īm* in Changki and Mongsen respectively.

However, the distribution of /a/ and /u/ is very similar to that of Jungli and Mongsen. In native Changki words, the back vowels /a/ and /u/ can occur only with /k/, /ʔ/, and /ŋ/. There are three words that appear to be exceptions to the phonotactic restriction, specifically to /a/ occurring with /m/, /p/, or /n/.

(20) [àm] ‘aspidistra leaf’
[ān] ‘chicken’
[t^hāp] ‘this morning’

However, these words in (20) can be explained to be a result of vowel deletion. Many words (of all categories) occur with prefixes in Changki, which is also commonly seen in Jungli, Mongsen, and other Tibeto-Burman languages. In nouns, the two common prefixes are *a-* and *tə-*, which attach to the root to form stems.[5] While a- attaches to common nouns, *tə-* attaches to body parts and kinship terms. Given the prefix *a-*, the above forms may be analysed as having a schwa in the root, which is deleted.

(21a) /a-ə̆m/ > [àm̀] ‘aspidistra leaf’
(b) /a-ə̄n/ > [ān] ‘chicken’

In (21a), vowel deletion results in the tone being assigned to the prefixal vowel and coda consonant. In (21b) as well, the tone is assigned to the prefix. The presence of a schwa in these words is supported by compound words, where the schwa emerges.

(22) *a-ə̄n* + *zá-là* > *ə́n.zà.là* ‘chick’
chicken DIM

In (22), when the diminutive suffix attaches to the stem, the /a/ is deleted.

A look at the Onset-Nucleus co-occurrences show that while most combinations are allowed, a few interesting gaps are observed. This is illustrated in Table 3.

V↓ C1→	i	u	ə	a
ts	-	-	✓	-
ts^h	-	-	✓	-
tʃ	✓	✓	✓	✓
$tʃ^h$	-	✓	✓	✓
s	-	✓	✓	✓
z	-	✓	✓	✓

Table 3 – Select Onset-Nucleus co-occurrence in Changki

[5] *a-* and *tə-* in Mongsen are treated as a non-relational prefix (NRL) and relational prefix (RL) respectively in Coupe (2007). We continue to use the same labels.

The first are the dental affricates, which occur only with the schwa and never with the other three vowels. A similar observation is made for Waromoung and Mangmetong Mongsen (Coupe 2003, 2007) and for Jungli (Temsunungsang 2009). However, their analyses differ. For Jungli, the dental affricate [ts] is analysed as an allophone of the palato-alveolar affricate /tʃ/. While [ts] occurs only with the back spread vowel [ɯ], [tʃ] occurs with the other vowels. In Mongsen, the affricates are treated as phonemic. Coupe suggests that the restricted distribution of /ts/ is perhaps an indication of a phonemic merger taking place in the language.

The idea of a phonemic merger can be extended to the other varieties, including Changki. In various Mongsen varieties, a look at the correspondence between /ts/ and /tʃ/ show that its distribution is not very symmetric (data from first author's field notes).

(23)	Khensa	Mangmetong	Changki	Khar	Gloss
(a)	***tsàʔ***	***tʃàʔ***	*tʃàʔ*	***tʃàʔ***	'to eat'
(b)	***mə́.tsák***	***mə́.tʃák***	*mə́.tʃák*	***mə́.tʃák***	'to chew'
(c)	*á.tsə́*	*á.tsə́*	*á.tsə́*	*á.tsə́*	'water'
(d)	***ā.tsə̄***	*ā.tsə̄*	*ī.tsə̄*	*ā.tsū*	'to look'
(e)	***mə́.tsə́***	*mə́.tsə́*	*mə̄.tsə̄ʔ*	*mə́.tʃī*	'to knit'

Table 4 – ts~tʃ correspondence in Mongsen varieties

In Khensa, /ts/ corresponds to /tʃ/ in other varieties when it occurs with /a/ (23a,b). With /ə/, it remains as it is. /ts/ can also occur with no change in all varieties (23c). However, in Khar, the vowel can change (23d), or the affricate corresponds to /tʃ/ (23e). While the data is inconclusive and a more detailed analysis is needed, it does point toward the restricted distribution of the dental affricate in many varieties, supporting the idea of a phonemic merger in the Ao varieties.

The second restriction in Table 3 is that of the aspirated palato-alveolar /tʃʰ/ not occurring with /i/. However, there is no explanation why this is so, and hence considered as an accidental gap.

The third co-occurrence restriction between onset and nucleus is that of the dental fricatives which do not occur with the vowel /i/. Hence, there are no words with **si* or **zi*. In Jungli and a few Mongsen varieties like Mangmetong, the dental fricatives have completely palatalized in the environment of /i/, resulting in [ʃi] and [ʒi]. In Changki, the situation is slightly different with no palatalization involved.

(24)	Mongsen	Jungli	Changki	
	āʃī	-	sə̄	'to look like'
	ʃì	a-ʃì	sə̄	'to comb
	áʃìʔ	aʃìʔ	asə̄	'not know'
	sə́sàʔ	ʃìsàʔ	sə́sàʔ	'to tear'

In Bruhn's (2014) reconstruction of Proto-Ao, he observes that **ʃ-* merged with **s-* before all vowels except /i/ in Mongsen, while in Jungli, any vowel following **ʃ-* was raised to /i/. Thus, for both languages, the result was a [ʃ] surfacing only before /i/. Given this situation, he also notes that it is not clear whether a phonemic sequence **si* existed in Proto-Ao. The data from Changki is inconclusive and does not shed much light as both sequences *ʃi* and *si* do not occur synchronically. From the data in (24), the *sə* sequence in Changki could possibly be from two different sources: *sə* and *ʃi*, or from another source (*si, ʃə*), which is no longer visible in any of the related languages or dialects.

6 Tones

Similar to Mongsen and Jungli, three level tones are identified to be contrastive in Changki: High, Mid, and Low, with every syllable assigned a tone. In the data, these tones are transcribed as V́, V̄, and V̀ for high tone (H), mid tone (M), and low tone (L) respectively.

In most of the Central Naga languages, word length varies according to the word category and hence, in Changki as well, it is necessary to examine tones in relation to word category. In nouns, less than 30 monosyllabic nouns are listed in the data list (<10%) and close to 70% of the words are disyllabic. The remaining are either trisyllabic or polysyllabic. However, for verbs, there is equal distribution of monosyllabic and disyllabic forms (40-45% each).

In Mongsen and Jungli, the past tense is a zero suffix. Hence, the past tense form of the verb is considered as the citation form. However, verbs in Changki are bound forms and cannot surface without an affix. Therefore, the identification of lexical tone on verbs becomes a challenge as the tone on the verb stem varies according to the affix attached.

	'to plant'	'to see'	'to listen'	'to spill'
PRESENT	*tʃʰə̄m-ɹī*	*ūŋ-ɹī*	*nālā-ɹī*	*ə́nsá-ɹī*
PAST	*tʃʰə̀m-ā*	*ùŋ-ā*	*nālā-ā*	*ənsā-ā*
PERFECTIVE	*tʃʰə́m-ùkù*	*ūŋ-ūkū*	*nālà-ùkù*	*ə́nsá-ùkù*
FUTURE	*tʃʰə̄m-i*	*ūŋ-ī*	*nālə̄-i*	*ə́nsə́-ì*
IMPERATIVE	*tʃʰə̄m-úŋ*	*ùŋ-ūŋ*	*nāʔ-lūŋ*	*ənsə-ūŋ*
NOMINALISER	*tʃʰə̄m-pāʔ*	*ūŋ-pāʔ*	*nālā-pāʔ*	*ə́nsá-pàʔ*

Table 5 – Tonal patterns in verb stems

In Table 5, four verbal stems are given with six different suffixes. In 'to plant', all three tones surface on the stem, while in the remaining three verbs, at least two tones (high and mid) surface on the stems. However, the complexities of tonal variation as a result of affixation is not examined in this paper, restricting our focus to tone patterns in non-derived noun and verb stems.

All words were recorded three times with two speakers: twice in isolation and once in the frame sentence 'I said _____'. In the identification of tone, both are taken into consideration as some variation is observed. For instance, an LH pattern in isolation often surfaces as MH or HH in frame sentences. In such cases, the pattern that emerges in isolation is considered. However, to identify M and L tones on words, the frame sentences are more useful as the preceding and following tones serve as a better cue to tone identification. In the frame, a slight variation is observed where the tone on the quotative marker (QM) changes according to the verb tone.

(25a)	*ní-*	*nə́*	'stem with H/M tone'	*tə̀*	*sāānúʔ*
(b)	*ní-*	*nə́*	'stem with L tone'	*tə̄*	*sāānúʔ*
	1P.SG	AGT	verb stem	QM	say-PAST

If the verb stem ends in a high or mid tone (25a), tone on the quotative marker *tə̀* is usually low. However, if the verb stem ends in a low tone (25b), the tone on the quotative marker is usually mid *tə̄*.

The following minimal pairs/sets show the contrastive status of the three tones in Changki.

	HL	LH	M	L
ajəm	village	famine	biscuit	
li			to buy	to live
aju	garden		word	
aiŋ		journey	lonely	
ami	spear			taro

Table 6 – Tone contrasts in Changki

High tones have very restricted occurrence and seldom occur as the only tone in a word. Hence, there are no minimal pairs with a high tone in Table 6. The restricted occurrence of the high tone at the lexical level may be an indication of a merger with the mid tone. Two observations are noted here with regard to the high tone. Firstly, variation is frequently observed in words with HL and LH tone patterns. The HL may surface as ML (26a), while LH often surfaces as LM (26b) or MH (26c).

(26a) *ájə̀m ~ājə̀m* ‘village’
(b) *àjə́m ~àjə̄m* ‘hunger’
(c) *ʧə̀ŋ̍ú ~ʧə̄ŋ̍ú* ‘ablaze’

The above patterns are treated as variants since no clear minimal pairs are found to justify the patterns ML, LM, or MH as being phonemic. Figure 6 shows the four contrastive tone patterns (of words from Table 6), as spoken by a female speaker. For this speaker, the LH tone pattern is closer to MH.

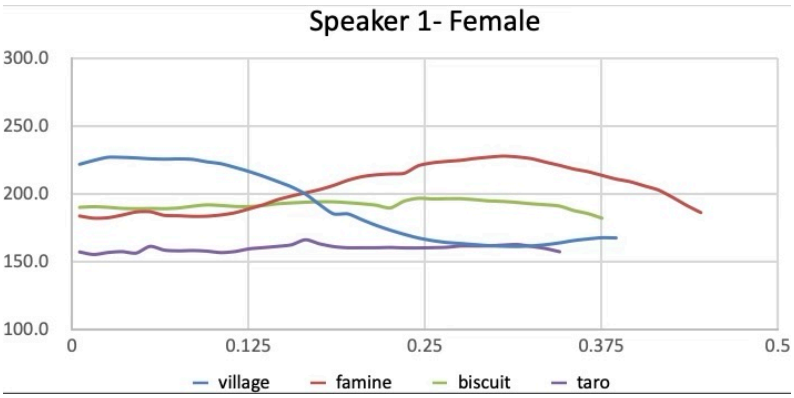

Figure 6 – Pitch contours of a female speaker

Secondly, while the high tone is restricted and not very visible in roots, it is very clear in suffixes. In (27a), the high tone on the suffix spreads to the stem, while in (27b), a high tone is realised on the suffix.

27(a) *nī-nə́* > *ní-nə́* ‘I-AGT’
(b) *ʧə̄k-pə́ʔ* ‘break-NOM’
ʧʰə̀m-ānúʔ ‘wear-PAST’

Coupe (2003) also notes that the high tone may be considered as marked due to its restricted distribution in Mangmetong-Mongsen.

Contour tones, as attested mostly in monosyllabic words (28), are treated as composite tones, consisting of the high and low level tones.

(28a) *hùú* ‘stage (age group)’
mìíp ‘to return’
(b) *ʧʰáì* ‘to play’
kʰúì ‘betel nut’

There are several reasons as to why we consider these as composite. Firstly, there are very few words with contour tones. Secondly, the vowel is always either a diphthong (28b) or long (28a), which suggests that each mora carries a tone. If the coda is a sonorant, it carries the tone [àḿ] ‘aspidistra leaf’. Thirdly, such contours may also result from morpheme concatenation as in (29a) or deletion (29b), and hence not considered to be phonemic (also see §6.1).

(29a) *à-íŋ* > *àíŋ* ‘NRL-journey’
(b) *tʰáʌà-pʰàlì* > *tʰáàʌpʰàlì* ‘ten and four’ (fourteen)

The tone patterns in underived nouns and verb stems are discussed in greater detail in §6.1 and §6.2. However, suffixation and compounding are not discussed. Underived nouns include nouns that surface with one of the following prefixes: *a-* ‘non-relational prefix’, *a-* ‘vocative prefix’, *tə-* ‘body-part prefix’, *tə-* ‘3rd P kinship prefix’.

6.1. Tones on nouns

In monosyllabic and disyllabic non-derived nouns, all four tonal patterns are observed: HL, LH, M, and L.

HL	LH	M	L
áì ‘hay’	*àíŋ* ‘journey’	*āə̄n* ‘chicken’	*kùà* ‘hair’
ázù ‘snow’	*àkʰə́n* ‘song’	*ājū* ‘snake’	*ànùk* ‘machete’

Table 7 – Tonal patterns in nouns

In Table 7, the words with underlying M tone surfaces as M or MM, depending on whether it is monosyllabic or disyllabic. Likewise, words with an underlying L tone surfaces as L or LL.

The prefixes are considered to be toneless and derive its tonal specification from the root either through spreading or associating with the root tone. In the examples of (30), the tone on the prefix cannot be treated as a default tone as it can occur with any of the three tones. This leads us to propose that HL and LH are part of the root, as shown in (30).

(30)	(a)	(b)	(c)	(d)
Root	HL \ | -i	LH \ | -k^{h}ən	M | -ən	L | -nuk
Prefixation	a-i	a-k^{h}ən	a-ən	a-nuk
Surface	HL | | á-ì 'hay'	L H | | à-k^{h}én 'song'	M / | ā-ən 'chicken'	L / | à-nùk 'machete'

In this analysis (30a) and (30b), the root carries both tones. In (30a), the H is delinked and linked to the prefix as it is toneless. Likewise, in (30b), the L delinks and links to the prefix. In (30c) and (30d), the M and L tones respectively spread to the prefix, surfacing as MM and LL. As noted earlier, there are no words with only a High tone.

In trisyllabic non-derived stems, the commonly observed patterns are HLL, HL, and M.

(31)	(a)	(b)	(c)
Root	HL L | | -ləmli	HL | | -mila	M | mərítsə
Prefixation	a-ləmli	tə-mila	———
Surface	HL L | | | á-lə̀mlì 'old days'	H L / | | tə́-mílà 'shadow'	M / / | mərītsə̄ 'chilli'

In (31a), the H on the first syllable delinks and links to the toneless prefix. In the other words (31b,c), the initial tone spreads to the prefix. While the number of tonal patterns are restricted with this class of words, other tonal patterns like LLL, LLM, LMM are possible in derived words and compounds.

6.2. Tones on verbs

As noted in §6, all verbs are bound and can surface only with some affix. The result is that stem tones can vary depending on the affix. Hence, the identification of the root tone on verbs is not easy. For this paper, the verbs were recorded with the two suffixes: *-ɹuʔ* 'present tense' and *-paʔ* 'nominaliser', and the root tones have been identified based on these recordings.

In monosyllabic verb roots, three patterns are observed: M, L, and HL. However, the HL pattern is very restricted and is found in less than 5 verbs.

(32) M: *nū* ‘to lead’
L: *tʰàm* ‘to finish’
HL: *múì* ‘to bless’

In disyllabic verb roots, the same patterns found in monosyllables are seen with the addition of the LH pattern. In disyllabic verbs as well, the HL pattern is restricted.

(33) M: *mālān* ‘to change’
L: *zàŋà* ‘to keep’
HL: *tsə́ŋlàik* ‘to fall down’
LH: *ìsə́* ‘to regret’

A comparison of the tone patterns in nouns and verbs shows that both monosyllabic and disyllabic nouns allow the four possible patterns (HL, LH, M, L). In monosyllabic verbs, the LH pattern is not attested, while the HL pattern is restricted.

7 A note on orthography

Among the Ao, Jungli is the standard language and is taught in schools and colleges, apart from using it in all official domains. All written literature is in Jungli. This means that Mongsen and Changki speakers must learn how to speak and write Jungli. Though spoken by a large section of the population, Mongsen, till date, does not have an orthography. Changki on the other hand has laid the base for the development of its literature by publishing a dictionary in 2018. In recent times, the use of Changki has been encouraged and propagated by various stakeholders.

In this section, we briefly review the orthography used in the dictionary, and based on the phonological analysis of this paper, suggest a few reforms that would make the orthography more consistent and transparent so that it is easier for children and adults to learn. Roman letters are used for writing Changki, as is the case with all the Naga languages. Of the 26 Roman letters, 19 <b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, w, y, z> are used to represent consonantal sounds while five <a, e, i, o, u> are used to represent vowel sounds. An additional grapheme <ü> is used to represent the schwa. <v> and <x> are the only letters not used. Hence, in total, 25 graphemes are used in the Changki orthography.

In orthography development, several factors come into play, resulting in an orthography that is linguistically sound, and one that is socially and politically accepted (Pike, 1947). While the present orthography may be socially and politically accepted by the community, a look at the graphemes used for writing Changki shows a lack of linguistic input in its development. This will undoubtedly result in learnability problems as there is no unambiguous grapheme to sound correspondence. Following are some of the observations.

Based on the phonemic analysis presented in §4, Changki does not have a voicing contrast in plosives. This means that the present orthography makes use of two graphemes to represent one sound: /p/ is represented by <p, b>, /t/ is represented by <t, d>, and /k/ is represented by <k, g, q>. The use of <q> is not necessary as all words spelt with <q> are pronounced as /k/.

In the representation of vowels, a similar problem is observed. While only four vowels are phonemic /i, u, ə, a/, six graphemes <a, e, i, o, u, ü> are employed. Of the six, only <a> is consistently used to represent /a/. Otherwise, /i/ is represented by two graphemes <i, e>, /u/ is represented by <u, o>, and /ə/ is represented by <ü, e>. This means that the grapheme to sound

correspondence is not transparent and hence, learners must memorise the spelling of each word.

In the development of orthography, transfer of knowledge from standardized orthographies play an important role (Rice and Cahill 2014). This appears to be the case with Changki as well, where the use of voiced graphemes <b, d, g> and multiple vowels seem to be transferred from the existing Jungli orthography. The orthography that was introduced for Jungli by the Christian missionaries in the 19th century was not based on the principles of orthography development and the choice of graphemes had no linguistic basis. Hence, similar problems of learnability crop up in Jungli too. The grapheme <f> also finds place in the orthography, though a labio-dental fricative is not attested in the data. However, this could be a dialectal variation and may be accommodated in the orthography to reflect this variation.

Given the above observations, we suggest a decrease in the number of graphemes that will lead to a transparent orthography, resulting in better learnability. Given a two-way contrast of voiceless aspirated and unaspirated for plosives at three places of articulation, and a glottal stop (/ʔ/), the following graphemes are proposed for the plosives: <p>,<ph>, <t>, <th>, <k>, <kh>.

		bilabial	**dental**	**velar**	**glottal**
Plosive	unaspirated	p <p>	t <t>	k <k>	ʔ <h>
	aspirated	p^h <ph>	t^h <th>	k^h <kh>	

Table 8 – Proposed graphemes for plosives

The voiced graphemes <b, d, g> currently used may be dropped as this leads to ambiguity. Note that <h> is used to represent three sounds in the current orthography: aspirated stops, the voiceless approximant /ɻ̥/, and the glottal stop. This usage may be retained as it does not create any ambiguity, with <h> occurring after stops, after <r>, and after a vowel to indicate the glottal. A fourth use may be employed. As noted in §4.3.3, [h] has very limited occurrence, only in the word initial position. The <h> can also be used in such words as it will always occur word initially, and can be differentiated from the aspiration and glottal use.

Nasals at three places of articulation are attested and the graphemes <m, n, ng> currently used is retained.

	bilabial	**dental**	**velar**
Nasal	m <m>	n <n>	ŋ <ng>

Table 9 – Proposed graphemes for nasals

In the current representation of affricates, <ts> is used to represent the dental affricates while <ch> and <j> are used to represent the palato-alveolar affricates. One will note that only one grapheme <ts> is used to represent the dental affricates despite a two-way contrast /ts/ vs. /ts^h/. Hence, it is proposed that <tsh> be used to represent the aspirated dental affricate.

		dental	palato-alveolar
Affricate	unaspirated	ts <ts>	tʃ <j>
	aspirated	tsʰ <tsh>	tʃʰ <ch>
Fricative	voiced	z <z>	
	voiceless	s <s>	

Table 10 – Proposed graphemes for fricatives and affricates

The voiced and voiceless dental fricatives currently represented by <s, z> is retained.

Of the lateral and three approximants, the lateral is currently represented by <l> while the palatal approximant is represented by <y>. The voiced and voiceless post-alveolar approximants are represented by <r> and <rh> respectively. These representations are retained as there is a clear correspondence between one grapheme and one sound.

		Post-alveolar	palatal
Lateral	voiced	l <l>	j <y>
Approximant	voiced	ɹ <r>	
	voiceless	ɹ̥ <rh>	

Table 11 – Proposed graphemes for lateral and approximants

The grapheme <w> which is used in current orthography may be dropped as it is not phonemic and can be represented by the vowel <u>. In the representation of vowels, the use of the graphemes <i> and <u> may be streamlined so that it represents only /i/ and /u/ respectively, with the discontinuation of <e> and <o>. The representation of /a/ by <a> can be retained.

	front	central	back
High	i<i>		u <u>
Mid		ə <e>	
Low			a <a>

Table 12 – Proposed graphemes for vowels

At present, the schwa /ə/ is represented by <e> as well as <ü>. In the development of an orthography, the choice of easy to print symbols is one of the social goals (Pike, 1947). In today's context, this can be interpreted as symbols that are easy to type on a keyboard. Hence, going by this factor, <e> should be the ideal grapheme to represent the schwa, as using <ü> involves an extra keystroke in typing the umlaut. Based on the ease of use, it is proposed that the grapheme <e> be used to represent the schwa.

However, in working with Naga communities on orthography in the past, it has been noticed that many people consider <ü> to be an inalienable part of the language and there is an emotional attachment to the symbol. Therefore, if there is a problem of social acceptability with regard to the use of <e>, <ü> may be used to represent the schwa in Changki.

Given the above suggestions based on a phonemic analysis, the following graphemes may be used to represent the Changki orthography:

<a, ch, e, h, i, j, k, kh, l, m, n, ng, p, ph, r, rh, s, t, th, ts (tz), tsh, u, y, z>

In the current orthography, digraphs are not treated as separate sounds. Hence, words with <t, th, ts (tz), tsh> are all listed under 'T' in the dictionary. In the proposed orthography, the digraphs have been listed as separate graphemes. This will help learners in understanding that the digraphs are different from the single consonants and hence must be pronounced accordingly. <tz> is also listed as a variant of <ts>, as this practice comes from Jungli where the word for 'water' <tzü> is written with <tz>. Hence, all words derived from 'water' is represented with <tz>.

Tones have generally not been marked in the orthographies of any of the languages of Nagaland. It is only in recent times that efforts have been made to mark tones in some languages like Pathso-Khiamniungan, Yimkhiung, and Mongsen-Ao through community-based dictionary-making workshops conducted by Alexander Coupe and T Temsunungsang in the years 2017, 2018, and 2019 respectively. Given that orthographies for languages in Nagaland have existed for many years without tone marking, the acceptability of marking tones is not very positive despite its advantages. One main reason is the drastic changes to existing orthographies that result from marking tones.

For Changki as well, tones are not indicated in the orthography. At present, no specific proposals are given for tone marking. However, in the event of the community wanting to mark tones for Changki, there are a number of ways in which this can be done. Roberts (2013) gives an overview of the different ways in which tones are represented with examples from different languages. Some of the more common representations are:

- Use of diacritics
- Use of superscript numbers
- Silent consonant graphemes
- Use of punctuation symbols
- Doubling of vowels

8 Conclusion

With many languages disappearing from the world, and a larger number being vulnerable, it is necessary to document and describe such languages. Changki is one such language, that is under threat not only from global languages, but also from the prestige language of the community. The community is aware of this, and efforts are made to encourage the use of their language in more domains.

In this paper, a phonological description has been presented. In terms of the consonants, vowels, and tones, Changki is similar to both the Mongsen and Jungli systems, though differences are observed in the distribution of these phonemes. A comparison of the data set with Jungli and Mongsen shows about 50% similarity with Mongsen. Similarity of forms is considered based on segments alone, ignoring the tonal differences. One main reason why Changki has a 50% similarity with Mongsen is the prefix *a-*. A major difference observed between Jungli and Mongsen is the occurrence of the prefix *a-* on verbs and nouns (Temsunungsang 2008, 2009). In Jungli, a- occurs with verbs while in Mongsen, it occurs with nouns, resulting in an exact mirror image. Though the occurrence of *a-* initial words in Changki is lesser, it follows the Mongsen pattern where the nouns take the prefix *a-*. For example, *lùŋ* 'stone' in Jungli corresponds to *á-lúŋ* in Changki and Mongsen.

With both Jungli and Mongsen, Changki shares a 30% similarity. About 20% of the words are distinct to Changki. It is also observed that many function words like *à.lí?* 'but', *à.nó?* 'and', and suffixes like *rù.bà?* 'ordinal marker' in Changki differ from Jungli and Mongsen.

Despite the similarity with Mongsen, an interesting phenomenon can be observed where Changki and Mongsen tone patterns are different. The difference is such that a pattern in one corresponds to the opposite pattern in the other. For example, *tə̀kʰə́t* 'hand' with LH pattern in Changki corresponds to *tə́kʰə̀t* in Mongsen (HL pattern), and *màzàm* 'poison' in Changki with L tone corresponds to *mázám* in Mongsen (with H tone). Kingston (2011) reports of a similar phenomenon in the Athabaskan languages. Thus, though Changki and Mongsen share most of the vocabulary, it is the tonal differences that reduces intelligibility between speakers.

In this paper, it is concluded that Changki has four vowels, six diphthongs, 21 consonants, and three contrastive tones. The syllable structure is simple with an obligatory tone and no consonant clusters. All consonants, barring the glottal stop, are allowed in the onset position while only stops and nasals are allowed in the coda position. In term of distribution, the dental affricates /ts/ and /tsʰ/ are highly restricted as it can occur only with the schwa. In terms of frequency, the glottal fricative /h/ has the least number of occurrences as it is attested only in about ten lexical words. Tones are analysed based on the word category and four tone patterns are identified in stems: HL, LH, M and L. In verbs, the HL pattern is highly restricted. Of the three tones, the high tone is considered to be marked as it does not occur frequently like the low and mid tones. Based on the orthography used in the Changki dictionary published in 2018, problems and inconsistencies in the spelling system are discussed. Some suggestions are proposed for spelling reforms based on the phonological analysis, so that the system is unambiguous and easy to learn.

References

Bruhn, D. W. (2014). *A Phonological Reconstruction of Proto-Central Naga*. PhD thesis, University of California at Berkeley.

CAASM (2018). *Changki ayu rongmen*. Changki Ayim Asem Senso Mungdang, Changki.

Cahill, M. and Rice, K. (2014). *Developing orthographies for unwritten languages*, volume 6. Dallas.

Coupe, A. R. (1998). The acoustic and perceptual features of tone in the Tibeto-Burman language Ao Naga. In Mannell, R. and Robert-Ribes, J., editors, *Proceedings of the 5th international conference on spoken language processing, Vol.2*, pages 57–60, Canberra. The Australian Speech Science and Technology Association.

Coupe, A. R. (2003). *A phonetic and phonological description of Ao: A Tibeto-Burman language of Nagaland, north-east India*. Pacific linguistics, Research School of Pacific and Asian Studies, The Australian National University.

Coupe, A. R. (2007). *A grammar of Mongsen Ao*, volume 39. Walter de Gruyter.

Gowda, K. G. (1972). *Ao-Naga phonetic reader*. Central Institute of Indian Languages, Mysore.

Gowda, K. G. (1975). *Ao grammar*. Central Institute of Indian Languages, Mysore.

Grierson, G. A. (1903). *Linguistic survey of India*, volume 3.2. Office of the superintendent of government printing, India, Calcutta.

Kingston, J. (2011). The phonetics of Athabaskan tonogenesis. In Hargus, S. and Rice, K., editors, *Athabaskan prosody*, pages 137–184. John Benjamins Publishing Company. https://doi.org/10.1075/cilt.269.09kin.

Longkumer, J. (2005). *A Sociological Study of an Ao Naga Village Changki Village*. PhD thesis, North-Eastern Hill University.

Maddieson, I. (2013). Consonant inventories (v2020.4). In Dryer, M. S. and Haspelmath, M., editors, *The World Atlas of Language Structures Online*. Zenodo. Last accessed 27th July 2023.

Mills, J. P. (1926). *The Ao Nagas*. Macmillan and Company, limited.

Pike, K. (1947). *Phonemics: A Technique for reducing languages to writing*. University of Michigan Press.

Roberts, D. A. (2013). A tone orthography typology. In Borgwaldt, S. R. and Joyce, T., editors, *Typology of writing systems*, pages 85–111. John Benjamins, Amsterdam.

Spencer, A. (1996). *Phonology: Theory and description*. Blackwell Publishers, Cambridge.

Temsunungsang, T. (2008). Tonality and the analysis of subminimal words in ao. In Morey, S. and Post, M., editors, *North East Indian Linguistics*, pages 45–64. Foundation Books (Cambridge University Press India Pvt. Ltd), Delhi. https://doi.org/10.1017/UPO9788175968431.005.

Temsunungsang, T. (2009). *Aspects of the prosodic phonology of Ao: An inter-dialectal study*. PhD thesis, The English and Foreign Languages University, Hyderabad. http://hdl.handle.net/10603/108955.

Tiasunep (2021). Revisiting J.P. Mills' Portrayal of Changki Ao Naga. In Behera, M., editor, *Tribe-British Relations in India: Revisiting Text, Perspective and Approach*, pages 123–142. Springer. https://doi.org/10.1007/978-981-16-3424-6_7.