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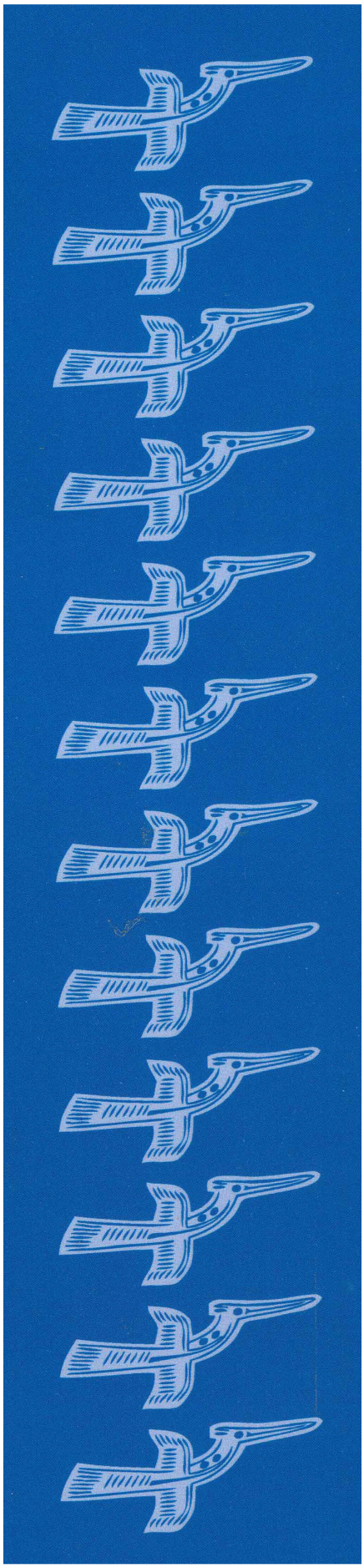

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A phonological description of Muak Sa-aak

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Abstract
The Austroasiatic language Muak Sa-aak, belonging to the Angkuic branch of Eastern Palaungic, is a tonal language spoken in Eastern Shan State of Myanmar and in China. This paper provides a phonological description of a variety spoken in Eastern Shan State. Like other Angkuic languages, Muak Sa-aak has undergone a shift whereby proto voiced stops have become voiceless and voiceless stops have become aspirated. However, the language does have the voiced stops /b, d/, due to borrowing. Despite the development of tone, Muak Sa-aak retains contrastive vowel length. Another surprising feature of this language is the phenomenon of final sonorant lengthening for short vowels.
Keywords: Palaungic, Angkuic, phonology
ISO 639-3 language codes: tlq

1. Introduction

Languages of the Palaungic branch of Mon-Khmer are located mainly in Southern China and in Myanmar, as well as in Thailand and also in Laos. Among these, the known Angkuic languages are located primarily in China, although some have previously been documented in other places: Samtao in Myanmar, Mok in Thailand, and Kiorr in Laos (SIL Ethnologue 2009). For Eastern Palaungic language groups, there is published work on Waic languages, including Wa and Plang varieties (such as Diffloth 1980, Paulsen 1992, and Watkins 2002), and some on Lametic languages (such as Narumol 1982 and Conver 1999). There is not, however, very much recent published work available on Angkuic languages. The areas where they live are places that have been, for the most part, difficult for outside researchers to access in recent years. U and Hu have been studied by Svantesson (1988, 1991), who gives a listing of available Angkuic wordlists (1988). Some limited data is also available on Man Met (cited in Diffloth 1991) and on Mok (Wenk 1965, Diffloth 1982[1]). Other Angkuic languages are known only from nineteenth and early twentieth-century wordlists.

The old distinction between the proto *h- and *s- initial consonants, lost in other Palaungic languages, is still maintained in the Angkuic languages (Diffloth 1977). Angkuic languages underwent a Germanic shift in the initial consonants (Svantesson 1991) so that old voiced stops became voiceless, and old voiceless stops became aspirated. Some Angkuic languages have also developed tone and denasalization of final nasals. The latter is seen in P'u-man and Pou Ma as well as in U (Svantesson 1988).

This paper provides a full phonological inventory of the Angkuic language Muak Sa-aak.[2] The Muak Sa-aak people live primarily in the eastern part of Shan State of Myanmar, in Mong Yawng Township. Some of their villages are located near Mong Yawng, and some are near the Chinese border, in what is called Special Region #4. At least two villages are located across the border in China. There are reported to be some Muak Sa-aak people in Thailand as well, although no village locations are currently known; it is not known if they would be the same as the speakers of the language listed in the SIL Ethnologue as Mok (Lewis 2009). The estimated population total is 4,460 in Myanmar and China (Hopple 2007, unpublished).

[1] According to Svantesson (1988: 76), Wenk's "Ya Ang Lawa" is the Mok presented by Diffloth (1982).
[2] A more detailed description of Muak Sa-aak phonology is given in the underlying MA thesis by the author.

Hall, Elizabeth. 2013. A phonological description of Muak Sa-aak.
Mon-Khmer Studies. 42:26-39

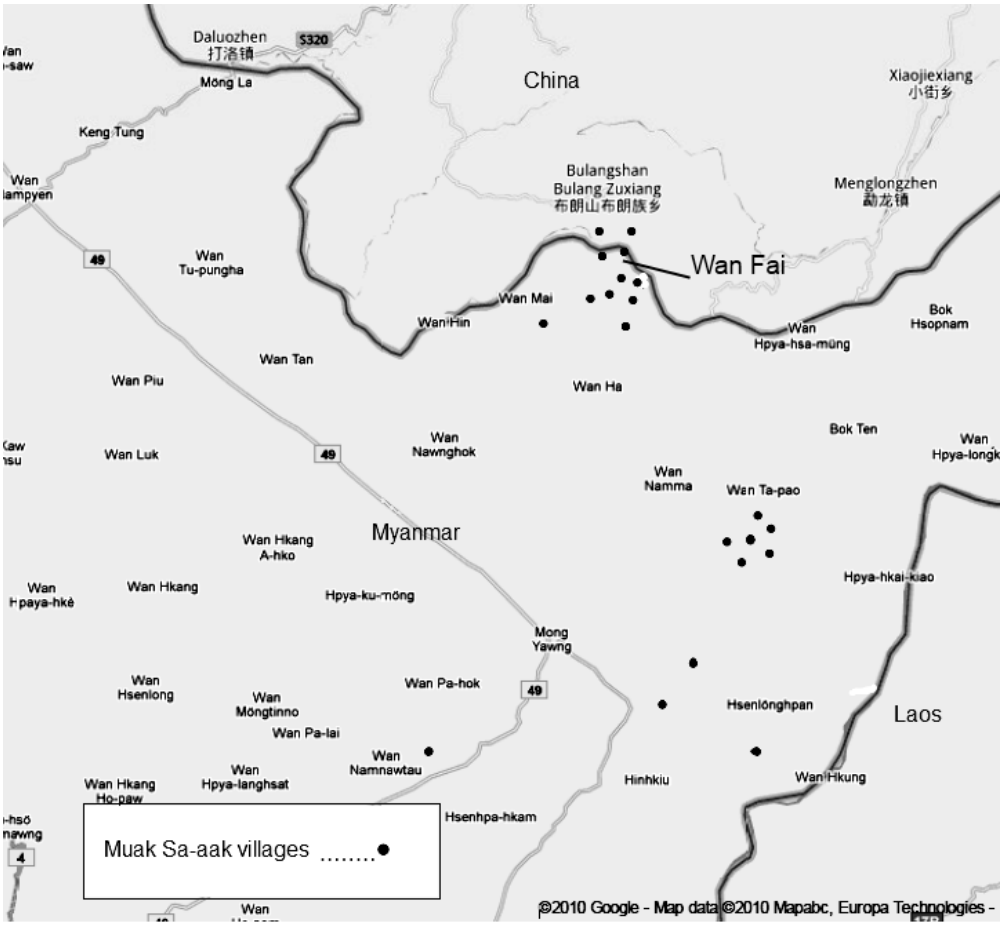

Figure 1. Map of known Muak Sa-aak villages, Eastern Shan State (adapted from Hopple 2007, unpublished)

The position of Muak Sa-aak in relation to other known Palaungic languages is shown in Figure 2.

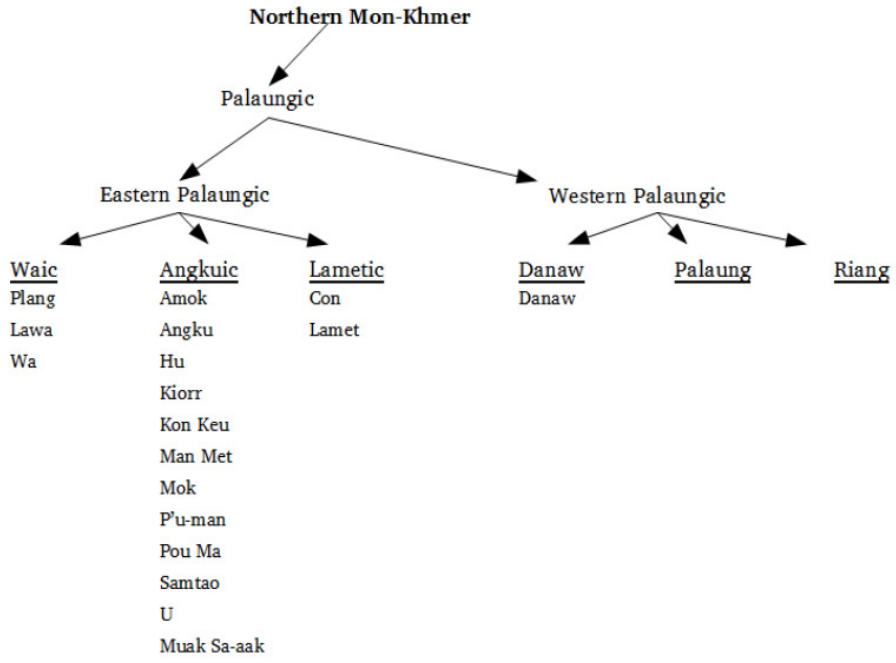

Figure 2. Language family tree for Muak Sa-aak (adapted from SIL Ethnologue 2009)

The data in this paper was gathered from speakers from an old village called Wan Fai in eastern Shan State, Myanmar with a population total of about 620 people (Hopple 2007, unpublished). The 1,659 item wordlist that this analysis is based on was fully or partially recorded from four Muak Sa-aak mother tongue speakers in their early forties to mid fifties in 2007 and 2008.

The Muak Sa-aak are currently listed in the SIL Ethnologue (16th Edition) under two names. The first is "Mok" (in Thailand), for which they are listed as an alternate name. This listing, however, is still uncertain. The second is the name "Tai Loi," for which they are listed as a dialect ("Saneung Muak;" saneun means "language") (Lewis 2009). According to speakers, the Muak Sa-aak are typically called Tai Loi or Tai Doi by outsiders, "Loi" or "Doi" being the Shan and Tai Lue words for mountain. According to Lebar, Hickey and Musgrave, the Shan sometimes call the Palaung "Kunloi," or "mountaineer" (1964: 121) and the Buddhist Wa have been called "Tai Loi" and "Hkun Loi" (1964: 129). Scott also speaks of Tai Loi as being a generic term of reference to hill groups which have become Buddhist, but also principally meaning Buddhist Wa, also called "Wa Küt" (J. George Scott and J. P. Hardiman 1900: 517)

2. Word structure

Muak Sa-aak words follow general Mon-Khmer word structure in being mono- and sesquisyllabic. There is active borrowing from the neighboring Tai Lue (Tai-Kadai language), so many words are loan words. They are realized following Muak Sa-aak phonology and phonotactics. Taking into account main syllable structure, reduced syllables, and tone, the overall word structure can be represented as follows:

$(C).(C)(C)V(C)^{T}$

Reduced syllables in Muak Sa-aak have a limited inventory of onsets /p, p^{h}, t, k, k^{h}, m, s/, and a non-distinctive very short vowel which is not transcribed.

Compounding is very common, as in *mul³.tʰi²* 'silver-hand' =bracelet, or *cʰak².ŋa:j³.laŋ³* 'seed-face-black' = pupil.

Examples for Muak Sa-aak word structure (1-10) are given below.

(1)	CV^{T}	*ci²*	'do'
(2)	CVC^{T}	*puk²*	'rotten'
(3)	CCV^{T}	*kra:³*	'mat'
(4)	$CCVC^{T}$	*kʰrɛp²*	'fish scale'
(5)	$C.CV^{T}$	*k.tɯ²*	'nose'
(6)	$C.CVC^{T}$	*k.can³*	'stand up'
(7)	$C.CCV^{T}$	*t.krɔ²*	'peel/ shell'
(8)	$C.CCVC^{T}$	*t.prɯ:t¹*	'swallow'
(9)	V^{T}	*ɔ:¹*	'cheek'
(10)	VC^{T}	*ɛl³*	'chicken'

3. Consonants

Muak Sa-aak has 21 distinctive consonants. They include oral and nasal stops at the bilabial, alveolar, pre-palatal, and velar points of articulation, plus a glottal stop. Aspiration and voicing are distinctive for the stops, although the voiced stops are not common and mostly occur in borrowed words. Also there are no voiced stops at the pre-palatal or velar points of articulation. This shows that Muak Sa-aak underwent a sound shift comparable to the Germanic shift observed by Svantesson (1988, 1991) for U and Hu.

Hall, Elizabeth. 2013. A phonological description of Muak Sa-aak.
Mon-Khmer Studies. 42:26-39

3.1 Initials

As shown in Table 1, Muak Sa-aak has oral and nasal stops at four points of articulation. The alveolar stop is fronted [t̪].

Table 1. Muak Sa-aak initial consonant phonemes

	Labial	Alveolar	Pre-palatal	Post-palatal
Stop	b p pʰ	d t tʰ	c cʰ	k kʰ
Nasal	m	n	ɲ	ŋ
Fricative	f	s		h
Approximant	w	l, r	j	

3.1.1 VOT of aspirated, tenuis, and voiced plosives

To illustrate the aspirated, tenuis, and voiced contrasts, VOT measures are given in Table 2 below. The voice onset timing (VOT) was measured for initial plosives in six items, the set of *bɛt²* 'fish hook', *pɛ²* 'goat', *pʰe²* '2nd sg pl' and the set of *dɛt²* 'flatten', *tɛk²* 'small', *tʰuːm³* 'love' (see Table 1). Negative VOT for /b, d/ reflects clear voicing. Initial tenuis plosives have very short release noise, with VOTs as short as 0.001s for /p/, or 0.003s for /t/ (because these are initial plosives, VOT during closure cannot be measured). VOT for aspirated plosives, however, varies between 0.061-0.096ms for /pʰ/ and 0.037-0.051s for /tʰ/ and is significantly longer than for the non-aspirated stops.

Table 2. VOT for voiced, tenuis, and aspirated voiceless stops (seconds).

Ref.	Item	Gloss	Speaker 1		Speaker 2	
804	*bɛt²*	fishhook	-0.094	-0.058	-0.072	-0.054
965	*pɛ²*	goat	0.001	0.005	0.004	0.006
1652	*pʰe²*	you (pl)	0.065	0.061	0.096	0.074
1526	*dɛt²*	flatten	-0.064	-0.083	-0.121	-0.138
1509	*tɛk²*	small	0.006	0.007	0.003	0.004
284	*tʰuːm³*	love	0.039	0.038	0.051	0.037

3.1.2 Pre-palatals

Oral and nasal pre-palatal stops /c, cʰ, ɲ/ are realized as alveolopalatals [t̠ɕ, t̠ɕʰ, ɳ̠ʑ][3]. The aspirated plosive occurs in free inter- and intra-speaker variation with a homorganic fricative [ɕ~t̠ɕʰ], as in [ɕak²] versus [t̠ɕʰak²] for 'seed'. In syllable-final position, the alveolopalatal oral and nasal stops /c/ and /ɲ/ are accompanied by a short [i]-like transition, like in other Mon-Khmer languages. Evidence for the interpretation as plosives rather than affricates is provided through VOT measures for the three places of lingual articulation: alveolar, alveolopalatal, and velar (Table 3). The VOT for /c/ and /cʰ/ is in line with that of the other stops. For speaker 1, aspiration of the alveolopalatal stop with 0.070-0.090s is even shorter than for alveolar with 0.076-0.095s. For tenuis stops, the alveolopalatal place of articulation with 0.023-0.024s VOT shows the longest release noise for this speaker, compared to 0.010-0.011s for alveolar and 0.010-0.011s for velar stops. For speaker 2, VOT for alveolar and velar tenuis stops with 0.009-0.011s and 0.006-0.009s is only slightly shorter than for alveolopalatal tenuis stops with 0.011-0.015s.

[3] Since alveolopalatal consonants appear to be a Mainland-Southeast Asian areal feature, Clark represents them with single letters that Chinese researchers use in their description of Hmong-Mien languages (2008). These symbols are chosen for the phonetic transcriptions of the alveolopalatal consonants in this study as they accurately describe the phonetic quality of these sounds; however, the usual palatal symbols will be used for the phonemes since they are widely used in the literature.

The longer release noise of alveolopalatal tenuis stops is caused by the large area of impact of the tongue blade with the alveolopalatal region, and the close approximation of the back of the tongue to the hard palate during closure. The resulting friction upon release is clearly heard with tenuis stops, whereas aspiration superimposes the alveolopalatal release noise. This explains why VOT of initial aspirated alveolopalatal stops does not necessarily differ from VOT measures of initial alveolar or velar stops.

To further support the interpretation of alveolopalatal obstruents as plosives rather than affricates, the length of the sibilant /s/ is also included in Table 3. VOT for the /s/ is considerably longer than any of the stops, including that of alveolopalatal /c/ and /cʰ/, which is evidence for considering these to be stops rather than affricates. For comparison, Thurgood and Demenko (2003), studying Polish affricates, found a duration of about 0.110s for the alveolopalatal affricate, with stop closure of only about 0.050s, leaving the frication duration at about 0.060s. The unaspirated Muak Sa-aak equivalent has a release noise of only 0.011-0.024s.

Table 3. Release noise duration for alveolar, alveolopalatal, and velar stops, and the alveolar fricative (seconds).

Ref.	Item	Gloss	Speaker 1		Speaker 2	
868	*tap²*	army	0.011	0.010	0.011	0.009
17	*tʰa:k¹*	tongue	0.095	0.076	0.068	0.091
1434	*cak²*	pull	0.023	0.024	0.011	0.015
1202	*cʰak²*	seed	0.090	0.070	0.088	0.091
322	*kak²*	obstruct	0.010	0.011	0.009	0.006
206	*kʰat²*	ill	0.082	0.068	0.109	0.084
559	*sak*	tattoo	0.138	0.163	0.080	0.056

For further illustration, spectrograms for initial lingual plosives are provided in Figures 3 and 4, showing similar amplitudes and durations for release bursts and aspiration in all three lingual stops.

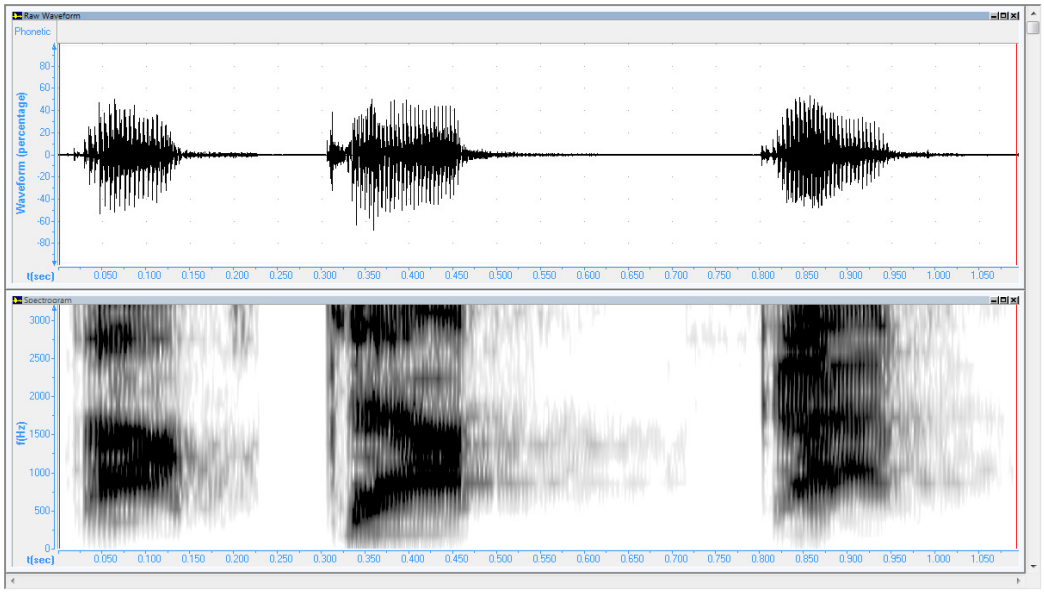

Figure 3. Spectrograms for tenuis stops in *tap²* ‘army’, *cak²* ‘pull’, and *kak²* ‘obstruct’.

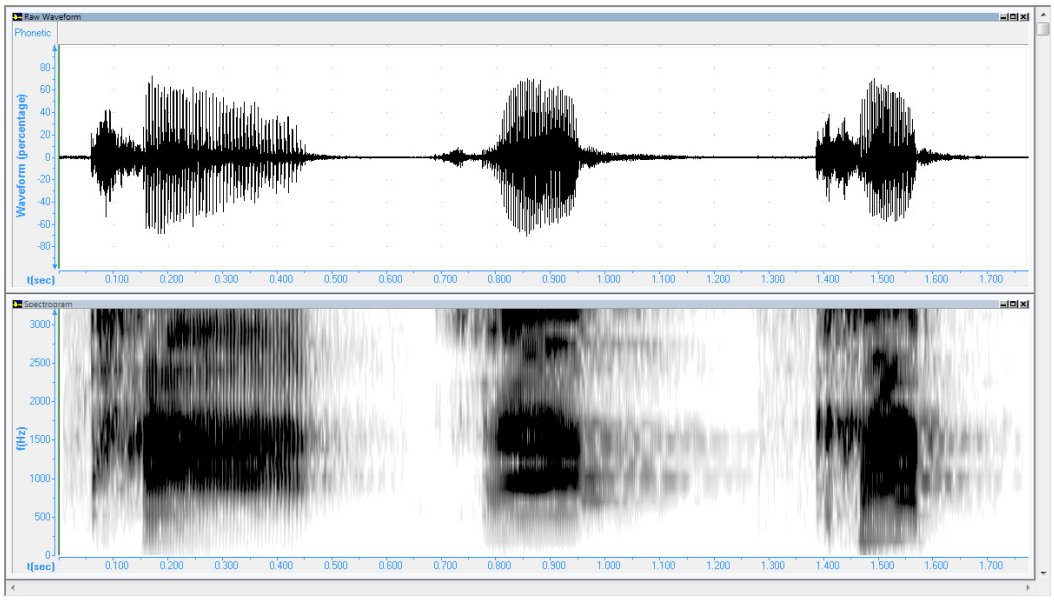

Figure 4. Spectrograms for aspirated stops in *tʰaːkˡ* 'tongue', *cʰakˀ* 'seed', and *kʰatˀ* 'ill'.

3.1.3 Fricatives

There are three voiceless fricatives: labiodental /f/; alveolar sibilant /s/; and glottal /h/. There are only a few occurrences of the labiodental fricative /f/ (23 items in the wordlist, of which nine are borrowed), and some speakers seem to realize it as the frequently occurring aspirated stop [pʰ] instead (the phoneme /pʰ/ is found in 116 items). For example, when referring to the name of their own village, sometimes a speaker would say /faːjˡ/ and other times a speaker would say /pʰaːjˡ/. It is possible that there is a change ongoing caused by Tai Lue borrowings, which do not have the /f/. Analysis of this in more speakers with more data might perhaps resolve this question. The phoneme /h/ occurs in only 31 of 1,658 words in the data, most of them Tai Lue loanwords, all of them monosyllabic, but it does contrast with the sibilant /s/.

3.1.4 Approximants

Muak Sa-aak has four approximants /w, l, r, j/. The labial-velar approximant /w/ is in free variation with a delabialized approximant [β̞] in syllable-initial position, as in [s.wɛŋːˢ] and [s.β̞ɛŋːˢ] for 'flea'. However, in monosyllabic words, [w] commonly occurs before open vowels, particularly the vowel /a/. As the second consonant of a cluster, or as a final consonant, this phoneme is realized as [w]. Word initially, the central alveolar approximant /r/ is in free variation with an alveolar trill. When it is the second consonant of a cluster, it is usually pronounced as an approximant. This phoneme does not occur syllable-finally; /l/, in contrast, occurs syllable-finally but not in clusters, although both occur syllable-initially. The palatal approximant /j/ has palatal and alveolopalatal fricative allophones if preceded by reduced syllables with aspirated onsets. If the reduced syllable vowel is maintained in this environment, the approximant is realized as a voiced fricative [j̟]. If the vowel is entirely omitted, the approximant merges with the aspiration of the minor syllable onset to voiceless [ç, ɕ]. This can be seen in a word pronounced twice by the same speaker: [pʰjaŋˢ]~[p.ɕaŋˢ] for /pʰ.jaŋˢ/ 'fat'. This is in agreement with Svantesson's observations on the palatal approximant in U (1988).

3.1.5 Glottal stop

The glottal stop occurs only phonetically as a predictable vowel onset which may be dropped in continuous speech. In syllable-final position, it is not a consonant, but a suprasegmental feature linked to tone. It occurs only with the constricted Tone 2 in smooth syllables ending in vowels, nasals, or approximants, where consonant clusters are not permitted.

3.2 Consonant clusters

A limited number of consonant clusters are permitted. There are no syllable-final consonant clusters; all are syllable-initial. Only voiceless bilabial and velar stops take the position of the first consonant in a cluster and they can only be followed by /w/ and /r/. The clusters found in the data are given in Table 4.

Table 4. Syllable-initial consonant clusters

	w	**r**
p	pw	pr
pʰ	pʰw	pʰr
k	kw	kr
kʰ	kʰw	kʰr

3.3 Final consonants

The following consonants occur in the syllable-final position: /p, t, c, k, m, n, ɲ, ŋ, l, j, w/.

These finals are the voiceless unaspirated stops, the nasals, and the approximants except for /r/, which does not occur in the syllable-final position. The final stops are unreleased. Final consonants are summarized in Table 5.

Table 5. Final consonants

	Bilabial	Alveolar	Pre-palatal	Velar
Stop	p	t	c	k
Nasal	m	n	ɲ	ŋ
Approximant	w	l	j	

One curious phenomenon regarding finals is found in Muak Sa-aak, namely the occurrence of lengthened final consonants after short vowels. Final sonorants - nasals and the final approximants /l, w, j/- are usually shorter after long vowels, and longer if preceded by short vowels, so that the overall syllable length appears equal (see examples 11-18). This is most easily heard in utterance-final syllables, where there seems to be a preference for a certain syllable length, accomplished through the lengthening of final sonorants if paired with short vowels.

(11) *pʰɤl³* [pʰɤlː³] ‘fly’

(12) *pʰ.juːl³* [pʰ.juːl³] ‘wing’

(13) *jam³* [jamː³] ‘die’

(14) *jaːm³* [jaːm³] ‘cry, weep’

(15) *cʰim³* [cʰɪmː³] ‘bird’

(16) *cʰɯːŋ³* [cʰɯːŋ³] ‘cloth

(17) *kʰaːj³* [kʰaːi³] ‘eat’

(18) *kʰaj³* [kʰaiː³] ‘fat (cow)’

Average lengths for sequences of long vowels followed by short sonorants, and short vowels followed by long sonorants (four tokens each word), are given in Table 6.

Table 6. Comparison of durations of vowel, sonorant, and rime (seconds).

Reference	Item	Gloss	Vowel	Sonorant	Rime
823	*kʰiŋ³*	expensive	0.253	0.285	0.538
1231a	*kʰi:ŋ³*	ginger	0.437	0.212	0.649
134	*ŋaŋ³*	hear	0.182	0.387	0.569
1565	*ŋa:ŋ³*	sweet	0.362	0.198	0.560
249	*jam³*	die	0.139	0.334	0.473
272	*ja:m³*	cry, weep	0.394	0.190	0.584
1267	*kʰum³*	pit	0.244	0.341	0.585
740	*kʰu:ŋ³*	dig	0.435	0.253	0.688

The overall length of the rime is usually slightly longer for syllables with long vowels than for those with short vowels; however, the overall rime duration difference is smaller than the vowel duration difference. For example, the entire average rime length of *kʰiŋ³* and *kʰi:ŋ³* differs by 0.111s, but the length of the vowels differs by 0.184s. For *kʰiŋ³* vs. *kʰiŋ³*, the rime duration differs by only 0.009s whereas the vowel duration difference is 0.180s, similar to the one in the first example. With the exception of two tokens in the data, the sonorant following a short vowel is longer than the sonorant following a long vowel. Averaging these results in the following:

Short vowel 0.204s + Long sonorant 0.337s = 0.541s

Long vowel 0.407s + Short sonorant 0.213s = 0.620s

As can be seen in these averages, short vowels have about half the length of long vowels, and short final sonorants are only about two thirds of long final sonorant duration.

An explanation for this phenomenon might be available from Thai. Brown sees vowel length in Thai as "more a function of where the final consonant begins than where the vowel ends" (1979: 12). He uses a two-fold classification of Thai tones, the one-part tones: falling, low, and high dead in closed syllables, and the two-part tones: rising, mid, and high live in open syllables. After a short vowel, the final consonant begins earlier, in the first part, or head, of the tone; if a vowel is long, the final consonant begins in the second part, the tail (1979).

Rungpat Roengpitya (2002) similarly found that vowel quality and length of final nasal consonants in Thai are secondary markers used to distinguish between short and long vowels. In particular, short vowels have longer nasal finals than long vowels, and a word with a long nasal final was more likely to be identified by the listener as having a short vowel (2002).

Although this regards only nasals, the same phenomenon could be at work with Muak Sa-aak final sonorants, especially since it has long been in direct contact with a Tai language. The question of whether final sonorant lengthening is an Angkuic feature or whether its development is motivated by language contact can only be answered through research on further Angkuic or Palaungic languages.

4. Vowels

Muak Sa-aak has nine monophthongs with contrastive length except for the open-front and open-back vowels. In addition, there are two diphthongs, /ia/ and /ua/. The complete inventory of 18 vowels is shown in Table 7.

Table 7. Muak Sa-aak vowel phonemes

	Front	Back unrounded	Back rounded
Close	i iː	ɯ ɯː	u uː
Close-mid	e eː	ɤ ɤː	o oː
Open	ɛ	a aː	ɔ
Diphthongs	ia	ua	

4.1. Monophthongs

The close unrounded front vowel occurs both as long and short vowels /i, iː/ in Muak Sa-aak. The short vowel has the near-close allophone [ɪ], occuring before final nasals or the lateral approximant. Before all other final consonants and in open syllables, it is realized as the close vowel [i]. The short close rounded back vowel /u/ has two allophones in free variation, [u] and [ʊ]. However, in the data, the near-close allophone [ʊ] usually occurs before final nasals, with checked Tone 2, or falling Tone 3. The allophone [u] is more common, and may occur in all environments (including those where [ʊ] occurs). The sound [ɛː] occurs in free variation with the frequently occurring long mid vowel /eː/ in open syllables. There is a clear contrast between the short vowels /ɛ/ and /e/ in all environments in which they occur. The long [ɔː] and [ɛː], however, appear to have shifted to the diphthongs /ia/ and /ua/ as described below in all other syllable types except for the open syllable.

4.2 Vowel length

Muak Sa-aak does display distinctive vowel length. When trying to describe the difference in some words, one speaker used the terms "heavy" and "light" to refer to syllables with short and long vowels (short being "heavy" and long being "light").

Vowel lengths were measured for minimal pairs or near minimal pairs of [a, i, u], four tokens each: *kʰiŋ³* 'expensive' and *kʰiːŋ³* 'ginger', *ŋaːŋ³* 'sweet' and *ŋaŋ³* 'hear', *jam³* 'die' and *jaːm³* 'cry', *kʰum³* 'pit' and *kʰuːŋ³* 'dig', *kat²* 'burn' and *kaːt¹* 'fasten', and *kut²* 'think' and *kuːk¹* 'stoop'. The average length for short vowels was 0.183s; for long vowels it was 0.393s. Vowel lengths are given in Table 8.

Table 8. Duration of short and long vowels (seconds).

Wordlist reference	Item	Gloss	Vowel durations for each token				Avg.
			Speaker 1		Speaker 2		
823	*kʰiŋ³*	expensive	0.281	0.258	0.258	0.215	0.253
1231a	*kʰiːŋ³*	ginger	0.474	0.470	0.423	0.381	0.437
134	*ŋaŋ³*	hear	0.147	0.177	0.190	0.214	0.182
1565	*ŋaːŋ³*	sweet	0.366	0.376	0.399	0.305	0.362
249	*jam³*	die	0.143	0.128	0.161	0.123	0.139
272	*jaːm³*	cry, weep	0.369	0.390	0.431	0.386	0.394
1267	*kʰum³*	pit	0.280	0.275	0.221	0.200	0.244
740	*kʰuːŋ³*	dig	0.462	0.432	0.472	0.374	0.435
1498a	*kat²*	burn	0.124	0.135	0.131	0.118	0.127
655	*kaːt¹*	fasten	0.356	0.316	0.435	0.459	0.392
252	*kut²*	think	0.168	0.125	0.155	0.165	0.153
172	*kuːk¹*	stoop	0.294	0.389	0.359	0.320	0.341

Waveforms and spectrograms for the pair *jam³* 'die' and *jaːm³* 'cry, weep' are given in Figure 5 to illustrate the difference in vowel length as well as accompanying final sonorant length.

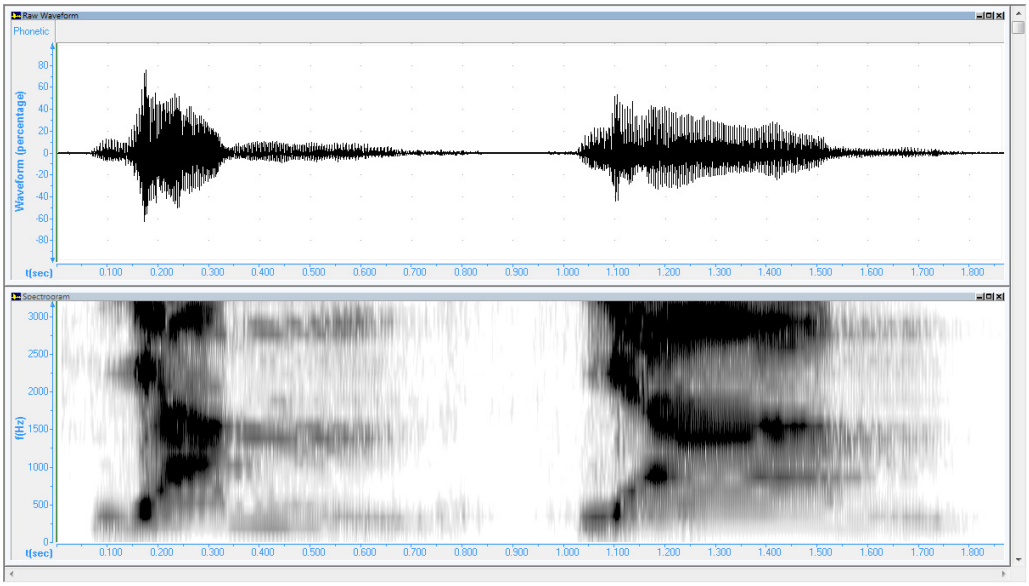

Figure 5. *jam³* 'die' followed by *ja:m³* 'cry, weep'.

4.3 Diphthongs

The diphthongs /ia/ and /ua/ in Wan Fai Muak Sa-aak correspond to the long vowels [ɛ:] and [ɔ:], respectively, in the variety of Muak Sa-aak spoken in Wan Saw [wan¹ sɔʔ²], a Muak Sa-aak variety which does not have these diphthongs. When speakers from Wan Fai try to write their own words in the Tai Lue script, which does not have /ia/ or /ua/, the vowels they choose are ones normally used to write the Tai Lue vowels /ɛ:/ and /ɔ:/. If they then unintentionally read them back as written with long open vowels, they refer to it as "Wan Saw language," meaning that they are aware of this sound change. This sound change also affects words borrowed from Tai Lue; if the Tai Lue word contains the Tai Lue phoneme /ɛ:/ or /ɔ:/, when borrowed into Wan Fai Muak Sa-aak, it typically becomes /ia/ or /ua/. The diphthongs /ia/ and /ua/ then, if seen as replacements of former [ɔ:] and [ɛ:] in most environments, fill in the empty spaces for the long open front and back vowels (see Table 7, above).

In the Wan Fai Muak Sa-aak variety under study, /ua/ occurs only in closed syllables. The sound [ɔ:] normally occurs in open syllables, although there are a few occurrences in borrowed words with final consonants. This complementary distribution also suggests that the sounds [ua] and [ɔ:] are actually allophones of the phoneme, /ua/. This phoneme could be represented as /ɔ:/ or as /ua/. In this paper, the latter has been chosen because of the limited occurrence of [ɔ:], and for greater symmetry with the diphthong /ia/.

5. Tone

In Muak Sa-aak, there are three distinctive tones: a low Tone 1, a checked Tone 2, and a falling Tone 3. All main syllables have one of these. Presyllables do not display tonal contrast; although speakers labeled them all as Tone 1, the fact that they routinely identified them as the same tone shows that there is no contrast.

Voice quality is not distinctive in Muak Sa-aak but is an accompanying feature of tone. This is most apparent in words with long vowels. Except for the falling Tone 3, these voice qualities are not produced consistently and showed a high degree of both intra- and interspeaker variation.

5.1 Tone 1

The first tone, Tone 1, is a low tone. In one of the recorded speakers, it tends to rise a little. In some words it is realized with stiff voice, a tight, tense phonation type which is more tense than modal voice but less tense than creaky voice[4] such as in *tʰa:k¹* 'tongue', which was often pronounced with even creaky voice, [tʰa̰:k¹]. However, no contrast could be identified based on voice phonation, and this phonation was not even heard consistently with the same word and the same speaker on different occasions. See examples 19-25 for Tone 1 words.

(19) *tʰa:k¹* 'tongue'
(20) *le:k¹* 'pig'
(21) *t.lɤ:¹* 'lizard'
(22) *cʰa:j¹* 'sky'
(23) *li:¹* 'come out, exit'
(24) *rɤ:m¹* 'fade'
(25) *naj¹* 'melt

Tone 1 occurs only in long syllables: syllables with long vowels or diphthongs (regardless of final consonant), or short vowels if followed by a sonorant final.

Presyllables form an exception in that they do have short vowels, and no final consonant; they do not display tonal contrast, but if asked, speakers consistently identify them as having this tone. This suggests that Tone 1 may be the default tone; as Yip describes, tone languages may be considered to have a default, or unmarked, tone, and another tone or tones which are marked (Yip 2002).

The final lateral occurs only rarely and the final pre-palatal nasal does not occur with this tone. Although the other final nasals do occur with this tone, they occur more frequently with the falling Tone 3; those occurring with Tone 1 are commonly borrowed words.

5.2 Tone 2

Tone 2 occurs only on checked syllables, and has two allotones in complementary distribution: high tone on short syllables, and high falling tone on long syllables. The first allotone is a high tone. It occurs only with syllables that have short vowels, with either stop final consonants or a phonetic glottal stop.

The high-falling allotone occurs less frequently, in phonologically open syllables with long vowels, or in closed syllables which have either long or short vowels followed by sonorant finals. This allotone has very creaky voice, and long vowels with this allotone of Tone 2 are slightly shorter than long vowels with either Tone 1 or Tone 3.

With the falling allotone, there are no final stop consonants other than the glottal stop. All syllable types with this allotone can occur with a final glottal stop; however, final glottal stop occurs only with Tone 2 (either allotone), and should be considered a suprasegmental feature of this tone.

There is a complementary distribution between the types of syllables which can occur with the high allotone of Tone 2, and the types which may occur with the falling allotone (Table 9). The two allotones are identified by speakers as being the same tone.

[4] See Ladefoged and Maddieson (1996: 48-50) for further discussion of these voice phonation types.

Table 9. Tone 2 final consonant types distribution by allotone.

	High allotone (short)	High-falling allotone (long)
Open syllable-short vowel	X	
Open syllable-long vowel		X
Stop consonant finals	X	
Nasal consonant finals		X

Examples 26-30 are words with short vowels and the high allotone of Tone 2.

(26) *rɤp²* ‘fishing net’
(27) *tʰi²* ‘arm’
(28) *sut²* ‘smell’
(29) *pa²* ‘have’
(30) *cʰɔ²* ‘dog’

Examples 31-34 take the falling allotone of Tone 2.

(31) *pʰrɤːŋ²* ‘bee’
(32) *cuː¹ ciː²* ‘dung beetle’
(33) *p.niː²* ‘today’
(34) *maːŋ²* ‘destroy, spoil’

All but one of these are probably borrowed words, which is characteristic of words with this allotone of Tone 2.

5.3 Tone 3

Falling Tone 3 has modal voice and is a high falling tone. It does not occur with stop final syllables but only on live syllables. Open syllables do not show a vowel length contrast in this tone; they are all long vowels. The final pre-palatal nasal /ɲ/ occurs only in syllables with this tone, and only with short vowels in the data collected. The majority of words ending with the lateral approximant /l/ also occur with this tone. Examples 35-43 take this tone.

(35) *t.waːj³* ‘tiger’
(36) *kʰaːj³* ‘eat’
(37) *t.poːl³* ‘night’
(38) *kual³* ‘sew’
(39) *ŋaːŋ³* ‘sweet’
(40) *ŋaŋ³* ‘hear’
(41) *p.sɤɲ³* ‘snake’
(42) *feː³* ‘buy’
(43) *tʰuː³* ‘apply, besmear’

Various minimal pairs were found based on tone. Two full sets of minimal pairs, based upon tone plus vowel length, are shown in Tables 10 and 11 below.

Table 10. Tone and vowel contrast in nasal final syllables

	Short vowel		Long vowel	
Tone 1	*raŋ¹*	'rich'	*ra:ŋ¹*	'no one there'
Tone 2	*raŋ²*	'field with no-one working it'	*ra:ŋ²*	'leave/ separate'
Tone 3	*raŋ³*	'shining [of the sun]'	*ra:ŋ³*	'flower'

Table 11. Tone and vowel contrast in open syllables

	Short vowel		Long vowel	
Tone 1	(not possible)		*ci:¹*	'sap'
Tone 2	*ci²*	'do, make'	*cu¹ ci:²* *ci:²*	'dung beetle' 'point'
Tone 3	(not possible)		*cu¹ ci:³*	'make a hole'

Tone is closely related to syllable structure, but the effects of borrowing have had an additional impact and thus complicated tonal features in general, and the picture of tonogenesis in particular. The interaction of tone, syllable structure, and borrowing is complex (Hall 2013) and must be addressed separately.

7. Outlook

The findings on the interaction of Muak Sa-aak vowel and sonorant length and their impact on tonal behavior suggest further studies on syllable weight. The phenomenon of final sonorant lengthening would require further investigation in other Palaungic languages in order to decide whether this is an indigenous Austroasiatic feature or the result of borrowing from a Tai-Kadai contact language. To this author's knowledge, nothing else has been published yet on this language, so there are many additional areas for further study, especially dialect survey and diachronic linguistics, as well as grammar and discourse studies.

Since this study examined only the variety of Muak Sa-aak spoken in one village, insights about the variation between villages in this geographic area would be gained by a dialectal comparison. This appears especially promising in regards to laryngeal settings like pitch and laryngeal constriction since these might possibly be influenced by borrowing. Since the speakers in this study were primarily older speakers, it would also be helpful to examine the speech of younger speakers, to see how the language and its phonology might be changing between generations. Several of the speakers involved in this study expressed concern about the possibility of their children or grandchildren losing their language.

A detailed historical comparative linguistic study would be helpful in better defining the relationships between Muak Sa-aak and the other Angkuic languages. The diphthongs /ia/ and /ua/ were not seen in the small amount of data this author has from another Muak Sa-aak village. These diphthongs are also not seen in Tai Lue, the major language influencing Muak Sa-aak. In Muak Sa-aak as spoken in Wan Fai village, however, the diphthongs are seen both in native words and in borrowed words. Another influence from Tai Lue, which does not have labiodental fricatives, might be the occasional realization of the fricative /f/ as the aspirated plosive /pʰ/.

A study of the grammar of Muak Sa-aak remains to be done; in fact there is still very little written on the grammar of any Angkuic languages. Likewise, this author is not aware of any discourse analyses having been performed in these languages to this date.

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