Studying tones in North East India:
Tai, Singpho and Tangsa[1]

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Drawing on nearly 20 years of study of a variety of languages in North East India, from the Tai and Tibeto-Burman families, this paper examines the issues involved in studying those languages, building on three well established principles: (a) tones are categories within a language, and the recognition of those categories is the key step in describing the tonal system; (b) in at least some languages, tones are a bundle of features, of which (relative) pitch is only one; and (c) tones may carry different levels of functional load in different languages.

I will discuss the use of historical and comparative data to assist with tonal analysis, while raising the possibility that the tonal categories of individual words may vary from one language variety to the next. Different approaches to marking tones, for linguistic transcriptions, presentation of acoustic data (F_0) and in practical orthographies are discussed, along with the effect of intonation and grammatical factors such as nominalisation on the realisation of tones.

1. INTRODUCTION. This study of lexical tone in Tai, Singpho and Tangsa takes as its basis three principles, long established in the literature, going back to at least Pike (1948). First,

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tones are categories within a language, and the recognition of those categories is the key step in describing the tonal system. Second, in at least some languages, tones are a bundle of features, of which (relative) pitch[2] is only one. Finally, tones may carry different levels of functional load in different languages.

While these principles are well known to those who work on the documentation and description of tonal languages, they are not trivial points. Every word that we utter has a certain pitch and could be marked for that pitch, but it is only languages where pitch – and any other features that are part of 'tone' – marks meaning distinctions that are treated as 'Tonal Languages'. Whether a language is tonal or not may not be straightforward[3]. There are some languages for which there remains disagreement in the literature about whether they are tonal or not. The phonology of the Puroik language (earlier known as Sulung) in Arunachal Pradesh, India, and across the border in China, has been described in detail by Sun Hongkai et al. (1991) and Remsangpuia (2008). The former found the language had a level tone notated as $/^{33}/$ and a falling tone notated as $/^{53}/$, and several other tonal distinctions, but Remsangpuia (2008:91) said that "whatever pitch variations Puroik have do not function to change the meaning of words. I could not find any minimal pair for tones in the language"[4].

Even in languages for which lexical tone is uncontroversially present, there may be disagreement about how many contrastive tones there are and which words belong in which categories. Studying the tones of Boro, Burling and Joseph (2010) commenced by saying that "there is a conspicuous lack of agreement about just how many tones need to be recognized", having reviewed four earlier studies of Boro, two of which described the language as having two tones, one as having three and one as having four. How the analysis is undertaken may affect the resulting number of tone categories proposed in the linguistic analysis (as Snider this volume shows for Songjiang Wu), but there may also be a different number of contrastive tones in different varieties of the same language.

In view of this, the safest course for the researcher is to confirm the tonal categories with native speakers. As we will see, in the case of Tai (section 2), this could be achieved without considerable difficulty, but with the Turung variety of Singpho (section 3.1) this was less easy. I do strongly suggest that linguists should make it a practice to explicitly indicate whether the tonal categories have been recognised by native speaker consultants and whether words cited have been confirmed in those categories by native speakers, or whether those categories are the result of the linguist's own analysis.

Wherever possible I have followed a process of first identifying tonal contrasts before

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[2] Since at least the time of Pike (1948:20) it has been identified that the pitch distinctions being talked about are relative. As Pike put it "a toneme is "high" only if it is higher than its neighbors in the sentence, not if its frequency of vibrations is high". Pitch distinctions are also relative between different speakers, with adult female speakers usually having higher frequency of vibrations than adult male speakers for the same tone.

[3] Both Coupe (this volume) and Mazaudon (this volume) mention that they could not be sure at the beginning of their research, on Mongsen Ao and Tamang respectively, that the languages were tonal.

[4] Ismael Lieberherr (pers. comm.) who is undertaking a major study of Puroik confirmed to me that Puroik does not appear to have contrastive lexical tone. It must be added that the lack of minimal pairs does not mean tonal contrast is absent, and, as shown in Snider (this volume), the presence of minimal pairs is not necessarily evidence for tonal contrasts at an underlying level.

exploring the phonetic detail of those contrasts, a process also followed by Mazaudon (this volume) and Cruz and Woodbury (this volume), who described this process as 'Saussurian'.

One might think that comparison with a cognate word in a closely related variety would be useful in establishing the tone category of an individual word. The Gedney Tone box is a useful tool in the study of Southwestern Tai languages (see below Table 1), because in these languages the tonal category of a particular word usually does not vary from language to language, even if the form of the tone varies markedly. However, as we will see in Tangsa, sometimes the tonal category of a particular word or group of words differs from variety to variety, and this variation itself may be quite regular (see below Table 10).

The second principle above relates to the fact that at least in the languages I am working on, tones include features that are not only pitch (and change in pitch, here termed contour[5]), but additional features such as phonation (creakiness, glottalisation, breathiness), duration and intensity. There are many theoretical studies of tone which treat tone as purely a matter of pitch. Hyman (2007:485) defines a language with tone as a language "in which an indication of pitch enters into the lexical realisation of at least some morphemes". In a very broad sense this definition will work with the languages I have studied: Tai Phake can be included as a tonal language because some of the tonal distinctions do involve only pitch (and contour) features, but such definitions would not cover languages where the tonal distinctions are basically phonation, as is believed to have been the situation with the proto-Tai tones (see below section 1.1), and may also have been the case with the proto-Tangsa tones (below section 3.2).

Extending the approach that pitch is the key (or even only) contrastive feature in tonal analysis, leads to the idea that the features are binary, basically H and L ('high' and 'low'). These features are obviously useful for the analysis of many languages, as we see in a number of the papers in this volume, but there seems to be a desire to establish this binary analysis as universal to all languages. For example, Gussenhoven (2004:28) treats the four tones of Mandarin Chinese as being able to be represented by the formal symbols H and L[6]. To deal with many East Asian languages in which there are many tonal distinctions, Yip (2002) developed a two stage system: a primary feature [+upper] or [-upper] and then secondary features [+high] or [-high] within each of the primary divisions.

I do not find the idea of binary features necessary or helpful in analysing the languages that I have worked on. In these languages, I do not believe that reducing the analysis of tones to a binary choice of H and L will assist in the understanding of the tonal system. In the discussion of Tai (section 1.1), we will see that phonation and duration are key features

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[5] Pike (1948) suggested two categories of tonal systems: Level-pitch register systems and Gliding-pitch contour systems, terms sometimes abbreviated to 'register' and 'contour'. The languages discussed in this paper probably all fall into the 'Gliding-pitch contour' category.

[6] There are two tones in Mandarin Chinese that involve rise. Gussenhoven treats the second of these, conventionally numbered 3 and sometimes called a dipping tone, which starts low with a slight fall and is followed by a rise to a high pitch, as L (H), explaining the rise as "an utterance tone, since it is not present when the word is non-final". The implication of his analysis is that this tone can be treated as underlyingly L, and that the four tones of Mandarin Chinese can be expressed as H, HL, L, LH.

of at least some tones, and that even those tones that do not employ those features are not able to be described in terms of binary distinctions or with features H and L.

The third principle is about functional load – an area that requires more research than is possible here. I am not aware of any experimental data which can quantify my impressions, but I have concluded, after many years of working on Tai and Singpho (particularly the Turung variety of the latter), that tone plays a more important role in Tai than it does in Singpho (see below section 3.1). On a qualitative level this has been repeatedly confirmed by native speakers of Turung who are bilingual in Tai and talk about how in Turung they rely more on context than on the tones to disambiguate meaning in connected text, whereas in Tai the tones are indispensible. The difference in functional load also relates to linguistic registers. It is the case that in some song styles, the functional load of tones may be less than in speech, even for Tai languages (see Ladd in press, Morey in press).

Many other factors may affect the tones of a language. One which will not be dealt with here in any detail is language contact. For example, the loss of lexical tonal categories in some languages may be due to contact with non-tonal languages. Of the Turung variety of Singpho, the most linguistically aware consultant, Ananta Singphow, said this "Long ago, we spoke the Turung words with different tones, we knew them, whereas now that we are staying in Assam, and we are speaking the Assamese words, our tones have become a little straight." In other words, the tones appear to have altered as a result of contact.

My observations in this paper are based on experience working with tonal languages in North East India since 1996. In 20 field trips totalling nearly four years of time in the field, I have worked first on various Tai languages (Morey 2005a, 2005b, 2008b, 2010b, in press and Morey and Schöpf 2011), then on two groups of Tibeto-Burman languages, Singpho, particularly the Turung variety (Morey 2008a, 2010a) and more recently the very diverse Tangsa language group[7] (Morey 2011, forthcoming).

1.1 REPRESENTING TONE. There are a number of ways to represent lexical tone:

1) (i) Above-vowel diacritics, such as $\bar{a}$, $\acute{a}$, $\grave{a}$, $\hat{a}$, $\breve{a}$, recommended by the IPA;

   (ii) Tone numerals, in the system devised by Y.R. Chao (1930), using the numerals 1-5 (1 as the lowest pitch, 5 as the highest), such as a^{11}, a^{31}, a^{25}, a^{324}, or in the Mesoamerican notation system referred to by Cruz and Woodbury (this volume) where 1 is highest and 4 the lowest;

   (iii) Tone letters, also recommended by the IPA, also devised by Y.R. Chao, such as $a˥$, $a˦$, $a˧$, $a˨$, $a˩$, $a˦˥$; and

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[7] A brief sketch grammar of the Chamchang variety, which will also be discussed in this paper, is available on the DoBeS archive site, maintained by the Max Planck Institute in Nijmegen. The address for the MPI is corpus1.mpi.nl/ds/imdi_browser/. After opening that, click on *DoBeS archive* and then on *Tangsa, Tai, Singpho in North East India* to access our data. Other sketches, word lists and articles are being progressively uploaded.

(iv) Arbitrarily assigned symbols, such as letters, numerals, or punctuation marks[8] used as tone marks, such as *ax, az, a¹, a², a; a:*

The first three of these have in common that they strive to represent the form of the tone in the marking, concentrating in most cases on pitch and contour. The last is quite different in that it makes no such claim but requires anyone studying the language to learn what is meant by those arbitrarily assigned symbols. I had adopted this arbitrary system when I first started work in Assam because it had been used by Banchob (1987) in her dictionary of Tai Phake.

The use of arbitrary numerals to mark the tone categories has a number of advantages when dealing with comparison between varieties. For examples, it is clear that in the case of Tangsa, there are three groups of words having open finals (vowel and nasal), which, in every variety so far investigated, belong together in the same tonal category, notated as Tone 1, Tone 2 and Tone 3 (see Table 7). Both the Lochhang and Chamchang varieties have a mid-high level tone, which in Chao tonal numerals would be notated 44. However, in Lochhang this mid-high level tone occurs with words in the tone category that I have labelled Tone 3, whereas in Chamchang it occurs with Tone 2. This use of arbitrary symbols does allow for easier comparison of tone categories between varieties, because it is simply an indicator of that category and does not represent the form of the category, something that varies between vareities.

Lexical tone can also be represented using measurements of fundamental frequency (F_0), using programs like Praat (Boersma and Weenink 2013). As Yu (this volume) discusses, F_0 is an acoustic measurement, whereas pitch is perceptual, so acoustic studies are measuring F_0 not 'pitch'. The tradition in linguistics is to present F_0 measurements in the Hertz (Hz) scale, the unit of frequency in the International System of Units. However, although the Hertz scale, which measures the number of cycles per second, is a linear scale, human perception does not accord with Hertz.

The same pitch differences or spans on the Hz scale are perceived differently when they are at different pitch ranges. This is perhaps most easily explained by reference to music. The musical scale divides an octave into 12 semitones (or 1200 cents)[9]. The notes are named following letters of the alphabet, with semitones marked by sharps (#). In human perception, the distance between any A and the semitone above it, A#, is the same. But in the Hz scale, the distances are quite different. The A below middle C (in the musical scale) has a pitch of 220 Hz[10] and one semitone above that (A#) is 233.08 Hz, whereas the A one octave lower has a pitch of 110 Hz and the A# a semitone above it has a pitch of 116.54 Hz.

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[8] The reformed Shan script uses symbols based on Roman punctuation symbols as tone marks (Egerod 1957)

[9] There are different 'temperaments' into which an octave can be divided. The system of semitones under discussion here is equal temperament, 100 cents to the semitone and 12 semitones to the octave.

[10] These figures are based on the modern concert pitch which is based on A=440 Hz (the A above middle C). Semitones can be measured from any frequency, but for the purposes of the argument here, we have adopted a measurement of semi tones related to concert pitch.

The perceptual distance between these two pairs is the same, one semitone, but the Hz difference at the higher octave is 13.08, twice that at the lower octave (6.54). To put it another way, a fall of 10 Hz from a base of 110 Hz would be perceived as falling twice as far as a fall of 10 Hz from a base of 220Hz.

In other disciplines, such as musicology, so-called 'psycho-acoustic scales' are used. Nolan (2003:771) reports on experiments that show that these scales "best reflect subjects' intuitions". The different types of scales are listed by Nolan as "semitones, mels, Bark and ERB-rate". Praat currently allows F_0 to be measured using Hz, mel, ERB or semitones, the latter of which can be measured from a base of 1, 100, 200 or 440 Hz. In this paper I will present acoustic information in both Hz and what are termed 'cents' which are semitones multiplied by 100 (using a base of 100 Hz),

Writing systems and practical orthographies may also mark tone in different ways. Tai languages in Assam use a traditional script that does not mark tone, and the introduction of tone marking would present some challenges (see section 2.4 below). The long-standing orthography used for Jinghpaw in Myanmar also does not mark tone, and nor does the orthography used for the Turung variety (see section 6 below). Most, but not all, of the orthographies developed for Tangsa, on the other hand, do mark tone, as does the Tangsa script developed by Lakhum Mossang (see 3.2.1 below). As we shall see, Lakhum Mossang's system marks tone in a completely different way from any of the other systems discussed here, combining vowel and tone into a single symbol.

2. TAI LANGUAGES. This discussion of Tai languages will concentrate on four main points. In 2.1, I will show how, at least in Southwestern Tai, comparison with other varieties is particularly helpful in tonal analysis. In 2.2, I will present detailed analysis as to why pitch alone cannot be used as the defining feature of the tones, while in 2.3 I will show the process used by native speakers in identifying the tonal categories. Finally in 2.4 some principles of Tai writing systems, relating to tone marking, will be discussed.

2.1 COMPARATIVE TONOLOGY IN TAI LANGUAGES. For Tai languages the establishment of tonal categories is relatively straightforward and has a well-attested historical background. Li (1977) and Gedney (1972), among others, posited that Tai languages had three proto tone categories for open syllables (vowel or nasal final), conventionally called A, B and C, and two categories for closed syllables (stop final) conventionally called DS and DL (short and long vowels respectively). While the original form of these tones is not known, some scholars at least, such as Brown (1985), have suggested that the three open tones, A, B and C, could be reconstructed as being distinct phonation types: whisper, normal voicing and creaky voicing respectively.

The modern reflexes of these tones come about as a result of changes that were influenced by a combination of the proto tones and the proto initial consonants (syllable onsets) the latter of which were in four series: voiceless aspirated, voiceless unaspirated, pre-glottalised and voiced.

For the study of Southwestern Tai varieties, which includes all those Tai varieties I have worked on, Gedney (1972) created a 'tone box', reproduced in Table 1, and suggested three or four words for each of these 20 categories which would be sufficient to discover the tonal system for any Tai variety. It works because, with very few irregular exceptions,

all the words in a particular box have the same tone category in any given variety. The form of the tone may vary from variety to variety, but the category remains the same. Thus, for example, words from box 1 (having the proto A tone and a series 1, proto voiceless friction/ aspirated, initial) are all rising tones in Tai Phake as well as in standard Thai, but are all high level in Khamti (where words from boxes 9 to 11 are realised with a rising tone).

No Tai language has the maximum 20 distinct tones; most have between four and seven, meaning that the tone of some of these boxes has merged with others. In Tai Phake, for example, boxes 5-7 (B1-3) are merged in a single tone[11], whereas box 1 (A1) is a separate tone. In Tai Khamti, on the other hand, boxes 5-7 have merged with box 1 (B1-3 and A1) into a single tone.

			Proto-Tai Tones				
			A	B	C	D-short	D-long
	1	Voiceless friction sounds, *s, hm, ph,* etc.	1	5	9	13	17
Initials, at the time of tonal splits	2	Voiceless unaspirated, *p,* etc.	2	6	10	14	18
	3	Glottal, *ʔ, ʔb,* etc.	3	7	11	15	19
	4	Voiced, *b, m, l, z,* etc.	4	8	12	16	20
			Smooth Syllables			Checked Syllables	

TABLE 1: The Tai Tone Boxes (after Gedney 1972)

The task of working out the tonal system for a Southwestern Tai variety can thus be undertaken by eliciting around 60 words, and the task of assigning tones to other words is made immensely more easy by the fact, further discussed below in 2.4, that the Standard (Bangkok) Thai writing system marks not the modern realisations of tones but the proto categories as shown in Table 1, and preserves the original four series of initials, even though some have merged in the spoken language.

As an example, in most Tai languages the originally voiced stops and fricatives have

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[11] The stopped tones in boxes 13-15 (DS1-3) and 17-19 (DL1-3) are also analysed as being merged into a single tone with these, which was conventionally numbered Tone 1 by Banchob (1987). The question of whether the tones of stopped syllables can be regarded as 'allotones' of the tones of open syllables is one that is treated differently by different linguists. In the Tai tradition, the stopped tones are treated as allotones and hence Tai Phake is regarded as having six tones.

become voiceless, usually voiceless unaspirated in Shan and the Tai languages of North East India (e.g. *d > /t/), while becoming voiceless aspirated in Standard Thai (e.g. *d > /th/). Standard Thai writing has a different letter for the voiceless aspirate that was originally a voiceless aspirate (e.g. the /th/ that was proto *th) from the voiceless aspirate that was originally voiced (/th/ that is a reflex of *d). This, together with the fact that the Thai writing system marks the proto tonal categories not the modern realisations, means that every word in Standard Thai can be assigned to one or other of the 20 tone boxes by looking at the written form.

Thus, when investigating a new variety, once we know the tonal features of a small number of words from each box, we can predict with some confidence that all of the other words in that same tone category will have those same tonal features. Furthermore, since the Southwestern Tai languages have not diverged so greatly, many of the words in Standard Thai are also to be found in cognate forms in the other Southwestern Tai varieties. Thus a Standard Thai dictionary is an essential tool for the researcher.

2.2 THE KEY FEATURES OF TAI TONES. The tones of Tai Phake, one of the varieties I have worked on in North East India, are presented in Table 2, using the Gedney format shown in Table 1.

	A	B	C	DS	DL
1	6	1	3	1	
2	2				
3					
4		5	4	4	

TABLE 2: Tone box for Tai Phake (see Morey 2005, Morey in press)

Table 3 presents the features of the six tones of Phake[12], the wave form and F_0 traces for which are presented in Figure 1, which is produced using Praat.

I did not collect these words using a 'frame' or 'carrier sentence', because the Tai Phake consultants whom I have interviewed have always been very clear in the pronunciation of tones, and list intonation effects have not been present in my recordings (see for example Coupe, this volume, for further discussion of the use of frames and the problems of list intonation). Furthermore, readers of Snider (this volume) will have noted the suggestion that lexical categories should be kept separate in tone analysis, because in the languages cited there, the behaviour of nouns and verbs, for example, is different. This is not a factor here because (i) the lexical categories in Tai are not so clear-cut as the noun-verb dis-

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[12] The phonetic symbols used here vary slightly from IPA standard. In Tai Phake, following Banchob (1987) macrons are used to show vowel length, as /ā/.

tinctions in some other languages and (ii) all six tones are found in all possible categories in Tai Phake. Finally I am presenting synchronic and surface tonal contrasts here, rather than positing any underlying system (see Snider, this volume, for discussion of the advantages of identifying the underlying system). The 'underlying' system of Tai languages can be thought of as that presented in Table 1.

No.	Tonal features	Tone Numerals	Hz values	Cents	Examples
1	level	44	223-223	1390-1390	nā[1] 'quarrel'
2	high rising then falling	452	223-262-166	1392-1669-886	nā[2] 'rice field'
3	creaky	31	198-151	1191-718	nā[3] 'face'
4	falling	31	193-155	1138-767	nā[4] 'mother's younger sister'
5	low (falling) and long	31	196-163	1173-874	nā[5] 'melt away'
6	rising	35	195-289	1159-1866	nā[6] 'thick'

TABLE 3: Tones 1–6 pronounced on the syllable /na/ in Tai Phake
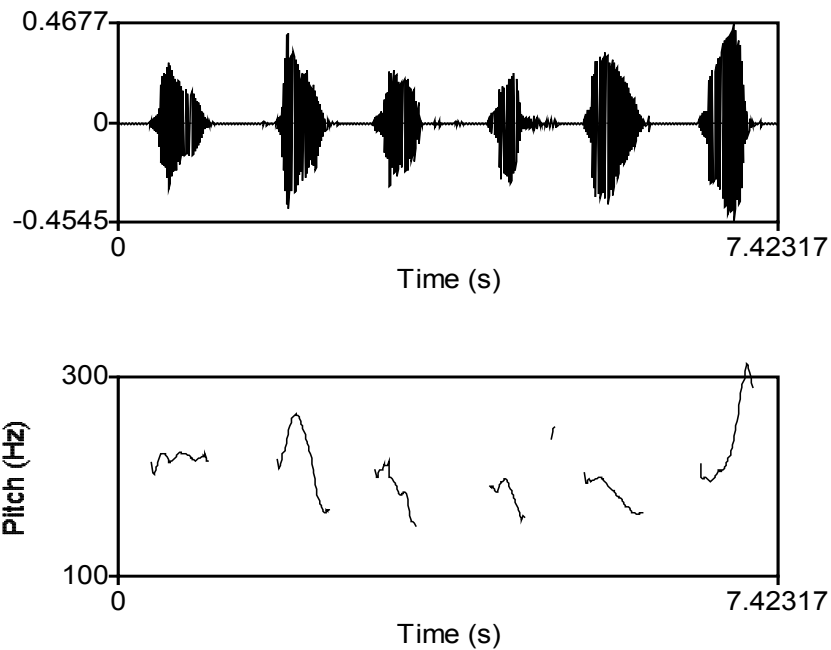

FIGURE 1: F_0 trace for the 6 Phake tones exemplified in Table 3

The study of Phake demonstrates point number (2) in the first paragraph of this paper. that pitch is not the only feature of tone. **Pitch** may be combined with other features, such as **contour** (movement in pitch), **duration**, **phonation** and perhaps **intensity** to form the bundle[13] of features that makes up 'tone'. I will explore this a little more below, but in Phake (described in more detail in Morey and Schöpf 2011, Morey in press), the first four of these features are involved in the tonal distinctions.

The portion of the syllable which is regarded as carrying tone (the tone bearing unit[14]) is the rime, including vowel (nucleus) and any final consonant, (of which there are none in this example). Figure 2 is a screen shot of the Praat window for the first three tokens of Figure 1, representing the exemplars of Tones 1, 2 and 3. The wave form is in the top half and F_0 (in blue dots), formants (in red dots) and spectrogram (in black) in the lower half. The tone bearing unit commences with the vowel, easily seen because that is where the blacker section begins.

Each of the words exemplified here commenced with an /n/, and where there is an initial voiced segment, particularly a nasal, there is usually pitch rise associated with that nasal. This rise at the beginning of each of the three syllables can be seen in Figure 2. However, whereas the rise in Tone 1 and Tone 3 is solely associated with the initial consonant /n/ and ceases as soon as the vowel commences, with Tone 2, the rise continues and must be analysed as being part of the tone.
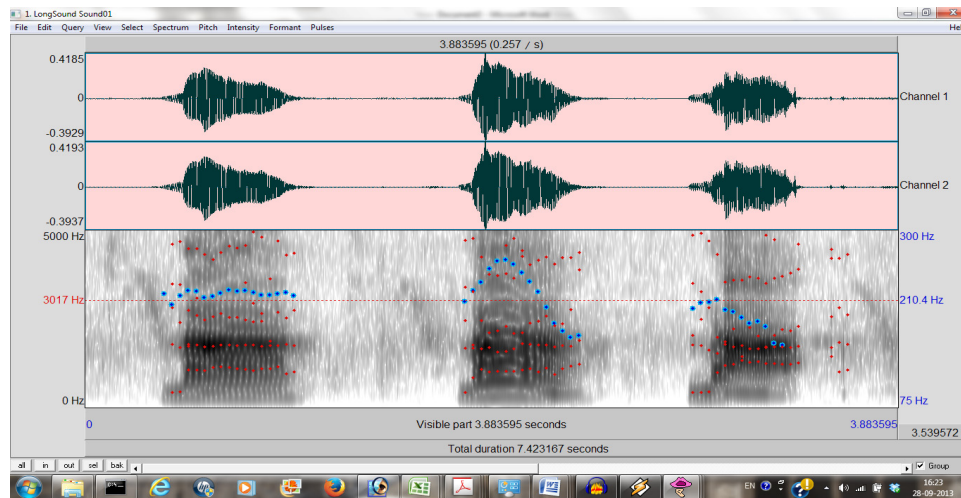
FIGURE 2: Wave form, F_0 trace and formants for Phake Tones 1, 2 and 3 exemplified in Table 3

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[13] Mazaudon (this volume) points out that in Tamang also "the speaker and the hearer make use of a bundle of cues to identify the phonological tone of the word."

[14] Space does not allow for a discussion of the criteria which define the tone bearing unit (TBU). Coupe (this volume) points out that there is variation from language to language about what the TBU is. Cruz and Woodbury (this volume) suggest that it is the 'monosyllabic word', which would include the initial consonant (onset), which is not included in this analysis of Tai Phake.

Returning to Figure 1, we can see that the pitch and contour of Tones 3, 4 and 5 are quite similar. However, when phonation and duration are considered as well as pitch and contour, as shown in Table 4, the distinction between these tones becomes clear.

	(1) Pitch (Hz)	(cents)	(2) contour	(3) phonation	(4) length
Tone 3	198-151	1191-718	falling	creaky	0'44"
Tone 4	193-155	1138-767	falling	plain	0'36"
Tone 5	196-163	1173-874	falling	plain	0'66"

TABLE 4: Tones 3-5 in Tai Phake: Pitch and contour

While each has approximately the same pitch and contour, the phonation of Tone 3 is quite distinct from the other two, and both Tones 3 and 4 are perceptibly considerably shorter than Tone 5. These distinctions cannot be conveyed by pitch based symbols L and H alone, and I argue that pitch is not even a feature of all these tones at all. In my analysis the only feature of Tone 3 that is important is creakiness, its pitch does not appear to be contrastive at all.

2.3 THE RECOGNITION OF CATEGORIES. Returning to our first point about categories, I want to demonstrate the way that Tai Phake speakers identify the six tonal categories. In the nearly 40 years since Banchob worked in the Tai area, and even more so in the nearly twenty years that I have been regularly visiting some Phake speakers, Banchob's six tones have become very familiar to many speakers. When asked the tone of a new word, Aije Let Hailowng, a male speaker aged around 75, will speak out each of the six tones in isolation and in the order that Banchob presented them, and then identify which is correct. This is demonstrated in (2) (a similar process is referred to by Cruz and Woodbury this volume):

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2.1) ma^5 kin^6 seŋ^6 saŋ^6 pen^2
      NEG   NEG.eat sound   which   be
   'And "Not eat" is which tone?'

Aije Let

2.2) kin^6 / kin^1 kin^2 kin^3 kin^4 kin^5 kin^6 kin^6 / hok^1
      NEG.eat   NEG.eat six
   '"Not eat?" *kin^1 kin^2 kin^3 kin^4 kin^5 kin^6,* it is number six.'

In making transcriptions of Phake spoken texts, I have checked the tone of every unfamiliar word with speakers using this method, so that I have confidence that the tonal transcriptions in the Phake texts that have been analysed[15] are accurate. As already men-

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[15] These can be searched at the Tai and Tibeto-Burman Languages of Assam website, maintained by the Centre for Research on Computational Linguistics (http://sealang.net/assam).

tioned, I think it is important for linguists to be explicit about whether the tonal categories listed are confirmed by native speakers in this or some other way, or whether they are the analysis of linguists. This is not to suggest that the analysis of linguists is in some way less valuable, but it is to suggest that if speakers themselves have confirmed the categories in use, we can both be more confident about that analysis, and have more information about the source of the analysis.

Another feature of Tai Phake which is rare in Tai-Kadai languages, is what I termed "changed tones", where, for example, verbs carrying Tone 2 change to Tone 6 (rising) when negated, as in (2) (see Morey 2008b for more details). This morphological use of tone is also found with Tangsa, where some verbs change tone category when nominalised (see 3.2.3). The possibility of morphological tone change has to be taken into account when assigning tone categories. If we assigned a Phake verb to the category of Tone 6 solely on the basis of a negated example, we might be making a mistake.

2.4 WRITING TONES IN TAI LANGUAGES. Although tones in Tai languages are required in speech if one is to be understood, they are not marked at all in the traditional Phake script (or indeed any of the traditional Tai scripts of North East India). Traditional Phake script also underspecifies vowel contrasts (in many consonant final words, for example, /i/, /e/ and /ɛ/ which are clearly distinct phonemes, are written with the same symbol), but is nevertheless completely explicit when it comes to consonants (see Morey 2005a:185). This derives from the Indic origins of the Phake script (via Mon and Shan) because Indic scripts have many consonants, a restricted set of vowels and no tones. Despite the lack of tone marking, trained Phake speakers can read their old manuscripts by working out the meaning of words from the context, though this is a dying art.

It might be thought that marking tone would be a benefit to the Tai community, and it has been suggested for Tai Phake and is being implemented for the related Tai Khamti language which is spoken both in Myanmar and India, in a similar way to the earlier introduction of tone marking for Shan (see Egerod 1957 and Sai Kam Moeng 2004 for further details of Shan script and script reform). This kind of tone marking represents the present-day tone categories with arbitrary symbols. Its introduction in India would be problematic, where the four spoken Tai languages all have different tonal systems. For example, taking Table 1 as the basis of this explanation, in Khamti, categories A1 and B1-3 are merged into a single tone category, whereas in Phake, A1 and B1-3 are separate categories, as seen in Table 2. Whereas without such tone marking, Tai Phake and Tai Khamti words are written in almost exactly the same way, when such tone marking is adopted in Khamti, Phake speakers may have difficulty interpreting it because words marked as having the same tone in Khamti are realised with different tones in Phake. (See Morey 2005b for a more detailed discussion of the tones of all the varieties of North East India).

This problem does not occur in Thailand, because the Standard Thai writing system marks the original tone categories A, B and C from Table 1 and not the contemporary realisations of those tones. Tone category B, for example, is marked with a small vertical dash above the consonant (called mái èk) and in combination with words that have proto voiceless and glottal initials (1-3), it is realised with a low tone in Standard Thai. In combination with words that have proto voiced initials (line 4) it is realised with a high falling tone. Since the Thai script preserves the proto initial distinctions, even though they are no longer contrastive

consonants in the modern spoken language, the reader can combine their knowledge of the class of the initial consonant and tone mark to work out the form of the tone[16].

This sounds complex, but because it preserves the original 20 categories in Table 1, which have merged in different ways between different varieties, readers in different dialects of Thai whose tone systems are different can easily pronounce the written words in their own variety. The reformed Shan and Khamti systems do not allow this.

3. TIBETO-BURMAN LANGUAGES

3.1 SINGPHO. I was rather spoiled by first working on Tai, where the apparently higher functional load of tones[17] and ability of the speakers to categorise the tones made the task of tonal analysis simpler. It is counter-intuitive, but the six tones of Phake have proved much less challenging over the years than the three tones in the Singpho varieties.

The Turung (or Tai Turung) are regarded by Tai people, particularly the Tai Aiton, as being part of the Tai group within North East India, despite the fact that Turung do not speak Tai. They speak a version of Singpho (ISO 639-3:sgp) which is mixed with Tai words, and their culture is influenced by both Tai and Singpho. Singpho people, on the other hand, regard them as part of the Singpho community.

Since the vocabulary of Singpho is not Tai, and since there are no Gedney tone boxes to work with, I was nervous about commencing the tonal analysis of Turung. However on the first day of work, Kon Kham Turung came up to me and told me that there were three tones on live syllables and demonstrated the distinctions. I was extremely delighted, but the delight did not last. When I tried to make categories similar to the Tai Phake categories in Table 3 above, he had difficulty assigning words to the three different tones categories he had told me about.

Part of the problem was that I could not easily find a three-way contrast that demonstrated the three tones on monosyllables. The three tones suggested by Kon Kham were based on a syllable *wa*, but one of the three words was a grammatical form, a definiteness marker, one a verb and the third a noun. The grammatical function of the definiteness marker made it hard for people to consider it as a word and use it as an exemplar of a category.

It took a long time to find a suitable three-way contrast, and this was only finally possible when I found a contrast that involved three words from the same word class (see Snider this volume). Example (3) demonstrates the three way contrast on a minimal triplet as pronounced by Soi U Shyam, Na Kthong village, Titabor. Each word was pronounced in a frame with the realis particle *de*, as all three are verbs. This three-way contrast of words having the same part of speech, and consequently expected to occur in similar prosodic situations, is the only example of such a contrast that I could find[18].

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[16] A relatively clear explanation of the Standard Thai writing system can be found on the Wikipedia page http://en.wikipedia.org/wiki/Thai_alphabet, consulted 27th April 2014.

[17] I am very grateful to the anonymous reviewer who advised a number of different approaches to treating the complex issue of functional load.

[18] The arbitrary numbering of the tones as 1, 2 and 3 had been commenced some time before he pronounced these words. In fact the order in which he pronounced them was 'see', 'reap' and

It is an example of what Rice (this volume) calls a context "in which tone distinctions are maximally salient."

3) *mu de* /muu¹ de¹/ 'delicious'
   mu de /muu² de¹/ 'see'
   mu de /muu³ de¹/ 'reap'

The F_0 values in Hz and cents for the tone bearing unit (TBU), the coda (vowel plus tone), of each of the examples of *mu* are given in (4):

4) Tone 1   135-132Hz   523-493 cents
   Tone 2   210-244-184Hz   1285-1546-1057 cents
   Tone 3   141-158Hz   599-797 cents

I categorised the tones as follows: Tone 1 Low (falling), Tone 2 High falling, Tone 3 (Mid) Level. Once Soi U's recording was played to Ananta Singphow in Pahukatia village, he was immediately able to categorise the tones, describing them (in English) as follows, example (5):

5) Tone 1   Simple
   Tone 2   Pressured or Strong
   Tone 3   Straight

None of these three names suggest that pitch is the key feature and the categorisation of Tone 2 as pressured or strong is confirmed when we look at the wave form and F_0 trace for example (3) in Figure 3. Note that each exemplar has the form *mu de*, the second syllable in each case being the realis marker *de*. Here we can see that the intensity of the second tone is much greater than that of the others, and the third tone is longer and very clearly quite level. Thus I have come to feel that Ananta Singphow's designation for the tones is probably more helpful in describing them than the one that I have used above.

As was the case in Tai Phake (see above discussion of Figure 2), the effect of an initial voiced nasal means that for all three tokens of *mu*, F_0 rise is shown at the beginning of the syllable, as we see in Figure 3.

Ananta Singphow was the only person that I met in six years of researching Turung who was able to categorise the tones of new words; every word in the Turung lexicon (Morey 2010) was checked with him and I am confident that the transcriptions I have done accurately reflect word tone in his speech. As soon as I played the recording of the three tones in (3) to him, he started to think about it and came up with two observations of importance, that words with stopped syllables (final -p, -t, -k and -ʔ) also had three tones (Morey 2010a:177) and that you could make sentences with exemplars of each of the three tones to illustrate the distinctions. These are exemplified in Morey (2010a:176, 177).

'delicious' but we have edited the recording and re-ordered them to make it easier for reader, presenting Tone 1 first.
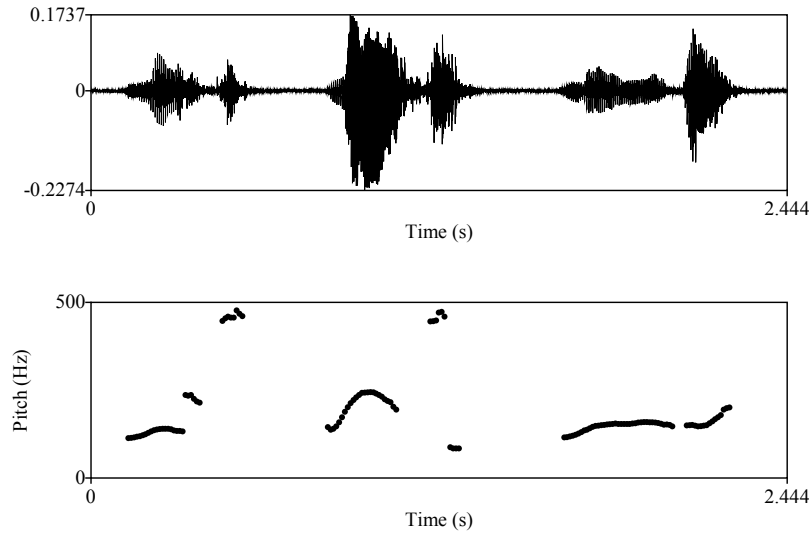
FIGURE 3: Wave form and F_0 trace for the three Turung tones in example (3)

A further issue in studying the tones in Turung is that a large number of words are not monosyllabic. The language is strongly iambic, with stress on final syllables, making the last syllable usually longer, which allows for more contour movement. In Morey (2010a:186) I discuss in detail the features of disyllables of various kinds, but the general observation to be made here is that we should not expect the same tone to have the same pitch/contour features in different positions within a word. This is also demonstrated below for Tangsa, and discussed in more detail there with regard to in Figure 10.

Perhaps even more importantly, the study of higher level 'tones', what we would otherwise term intonation, seems to suggest that intonation overrides tone. Consider (6), presented with its wave form and pitch contour as Figure 4:

6)   *phrowng*   *na*   *mu*   *nga*
     phrooŋ²   naa³   muu¹   ŋaa²
     white   POSS   also   have

     kheyng   *na*   *mu*   *nga*
     kheeŋ³   naa³   muu¹   ŋaa²
     red   POSS   also   have

'There are white types and there are red types.'
SDM07-20050703-012 , told by Phonidhar Shyam (Doga), (29)
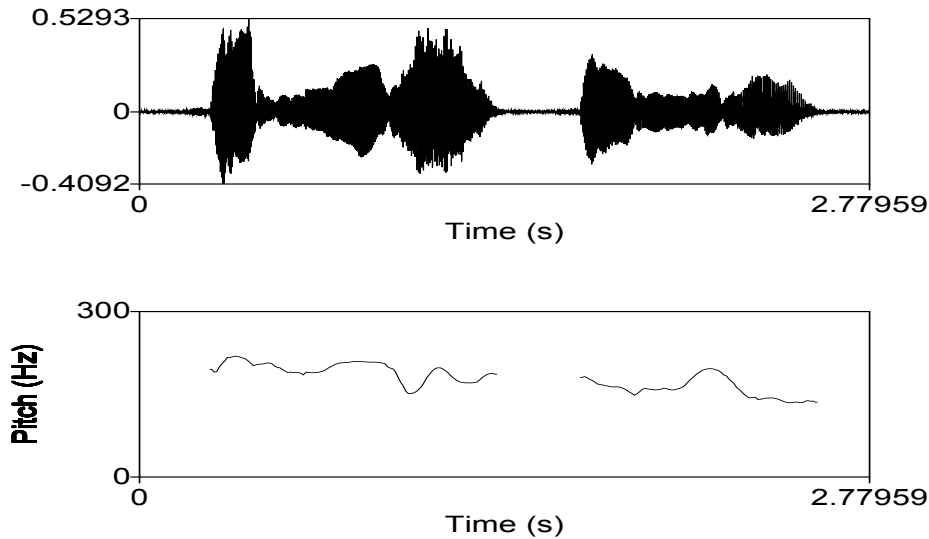
FIGURE 4: Wave form and pitch diagram for example (6)

Example (6) is two clauses in contrast, each with its own intonation unit, and each ending in the same word, *nga* 'have', which in citation carries Tone 2. Both perceptually and by look at instrumental analysis, it is clear that the pitch and contour of the two tokens of this word varies significantly between the two IUs.

In the first, the word *nga* has a clear pitch rise at the beginning of the TBU, which is a feature of Tone 2, as we saw in Figure 3. But after that rise, the pitch undergoes fall and then rise, with F_0 and cents measurements from the beginning of the TBU, given in (7):

7)   152-198-170-185 Hz   728-1183-925-1069 cents

This appears to show the rise-fall feature of Tone 2 combined with a final rising intonation that typical of final elements of non-final clauses. The second token of *nga*, however, at the end of the second intonation unit, does not show any rise, and the word as a whole has a much lower pitch and a very gentle fall, measurable in F_0 as there is not such rise and the word as a whole is expressed with much lower pitch, 143-136 Hz / 619-537 cents. Both perceptually and in terms of the instrumental measurements, this token is more like Tone 1, which is not the citation tone for this word, but rather this represents the falling intonation that is typical of declarative clauses. (Intonation in Turung is described in some detail at Morey 2010a:201-215)

As already mentioned, the Turung lexicon presented as part of Morey (2010a) was checked by Ananta Singphow and the tones marked there represent his intuitions. This is not necessarily an accurate representation of what all the Turung speakers do with tone, and leads to an open question as to what it means to make a lexicon or a dictionary of such

a language where all the tones are marked according to the intuition of just one speaker (or even several). With regard to stopped syllables, I remember well in the early stages of fieldwork that while Kon Kham felt there were three distinctive tones on stopped syllables (Morey 2010a:172), some of the older speakers maintained there were only two. My final analysis, confirmed by Ananta Singphow, was that there are indeed 3 contrastive tones on stopped syllables in Turung, but this may not be a feature of the language of all the community. I can really only claim that the phonological system that I presented in the grammar and the lexicon that went with it represent the speech of this single speaker. Further details about the differences between individual speakers intuitions are discussed at Morey (2010a:93).

Unlike in Tai Phake, 'List intonation' is an issue with eliciting tones in Turung. When collecting a word list in Tai varieties such as Phake I would ask speakers to pronounce the Tai word three times, and the three exemplars of the word produced would be perceptually the same in pitch, contour, phonation and duration. However this is not the case with at least some Turung consultants. The first thing that often happens is a list intonation effect where the last syllable is lower and falling whatever its underlying tone. A fairly clear example of this was when I asked Sundor Turung to pronounced the words *wah san* 'pork' (which I analyse as /waʔ²san²/), as shown in Figure 5:
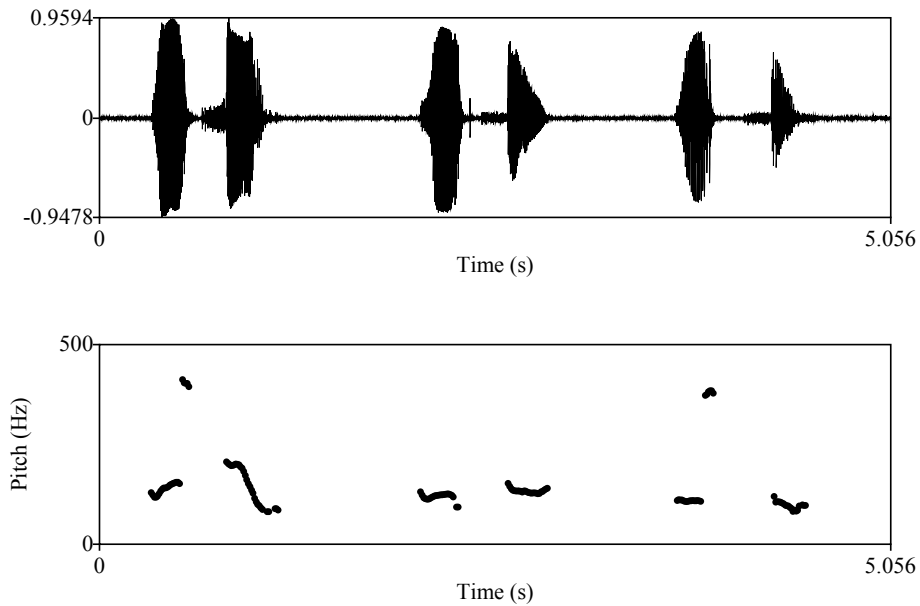

FIGURE 5: Wave form and pitch diagram for the word wahsan 'pork'

Let us consider the second syllable of the three tokens, /san²/, which is supposed to carry the high falling (pressure) Tone 2. This can be seen plainly enough in the first token, where the rise caused by the initial nasal as seen in Figure 3 is absent, because the initial is a voiceless segment. However the second and third tokens have completely different F_0 traces, more similar to the third tone (level or straight) and the first tone (low falling or simple) respectively. How can this be?

In order to explain this, I will tell the story of the word *udi* 'egg'. In the Turung variety of Singpho, this word is pronounced with both syllables having the high falling tone, as /u²di²/. When I started work in the Numhpuk variety of Singpho (see Morey 2008a), I was at that time more familiar with Turung pronunciation, and I pronounced it in that way. After some discussion, it emerged that for my Singpho consultant, Manje La Singpho, the word should be pronounced with two low falling tones, phonemicised as /uu¹dii¹/.

Manje La accepted my pronunciation of the word, and this led to a discussion, in which Manje La said "there is no substitute word of *udi*, that's why if the sound is up and down, you can understand. But in case of the *wa* you should care about the sound of this word." In other words, tones bear less functional load in a word like *udi*, because the combination of two syllables *u* and *di* cannot be misunderstood for any other word, whatever pitch and contour might be employed.

3.2 TANGSA. In 2007 I started work on a new language, Tangsa (which the Ethnologue and ISO call 'Naga Tase' and give the code ISO 639-3:nst). The short book of Das Gupta (1980) should have been enough to warn me of the substantial diversity I would encounter, but there are more than 70 subtribes of Tangsa (called Tangshang in Myanmar/Burma) all of which have distinct language varieties, sometimes mutually intelligible and sometimes not[19]. Within Tangsa, there is one large sub-group of about 30 varieties that is termed Pangwa in India. Pangwa can be identified as group on both linguistic and non-linguistic criteria, and most of the data presented in this paper is from Pangwa varieties. One feature which differs from one Pangwa variety to the next is Tone (see Table 9 below and Morey, forthcoming).

Prior to beginning my work, the most reliable source for information about the tonal systems of Tangsa was to be gleaned from examining the words cited in Weidert (1979, 1987). It is not completely clear which Tangsa variety Weidert collected data on. In one place (1979:51) he refers to the language as "Tangsa or Moshang", possibly influenced by the fact that Moshang (Mueshaungx) was the variety mentioned in Grierson (1903), based on Needham (1897), while at (1979:85) he stated that the tone system being discussed was that of "Tangsa (Jugli dialect)". Mueshaungx and Joglei are clearly different in significant ways, though perhaps still mutually intelligible. Whatever the variety, Weidert identifies three tones on open syllables (vowel, nasal or lateral finals), which he numbers Tone 1: low, Tone 2: mid and Tone 3: high. In addition there were stop-final words for which he does not mark tone. Significantly he marks a glottal stop in brackets for words carrying Tone 1, stating that those words "are obligatorily pronounced with a glottal stop if the syllable is in isolated or final position (this is considered to be a case of phonetic redundancy so that

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[19] Currently the most accurate published list of Tangsa varieties is that on the Wikipedia site http://en.wikipedia.org/wiki/Tangsa_people, consulted on 28th April 2014.

the glottal stop is dropped in phonemic representations)." This latter feature refers to the phonation feature of glottalisation for Tone 1. In the study presented in this paper, the Tone categories numbered 1, 2 and 3 correspond to Weidert's 1, 3 and 2 respectively[20].

The analysis of tones presented here does large rely on the categories that are marked in the Tangsa orthographies, and for that reason, in this section on Tangsa, I will first discuss the marking of tone in some of the writing systems in use (section 3.2.1), before discussing the comparative tonology of the Tangsa varieties (section 3.2.2), the effect of grammatical factors on tone (section 3.2.3) and finally some unresolved issues (section 3.2.4).

3.2.1 TONE IN TANGSA SCRIPTS AND ROMAN-BASED ORTHOGRAPHIES. At least four roman-based orthographies and one native script marking tone have been developed in recent years for Tangsa. All of them consist of three tones on open syllables, with no tonal distinction on stop final syllables, which are then treated as a fourth tone category[21]. One of these, the Ngaimong writing developed in Myanmar in the 1960s, has not continued to the present day, apparently because it was banned by the government. The Ngaimong system used the colon and hyphen symbols to mark two of the tones, and left the third tone unmarked.

Among the Tangsa in India today, there are three orthographies in use among Christian Tangsa for which there are Bibles, hymn books and other religious texts in print. One of these, in the Joglei variety, does not mark tone[22], but that for the Chamchang (general name Kimsing) used for the Bible translation that is approved by the Bible Society of India and adopted by the Tangsa Baptist Churches Association (TBCA) and that for Mueshaungx (general name Mossang), both mark tones, as shown in Table 5 (Gam Win et.al 2006)[23].

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[20] I have followed the order of tones followed by both the Chamchang orthography and the Mueshaungx orthography (see below 3.2.1). The script developed by Lakhum Mossang, has the tones in the order 1, 3, glottal stop final and 2, as shown in Table 6.

[21] These are (i) the Chamchang orthography devised in India by Rev. Yanger Thungwa and adapted and revised in Myanmar; (ii) the Mueshaungx orthography devised by Rev. Gam Win, (iii) the Mungre orthography devised by Baike Mungray, and (iv) the Ngaimong orthography.

[22] I was present at a discussion between Joglei and Mueshaungx speakers about this. The Joglei orthography is much easier to write because of the lack of need to mark tone, and the Joglei consultants present felt that was a big advantage in a time when literacy is in its infancy. This question of whether tone marking in these languages is really a benefit for the development of literacy is an issue that deserves more research.

[23] Although it is clear that the final vowel /-a/ in Chamchang correspondences with /-auŋ/ in Mueshaungx, there is no corresponding /-auŋʔ/ in Mueshaungx, so the word /miʔ/ 'person' has been used to exemplify the glottal tone. The /-a/ ~ /-auŋ/ correspondence is a reflex of proto /-aŋ/ as found in the word *Tangsa*, which is realised as *Tase* in Chamchang. The name codified by the ISO, Naga Tase, for this 'language' is based on the Chamchang pronunciation because the Chamchang Bible translation was the first to be commenced and therefore the *Ethnologue* (http://www.ethonologue.org) adopted this name in their listing which was then automatically adopted by the ISO.

Our category	Chamchang			Mueshaungx (Mossang)		
glottal	-q	maq	'blurred'	-q	miq	'person'
1	-x	max	'dream'	-z	maungz	'dream'
2		ma	'corpse'	-x	maungx	'corpse'
3	-f	maf	'full'	-c	maungc	'unconscious, half dead'

TABLE 5: Comparison of tone marking in the Chamchang and Mueshaungx varieties

One thing is immediately obvious; the use of -x to mark Tone 1 (low) in Chamchang but Tone 2 (high falling) in Mueshaungx means that there is a mismatch of tonal category marking between the two varieties.

There are at least two more writing systems to be mentioned in connection with marking tone. The Hakhun variety, which is linguistically similar to what is called Nocte (ISO 639-3:njb) is included under Tangsa inside Assam. The Hakhun have recently produced a new orthography and several books using it, not for use in church but for use in language and literacy development. In Hakhun, tones are marked using diacritics following the word, a system found in some minority orthographies in Myanmar and probably influenced by that. The explanation of the tones as developed by the Hakhun community members is given in Figure 6:

Signs and indicators of tone
1. ^   High   wiˆ   'monkey'
2. ˇ   Low   wiˇ   'thigh'
3. -   Middle wi-   'grandmother'
4. q   Short   wiq   'write'
Note - ˆ and ˇ are used for high and low tones. This sign like a V is in English, but it is written in smaller size and is placed after and above the last letter of the word.

FIGURE 6: Tones in the Hakhun orthography

In actual usage, it looks like Figure 7, where the colon symbol before a stop conveys aspiration. In this variety, tone is marked on every syllable.

Tiˆvaˇ nøeˇ miq ni- yuˆbeˇ rungˆlaˇ tungˆ tˆṅaˇ, taˆniˆ vaˇniˆ rweˆyerˆ aˆroq, Mun-riˇtˆṅaˇ. I-rөeˇ :kaˇmøeˇ tiˆkaˇ vaq, kˆmøeˇ maˆmaˆ nøe- tungˆlat ṅaˇmøeˇ i-ruq, tˆniˆ vaˇniˆ mik, nøe- veˆ kˆmøeˇ haˆniˆ mik, nøe- pat tˆṅaˇ. I-rөeˇ :kaˇmøeˇ yaˇkaˇ yuˆbeˆ ni- miq lap :kiˆmunˆ miq ṅaˇ. Nøe- mik nøe- aˆlamˇ lamˇ møeˇ lap :kiˆkeq aˆnaˇ aˆbөeˆ ṅaˇ. Ha:kunˇ kˆmøe i-ruk :panˇ keq.

FIGURE 7: Hakhun story written in Hakhun orthography

I also wish to exemplify the script devised by Lakhum Mossang devised in order to write any one of the Tangsa varieties, something none of the roman-based orthographies can easily do. This script uses 73 symbols (termed linguals); 46 vowel symbols and 27 consonants. In his charts, the vowel symbols are presented first, unlike every other orthography or script that I have dealt with in North East India, where consonants are always presented first. The vowels also incorporate tones (of which final glottal is regarded as one) as we can see in Table 6:

1	ᴐ	[ò]	o¹	Low falling
2	ℨ	[o]	o³	Level
3	ᴀ	[oʔ]	oʔ	Glottal final
4	ᵧ	[ô]	o²	High falling

TABLE 6: Sample of Lakhum Mossang's Script: First four vowel linguals[24]:

Lakhum Mossang's script, uniquely among all the writing systems proposed or in use for any of the varieties I am working on, combines vowels with tone categories, and brings the importance of tone to the centre of the attention of the reader – something that none of the four systems in example (1) achieves, because in all of those systems and in all of the various Roman based orthographies, tone is always marked as a separate, additional feature.

Lakhum's system will be exemplified by a line from a Wihu song, as written out by him (Line 1), together with Gam Win's system (Line 2) and my phonemicisation (Line 3)[25].

8)

ᴦᴡℨ	ᴌᴡℨᴌ	ℨᴡᴦᴜᴡℨ	ᴜᴒᴌℨᴌ	ℨᴌᴦℨᴌᴒᴦℨᴌ
nangz	tvix	sanwangx	wax-rueq	mvnzphvnc
naŋ¹	təi²	san²βaŋ²	wa¹-rəʔ	mən¹pʰən³
1PL	grandfather	PN	father-AG	story

ᴌᴌᴒ	ᴃℨᴒ
v-tueq	luex
a¹-təʔ	lu¹
PRE-PST.3	PRT

'Our grandfather Sanwang told his story.'

---

[24] Font created by Paul Hastie. A proposal to include this script in the Unicode is being prepared.

[25] The handwritten manuscript from which this line is taken is the only example of a Wihu song written out in full by a Tangsa speaker; indeed the only traditional song text of any kind so written.

Note that in spoken Mueshaungx, the forms are different from the song language, with, for example, 'our grandfather' being *naungz jix* /nauŋ¹tɕi²/.

3.2.2 COMPARATIVE TONOLOGY OF TANGSA VARIETIES. Returning to the tonal categories listed above in Table 5, I have been able to collect reliable information on at least seven Pangwa varieties, and in Table 7, I present example words from each of these varieties, illustrating Tone categories 1, 2 and 3:

English Gloss	Mueshaungx	Chamchang	Shecyü	Mungray	Cholim	Lochhang	Ngaimong
Tone 1	low falling	low falling	mid falling	high falling	high level, glottalised	mid level, glottalised	falling, glottalised
chicken	βu¹	βu¹	vu¹	vu¹	ɓu¹	ɣau¹	βu¹
dream	mauŋ¹	ma¹	maa¹	mɔ¹	maŋ¹	ma¹	maŋ¹
elder brother	ə-pʰu¹	pʰu¹	apʰu¹	afu¹	pʰu¹	əpʰau¹ ('father')	pʰu¹
father	ə-βa¹	βe¹	ve¹	vei¹	βe¹	ßi¹	βaa¹
fire	βər¹	βa¹	vaa¹	vaar¹	βai¹	ße¹	βal¹
Tone 2	high falling	mid level	mid level	high level	plain	high falling	high level
bear	tɕəpbɔ²	tɕapbi²	tɕaapbi²	tɕʰaapbe²	tɕap²ba²	tɕʰeʔbo²	tɕapbeŋ²
corpse	mauŋ²	ma²			maŋ²		
door	ka³lɤ²	ki³lɯ²	ki³lɯ²	kei³luŋ²	ke³ljo²		kaa³loŋ²
paddyfield	na²	ni²	ni²	nei²	ne²	ni²	naa²
younger brother	no²	no²	anɔ²	ano²	ə-no²	ənu²	naau²
Tone 3	high rising	high falling	high falling	low falling	high falling	mid level	low level
ear	na³	ni³	ni³	nei³	ne³	ni³	na³
buffalo	ŋa³	ŋi³	ŋi³	ŋei³	ɲe³	ŋi³	
four	bəli³	bəlai³	bəlai³	bəlai³	bəlai³	bəli³	bəlai³
snake	pɤu³	pau³	pau³	pao³	pu³	pau³	pau³
yesterday	m²-ja³		m¹ji³	m¹jɤ³	bəʒɤ³	mədʒi³	

TABLE 7: Examples of unmarked Tone Correspondences between 7 Pangwa varieties

In a sense, we can regard the categories 1, 2 and 3, together with stop final words as a fourth category, as being the 'underlying' tones of all the Pangwa Tangsa varieties. The form of these tones differs markedly from one variety to the next, as we will see in Table 9, but in general, words that are in the category of Tone 1 in one variety are also in Tone 1 in all the others. Some of the exceptions to this are presented in Table 10.

Wave forms and F_0 traces for the four Chamchang tones are given in Figure 8, using as examples the four words from Table 5 in the same order. Each of the words was preceded

by a syllable /a-/, analysed as carrying low tone, which is nominaliser for verbs and a third person possessive prefix for nouns. As we can see in this table, of the three open tones (tokens 2-4), Tone 1 (termed by Chamchang speakers as low) and Tone 3 (high) are both falling, whereas the Tone 2 (mid) is more or less level – much the same pattern as is found in Turung Singpho (see Figure 3). Also, just as in Turung, the mid level tone is perceptibly longer in duration and the high falling tone has more intensity, shown by amplitude.
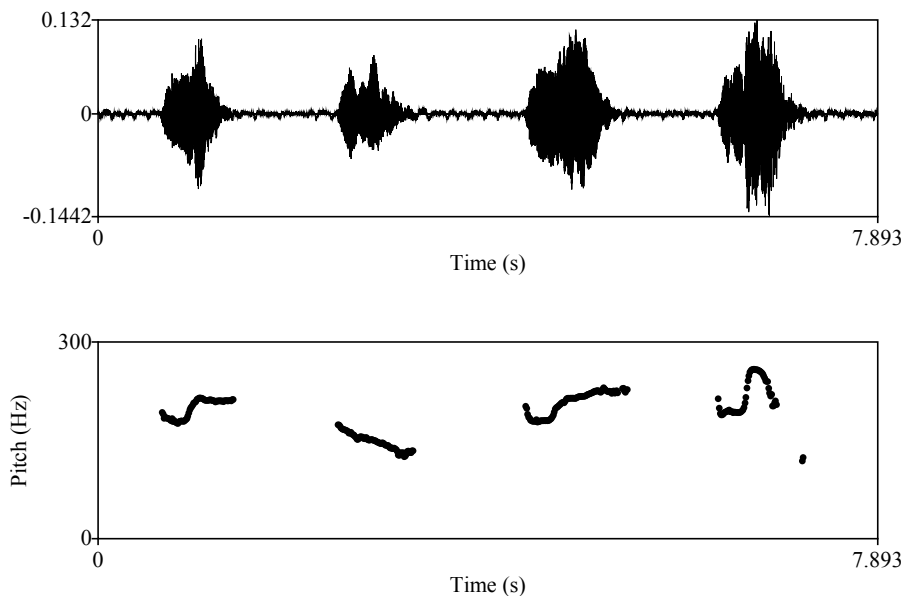

FIGURE 8: Wave form and pitch diagrams for the four tones of Chamchang

When discussing the tones of unfamiliar words with my Chamchang consultants, there is sometimes confusion between Tone 1 and Tone 2, or between Tone 2 and Tone 3, particularly if there is not a three-way contrast such as that with the syllable /ma/. I think this arises for two reasons. Firstly because Tone 2, the mid tone, does not fall, whereas the other two do, the initial pitch of Tone 1 (low) and the initial pitch of Tone 2 (mid) are similar, just as the final pitch of Tone 3 (high) and the final pitch of Tone 2 (mid) are also similar. With my consultants it sometimes happens that when we are checking the tone of a word carrying high tone, they may first pronounce a contrasting word carrying Tone 1 (low tone) with a different meaning, and then categorise the word we are checking as mid (i.e. Tone 2), because there is no contrast with Tone 3 on that syllable.

I have also noticed that among those Tangsa speakers who are very skilled in categorising tones, some seem to take the initial and some the final pitch of the tone as the point of comparison. Some are therefore more inclined to confuse low and mid tones, and others mid and high tones. As we shall see below, which of the three tone categories can

be categorised as 'low', which 'mid' and which 'high' will vary from variety to variety, but in Chamchang at least, this means confusing Tone 1 and Tone 2, or Tone 2 and Tone 3.

In Mueshaungx, the tones have been named as we see in Table 8:

glottal	thuic htaq	ʈuu³ tʰaʔ	'half tone'	-q
1	thuic nyenz	ʈuu³ ɲen¹	'soft tone'	-z
2	thuic hvlz	ʈuu³ həl¹	'middle tone'	-x
3	thuic tsanz	ʈuu³ tsan¹	'hard tone'	-c

TABLE 8: The names of the Mueshaungx tones

Mueshaungx is the only language I have investigated where metalanguage has been developed for describing tones. I asked several Mueshaungx speakers for the literal meanings of these words[26] and was given: *thuic* 'tune, voice', *htaq* 'half', *nyenz* 'soft, low', *hvlz* 'between, middle' and *tsanz* 'hard'.

As we can see from Figure 9, where the three open syllable instances of /mauŋ/ are pronounced as monosyllables (no initial *a-* as in Chamchang), the pitch and contour of the three open tones is quite different to those in the Chamchang examples. Whereas Tone 1 (the second exemplar in Chamchang, Figure 8 but the first in Mueshaungx, Figure 9) is low falling in both, Tone 2 in Mueshaungx is rising then falling, whereas in Chamchang it is level, and Tone 3 in Mueshaungx is a mid-high rising tone, whereas in Chamchang it is a high falling tone.
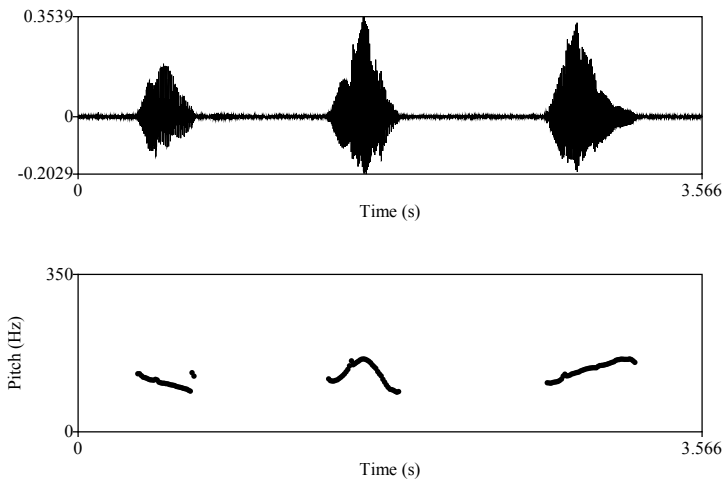

FIGURE 9: Wave form and pitch diagrams for the three tones of Mueshaungx

Another feature of the Mueshaungx orthography is that it has been judged unnecessary to mark the tone of the first syllable in disyllabic words. This reflects what we have already

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[26] I am grateful to two of my Facebook friends, Aakhum Moxxang and Renman Mossang, for providing me with these explanations.

discussed for Turung Singpho above, namely that the iambic nature of these languages makes the tonal profile of the first syllable less prominent, and also that the combination of two syllables means that there will not be an alternative word and tone marking is less essential. Thus the word for 'fowl' is *wuz* on a low tone, but the compound word for 'bird' is written *wushawx*, not *wuzshawx* and 'parrot' as *wukuiyq* not *wuzkuiyq*. We see the same phenomenon in the autonym, which is written *Mueshaungx*, rather than *Muexshaungx*.

We can demonstrate the difference between a first and second syllable in the same word by considering the word *kufkuf* 'dog' in Chamchang which contains two syllables considered to carry high tones (Tone 3) according to our consultant, Rev. Yanger Thungwa. The wave form and F_0 trace for three tokens of this word are given in Figure 10:
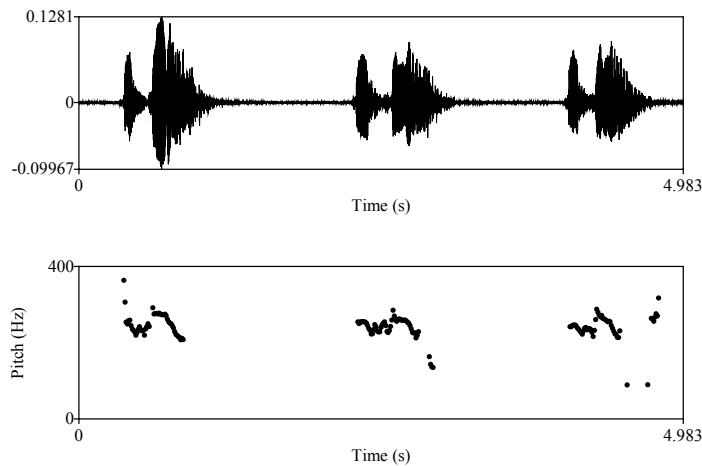

FIGURE 10: F_0 trace for kufkuf 'dog'

As we can see, in each case the first syllable is shorter in duration, has less intensity and has much less pitch fall. The typical first syllable has a modest fall (251-233 Hz 1599-1466 cents, duration of 0.13"), whereas the second syllable has a much longer fall and longer duration (261-191Hz, 1662-1121 cents duration of 0.36"). This reduction of tonal features in the first syllable, already mentioned in connection with Turung Singpho in 3.1 above, is very typical of these languages and makes the tonal analysis more challenging in the case of disyllables. My analysis is that both of these syllables are Tone 3 (confirmed by my consultant) and that the first syllable is reduced in length and the size of the fall in pitch is also reduced. I do not think it is necessary to suggest a 'tone sandhi process' as occurring here, any more than it would be necessary to suggest that the vowel of the first syllable is phonemically short and that of the second syllable phonemically long.

In Table 9 below, to more easily demonstrate the differences between varieties, we have assigned tone numerals to the 3 tones of several different varieties of Tangsa, for the citation forms of monosyllables. Tone 3 is described as /53/, although the second syllable in Figure 10 may be more like /52/. If we did use tone numerals to describe the tones,

we could have regarded what is happening with *kufkuf* as a kind of tone sandhi, needing a rule similar to "toneme /53/ is realised with a [54] allotone in front of another [53] tone." (Coupe, this volume, discusses other examples of such tone sandhi processes). My preferred analysis, however, is to treat the first syllable as reduced and less stressed one, leading to both shortening of length and reduction of the contour. With less duration there is less time for the pitch to fall.

We have already seen variation in the form of the 3 tone categories in open syllables. A more in depth study of Tangsa tones has shown that most words belong to corresponding tone categories (Tone 1, Tone 2 and Tone 3) in the different Tangsa varieties, but the form of those tones varies, as we see in Table 9 which gives pitch information in both Hz[27] (rounded to the nearest 5) and also in tone numerals for 15 different Tangsa varieties. This is discussed in more detail in Morey (forthcoming).

	Tone 1 pitch	phonation	Tone 2 pitch	phonation	Tone 3 pitch	phonation
Chamchang	**/21/** 150-130	plain	**/44/** 210-225	plain	**/53/** 255-210	plain
Shecyü	**/42/** 200-150	slight glottal	**/33/** 170-165	plain	**/53/** 210-215-170	
Mueshaungx	**/21/** 115-90	plain	**/52/** 160-100	plain	**/35/** 120-160	plain
Cholim	**/44ʔ/** 200-200	glottal	**/32/, (/33/)** 180-120	plain	**/52/** 220-140	plain
Longri	**/44ʔ/** 135-135	glottal	**/33/** 125-125	plain	**/52/** 130-110	plain
Lochhang	**/33ʔ/** 175-165	glottal	**/51/** 220-100	plain	**/44/** 190-190	plain
Ngaimong	**/31ʔ/** 125-90	glottal	**/344/** 125-135-135	plain	**/11/** 95-95	plain
Khalak	**/54/** 215-200	glottal	**/33/** 170-160	plain	**/41/** 190-140	plain
Rinkhu	**/55/** 170-170	glottal	**/33/** 145-145	plain	**/21/** 135-120	plain
Mungre	**/41/** 135-95	plain	**/44/** 135-135	plain	**/21/** 115-90	plain
Joglei	**/41/** 175-120	plain	**/452/** 170-195-125	plain	**/44/** 180-180	plain
Maitai	**/33ʔ/** 150-150	glottal	**/21/** 145-130	plain	**/55/** 200-220	plain
Rera	**/55/** 190-200		**/33/** 170-170		**/21/** 155-135	
Shangte	**/55/** 175-175		**/33/** 150-150		**/21/** 125-85	
Lakki	**/44/** 140-140		**/52/** 145-110		**/31/** 130-90	

TABLE 9: F_0 values in Hz and phonation values for the Pangwa Tangsa tones

[27] For reasons of space we have not included cents in this table.

As we can see from Table 9, a significant number of the exemplars of Tone 1 have glottal phonation, whereas they have a wide range of pitch realisations both level and falling, from high to low. Initial research on the non-Pangwa Phong (or Ponthai) variety suggests that Tone 3 is there a breathy tone, and this leads me to posit that the proto tonal system for Tangsa (and perhaps Nocte too) may have been Tone 1 – glottal / creaky, Tone 2 – plain or modal phonation and Tone 3 – breathy.

The fact that in some of the varieties Tone 1 is realised with a final glottal constriction should not be confused with final glottal stop as a segment, a fact already noted by Weidert (1987). In Cholim, for example, there is a clear distinction between *se¹* 'child' where the vowel is longer and the glottal constriction is limited, but still clearly audible, and *seʔ* 'eat' where the vowel is shorter and the glottal stop is clearly a segment.

A comparison of a large number of words across eight Tangsa varieties shows that in a large majority of cases the Tone category is the same in all varieties, with the actual features of the Tone differing as in Table 9. However, there are a significant number of words where the Tone categories differ from variety to variety in regular ways. In Table 10, we see a group of words that carry Tone 2 in Chamchang and Shecyü, Tone 1 in Mungray, Lochhang, Ngaimong and Mueshaungx and glottal stop final in Cholim. Further research is needed to establish what motivates this correspondence, but it goes to show that if a word carries Tone 1 in one variety it cannot be assumed to carry Tone 1 in another[28].

	Chamchang	Shecyü	Mungray	Lochhang	Ngaimong	Mueshaungx	Cholim
Tone category	2	2	1	1	1	1	ʔ
blow	meɪ²	me²	moi¹	əmaɯ¹	mul¹	mui¹	moʔ¹
fall	dɛə²	dia²	dai¹	əde¹	dal¹	dəi¹	djɤʔ¹
ill	tsi²	adzi²	atsaa¹	ədi¹	ðaa¹	ə-θɤu¹	ə-deʔ¹
cloth	kʰɛ²	khia²	khai¹	khe¹	khal¹	kʰəi¹	kʰjɤʔ¹
fly	bi²	bi²	bei¹	bi¹		ba¹	be¹
trample	na²	naa²	na¹		naa¹	ənɯu¹	

Table 10: Examples of Marked Correspondence tone sets

3.2.3 GRAMMATICAL TONE. Tones also play a grammatical role in Tangsa languages; in the variety recorded by Weidert, and also in both Chamchang and Mueshaungx, there are sometimes two forms of verbs, one that we can describe as 'verbal' or even 'finite' and which is used with the TAM agreement particles, and a second that is used with nominaliser, causative and middle prefixes. In many cases the latter involves a changed tone, hence in Chamchang *bom* /bom²/ means 'speak', and *bomtof* /bom²-to³/ 'speak-PST.3SG' means

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[28] The Chamchang, Shecyü, Mueshaungx and Mungray data were supplied by native speakers who use tone marking for transcription. The same consultant, Bynn Kham Lann, provided the Shecyü and Mungray lists, and specifically confirmed that for these words the tone categories in Mungray and Shecyü were different. When this was compared with Cholim, where almost all these words have final glottal stop tone, a clear pattern emerged.

'he spoke' where the verb in both cases carries a mid tone, and the TAM suffix high tone. When combined with the nominaliser *a-*, the tone changes to be high, as *abomf* /a-bom³/ 'speaking'[29].

Some examples from a range of varieties are presented in Table 11, where the 'verbal form' (considered to be the underlying or underived form) and prefixed nominal forms of verbs, are shown in pairs of lines. Where the form is changed when prefixed, it is shaded yellow.

	Chamchang	Shecyü	Lochhang	Ngaimong	Mueshaungx
be born		teɤ³	tɕʰɯɯ³	tɕeeŋ²	tɕɔ²
be born.NOMZ		ateɤ³	i-tɕʰɯɯ²	atɕeeŋ³	ətɕɔ³
sleep	kon¹	kɔn³	kon¹	kun¹	
sleep.NOMZ	akon³	akɔn³	ikon²	akun³	
weep	hoʔ	hɔʔ	hwaʔ	kʰok	kʰor²
weep.NOMZ	aho²	ahɔ²	i-hwaʔ	akʰo⁴	əkʰor²
laugh	nai²	nai²	ŋai¹	nai²	nɤi¹
laugh.NOMZ	anai²	anai²	i-ŋai¹	anil⁴	ənɤi¹
stand	tɕap	tɕaap	tɕʰeʔ	tɕap¹	tɕəp
stand.NOMZ	atɕap	atɕaap	i-tɕʰeʔ	atɕap⁴	ətɕəp
go	ki¹	ki¹	ki¹	ka¹	ka¹
go.NOMZ	akai²	akai²	i-ki¹	akal⁴	əkai¹
see	tɕʰi¹	tɕʰi¹	kʰu¹	kʰui¹	kʰi¹
see.NOMZ	atɕʰi³	atɕʰi³	i-kʰu²	akʰui³	əkʰi³
give	kuʔ	kuʔ	kau¹	koʔ¹	kuʔ¹
give.NOMZ	ake²	ake²	i-kau¹	akoʔ⁴	əkui¹

TABLE 11: Examples of Changed tone in Tangsa

Exemplars of eight different verbs are given here, all of which have a changed nominalised form in at least one variety. There are verbs that do not change form in any of the varieties we have examined so far, but most of the verbs which we have got examples from a range of varieties change in at least one.

The changes are not consistent. For example, Tone 1 verbs like 'see', (the only verb that has a changed form in all five varieties), change to Tone 3 in Chamchang, Shecyü, Ngaimong and Mueshaungx, but to Tone 2 in Lochhang. A similar pattern can be seen with 'sleep' and 'be born'.

In Ngaimong this process has even led to the creation of a fourth tone on open syl-

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[29] The tone of the nominaliser is a matter for further research. In Chamchang at least it appears to carry a low tone, and this is apparent in Figure 5. However our main Chamchang consultant felt that it is not necessary to mark the tone, as there was no contrastive form in that position.

lables, and to a tonal distinction in stopped syllables[30]. As we see in Table 9, Ngaimong has one falling Tone (Tone 1 /31ʔ/) and two other level or even rising tones. When a verb carrying Tone 1 is prefixed in Ngaimong, it acquires a high falling tone (/53/), as in the pair /pʰal¹/ 'vomit' (136-98 Hz, 541-–28cents) and /i¹pʰal⁴/ 'ɴᴏᴍᴢ-vomit' (178-178-115 Hz, 1002-1002-250 cents).

The Ngaimong speakers recognise this as a 'fourth tone' but the genesis of a new tonal category in this way is a phenomenon which has not yet been observed in any other Tangsa variety (for further details see Morey forthcoming). This not only means that the Ngaimong tone system is significantly different from other Pangwa Tangsa, but also that in Ngaimong almost all verbs have a changed tone in the nominalised form.

A number of the papers in this volume (Cruz and Woodbury, Snider) discuss the concept of floating tones which could be an explanation of what is happening in Tangsa. Further research is certainly needed to describe in a wider range of varieties the presence (or absence) of what I have termed changed tones. On the basis of Table 11, if floating tones are to be posited to explain the tone changes, they will have to be posited in different ways in the different varieties.

Comparative study suggests that the verbal form is the underived form. Consider the verb 'go', which is *ka¹* in Ngaimong and Mueshaungx and *ki¹* in Chamchang, Shecyü and Lochhang. Comparative study suggests proto *ka within Tangsa, (PTB *ka Matisoff 2003:652), and all these verbal forms concur with that, because there is a regular *a >/i/ change in Chamchang, Shecyü and Lochhang. The verbal forms in /-ai/ and /-al/ are analysed as derived forms. It is likely that in some cases the derived nominal form has been generalised to both verbal and nominal form, as we seem to see in the Lochhang form for 'give' and the Shecyü forms for 'be born' and 'sleep'. Given this, it is clearly necessary in Tangsa to collect both verbal and nominal forms for all verbs to understand the tonal system.

3.2.4 SOME DIFFICULTIES FACED. The first Tangsa variety that I worked on is Cholim, where I found that there are three tones on open syllables (vowel, nasal or lateral final) but also a two way tonal distinction in stopped syllables, demonstrated by my main consultant but which I will not discuss further here (see Morey forthcoming for more details). The three tones on open syllables are Tone 1, mid-high level and glottalised, Tone 2, mid with plain (modal) phonation and Tone 3, high falling. These are the three categories for open syllables that we will use throughout this discussion of Tangsa.

The Cholim word list[31] was then marked up for tones based on my own analysis and not on categorisation by speakers, because I have not yet been able to find speakers who

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[30] It was a Ngaimong speaker, Mr. Wangkui Ngaimong, who first explained to me that Ngaimong had an additional tone. A most linguistically sophisticated consultant, he was aware that the changed tone process leads to a new tone in Ngaimong in a way that it does not in the other varieties.

[31] Searchable on-line with links to sound files at http://sealang.net/cholim.

could place the tones into categories, as was the case with Chamchang, Mueshaungx, Ngaimong, Shecyü and Mungre. When lists from these varieties were compared with the Cholim list, some inconsistencies were noticed, and I listened again to the Cholim words. In Table 12 below we will see a list of words for animals. Recording three tokens of each word, it was found that the pronunciation of the word for 'snake', which carries Tone 3 across the Tangsa varieties, was a clear high falling with F_0 approximately 208-106 Hz, 1272-114 cents, similar for all three tokens. The word for 'elephant' had a clear glottal constriction and high level F_0 for all three tokens at around 217 Hz, 1348 cents and is clearly Tone 1, as it is in other varieties.

Because the very first minimal pairs that I was given in Cholim compared a high level glottal tone (i.e. Tone 1) with a low falling tone (Tone 2), I incorrectly assumed at first that words with a high level tone were Tone 1, even if the glottalisation was not present. Thus, the word for 'monkey', all three tokens of which have level tones around 192-187 Hz, 1133-1090 cents, was at first assumed to carry Tone 1. When I realised that in other varieties this word carries Tone 2, I checked it again and found that it was lower in pitch than the typical Tone 1, but more importantly lacked final glottalisation. Therefore I have provisionally assigned this word to Tone 2 in Table 12. This will only finally be confirmed when a speaker who can assign categories to each of the tones is found. It is an illustration of an error in choosing the wrong feature as the distinctive feature. Tone 1 is both high level and glottally constricted, but it is the latter feature that is the distinctive one.

In Table 12, both to further illustrate the diversity of Tangsa varieties and also to develop the discussion about tones, we present the terms for several animals in three varieties of Tangsa: Champang, Cholim and Muklom. The Cholim words are marked for phonemic tone, based on the three-tone system mentioned earlier.

The principal differences between the three varieties are that Champang has disyllabic words for all of the tokens presented here, whereas for around half these words in Cholim and all in Muklom, the equivalent word is a monosyllable. In the case of the first four words, 'snake', 'bee', 'pig' and 'rat', the first syllable of the Champang word is clearly cognate to the Cholim and Muklom words. The second syllable in Champang is probably a grammaticalisation of the words *nu* 'mother' and *ku* which means 'large' in some varieties and is used as a classifier for animals in others.

Our research on Champang so far has not led to being able to posit tonal categories[32]. In Table 12 I have marked the F_0, in Hz rounded to the nearest 5[33], for each of the words, for both syllables. Readers will notice that for every word except 'ant', the pattern is remarkably similar – a more or less level pitch on the first syllable, in the lower range of the speaker's voice, and then a step up and a higher falling tone in the second syllable. This pattern is so ubiquitous for Champang nouns (not just words for animals) that I have been tempted to speculate that tone is no longer functional – at least for the disyllabic nouns – for much the same reasons as suggested by Manje La for the Singpho word *udi* 'egg'. However, the word for 'ant' is plainly different and suggests that tone still plays a role.

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[32] The Champang village in Assam is in an area which could not be visited during the 2012-13 field season, due to some disturbances.

[33] For reasons of space I have not included cents values here.

In the case of Muklom, where most words are monosyllabic (all of the ones in the table), a word list was collected from two speakers, and the Hz figures for the tones of both are given in the right most column of Table 12.

The first speaker was consistently higher in pitch than the second, illustrating that pitch categories, at least, can only be made reliably with a single speaker. I have not yet been able to work out the tonal categories of Muklom, and on the basis of information gathered so far, they do not seem to match the tonal categories in the Pangwa varieties. 'Monkey' and 'cattle' for example, have the same tones in Pangwa varieties, but both Muklom speakers pronounced the word for 'monkey' on somewhat higher pitches than the word for 'cattle'.

Gloss:	Champang	(Hz)	Cholim	Muklom	(Hz)
snake	punu	σ1 140-140 σ2 150-135	pu³	pu	sp1 155-165-110 sp2 125-100
bee	nɐʔnu	σ1 130-130 σ2 145-130	ɲɤʔ²	naʔ	sp1 150-140 sp2 115-100
pig	wɛkku	σ1 120-120 σ2 140-125	βak¹	βak	sp1 160-160-120 sp2 110-100
rat	juʔpo	σ1 125-125 σ2 150-130	ʒuʔ²	ʒuʔ (po)	sp1 140-180 sp2 110-90
monkey	jukku	σ1 120-120 σ2 145-130	βo²	βi	sp1 220-240-140 sp2 140-140-110
elephant	bokla	σ1 130-130 σ2 145-125	cʰa¹	puk	sp1 260-280-160 sp2 150-150-120
tiger	sɛpbe	σ1 120-120 σ2 145-125	cʰjɤʔ¹	ʃaʔ	sp1 175-175 sp2 120-95
bear	sɛpba	σ1 125-125 σ2 145-125	cap²ba²	ʃap	sp1 190-170 sp2 120-105
ant	sjamu	σ1 150-135 σ2 140-120	xip¹xa²	sip	sp1 250-170 sp2 120-95
cattle (bovine)	mɛnsu	σ1 135-135 σ2 150-125	men²su²	man	sp1 185-220-115 sp2 115-115-95
frog	lutja	σ1 130-130 σ2 145-110	luk¹ha²	luk	sp1 180-190-140 sp2 120-115

4. CONCLUSION. This paper has documented my experience of working with different tonal languages over the last twenty years. In this section I will summarise the main conclusions.

I have found it more useful to establish tonal categories first and analyse finer phonetic details later (see also Mazaudon, this volume). In my experience, this process is best achieved when native speakers themselves have either earlier established those categories (as was the case with the Chamchang, Mueshaungx and Ngaimong varieties of Tangsa, see 3.2.1), or confirm the categories suggested by linguists (as with Tai Phake, see 2.3).

The establishment of these tonal categories may sometimes be assisted when historical

and/or comparative data is available. For example, the Tai tone box is a basic tool for investigating Tai languages (section 2.1) as are the unmarked correspondence sets in Tangsa (Table 7 in 3.2.2). However in Tangsa there are marked correspondence sets (Table 10), in which tone categories vary from one variety to another, and these are an example of a case where comparison may not be possible for establishing the tones of new words.

Even once the categories are established with some speakers, it may still be the case that not all the members of a community necessarily agree on the tonal category of individual words or even the number of tonal category distinctions, as we see in the case of Turung stopped syllables (section 3.1). This means that in some cases the lexicons we present may represent only some part of a 'language' and not the whole community's usage.

In the languages discussed in this paper, pitch and change of pitch (contour) are only two of a number of contrastive features that distinguish the tone categories, as shown by the Tai Phake data in section 2.2. Phonation, duration and perhaps intensity are also features that distinguish tones. For Turung, for example, it seems that Ananta Singphow's categories of 'simple', 'pressured' and 'straight' are perhaps more useful and accurate descriptions than 'low', 'high' and 'mid', as discussed in section 3.1. Furthermore, while undoubtedly the binary distinctions of H and L are helpful in the analysis of some languages, I do not consider that these are useful terms in referring to the tone systems discussed in this paper, either in the present day systems, or in the proto systems which for both Tai and Tangsa may have been entirely based on phonation distinctions.

When presenting tones in written form, linguistic transcriptions may use a number of different notational systems. I have preferred an arbitrary system that identifies which tone category a syllable belongs to, in combination with a detailed description of the tone, rather than tone numerals or diacritics (see 1.1 above). When presenting instrumental data, such as F_0 values, I think it preferable to use a psycho-acoustic scale, such as cents (based on semi-tones), if desired in conjunction with Hz, as also discussed in 1.1.

The best methods of collecting data vary from Language to Language. Because there was no problem with list intonation or different word categories in Tai, simple lists of repeated words in isolation was the best method of establishing the tones (see 2.2) and is the way the speakers themselves go about categorising them (see 2.3). This however did not work for Turung, where a frame was a useful method and only when words of similar word classes were compared could a clear minimal triplet be established (see 3.1).

In more natural speech, phrase intonation can significantly alter the phonetic realisation of tones, as in the Turung example (6) in section 3.1, and grammatical factors may also alter the categories of tones, as was the case for nominalisation in Tangsa in 3.2.3, a process that has led to the genesis of a new tonal category in one Tangsa variety, Ngaimong.

Impressionistically the functional load of tones is lower in Turung than in Tai. This observation is based both on the greater difficulty in having speakers assign tonal categories to words, and on the repeated statements that Turung speakers, and indeed speakers of other Singpho varieties, rely less on tones for disambiguating meaning than Tai speakers. The effect of functional load on the tonal systems needs more intensive research, which presumably could include auditory testing.

Even where functional load of tones is high (as with Tai languages) native writing systems and orthographies do not always see the need to mark them. As discussed in section 2.4, the marking of the synchronic tonal categories for Tai languages in North East India

would make mutual intelligibility of written texts less easy, because the tone categories do not coincide between the varieties. A similar problem might arise in Tangsa because of the marked correspondence sets demonstrated in Table 10 in section 3.2.2. Turung and related Singpho varieties do not mark tone in the developing orthographies being used or suggested, and tones have never been marked in the Jinghpaw script in Myanmar. While immensely helpful for linguists (it has made it possible for me to work effectively in Tangsa, for example) tone marking in orthographies is not necessarily always desirable for literacy.

On the other hand, in the only script developed particularly for one of these languages (the Tai scripts being borrowed from Mon via Burmese), the script invented by Lakhum Mossang for Tangsa (see 3.2.1), a single symbol incorporates information about both vowel and tone. Unlike in any of the other orthographies or indeed any of the linguistic notational systems discussed here, in Lakhum Mossang's system no word can be written without marking tone.

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