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Tone in speech and singing: a field experiment to research their relation in endangered languages of North East India

Stephen Morey & Jürgen Schöpf

1. Introduction: DoBeS-Project Assam, India[1]

In the framework of a DoBeS project funded by the *Volkswagen Foundation*, a team of linguists, anthropologists and an ethnomusicologist is currently researching three language groups in Upper Assam, India, a region known for its linguistic diversity. The full project title, *The traditional songs and poetry of Upper Assam – a multifaceted linguistic and ethnographic documentation of the Tangsa, Tai and Singpho communities in Margherita, Northeast India*, indicates that the focus of our cooperation has been on artistic expressions of language in the three language groups.

This paper is about two of the language varieties that we are documenting for the DoBeS project: Singpho (Numphuk variety)[2] and Tai Phake. We first present an analysis of the Singpho tonal system based initially on the intuition of one of the more linguistically aware native speakers (Manje La), but extending this with an alternative approach to the system that reanalyzes the lengthened vowels of some syllables to be one of the components of tone rather than a component of vowel length. We will then discuss the relation between tones and melody in Singpho and present a new method for investigating the relation of pitch in speech and singing in a field experiment.

For Tai Phake, we will present a traditional analysis of the tones based on the work of Banchob (1987) and then develop this with a discussion of the key features of the tones and the difficulty of notating tones using pitch symbols alone. We will then discuss the way in which Tai Phake tones are realised in traditional songs, and talk about the concept of melody in Tai Phake composition.

2. Numhpuk Singpho

The language called Singpho (ISO639-3:sgp)[3] takes its name from the Singpho word for a human, $sum^4pho?^3$, (also $cum^4pho?^3$, $m^4pho?^3$)[4]. These terms are used interchangeably with $si\eta^4pho?^3$, apparently originally the British pronunciation of the word, but now used by Singphos to distinguish themselves from other communities. Linguistically, Singpho is closely related to Jinghpaw (Jingpho), spoken in Burma (Hanson 1896, 1906, Maran 1971, Matisoff 1974a, b) and in China (Dài 1992 and Dài & Diehl 2003). As such, Singpho is part of the Bodo-Konyak-Jinghpaw group within Tibeto-Burman (Burling 2003).

The Singphos recognise four divisions within India, each speaking slightly different varieties. These are named (using an adaptation of the Jinghpaw script[5]) as:

Turung Hkawng	Jorhat, Golaghat, Karbi Anglong districts of Assam
Numhpuk Hkawng	Burhi Dihing River, Assam and Arunachal Pradesh
Diyun Hkawng	Upper Dihing River, Arunachal Pradesh
Tieng Hkawng	Lohit District, Arunachal Pradesh

These varieties are more or less mutually intelligible, although speakers of Turung have considerable difficulty understanding the speech of the Tieng and the Diyun and vice versa. The names of the three latter Hkawng (Numhpuk, Diyun and Tieng) derive from the Singpho names of the river

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[3] All four varieties of Singpho are subsumed under ISO639-3:sgp. There is another code for Turung, ISO639-3:try, but this refers to Turung as a Tai language and the Turungs all now speak Singpho, albeit mixed with Tai.

[4] Superscript numerals in the transcriptions represent tones (see Table 1 below).

[5] In the paper, we are using the version of the Jinghpaw orthography currently in use in the Singpho community. In this orthography, <hp>, <ht> and <hk> stand for aspirated voiceless stops, the symbol <aw> for the mid back vowel, and final <q> for glottal stop.

valleys on which they are settled, the Burhi Dihing, Upper Noa Dihing and Tengapani respectively. The name Numhpuk is related to the Tai name for the river, *nam⁴huk¹* in Phake (*nam⁴* 'water').

2.1. Overview of Numhpuk Singpho tones

The following structures are found in Singpho words:

(1)   Monosyllables, as /saa⁴/ 'eat'
        Monosyllables with initial clusters, as /kraa⁴/ 'hair of the head'
        Sesquisyllabic words, as /lətaʔ²/ 'arm'
        Nasal syllables, as /n⁴luŋ¹/ 'stone'
        Disyllables, as /num⁴saa⁴/ 'female'

As can be seen in (1), we do not treat the minor syllable of a sesquisyllabic word as bearing tone, whereas we do treat the minor syllable (syllabic nasal) of what we have termed nasal syllables as bearing tone, although this is perhaps marginal. In our analysis, Numhpuk Singpho has three tones on open syllables – syllables with vowel or nasal finals, and two on closed syllables – syllables with oral stop finals. These are based on a system worked out by Manje La, a male speaker, aged around 40 at the time of recording, living at Munggong near Nthem, who categorised the tones as shown in Table 1. The sound file for these five tones appears as MS1.wav.

Table 1: Tonal system in Numhpuk Singpho, after Manje La[6]

No	Vowel	Length (s)	Pitch contour (Hz)	Coda
1	aː	0.54	140–135	vowel
2	aʔ	0.28	140–145	glottal stop
3	ẹʔ	0.20	160–170	glottal stop
4	eː	0.41	150–150	vowel
5	eː	0.36	190–145	vowel

We exemplify these five categories in Table 2

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[6] When Manje La pronounced these tones, he did so with considerable emphasis.

Table 2: Examples of the five tones from Table 1.

No	Tonal features	Examples	Syllable type
1	low, usually falling tone	*saa¹* 'to go'	open
2	low, short tone	*sat²* 'rice'	closed
3	higher, short tone	*sat³* 'to kill'	closed
4	mid, level tone	*saa⁴* 'to eat'	open
5	high, falling tone	*saŋ⁵* 'to enter'	open

To illustrate the three Numhpuk Singpho tones on open syllables, in (2), the names of three riverine fish are given, all preceded by the word for fish /ŋaa⁴/.

(2)   *nga law*   /ŋaa⁴loo⁴/   '*bhangon* fish' (species unknown)
         nga ru   /ŋaa⁴ruu⁵/   'fish, unknown'
         nga hpin   /ŋaa⁴phin¹/   '*hilghuria* fish (*Labeodyochilus* sp.)'

A pitch trace of these three words can be seen in Figure 1 (MS2.wav).

Figure 1: Pitch trace of the words for three Singpho fish
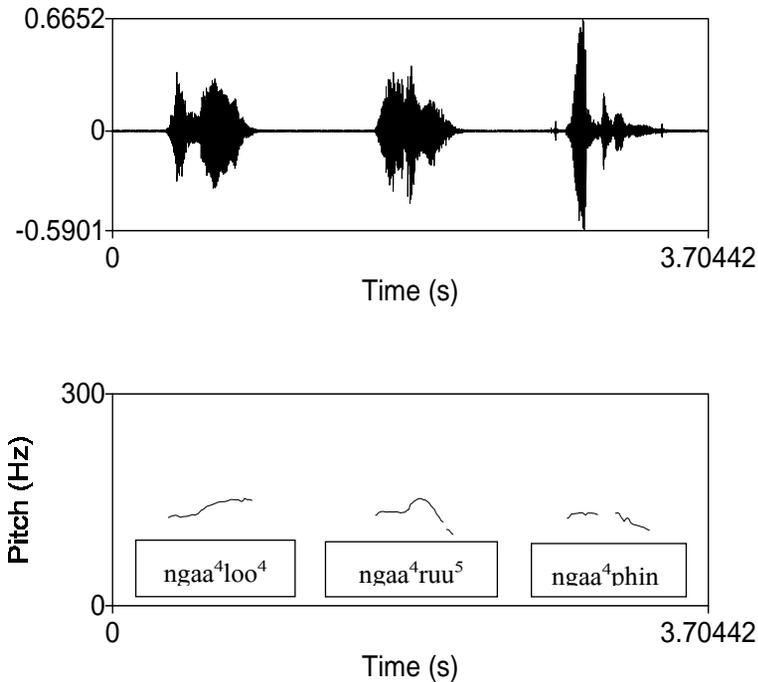
In each case these words consists of two syllables. The first syllable is shown as a level portion corresponding to the word for 'fish', which carries the mid-level tone, followed by the portion referring to the particular fish. In the case of the first word, /ŋaa⁴loo⁴/, the second syllable is level and slightly rising. In the case of the second, /ŋaa⁴ruu⁵/, it shows a rise followed by a sharp fall, whereas in the case of /ŋaa⁴phin¹/, the second syllable falls directly to the speaker's lowest range.

There is a further distinction between words that have closed syllables. In (3) we present four words recorded from Pabitra Ningda, a male Numhpuk Singpho speaker aged about 30 at the time of recording, whose voice range is somewhat lower than Manje La's (MS3.wav).

(3)

		Pitch	*Length* (s)
[waʔ]	'pig'	~110 Hz	~0.21
[gəwaʔ]	'bite'	~100 Hz	~0.20
[wa:ʔ]	'make a basket'	rising to 120 Hz	~0.38
[waʔ]	'pay a fine'	rising to 120 Hz	~0.21

Phonemically (using Manje La's system) these would be written as:

(4)   /waʔ²/   'pig'
        /gəwaʔ²/   'bite'
        /waaʔ³/   'make a basket'
        /waʔ³/   'pay a fine'

As can be seen, the word for 'make a basket' is significantly longer than the word for 'pay a fine', the two being distinguished only by the length of the vowel. Vowel length distinction is present in Numhpuk Singpho, also in Turung (see Morey 2010b: 142), unlike in Jinghpaw which does not have vowel length distinction. Because of this, we can analyse the difference between 'make a basket' and 'pay a fine' as being a case of vowel length distinction.

An alternative analysis for this, the one adopted in Morey (2010b: 277) for the Turung variety of Singpho, would be to posit a third tone on closed syllables for words like 'make a basket', a tone distinguished from the other two closed syllable tones by duration, as well as, or perhaps rather than, by pitch. As we will see below in our discussion of tones in Tai Phake, duration can be one of the features of tone.

Under this alternative analysis of tone, we would have the following tonal system for Numhpuk Singpho, including the longer tone found in 'make a

basket' together with Manje La's fourth tone, and the shorter tone found in 'pay a fine' with Manje La's fifth tone, as follows:

Table 3: Re-analysis of Numhpuk Singpho with three tones

No	Equivalent in Manje La's system	Examples (open) (using Manje La's tone categories)	Examples (closed) (using Manje La's tone categories)
a	1, 2	saa^1 'to go'	$wa\text{ʔ}^2$ 'pig'
b	4, 3 (long)	saa^4 'to eat'	$waa\text{ʔ}^{23}$ 'make a basket'
c	5, 3 (short)	$saŋ^5$ 'to enter'	$wa\text{ʔ}^{23}$ 'pay a fine'

Under this analysis, the tones on closed syllables are realised with less contour than the corresponding tones on open syllables; whereas there is a high rise-fall on the 'c' tone when it is on an open syllable, it will be simply high on a closed syllable. The fourth tone is level in citation with an open syllable and this matches the longer duration of the word under a closed syllable, in this case 'make a basket'.

The most substantial difference between the tonal systems of Numhpuk Singpho and that of Tai Phake, discussed below, is that by and large Numhpuk Singpho speakers have difficulty categorising the five tones and using those categories to assign a tonal category to a new word. Speakers disagree sometimes as to whether words have the same or a different tone. This is quite different from the situation in Tai Phake.

This problem arose early, on the first day of field work in Numhpuk Singpho in November 2005. In the Turung variety, the word *udi* 'egg' is pronounced with both syllables having the high falling tone, similar to the 5th tone in Manje La's system. Since Stephen Morey (SM) was, at that time, more familiar with Turung pronunciation, SM pronounced it in that way. After some discussion, it emerged that for Manje La, at least, the word should be pronounced with a low falling tone, phonemicised as /uu¹dii¹/.

Yet, Manje La had accepted SM's pronunciation of the word, and this led to a discussion in which Manje La said that '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*. The combination of two syllables *u* and *di* cannot be misunderstood for any other word, whatever pitch and contour might be employed. The syllable *wa*, on the other hand might mean many things (as we have already seen) and the tones have to be carefully observed. This makes the study of tones in Singpho very challenging.

In our analysis, there are also some toneless syllables in Singpho. The language contains many words which have a sesquisyllabic structure. The term 'sesquisyllable' was coined by Matisoff (1973: 86) to describe a very frequent syllable type in Tibeto-Burman languages, particularly those in the southern part of the Tibeto-Burman area (possibly as a result of Mon-Khmer substrate influence). Sesquisyllables refer to an iambic structure in which a minor syllable is followed by a major syllable. In our analysis, tone is carried only on the major syllable, but not on the first, minor, syllable in a sesquisyllabic structure. Thus, in the word /gəbaa⁵/ 'big', there is no tone marked on the first short syllable /gə/. (See Morey 2010b: 154 for further discussion of sesquisyllables in the Turung variety of Singpho).

In context, the tones may be (or appear to be) overridden by utterance intonation, and there are some complex rules affecting the pitch of syllables when a word consists of more than one syllable. Further discussion of tones in Singpho varieties of North East India can be found in Morey (2008, 2010b).

2.2. Singpho songs

Manje La, our primary consultant for the Singpho tones, is also a known singer and composer in his community. Intrigued by the question of whether and how speech tone might be reflected in composition and singing we asked Manje La not only to sing his compositions for recording, but also to read their lyrics out, so that we could compare both renditions. The song chosen by Manje La to be the most important for recording is a composition that is linked to a style of singing called *săyawq goi ningkin* /səyoʔ² goi¹ niŋ⁴kin⁵/.

This is a style that is fading out, with only a few old people able to sing *săyawq goi* today. The *săyawq goi* genre consists of several sub-genres. An important sub-genre was sung by a male and a female singer alternating, in which both singers need to be possible marriage partners, and the lyrics can be sexually explicit to an extent not accepted in modern Indian society. This, we believe, is the one reason that the practice of this genre ended about two generations ago[7].

In order to preserve the old style of song, Manje La has composed a song in a *săyawq goi* manner for a completely different purpose, and relating to a different model that does not have the alternating structure nor the improvised character. His song was made to raise donations for public works, e.g. the

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[7] We made considerable efforts to record this song with two elderly participants, however when they got together, they were unable to sing to each other.

repairing of the village temple, or to support a family who has lost their house in a fire. For such an event a group of people may visit the houses of the village and sing this song at an individual house until the residents respond with a donation. An Assamese song has been used in recent years and Manje La has taken on the task of composing a song in his native language, Singpho Numphuk, in order to replace the Assamese song. Whether his song has actually been used for the purpose intended is not known to us. We present a musical transcription of one line, in Figure 2; pitch traces for the sung (MS4.wav) and spoken (MS5.wav) versions of the song in Figures 3a and 3b; and a linguistic transcription and translation in (5).

Figure 2: First line of Manje's săyawq goi, the sung version, in music notation[8]

Figure 3a: First line of Manje's săyawq goi, the sung version, as Praat pitch contour. For improved visibility the initial melisma is omitted and the display starts after the quarter rest.

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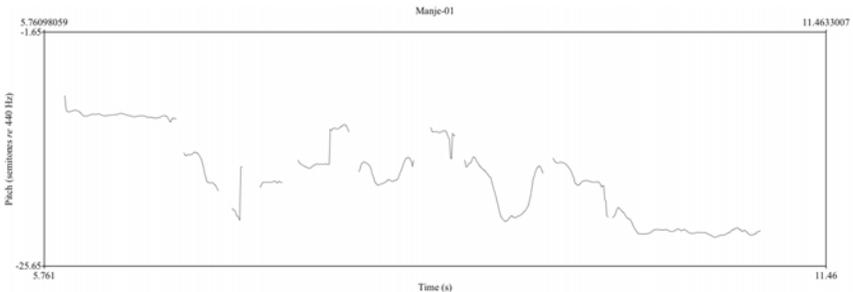
[8] Phonetic symbols cannot be printed in the lyrics by limitations of the notation software *Finale*, version 2003a. See example 4 for the linguistic transcription.

Figure 3b: First line of Manje's săyawq goi, the read version, as Praat pitch contour[9]

| e | hteng | sa/kut | sa | du | re | mit | sus | lang | nta | goi |

(5) *e*   *i*   *hteng*   *săkut*   *sa*   *du*   *re*   *mitsu*
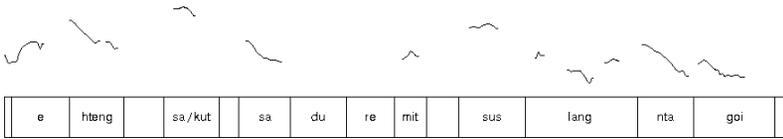   *ee⁴*   *ii¹*   *theeŋ¹*   *səkut³* *saa¹* *duu¹* *re¹*   *mit²suu⁴*
     EUPH   1PL   PL   try   go   come   REAL   adult

     sălang *n-ta*   *goi.*
     səlaaŋ¹ *n⁴taʔ²* *goi⁴*
     adult   house   at

     'Ah, we who have come here, ladies and gentlemen of the house,'

The music notation has come into being by carefully listening to the recording,   in half speed or even less. This is a conventional ethnomusicological method.[10] The roughly aligned pitch contours from the software *Praat* are derived from the sung (Figure 3a), and the read (Figure 3b), version of the same first line. The interesting thing to observe here is that despite the low functional load of pitch in the phonology of Singpho the overwhelming pitches of the sung version correspond to the spoken pitches. This is a rather surprising observation, and we do not have a good explanation for this, but the phenomenon is known already for a Southern African (South-East Bantu) language, Setswana (Schöpf 2008: 125).

   In an attempt to learn more about the effects of mutual adaption of a language when set to music we have used Manje La's recorded singing for a field experiment. We manipulated this sound file with the software *melodyne*[11]. This software, originally designed to correct pitches in music production environments to save on expensive studio time, is capable of

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[9] Unfortunately, the spoken version of Manje La's song has been lost in a hard disc crash, but the *Praat* analysis survived (source: http://www.fon.hum.uva.nl/praat/). See also Notes to sound file SM5.wav in the Appendix.

[10] Assisted with the software *Transcribe!*, see http://www.seventhstring.com

[11] Offered by the German company *celemony*, see http://www.celemony.com

altering individual tones[12], called 'blobs', in sound files, even in polyphonic environments to a certain extent. The manipulation can be with regard to pitch, time or dynamics. This provides a tool of unprecedented flexibility for field experiments. Field experiments are considered an important method in the present area of research where many intricacies of the music culture are not consciously reflected by our consultants, or usually not expressed in language. However, we do imply that there are musical rules no matter if they are reflected consciously or not. The methodological idea is thus to manipulate previously recorded singing, replay these manipulated sound files to the singers and have them describe, or judge, respectively, their impressions. This is done with the vaguest questions possible, in order to not pre-structure the response, e.g. the nature of the manipulation, as well as the point of manipulation, is not disclosed to the informants before playing back the manipulated files. The vague questions of the researcher are intended to invite the informants to reflect on their musical behaviour and develop their own (cultural as well as individual) conceptualisation of their music.

In the present example, the 'note' on the syllable *du* differs when spoken or set to the *sǎyawq goi* melodic model. In the spoken version it clearly has a low pitch (1st tone, see above; *Praat* fails to assign a pitch track here, but the auditive pitch is in no doubt). On the other hand, it has a rather prominent high pitch in the sung version. Therefore, JS manipulated the singing pitch on the syllable *du* down to a lower pitch, observing the available scale of the piece (see screenshot in Figure 4b), and then played it back to Manje La, asking him whether there was an audible difference with respect to his own way of singing this. After the first playing back he could not really make out the manipulation. After a second playing back of the file his response was: 'the *sǎyawq goi* tune is lost'. However, he did not specify the nature of my manipulation to the sound file. The result is clear: the melodic model of *sǎyawq goi* overrules in this instance the pitch of the spoken syllable. This is not surprising, given the low functional load of pitch in Singpho phonology. This was a test of the methodology and, of course, needs more examples to become more refined. A second point of manipulation missed its target as Manje La said this was wrong, but he referred to the lyrics that he had changed in the meantime. The original recording was done in 2006, while the experiment was performed in 2008 and he had improved the lyrics in the interim.

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[12] 'Tone' is used here as a musical category, not as a linguistic one. 'Tone' in music is not necessarily a transcultural concept, yet the present paper appears inappropriate for the required length of discussion. Equally, the discussion how *celemony* defines a 'blob' in its software *melodyne* and how this definition can be adapted in the software itself appears to be inappropriate as well.

Figure 4a: Sung line of Manje La before manipulation. The point of manipulation being immediately preceding the long vertical cursor line (see sound file MS4.wav)
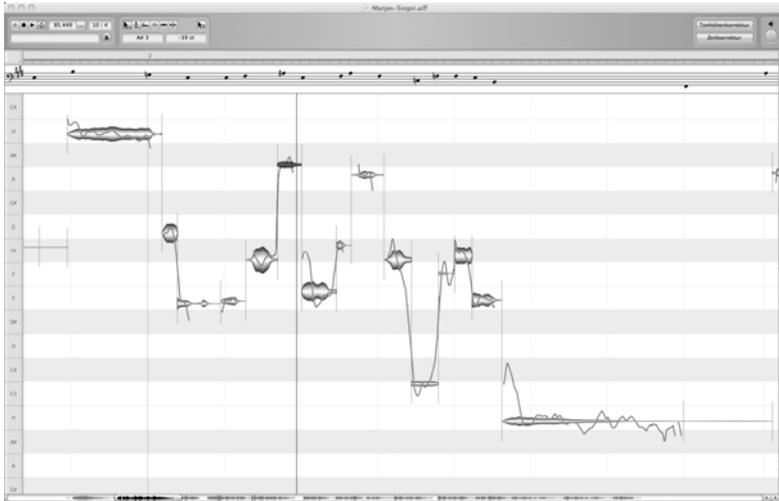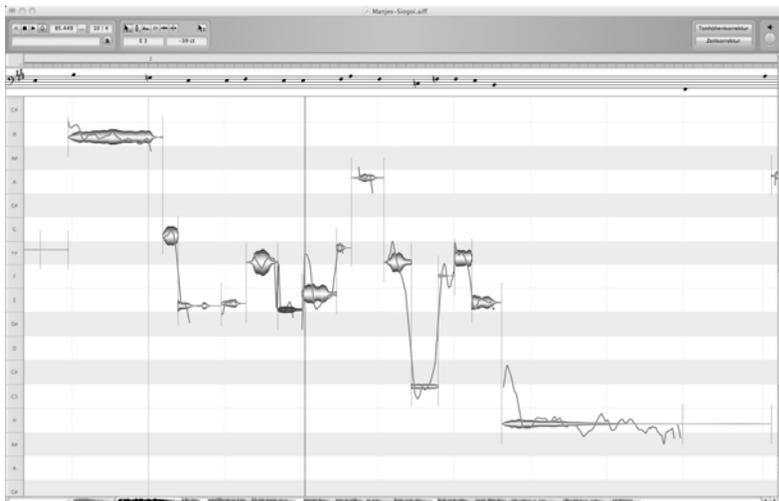

Figure 4b: the manipulated file: the syllable du has been brought in line with other notes in a lower pitch (see sound file MS5.wav)

3. Tai Phake

Tai Phake (*tai² phā⁴ke⁵*), also called simply Phake (Tai Kadai/Southwestern Tai), is spoken by around 2000 people in Upper Assam, North East India[13]. The ISO code for Tai Phake is ISO639-3:phk, but Phake is also mutually intelligible with Tai Aiton (ISO639-3:aio), Tai Khamti (ISO639-3:kht), and to a lesser extent with the highly endangered Tai Khamyang (ISO639-3:ksu). One of the main differences between the four varieties is in the tonal system (see Morey 2005a, b for further details of the other varieties).

Our work is based on word lists, texts and songs recorded between 1999 and 2010 in four Phake villages: Namphakey, Borphakey, Tipam and Phanaeng[14].

3.1. An overview of tone in Tai Phake

The study of tone in Tai languages rests on a fairly secure historical and comparative basis. All of the spoken Tai languages are tonal, having generally between three and seven tones for words in citation, based on tonal categories that can be related back to Proto-Tai.

In our discussion of Tai tones, we will use 'pitch' to refer to a relative pitch, and 'contour' to changes in that pitch within the tone. Absolute pitch is not a useful category for tones within a language, because obviously the high pitch range of one individual is not the same as that for another. Most men, for example, have lower absolute pitch than most women. However, we do want to draw a distinction between pitch (high, mid, low) and the contours (rising, falling, rising then falling, and level). Most particularly we want to argue that level is a contour feature.[15]

Li (1977) and Gedney (1972) posited that Tai languages had three proto-tone categories for open syllables, conventionally called A, B and C, and one or two categories for closed syllables (stop final), conventionally called D1 and D2 (long and short). The proto-tones may have been distinguished by phonation

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[13] Superscript numbers for Tai Phake words refer to the tones discussed below

[14] Namphake is located at North 27°16'58", East 95°22'0". Borphakey at N 27°19'41", E 95°42'34". Tipam at N 27°16'45", E 95°23'40. Ninggam at N 27°21'31", E 95°53'30". These recordings are, or will be made, available through the DoBeS archive at http://www.mpi.nl/ resources/data/dobes in the node 'Tangsa, Tai, Singpho in North East India'.

[15] Thanks to our anonymous reviewer, we would like to point out that absolute pitch in music, in music cultures of oral tradition, is a rare, if not disputed concept and is not referred to here.

(breathiness, creakiness and plain) rather than by pitch or contour, but in their modern reflexes they are often categorised by pitch and contour distinctions. (See Morey 2005b for a discussion of the historical tonology of the Tai languages in North East India.)

The modern reflexes of these tones came about from a combination of the proto-tones and the proto-initials which were in four series: voiceless aspirated, voiceless unaspirated, pre-glottalised, and voiced. As an example of how this is applied: in most Tai languages the originally voiced stops have become voiceless and are usually voiceless unaspirated in Shan and the Tai languages of North East India. This would create potential ambiguities if the original initial categories had not affected the modern reflex of the tone. For example, the tone of the group of words that had an originally voiced initial with tone A has generally undergone a different history to that of the group of words that had an originally voiceless initial with tone A. In Phake, the former have the high rising then falling tone (2nd), whereas the latter carry a rising tone (6th).

In our analysis, following Banchob (1987), Tai Phake has six tones (see Morey 2005a: 126 for a more detailed description). We will term these citation tones, because, as we will see later, the tone can sometimes alter. These are listed in Table 4: a record of the tones as spoken by E Kya Gohain, a female speaker aged around 35 at the time of recording. In the analysis we present here, the four tones combine the features of (1) pitch (high, low), (2) contour (level, rising, falling), (3) duration (short, long) and (4) phonation (plain, creaky). The key features for each tone are listed in the second column of Table 4 (MS6.wav).

Table 4: Tones 1–6 pronounced on the syllable na in Tai Phake[16]

No.	Tonal features	Examples	Assamese
1	level	*nā¹* 'quarrel'	*kaziya*
2	high rising then falling	*nā²* 'rice field'	*pothar*
3	creaky	*nā³* 'face'	*mukh*
4	falling	*nā⁴* 'mother's younger sister'	*mahi*
5	low (falling) and long	*nā⁵* 'melt away'	*goli juwa*
6	rising	*nā⁶* 'thick'	*dath*

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[16] The phonetic symbols used here vary slightly from the IPA standard. In Tai Phake, following Banchob (1987) macrons are used to show vowel length, as /ā/. In Singpho length is shown by double vowels as /aa/. Aspiration is shown by a following <h> as /th/, /ph/ and the palatal semivowel is shown as /y/.

Figure 5: Phake tones, showing wave form and pitch trace (tones 1 to 6)
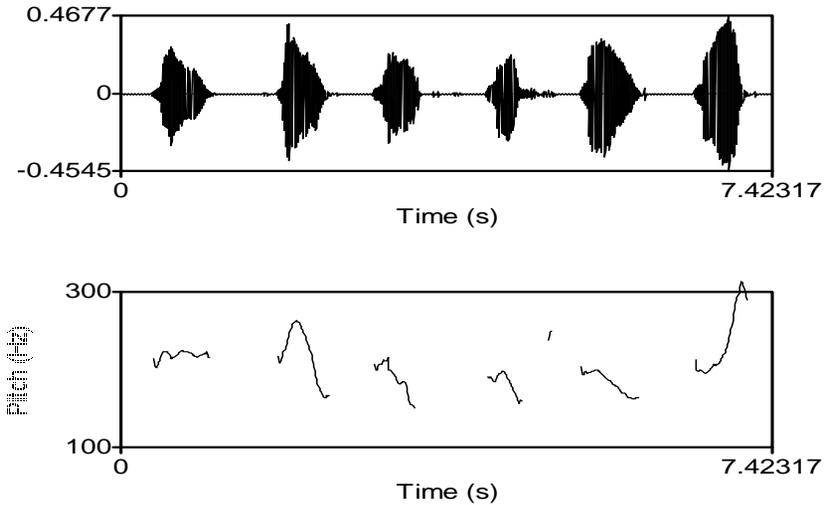
A wave form and pitch trace for each of these tones given in citation (using the words in Table 4) is given in Figure 5.

As can be seen in this table, the 1st, 2nd, 5th and 6th tones are longer and their amplitude greater than the 3rd and 4th tones. This is a reflex of the proto-tone, as the 3rd and 4th tones in Phake are reflexes of the C tone, which is generally believed to have been originally creaky or glottalised (see Morey 2005b) and this explains their shortness. Creakiness is still very much in evidence with the 3rd tone as it is realised by Phake speakers today, whereas its reflex in the 4th tone is the shorter duration of that tone.

The other four tones (1st, 2nd, 5th and 6th) are all longer in duration, as is clear from both the wave form and the pitch trace. All four of these tones also have plain phonation, so in the case of these tones the distinguishing features are pitch and contour alone. For these tones the use of 'pitch numbers', where 1 is low, 2 mid-low, 3 mid, 4 mid-high and 5 high, could be employed, as shown in (6):

(6)	Tone 1	44 (or 33)
	Tone 2	452
	Tone 5	31
	Tone 6	335

This notation does not work for distinction of Tones 3, 4 and 5, because they have almost identical pitch traces, and would have to be notated as 31 and we would have the following:

(7)	Tone 3	31
	Tone 4	31
	Tone 5	31

This is demonstrated clearly when we compare only the pitch and contour of the tones, using Hz values, based on the recording, as exemplified in Table 5.

Table 5: Tones 1–6, pitch and contour

No.	(1) *Pitch* (Hz)	(2) *Contour*
Tone 1	220–220	level
Tone 2	220–280–165	rising then falling
Tone 3	205–165	falling
Tone 4	195–165	falling
Tone 5	195–165	falling
Tone 6	195–300	rising

On the basis of Table 5, we can see that with only features (1) pitch and (2) contour, tones 3-5 could not be contrasted. The feature of (3) duration can also be measured, as in Table 6. This demonstrates that while there is no pitch/contour difference between tones 4 and 5, there is a difference in duration.

Table 6: Tones 1–6, duration

No.	*Duration* (seconds)
Tone 1	0.63
Tone 2	0.57
Tone 3	0.44
Tone 4	0.36
Tone 5	0.66
Tone 6	0.56

Historically the difference between tones 3 and 4, and the others, was one of phonation. In the modern language, however, the creaky phonation that we suggest was historically present in tone 4, is no longer present, and remains only in the form of shorter duration. Thus a new contrast is created: one of duration.

The final contrast, between tones 3 and 4, is that of phonation. Tone 3 is creaky and tone 4 is plain. The interplay of the four types of contrast is summarised in Table 7, where the features we take to be contrastive are shown in bold.

Table 7: Phake tones 1–6, summary

	(1) *Pitch* (Hz)	(2) *Contour*	(3) *Duration*	(4) *Phonation*
Tone 1	mid 220–220	**level**	long	plain
Tone 2	mid-**high**-low 220–280–165	**rising then falling**	long	plain
Tone 3	mid-low 205–165	falling	short	**creaky**
Tone 4	mid-low 195–165	**falling**	**short**	plain
Tone 5	mid-**low** 195–165	falling	**long**	plain
Tone 6	mid-high 195–300	**rising**	long	plain

From this, we can say that pitch is arguably not a key feature of any of these tones, although we have highlighted pitch features for tone 2 and tone 5. What is clear is that pitch alone is certainly not the key feature for any of them. For this reason, rather than using the pitch number notations seen in (6) above,

following Banchob (1987), we are using superscripted numbers to indicate the tone categories that are defined in Table 4 above.

There is a further complicating factor[17]. Phake, as analysed by Banchob (1987) and Morey (2005a: 126), has length contrast between /a/ and /aː/, although only in syllables with final nasals, semi-vowels and stops (long /a/ being written as <ā>). So duration can be treated as a feature both of the vowel and/or of the tone. With vowels other than /a/, the duration contrast between words bearing the fourth tone and those bearing the fifth tone is solely an issue of tone, as with the distinction between /yɔ^4/ 'praise' and /yɔ^5/ 'loosen'. It is also the case with words having final /-a/, because there is no length contrast in this situation[18].

We have mentioned above that Proto-Tai is reconstructed as having three tones on open syllables and one or two on closed, or stop final syllables. As in the proto-language, there are fewer tonal categories with closed syllables than with open syllables. Closed syllables in citation in Phake are found with the 1st or 4th tones only[19].

These tonal categories in Phake are well recognised by Phake speakers. Following contact with Dr. Banchob Bandhumedha in the 1960s and 1970s, and more recently with Stephen Morey (since 1996), many of the Phake elders and others interested in language issues are accustomed to referring to the tones using the numbering system in Table 4. For example, when asked to categorise the tone of an unfamiliar word, some Phake speakers will spell out all of the possibilities in the order Tone 1 through to Tone 6. Consider the following exchange between Stephen Morey and Aije Let Hailowng, a male speaker aged around 75 at the time of recording. In this example Aije Let is asked about the tone of the negative form of the verb 'to eat' (MS7.wav).

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[17] We thank our anonymous reviewer for pointing this out.

[18] Further work is needed to study the potential implications of this. At this stage we have not found a minimal quadruplet /(C)aC^4/~/(C)aC^5/~/(C)āC^4/~/(C)āC^5/, where the final C can be nasal, semi-vowel or voiceless stop. In particular, we have not investigated in detail the phonetic difference between a syllable with short vowel under tone 5 and a long vowel under tone 4. In many cases the tonal categories are established or confirmed after comparison with related varieties, where the tonal distinction is clear.

[19] There are a small number of words with closed syllables that Banchob (1987) notates with the 2nd or 3rd tone. Most of these are onomatopoeic and are not reconstructable to Proto-Tai. Words with closed syllables that are reflexes of Proto-Tai are found with only the 1st and 4th tones.

(8)   SM   *ma⁵*   *kin⁶*   *caü²*   *nā¹*
           NEG   NEG.eat   yes   QN[20]
           ' "Not eat", isn't it'

(9)   Aije Let   *ə²*   *ma⁵*   *kin⁶*   *caü²*   *ū¹*
                 EXCL   NEG   NEG.eat   yes   STAY
                 'Yes, it is "Not eat".'

(10) SM   *ma⁵*   *kin⁶*   *seŋ⁶*   *saŋ⁶*   *pen²*
           NEG   NEG.eat   sound   which   be
           'And "Not eat" is which tone?'

(11) Aije Let   *kin⁶*   */ kin¹ kin² kin³ kin⁴ kin⁵ kin⁶ /*   *kin⁶*   *hok¹*
                 NEG.eat   NEG.eat   six
                 ' "Not eat?" *kin¹ kin² kin³ kin⁴ kin⁵ kin⁶*, it is number six.'

Members of the Phake community can associate any one of the six tones with
any syllable that is possible in the language, and are able to conceive of
meaningless but possible words. This clear categorical feature of tones is not
shared by Singpho as discussed above.

Another important feature of Tai Phake, already demonstrated in (8) to
(11), is the presence of what we will term changed tones. For example, some
verbs, in most cases those that carry the 2nd tone (high rising then falling), are
realised with a rising tone, the same shape as the 6th tone, when they are
negated. This is not found in other Tai languages like Tai Aiton. In some
cases both forms are found in a single example, as we see in (12), an example
spoken by E Ngyan Kheit Gohain, a female aged around 65 at the time of
recording (MS8.wav).

(12) *kon²*   *yaŋ²*   *hən²*   *ma¹*   *yaŋ⁶*
      person   be   house   NEG   have.NEG
      'There are people but no houses.'

Tone change processes in Phake are used for negation, imperatives and
questions, and are described in detail in Morey (2005b).

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[20] An accidental use of the Aiton form of the question particle, in place of Phake /nɔ⁶/.

3.2. Phake songs

Our discussion of Tai Phake relies not only on recordings but also on interviews with the elder and scholar Aije Let Hailowng, as much a singer and composer as an expert in the language and literature of Tai Phake. The Tai Phakes recognise a number of traditional song styles. Several of these are listed below in Table 8. In Morey 2010a, we discussed the fact that in singing the *khe khyang* style, constrained as it was by a fixed 7 syllable per line pattern and a rigid rhyming scheme, the key features of the citation tones of Phake are clearly realised. Moreover, the melody of the *khe khyang* style is also constrained and we have recorded Aije Let Hailowng singing the melody without words (but with the fixed tonal rhymes). The very constrained nature of this style makes it necessary for the tones to be expressed, otherwise the meaning cannot be ascertained.

Table 8: Types of Song-Poetry among the Tai Phake

mɔ¹ khām² sɔi¹ yɔi ⁴	Rice pounding song
mɔ¹ khām² sā¹ əi²	Songs sung when visiting the forest
mɔ¹ khām² phɔi²	Songs in the composed/elaborated style
mɔ¹ khām² khe² khyāŋ²	Songs in the *khe² khyāŋ²* style

In the other styles listed in Table 8, there is much more freedom in terms of line lengths and rhyming patterns and we have yet to thoroughly investigate the relationship between speech tone and melody in all of these styles.

In 2010 we discussed issues of speech tone and its rendition in singing with Aije Let. In order to address this we started the discussions on the topic of composition. The same discussion was raised two years earlier with Ai Chang Chakhap of Ninggam village when he was actually composing a song for us to be recorded later on. In both discussions about how songs are to be composed, rhyming rules are explained. Such rules are complex and play an important role for the quality of a 'song' in Tai Phake, and apparently, this is the most important aspect of composition to the Tai Phake composers of the old generation (see Morey in print for a brief overview of some of the poetic devices used in Tai Phake).

Continuing the discussion with Aije Let in 2010, on the third (and last) day, he gradually became aware that we were looking at 'melody' independent of speech. We had tried to keep our questions deliberately vague in this respect in order to let him choose categories of his own language rather than imposing possibly foreign concepts such as 'melody' to him. It must be noted here that the Tai Phake today, and in past decades, have no tradition of instrumental music played by melody instruments. The only instruments in

use are drums and cymbals (apart from 'modern' music made by the younger generation after models of popular Assamese music and that which they hear from Thailand and the Shan States of Myanmar). As a last step in our discussion he attempted to sing the melody of the *khe khyang* style, using a vocable syllable *ta*, in the same way as had been done with Stephen Morey some years before (Morey 2010a). However, this was obviously not easy for him and took him a moment to achieve. Apparently, there are types of melodies independent of speech tone for Tai Phake that are used for certain genres, at least for *khe khyang*. But they are by no means the most important aspect of compositional creativity, the melody being rather fixed in this style. Composition in the creative sense, rather, means a creative application of rhyme rules. Indeed, for the *khe khyang* style, the words are carefully chosen so that their tones fit the melodic model that is associated with this genre. This process, we speculate, is rather a constraint driven one where speech tone pitch is negotiated against a melodic model. As yet, we have not been able to address the intricacies of such a process in our research.

Another style listed in Table 8 is the *mɔ¹ khām² sā¹ əi²*, described as 'songs sung when visiting the forest'. This is not a literal translation of *sā¹ əi²*, but more metaphorical: these songs were sung as love songs by young people when out of the village gathering food or wood, etc. Although the song is no longer sung in that context, older people can still sing the style and Ee Ngyan Kheit has sung several such songs for us. The text of one example is given in (13) (MS9.wav, beginning).

(13)   *khun⁶ e⁶   nāŋ²   yɛ⁴   mau¹ caü⁵ co⁵   cüŋ²nai³ sā¹əi²*
        self   wish female PRT   NEG   be   time   now   PRT.VOC
        'Indeed, ladies, is it not now the time that we should wish for you?'

The rhyming scheme of this style is that the line is divided in two sections, marked off by particles, in this example *yɛ⁴* and *sā¹*. The stretches of text between these particles have odd numbers of syllables. The last of those content syllables, in this case *nai³*, will rhyme with the last content syllable of the first half of the next line.

A transcription of the melody of example (13) is given in Figure 6. When she sang this for the first time, Ee Ngyan Kheit made an error with the first few syllables, *khun⁶ e⁶ nāŋ²* and repeated them. The transcription below includes both the error and the corrected version.

Figure 6: Ee Ngyan Kheit's mɔ¹ khām² sā¹ əi² (MS9.wav)

khun6 e na‐a‐ng2 khun6 e6‐_‐_ na‐a‐a‐ng2‐_ mau1 caü5 co5 cüng2 nai3 sa1 eui2‐_‐_‐_

This error is very helpful in our understanding of how the relationship between melody and tone works. The first word has a rising tone, but in the error version, that rise was not represented, and we believe it was this that caused Ee Ngyan Kheit to repeat the first three words. The rising contour of the tone is reflected in the melody by the rise d''–e''. This is followed by a long note on the syllable *e⁶*. Here there is only a slightly perceptible rise, as we can see in the left hand side of Figure 7, a *Praat* transcription of the first line not including the error.

Figure 7: Praat graph of Ee Ngyan Kheit's mɔ¹ khām² sā¹ əi²
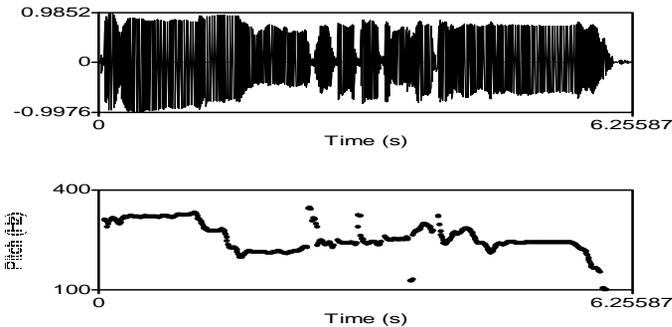
Whilst we can confidently say that at least some of the tones in this style were reflected in the melody, we are not sure that all of them are. The five syllables that make up the content of the second half of the line, *mau¹ caü⁵ co⁵ cüŋ²nai³* are sung on short notes with little melodic variation and no rhythmic variation (b'–b'–b'–b'–d''), though four different tones are represented. There is no clear fall on the syllable *cüŋ²*, and it is moreover followed by *nai³* on a rising melody which does not convey the features of this tone (short, falling, creaky). It is curious that the content words are sung in that portion of the melody that conveys the least information about tones, whereas the following particles are given considerable melodic prominence.

4. Summary

Researching the role of tone in Singpho Numphuk and Tai Phake, two different languages spoken in Margherita sub-district in Upper Assam, has revealed very different uses of tonal features for both languages. While Numhpuk Singpho appears to have a 3-tone system, that system has a reduced function in comparison to Tai Phake which makes extensive use of its six tones (although pitch is apparently not the most important feature of the speech tones). This is also reflected in the degree of consciousness about tone of our consultants in the respective languages.

However, observing the relation of speech tone in singing in both languages we find another divergence in the way this relation is constructed. For Singpho Numphuk, although tonal features are not often used to actually distinguish meaning, the speech tone is surprisingly well represented in the song analysed. Whereas, the field experiment of overruling melody by speech tone through the manipulation of a sound file was emically unacceptable for the *săyawq goi* genre.

For Tai Phake, where speech tone is heavily used in all levels of language, we see a style of song (*khe khyang*) where speech tone is fully represented, while in other genres this appears to be somewhat less the case, and where redundancy to secure understanding has to be brought about by the additional use of features of the language (see Morey 2010c).

We believe that software allowing the detailed manipulation of individual notes in a sound file – speech or singing – will be of major assistance in future research of the relation of speech tone in singing, especially for us and our consultants where it is difficult to address these intricacies through language.

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APPENDIX: LIST OF SOUND FILES

Name of file	*Relating to which section of the text*	*Notes*
MS1.wav	Table 1	This was recorded as part of the text numbered SDM08-2006-003.wav, archived at ELAR
MS2.wav	Example (2), Figure 1	This was recorded as part of the text numbered SDM08-2006-024.wav, archived at ELAR
MS3.wav	Example (3)	Recording of Pabitra Ningda
MS4.wav	Figure 3a	This was recorded as part of the text numbered SDM08-2006-126.wav, archived at ELAR
MS5.wav	Figure 3b	The quality of this manipulated file is much lower because it was re-recorded from playing it back during the actual field experiment through loudspeakers. It should not mislead the reader to attribute this lower quality to the processing quality of the used software. This file is presented because the original manipulated file has been lost in a hard drive crash.
MS6.wav	Table 4	This was recorded as part of the text numbered SDM01-2007-019.wav, archived at PARADISEC
MS7.wav	Examples (8)-(11)	This was recorded as part of the text numbered SDM01-20100129-173850_JS_E_AiCheLet_Discussion.wav, archived at DoBeS
MS8.wav	Example (12)	This was recorded as part of the text numbered 1-1-1-3, included in Morey (2005a)
MS9.wav	Example (13), Figure 6	This was recorded as part of the text numbered 1-7-1-2, included in Morey (2005a)