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The tonal system of Skou, New Guinea*

Mark Donohue,
National University of Singapore
mark@donohue.cc

1. Tone in the languages of New Guinea

Whilst not widely publicised outside the circles of New Guinea linguists, a wide variety of tonal systems are found in the languages of New Guinea (see various publications following Wurm 1954, or a more recent synopsis in Donohue 1997).¹ In most areas of New Guinea the lexical use of pitch distinctions is the norm, rather than the exception, and the kinds of tonal systems encountered in New Guinea reflect the full range of tonal diversity found anywhere in the world. The only main areas that are known to not possess tonal systems are, from the south moving anticlockwise, Kolopom island and the Trans-Fly region in the south, South-east New Guinea, the islands, Madang, the Sepik basin, and the delta and lands north of, and surrounding, the Mamberamo river. The area in which tone languages are known to be in New Guinea is shown in map 1 by shading. Note that some areas in this map which are not shaded, such as the Awyu area in the south-west inland from Kolopom island, are not known to be non-tonal, but lack sufficient description to definitively classify them as tonal; map 1 is then a conservative estimate of the area in which pitch is used lexically or grammatically.

This article presents an empirical study of the tonal system present in Skou, a language of the north coast of New Guinea, which presents some interesting insights into the behaviour of lexical tone when spread across words.

2. The Skou language

Skou is known from the work of Cowan (1952a, 1952b, 1957), Galis (1955), Voorhoeve (1971, 1975 and elsewhere), and Donohue (1999, 2002, forthcoming). It has been referred to as Sko, Skou, Səkou, and Tumawo, and is referred to locally as *Te Máwo pílang nè ne* ('Our, the Mabu people's, language'). Skou is related to other languages in the Skou family of which it is the westernmost member, stretching across the north coast of New Guinea, extending past Vanimo to Leitre (Donohue 2002). More distant relations can be established with other members of the Macro-Skou family (including, but not confined to, Krisa (I'saka), Rawo, Puare, Womo, Sumararu, Barupu,

* I would like to acknowledge the help and inspiration given to me by Duane and Heljä Clouse, who scared me enough with tapes of Kirikiri that I didn't start any serious work on New Guinea tone for the next two years, and to Tida Syuntarô and Larry Hyman, who read this paper and provided insightful comments. The bad bits are my own doing.

¹ Here and elsewhere I use the term 'New Guinea' to refer collectively to both the Indonesian province of Papua (formerly Irian Jaya), and the independent nation of Papua New Guinea.

Ramo and Sumo. See Donohue and San Roque (2003) for details. The language is spoken with minimal dialectal variation by the inhabitants of three villages, Skou-Yambe, Skou-Mabu and Skou-Sai, in the centre of the north coast of New Guinea (in Papua (formerly Irian Jaya); see Silzer and Clouse 1991). This is shown in figure 1.

Map 1. Tone languages in New Guinea

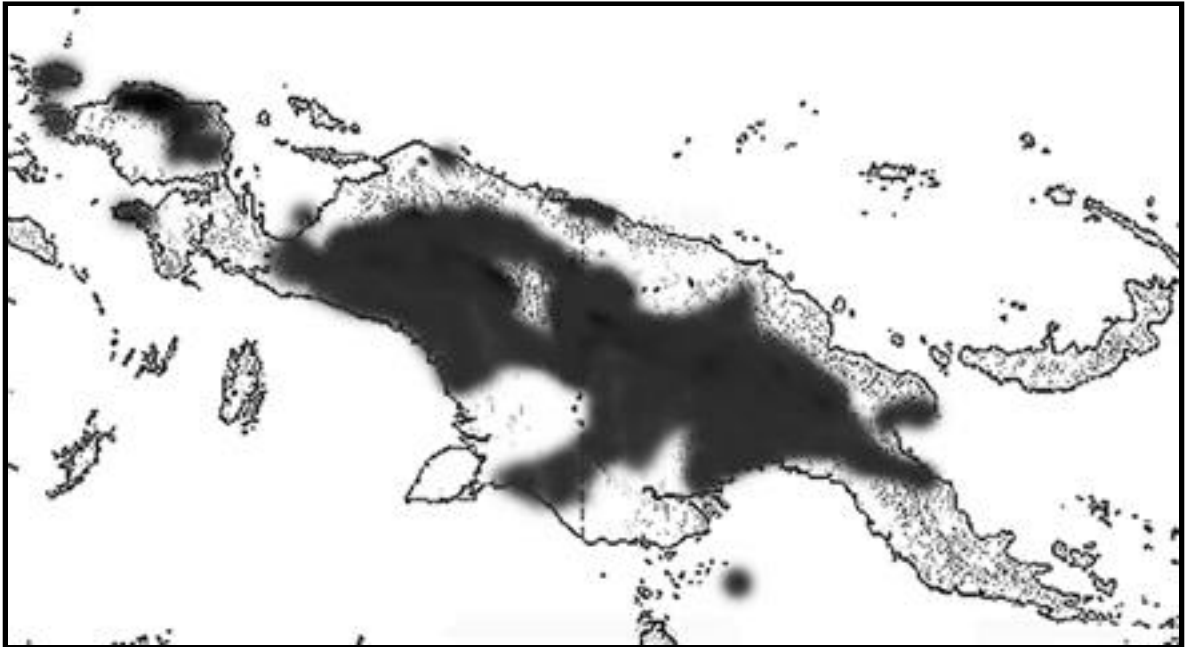
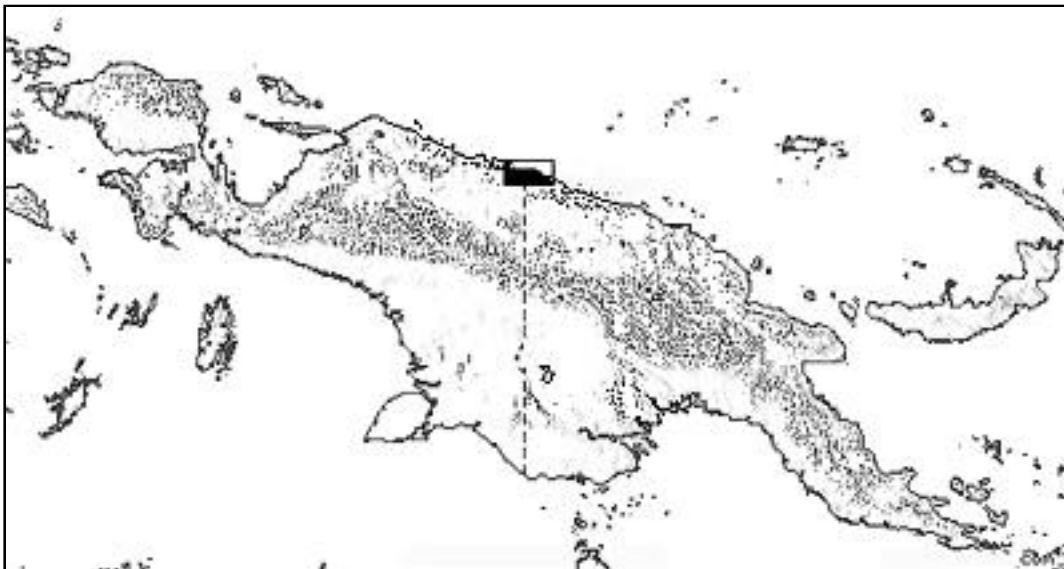


Figure 1. The location of the Skou family in New Guinea



There are 700 speakers of the language, almost exclusively in these three villages. Although the name *Te Máwo pílang nè ne* is the normal one used by native speakers to refer to their own language, the name Skou is acceptable, and recognised as the

‘official’ way to refer to their language. I shall refer to the language as Skou, following linguistic references to the language, speaker acceptance, and ease of typing. The name *Səkou* is the name used in Tobati, the western neighbour of Skou, to refer to the language and its speakers. The spelling *Skou* has become (along with *Skouw* and *Skow*, showing pseudo-Dutch influence) the standard spelling of this word in Indonesia, though linguistic works changed to *Sko* after 1971.

The materials presented here were collected by the author in 1998-2001, from people in Skou-Mabo and Skou-Yambe, while working on a cultural preservation project based in those villages. The materials reported here represent the conservative speech of Skou people from all three Skou villages, and are acceptable to all speakers with an active command of the language.

Skou has a fairly simple segmental phonology, with 13 consonants and 7 vowels, arranged in strictly (C)V syllables; nasalisation is contrastive on vowels. Examples are presented in Skou orthography: nasalisation is indicated by *-ng* in the coda of the syllable with a nasalised rhyme, and /ʷ/ and /ø/ are written with the digraphs *ue* and *oe*. The representation of the other vowels and the consonants follows IPA conventions, except that *y* represents [j ~ ɟj ~ dzj ~ dʒj] (in a cline of frequency of appearance, from younger to older speakers), and *j* represents [ɟʲ ~ ɟ] for older speakers, and [dʒ] for younger ones. See the appendix for details.

3. Tonal contrasts in Skou

In addition to its segmental phonological distinctions, the following contrastive, non-predictable pitch patterns are found on words of one, two and three syllables in Skou, when pronounced in isolation. They are presented both with tone staffs and with Chao tone letters. I shall break from most presentations of tone systems and describe the phonology of tone in Skou from the phonetic basis, discussing the steps involved in deriving the phonological units, rather than proceeding from the abstract phonological units and presenting the the principles for deducing the phonetic nature of these units in speech. Most earlier work on tone in New Guinea takes this second standpoint, probably driven by a practical, orthography-oriented report that has been adopted by most earlier writers.

Table 1. Pitch contours on words of different length

1-	2-	3-	
[/ˀ]	3(4)4	[/ˀˀˀ]	3(4)4-44-43
[ˀ]	22	[ˀˀˀ]	22-22-21
	[ˀˀ]	[ˀˀˀ], [ˀˀˀ]	22(3)-(3)44 / 23-34-43 / 23-33-44
	[ˀ]	[ˀˀˀ]	23-(3)41 / 23-43-21
[\]	41	[ˀˀˀ], [\ˀˀˀ]	43-21 / 343-21 / 34-43-21 / 34-33-21
	[\ˀ]	[\ˀˀˀ], [\ˀˀˀ]	44-41 / 34-44-41 / 33-44-41
	[\ˀ]	[\ˀˀˀ]	42-21 / 42-11 / 44-41-11

The observant reader will notice that no tones are transcribed with the highest pitch ‘5’. This is deliberate, since the transcriptions here represent the pitch contours heard in Skou Mabo. In Skou Yambe, perhaps one kilometre to the west, syllables that are reported in table 1 as 3(4)4 pitch are heard noticeably higher, 45. To preserve this pan-dialectal difference I have restricted the transcription here. See Rose (1990) for a similar discussion of tonal variation in Thai.

Certain of the contour features present in the pitches described above do not have their basis in the tone system, but rather in the intonational phonology of the language, and the OCP. We may list a set of intonational principles that apply to any utterance in isolation:

- all upper tones show an initial rise to a level at the beginning of an utterance; this is only occasionally found when the tone has a falling contour;

thus 33, 344 and 34 are positional variants of 44.

- all tones show some fall in pitch at the end of an utterance;

thus 43 and 42 are variants of 44, and both 11 and 21 are variants of 22.

- all tones accommodate the start or finish of a non-identical tone in an adjacent syllable;

thus 223 and 23 are variants of 22 preceding higher-pitched syllables; 43 and 33 are variants of 44 preceding lower-pitched syllables and 344 and 34 are variants of the high pitch following low pitched syllables. Similarly, the audibly convex pitch contour 341 is a predictable variant of 41 following a low-pitched syllable.

- tones dissimilate to some extent to avoid a series of identical pitches on adjacent syllables; this is especially true for high pitches (see (1) and its discussion in this section, and further on in section 6).

thus all the sequences 34-43, 34-44 and 34-33 represent two identical high-pitched syllables in a row, 44-44, with obligatory dissimilation.

Applying the principles that we can infer from these automatic processes, and adding our knowledge of the pronunciation of the words when not in isolation, or at a phrase boundary, we can ‘tidy up’ the information in table 1 to arrive at the idealised underlying pitch contours shown in table 2.

Table 2. Pitch contours on words of different length ('cleaned up')

1-	2-	3-
[↑]	[↑ ↓]	[↑ - -]
[↓]	[↓ - -]	[↓ - - -]
	[↓ -]	[↓ - -]
	[↓ \]	[↓ - -]
[↘]	[↑ -]	[↑ - -]
	[↑ \]	[↑ - \]
	[↘ -]	[↘ \ -]

Examining the pitch contours in table 2 it is immediately apparent that:

- there are less contrasts on monosyllables than on polysyllabic words;
- disyllabic and trisyllabic (and, though the data is limited, also four- and five-syllable words) all show the same number of contrasts, regardless of the number of syllables in the word;
- all the pitch contours observed can be described in terms of combinations of tonal units, which at the syllable level are L, H or HL (falling).

The fact that the number of contrastive pitch patterns found on a word does not increase as the number of syllables of the words under consideration increases suggests that we are dealing with either a complicated series of tone sandhi processes, which serve to collapse a large number of underlying distinctions, or a word-tone system, as opposed to a syllable-tone system (pace the description of Skou in Donohue 1997). Ross (1980), describing the tones of Dumo, a closely related language, suggested that there were three tones, a high, a fall, and a low, with a rule that converted falling tones to high tones preceding high or falls. This sandhi rule is shown in (1).

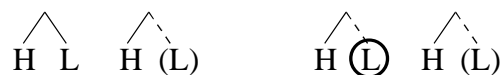
Ross' tone sandhi rule for Dumo

(1) F H / __F, H

The motivation for such a rule is clear, involving the assimilation of the end point of the fall to the high pitch associated with the start of the following syllable. We might express the same rule more clearly in terms of H and L tonal units as follows:

Ross' tone sandhi rule for Dumo (restated)

(1)'



Applying this to the pitch contours seen for disyllabic words in table 2, a similar rule would appear to apply in Skou as well: the three tones of the monosyllables are found in all combinations except FH and FF. Of the logical $3 \times 3 = 9$ combinations, two are ruled out by tone sandhi rule, and the remaining 7 are attested. Furthermore, across morpheme boundaries the tone sandhi rule appears to operate productively: when *hoe* [↘] 'sago' is suffixed with *ni* [↘] '1SG.GEN', the resulting pitch contour is [↑ \], not

*[\\ \]. Based on this data, then, it seems that we can confirm an analysis of the tonal system in Skou as having three tones and a productive tone sandhi rule that limits the perceived patterns on polysyllabic roots. Note that here and elsewhere I refer to syllables, and not morae or other possibly relevant units. While initially merely convenient, the fact that syllables in Skou are maximally limited to V or CV structures means that the distinction between syllable and mora is not motivated by any language-internal data.

With three-syllable words, however, a different pattern emerges. Given the restrictions imposed by the tone sandhi rule we would expect a total of 17 different pitch contours (the figure is obtained by calculating the maximum number of combinations of pitch contours on three sequential syllables, each with three possibilities (assuming syllable-based tone assignment), which is $3 \times 3 \times 3 = 27$, and then subtracting 10, the number of FF or FH sequences that appear in this list of 27 possible permutations [HFH, HFF, LFH, LFF, FHH, FHL, FHF, FFH, FFL, FFF]). There are, in fact, less than half this number of pitch contours, with a total of only seven contrasts, the same number of contrasts found on disyllabic words. Clearly the tone sandhi rule alone is not enough to account for the data here.

The fact that exactly the same number of contrastive pitch patterns that are found with disyllabic and trisyllabic roots, and that the same patterns are descriptively adequate for longer words, suggests that the best description of the tonal system of Skou is as a word-tone system, in which a tone melody is spread over the entire word (with some complications that go beyond most characterisations of word-tone languages (see Donohue 1997, James 1994), as will be explicated in the following section). The discrepancy between monosyllabic contrasts and polysyllabic contrasts represents an interaction of the tone melodies with a series of restrictions on pitch realisations, but the patterns seen in table 2 can be described in terms of representing the following series of underlying tone melodies:

Table 3. Pitch contours and tone melodies

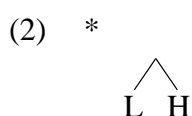
Underlying melody	Pitch contours
H	[ˉˉˉ], [ˉˉˉˉ], [ˉˉˉˉˉ]
L	[ˉˉˉ], [ˉˉˉˉ], [ˉˉˉˉˉ]
LH	[ˉˉˉ], [ˉˉˉˉ]
LHL	[ˉˉˉ], [ˉˉˉˉ]
HL	[ˉˉ], [ˉˉˉ], [ˉˉˉˉ], [ˉˉˉ], [ˉˉˉˉ], [ˉˉˉ], [ˉˉˉˉ]

The complications remaining involve the lack of complete contrasts on monosyllables, and the fact that, for polysyllabic words, there is more than one phonetic contour associated with the HL melody. These points shall be discussed in the following section.

4. Restrictions and extensions of the analysis

The differences between monosyllables and polysyllabic words involve the lack of LH and LHL melodies affiliated with monosyllables, and the lack of variety in HL melodies on monosyllables. It is not surprising that these should be the tone melodies that show restrictions with respect to their realisation on single syllables; Sundberg (1979) shows that F_0 drops are easier to implement than F_0 rises; Bao (1999), quoting Cheng (1973), documents the relative scarcity of rising tones versus falling or level tones in Chinese languages, and Zhang (2002) describes the restriction on similar tone melodies on monosyllables in Mende. Gordon (1999, 2001) presents some syllable-weight based explanation for these patterns.

In addition to the lack of a LH or LHL melody being found on a monosyllabic root, we can also note that there are no cases of a sequence of LH being found on a single syllable (producing a rising pitch on a single syllable): there are no syllables, in monosyllabic words or otherwise, in which the pitch contour rises: * [/], * [/ -], * [- /]. This may be formalised as a ban on a L and a H both attaching to the same syllable, in this sequence. This is shown in (2).



This accounts for both the lack of LH and LHL melodies on monosyllables, and the fact that (for instance) a LHL melody, when affiliated with a disyllabic root, results not in a [/ -] pitch contour, but [- -].

The variety of pitch contours found with a basic HL melody can be accounted for by the appearance of accents: not only the melody, but also a phonologically specified accent point is required to fully indicate the tonal contour. (This notation is also similar in effect to Leben's (1982) notion of lexically linking tonal elements to particular syllables. The fact that in Skou this device is employed in a large proportion of the lexicon, and not just a small 'residue', implies that, rather than being treated as lexical aberrancies, these phenomena should in Skou be assigned by rule.) The location of this accent is shown here with a ' preceding the tonal unit that is in the same position (final, penultimate) as the location of the accent. An accent is an attractor for tonal units: rather than being assigned according to automatic principles of tone spreading, the accent indicates that all relevant tonal units must attach to the specified syllable, after which they spread over the rest of the word by general principles of association (a similar device is employed by Kagaya in his study of Bakueri 1992).

On a disyllabic root, the presence or absence of an accent, in combination with a HL melody, results in the following different tonal assignments and surface pitch contours.

(3) No accent	[[^-]		HL
Accent on final syllable	[[^- \]		H'L
Accent on penultimate syllable	[[\^-]		'HL

The 'derivation' of the second of these contrastive pitch contours is shown below to illustrate the principles involved. At the first stage, step 1, we can see simply the lexical specification for accent and for tone melody. This information is purely stipulative, and so is specified in the lexicon, as it is not assigned by any rule, either universal or language-specific. The first step in the process of applying a pitch contour to the word comes with the pre-linking of all tonal units to the accented syllable, seen in step 2. Following this, automatic processes of tone spreading apply to ensure that there is a tonal unit associated with each tone bearing unit.

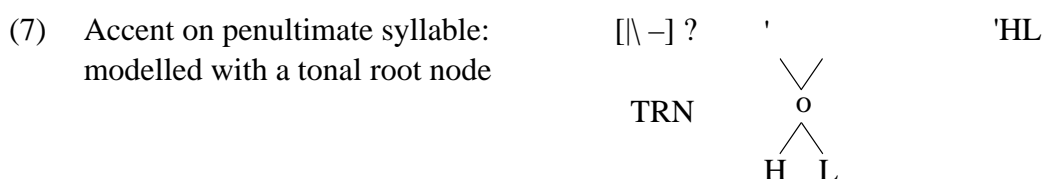
(3)' Step 1	lexical information	Syllables:	
		Tone melody:	H L
		Accent:	final
Step 2	accentual pre-linking		
Step 3	tone spreading		
Final stage	resulting pitch contour	[[^- \]	

The lack of contrast in the pitch contours of monosyllabic words with a HL melody is then accounted for by the lack of syllables for this contrast to be realised. Compare the different pitch contours achieved with HL melodies on disyllabic words with the predicted results from monosyllables. Since there is only one syllable over which the tone melody can be realised, there is no perceptual contrast between the (hypothesised) differing underlying tone melodies (though see section 5 for a discussion of the phonological contrast). We can see how the different phonological specifications would result in identical tonal melody assignment when applied to monosyllabic words.

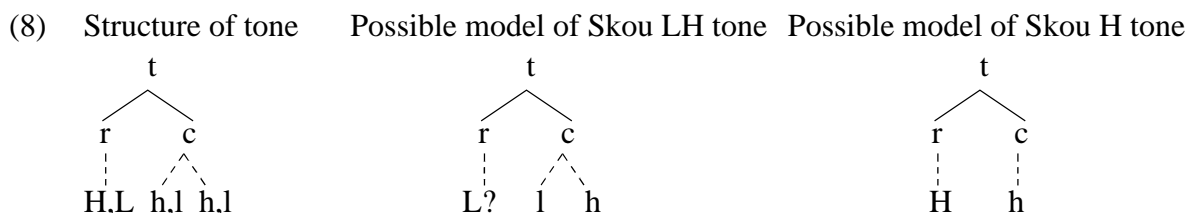
(4) No accent	[[\]]		HL
Accent on final syllable	[[\]]		H'L

we can state that there is no evidence for accents being assigned anywhere except the last two syllables of a word.

Note that the analysis here has implications for the architecture of tone, at least as it applies to Skou. Informally we have been representing the relationship between the tone melodies and the segmental tier as displaying no intermediate levels, such as tonal root tiers. Thus for the HL melodies in (3), the melodies were shown as applying directly to the syllables on the segmental tier. This is necessary, since the assignment of the elements of the tone melodies is dependent on the ability of the tonal melody to ‘scan’ the segmental tier and to assign differentially depending on the presence of an accent. Compare the last of the modelled tone melodies in (3) with that in (7), which demonstrates the problems encountered if we assume a tonal root node. When the tones are associated with a root node before associating with the segmental tier, the differences between the different accents are lost on multisyllabic words.



We can see that the models presented in the section, in addition to being descriptively adequate, are also motivated by an appeal to other models of the architecture of tone. The fact that there is no support for a tonal root node is also tied in to the lack of a register feature in Skou; while there are five contrastive tone melodies in Skou, H L LH LHL and HL, realised on disyllables as $[\uparrow \uparrow]$, $[\uparrow -]$, $[\uparrow -]$, $[\uparrow -]$, and $[\uparrow -]$, there are no contrasts in height other than H versus L: there is only one falling tone, and only one rising tone, for instance, so there is no need to posit (after Bao 1999) representations such as the following, which incorporate both a register node and a contour node:



The only possible use of a register feature would be if we were to model the LHL melody as involving underlyingly just a rise or a fall, and being differentiated from the LH or HL (as appropriate) by a register feature. This methodological account would not, however, be based on any phonetic evidence.

4.1 MORAIIC STRUCTURE: A POSSIBLE ALTERNATIVE

A possible solution to the question of the structure of tone on the syllable is to assume that the syllables of Skou are made up of two mora, each of which is potentially a tone-bearing unit. There is a simple choice of high or low associated with each mora (with

the same conditions that rule out any rise appearing on a single syllable). The lack of a third moraic position for tonal assignment means that the lack of a LHL melody being realised on a single syllable is expected, and not stipulative.

While robust in the treatment of tonal properties, the complete lack of supporting data for a complex moraic structure (Skou does not have codas, vowel length distinctions, or any phonological diphthongs) makes this analysis, in the end, as ad hoc as any other, since it exists purely to support a model of tonal behaviour.

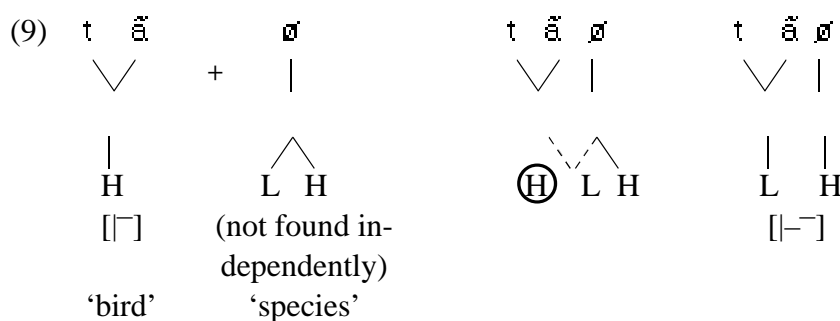
4.2 UNDERSPECIFICATION: A PREFERABLE ALTERNATIVE

Another way in which we could model the Skou tonal system would be to propose that there are, in fact, no L-melodies in the tonal inventory. We would assume, contra table 3, the following set of underlying melodies: H, HL, LH and LHL (the treatment of accent is identical under this analysis to the previous account). Those morphemes which appear with a consistently low pitch, [|-], [|- -] etc., are simply those that are not assigned one of the phonologically specified tone melodies. This would then explain why, of all the compound forms discussed in the following section, low-pitched melodies are not able to dominate and overwrite a preceding tone melody, when compounded. Rather than the L melody displaying ‘special’ behaviour, we have an example of a phonologically toneless morpheme acquiring the tone melody of another morpheme in the same compound, which would be expected behaviour. The marking of past tense, and the partial marking of dative case, by low pitch can be explained not as a result of a low tone melody replacing another tonal melody, but by a process of tonal stripping, in which the tone melody associated with a morpheme is removed.

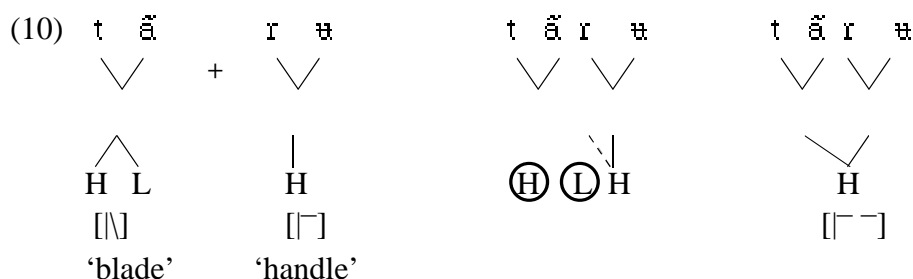
In the discussion that follows L will still be written as if it was an affiliated tone melody, even though the most plausible solution appears to be one with only found melodies, and a default low-pitch assignment for phonologically toneless morphemes.

5. Compounds, and evidence for more than three distinctions on monosyllabic roots

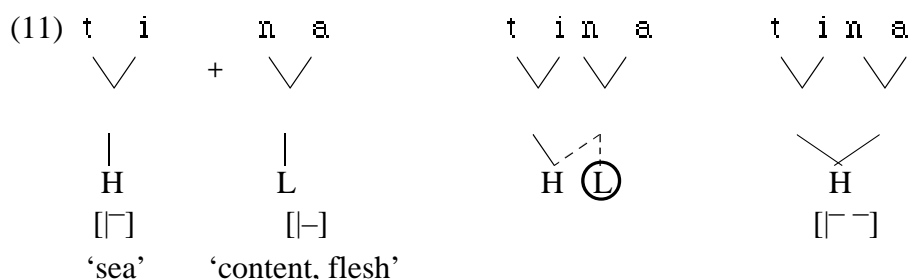
When two roots are compounded together the tonal specification of the final element of the compound is spread over the whole word; the two tones do not interact. For instance, the general classifier for flying creatures is *táng* ‘bird’, which has a high pitch, [|-]. The name of a large bat species is *tangóe*, with [|-] pitch. This is assumed to be the result of the H tone melody of ‘bird’ being overwritten by a LH melody that is associated with the specifier *-oe* ‘bat species’. The process can be modelled as follows:



A complex tone melody may also be overwritten in this way. In the following example the compound *tángrúe* ‘handle of a machete’ displays a [┌ ┐] contour, reflecting a H melody. When it is independent of the compound the element *tàng* ‘blade’ is found with a [┌\] pitch, reflecting a HL melody. Clearly the H melody of the second element of the compound overwrites the complex melody of the first.



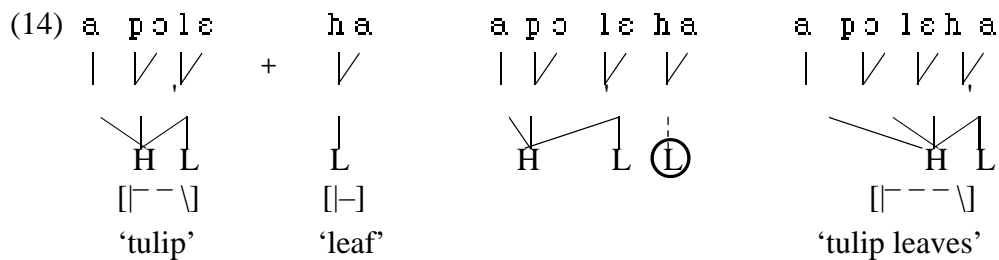
The only exception to such overwriting of tones is found when the tone of the last element in the compound is a low tone. Low tones do not cause the tone of the rest of the compound to dissociate, but are rather themselves overwritten or ignored.² Thus, for example, we might expect that ‘salt’, a compound composed of *tí* H ‘sea’ and *na* L ‘flesh’, would appear with a L tone melody spread over the two-syllable word. This is not the observed result, with the compound having a high tone throughout: *tíná*.



This is suggestive of an analysis by which a L tone melody associated with a word is in fact the absence of an assigned H tonal unit, in isolation or in combination with other tonal units. This is an analysis to which I shall return in section 7, where I discuss the behaviour of apparently toneless clitics.

The morpheme *kung* LHL ‘crustacean’ provides further evidence of the spread of tones over the domain of a L melody. When *kúng*, which appears as a high-pitched syllable meaning ‘small crab species’ when it occurs alone, is found with a following morpheme specified for a L tone melody, the LHL of *kúng* overwrites the L and spreads over two syllables, being realised as one L and one HL syllable. Similarly when an apparently disyllabic L-melody morpheme is added to *kúng* the LHL melody spreads over the resulting three syllables, surfacing as L, H and L.

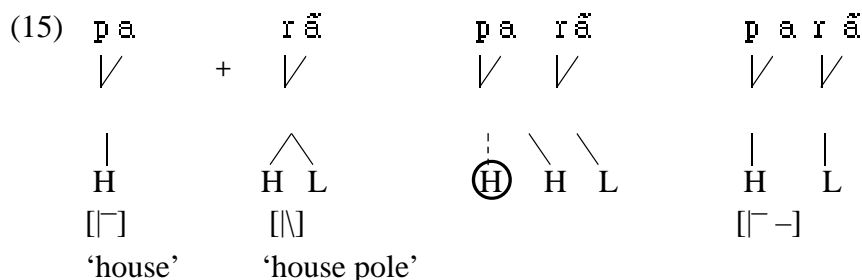
² There is one exception to this, the case of a floating L tone. This is discussed in section 7.



Notice that not only is the tonal melody of *ápólè* spread over the entire compound, but also the information regarding the position of the accent is now applied to the compound as a whole, with a constant final-syllable placement.

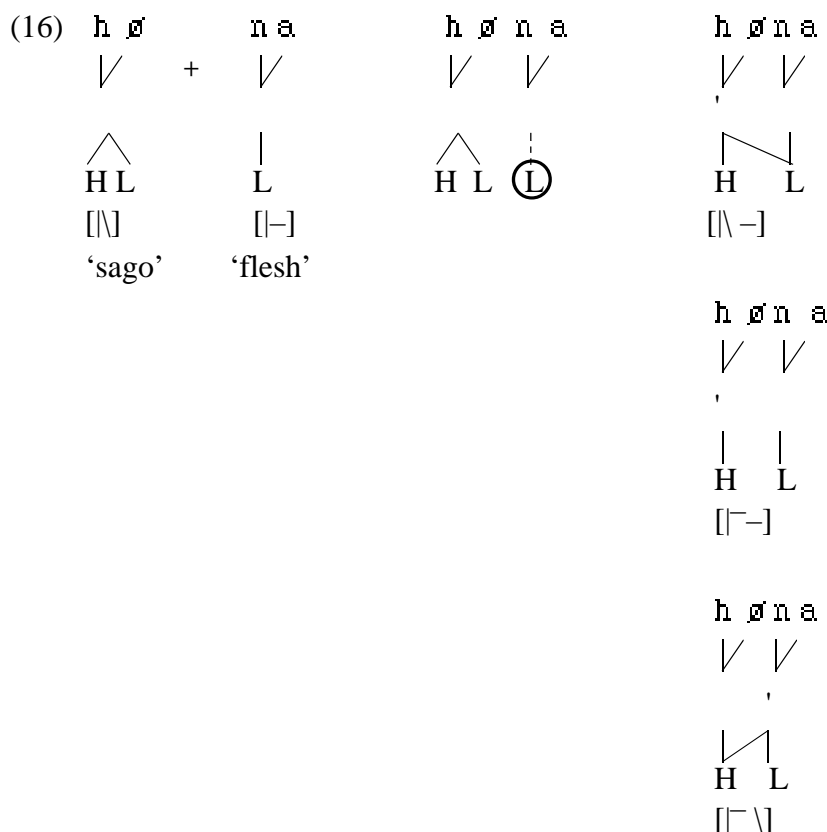
A similar example of L tonal melodies being eliminated can be seen in the word *pátángke* ‘kingfisher’, which is morphologically composed of the roots *pa* L ‘water’, *táng* H ‘bird’, and the bound form *kè* HL ‘kingfisher’. We can hypothesise that the L melody of ‘water’ is erased by the following H in ‘bird’, by the principle that L tones are always overwritten by a more specified tone melody, leaving a H-melody compound. We do, however, have direct evidence (from the phonetic forms heard) that any subsequent H-tone melody on the two syllable compound is then erased by the presence of a non-L tone melody on the final element of the compound, the HL. The final resulting three-element compound displays only the tonal characteristics predictable from the HL melody of the final element in the compound.

One interesting result of this rule of tonal suppletion in compounds is that it allows us to investigate the tone of a monosyllabic lexical item when it appears spread over two or more syllables, thus offering a positive answer to the question of whether or not there are more underlying phonological contrasts on monosyllabic roots than appears to be the case based on the phonetic data of them in isolation. For instance, the noun *hòe* ‘sago’ is a monosyllabic root pronounced with a falling tone: *hòe* [|\]. When it is combined with a following element, and that element has an inherent low tone, then, by normal conventions, the tone of the first element of the compound prevails, in this case the HL melody of ‘sago’, and is spread over the now disyllabic base. We would expect the disyllabic compound to shown a [|- -] pitch contour, by analogy with the tone spread in cases like the following compound or *pá* ‘house’ and *ràng* ‘house pole’.



In this example we can see that what is a falling pitch on one syllable spreads over two syllables to a disyllabic expression with one syllable bearing a high pitch and the

other bearing a low pitch. Identical patterning is found when *kue*-HL ‘jaw’³ combines with *ta* L ‘hair’ resulting in *kúeta* [|- -] ‘beard’. This would be our expected target for the compound composed of *hòe* ‘sago’ + *na* ‘flesh’, since *hòe* has a falling pitch, and *na* is low-pitched, and hence sees its tone melody overwritten. In fact we find a falling-low pitch contour, [|\-]. This gives evidence for the tone melody associated with *hòe* in fact being a ‘HL melody, and not either a H’L or a HL melody.



Three-syllable (and longer) words show exactly the same possibilities as are found for two-syllable words; furthermore, when observing trisyllabic (and longer) words we can note that there are accents located further than two syllables from the right edge of the word. Examine the following possibilities for the pitch realisations of a HL melody on a trisyllabic word. Only the first three patterns are attested, with the final pitch pattern, which would arise from a word that was specified with an accent on the first of its three syllables, not found in the Skou data.

³ This morpheme is not found as an independent lexical item: *kúéé* ‘jaw+bone’ is the normal collocation for ‘jaw’, with the H tone melody of *é* ‘bone’ spreading over the whole compound. Speakers are, however, able to produce the syllable in isolation.

(17)	No accent	[[⁻ - -], [[⁻ - -]		<i>kúkúfa</i> 'quick'
	Accent on the ultimate syllable	[[⁻ - \]		<i>nápáng̀hì</i> 'six'
	Accent on the penultimate syllable	[[⁻ \ -]		<i>hátòpu</i> 'comb'
	* Accent on the antepenultimate syllable	[[\ - -]		-

Why should there be this restriction on the placement of an accent? There are no clear answers, but it is worth noting that there are no unambiguously trisyllabic roots in the language. While there are many trisyllabic words, they are all composed of more than one morpheme. Some of the more convincing roots are plant terms, such as *sangbíki* 'pumpkin' and the already-mentioned *ápólè* 'kind of edible leaf; tulip', but even these are questionable, given, for instance the existence of the root *pó* 'vegetable', and the frequent pseudo-prefixal element *a-* in plant names, and the word *pupúki* 'eggplant', with the same final *-ki* and the same LHL melody as *sangbíki*. One possibly quadrisyllabic animal name, *ibábúeli* 'wasp', is known, but almost all other trisyllabic words have an easily identifiable first syllable that represents a generic or species designator. This restriction on the shape of roots may influence the phonological possibilities on multisyllabic roots.

6. Tone assimilation in phrases

There is some degree of dissimilation of tones across adjacent words, and also some degree of spread. The following sentence shows a different realisation of the pitch to that which we would expect, with the fall on *nì* not dropping nearly as low as is normal, and the low pitch associated with *kang* 'I eat' being realised lower than normal.

	Phonologically specified tones	Pitch
(18) <i>Móe nì=k-ang-kang.</i> fish 1SG=1SG-eat-RED 'I'll eat (a) fish.'	H HL L-L	44 43 11-11

The reduction in drop of the fall might be thought to be a result of identical tones cancelling each other out; in this case, the L of *kang* absorbs the L part of the tone melody on *nì*, leaving a sole H.

(19)	$m\ \emptyset$ \vee	+	$n\ i$ \vee	+	$k\ \tilde{a}$ \vee	$m\ \emptyset\ n\ i\ k\ \tilde{a}$ $\vee\ \vee\ \vee$	+	$m\ \emptyset\ n\ i\ k\ \tilde{a}$ $\vee\ \vee\ \vee$		
			^				^			
	H		HL		L	H	H	L	L	L
	[]		[\]		[]	[]	[]	[]	[]	[]
	‘fish’		‘1SG’		‘I eat’					

Similarly *nì=e* ‘I go to the east’, HL L, surfaces as H L (see appendices). An opposite example can be found when the following word has a high tone; in this case the contrast between the tones is maintained at the expense of the falling toneme, and so the H or the HL melody is absorbed by the preceding *móe*. Note that this, in combination with the previous data, allows us to rank the absorption of tones: a L tone absorbs an adjacent L in preference to a H absorbing an adjacent H.

				Phonologically specified tones				Pitch		
(20)	<i>Móe</i>	+	<i>nì=wí-wí.</i>		H HL H-H			43 22 34-43		
	fish		1SG=get.F-RED							
			‘I’ll catch a fish.’							
(21)	$m\ \emptyset$ \vee	+	$n\ i$ \vee	+	$w\ i$ \vee	$m\ \emptyset\ n\ i\ w\ i$ $\vee\ \vee\ \vee$	+	$m\ \emptyset\ n\ i\ w\ i$ $\vee\ \vee\ \vee$		
			^				^			
	H		HL		H	H	L	H	L	H
	[]		[\]		[]	[]	[]	[]	[]	[]
	‘fish’		‘1SG’		‘get’					

Spreading can be observed in the following utterance. The fall that is phonologically associated with the verb *è* is realised over both the syllable of the verb, and the following L-tone (toneless?) syllable.

				Phonologically specified tones		Pitch
(22)	<i>te=è=ko,</i>			L HL L		33 43 21
	3PL=cook=OBV					
			‘and they cook them, and then...’			

In the following example the HL associated with the verb spreads to the left, as there is no following syllable. The fact that there is only minimal spreading of the H to the left in *te=è=ko* shows that the preferred direction for tonal spreading is to the right.

				Phonologically specified tones	Pitch
(23)	<i>te=pèng.</i>			L HL	55 11
	3PL=leave				
			‘they leave (the village).’		

We have seen, then, that there are processes of tonal disimilation operating to avoid the loss of tonal contrast, and also processes of non-low tones spreading over

surrounding low tones, which suggests that the surrounding low tones, all grammatical morphemes in the data so far examined, are in fact phonologically toneless.

7. Tonal suppletion

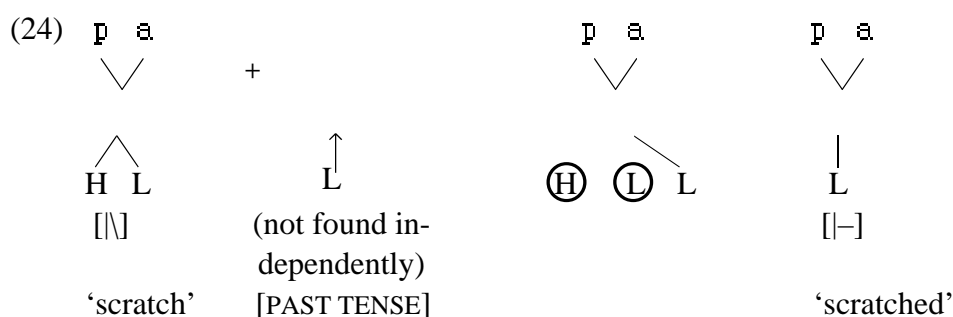
The previous section has demonstrated that a low tone melody is always disassociated from their segmental tier when it occurs in competition with another tonal melody. There is, however, one instance in which a low tone overwrites other tones.

Past tense in Skou is not marked by any segmental changes, but is indicated by a low tone on the verb. (It could be argued that past tense *is* segmentally marked by the absence of reduplication, found in future and intentional clauses, and the absence of an auxiliary, found in continuous and intentional clauses. Nonetheless, these TAM categories do not show the tonal behaviour that is found in past tense.) Compare the following examples, which show the pitch patterns in two different tenses for three different verbs. The tenses shown contrast a future tense, marked by reduplication, with a past tense.

Table 4. Tonal changes for tense

	future		past	
‘roast’	lələ	[↑ -]	lə	[↑ -]
‘vomit’	yāyā	[↑ -]	yā	[↑ -]
‘scratch’	pəpə	[↑ \]	pə	[↑ -]

The simplest account of these alternations is that the verbs ‘roast’, ‘vomit’ and ‘scratch’ (and many others like them) are assigned a tone melody lexically (H, L and HL, respectively), which is realised (with appropriate tone sandhi) in the future, and other, tenses, but which is stripped off in the past tense, appearing to be replaced with a L tone melody (though more plausibly it is simply removed, through a subtractive process associated with the past tense – see 4.2). We can model this for the case of ‘scratch’ as follows:



This model suggests a solution to the question of why the low tone manages to overwrite a lexically specified tone here, but not in compounds. While the compounding places two melody+segment units in a single prosodic word, the case of past tense low tone suppletion takes a melody+segment unit, the verb root, and adds a tone melody that has no segments associated with it. The only realisation of the tense morpheme is the tonal melody, while the verb root has both a tonal melody realisation

and a segmental realisation. For this reason the L tonal melody is ‘allowed’ to overwrite the lexical tonal melody of the word.

If this sort of tonal suppletion were not allowed, of course, we would never see any evidence for this morpheme, since it has no segmental form. We could theoretically posit any number of suprasegmental morphemes that do not successfully overwrite the tone associated with the segmental item (for instance, by being the first element in the ‘compound’ with the lexical element), but there would be no evidence for their existence.

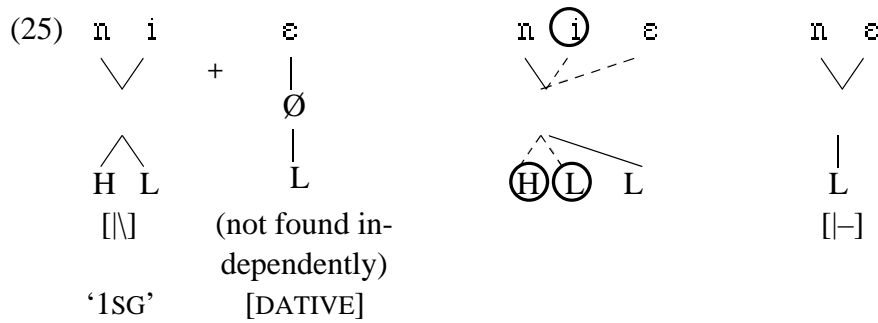
Another case of a probably tonal morpheme is found when we examine the forms of the plain pronouns and compare them with the genitive and dative pronouns. The different sets are given in table 5.

Table 5. Free, genitive and dative pronouns compared

	Free pronoun		Genitive Pronoun		Dative pronoun	
1SG	nɪ	[↘]	nɪ	[↘]	nɛ	[-]
2SG	mɛ	[↘]	mɛ	[↘]	mɛ	[-]
3SG.NF	kɛ	[-]	kɛ	[-]	kɛ	[-]
3SG.F	pɛ	[-]	pɛ	[↘]	pɛ	[-]
1PL	nɛ	[-]	nɛ	[↘]	nɛ	[-]
2PL	e	[-]	e	[↘]	e	[-]
3PL	tɛ	[-]	tɛ	[↘]	tɛ	[-]

The high, rather than falling, pitch on the 3SG.NF.GEN pronoun is discussed in section 9.

Just as with the past tense being marked by a low tone that overwrites the tone of the lexical item, we can most easily account for this pronominal data by assuming that the free pronouns represent the most basic form of the pronoun, and that the genitive pronouns are formed by the addition of a (no longer productive) morpheme (or formative), ‘genitive’, [↘], and the dative set is formed by the addition of a frozen dative morpheme, ‘dative’, -ɛ, [-]. In both cases the tones of these derivational morphemes overwrite the tone of the underlying pronoun, and so again we see a case of a low tone overwriting a more complex tone, though in this case it is associated with some segmental material. In the case of the dative set we can see that there is a vowel associated with the morpheme that has no corresponding position on the syllable tier, and so is realised by overwriting the vowel of the pronoun. The combination of the first person singular pronoun and the dative formative is shown in (25), showing both the overwriting of the HL tone melody associated with first person singular, and the overwriting of the vowel as well.



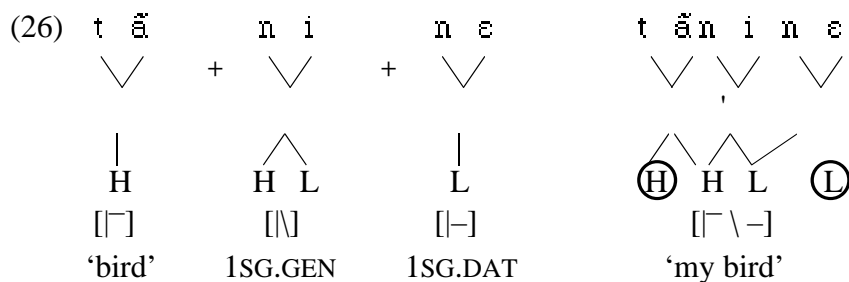
We can demonstrate the need to posit a segmentally specified, but syllabically deficient morpheme by reference to the focus marker =*a*, which does not supplete the vowel of a pronoun to which it attached: *mè a* 'you PROM', not **mà*.

The examples seen in this section show that special treatment is afforded to the low tone in compounds when it is not associated with any syllable structure. The last example shows that even with segmental material, if that material is not linked to the syllabic tier the tone is still capable of overwriting the tone of the lexeme.

8. Mismatches in the definition of 'word'

So far we have described the process of tonal suppletion and tonal spread in words in Skou. There is one instance in which, if we are to hold to the analysis currently advocated, we must assume that there are two tonal contours associated with the one word.

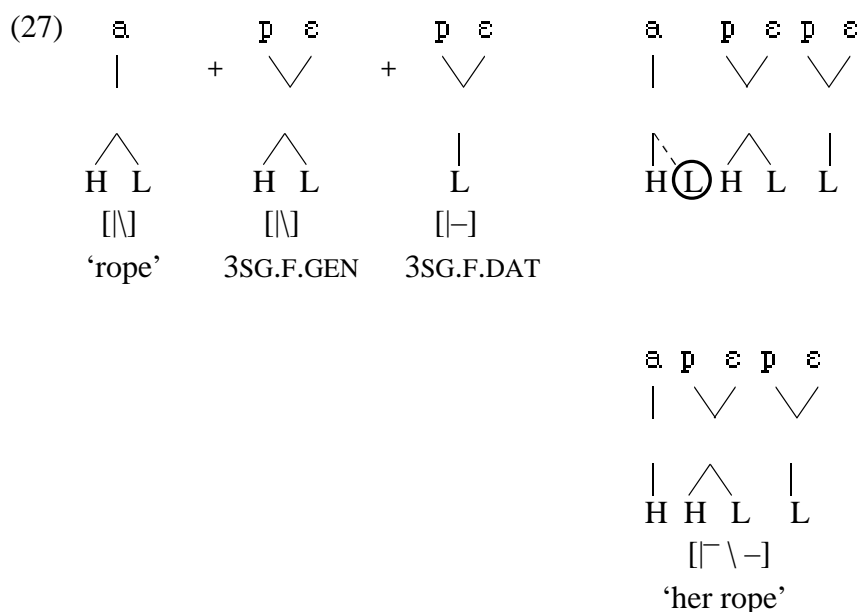
Examine the following data involving possessive marking on nouns. In the first example we might argue either that the HL associated with the genitive morpheme spreads over the whole word, and that the genitive tone is in fact a 'HL underlying tone', or that the underlying tones of each of the morphemes present are realised. The tonal structure of the word, assuming the first analysis, is shown in (26).



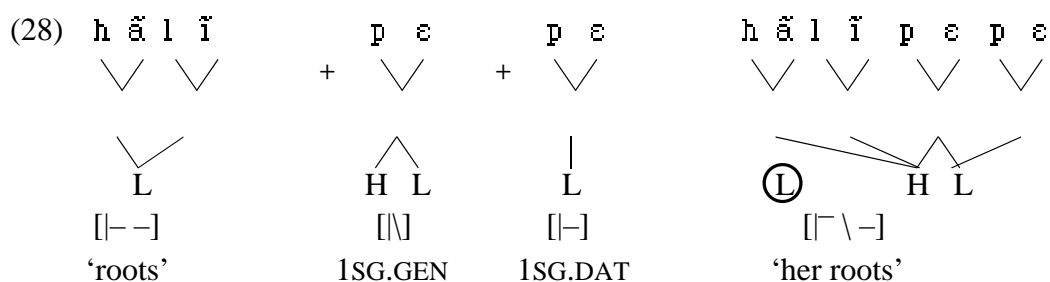
Here we can see that both the tone melody associated with the lexical root and the tonal melodies lexically associated with the inflectional material are preserved in the complex word. The disassociation of the L associated with the dative suffix takes place under the general provisions for the automatic simplification of like tonal units when they are adjacent.

Confirmation of this first analysis might be thought to be found in words with a lexical falling tone on the noun root, in which the lexical tone is realised as a high tone. This is shown in (27), but we should note that an alternative analysis, in which the HL

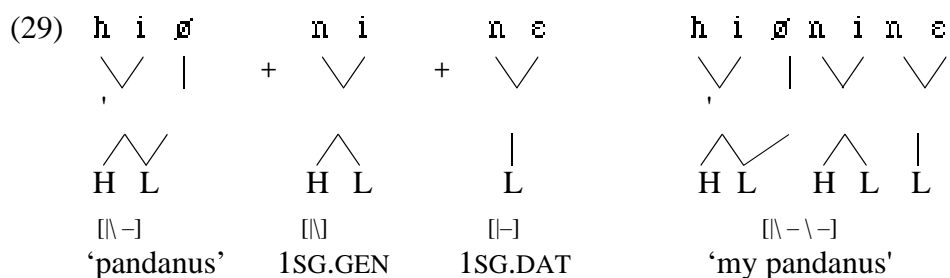
of *à* is changed to a H because of the sandhi environment (preceding H or HL), is also possible.

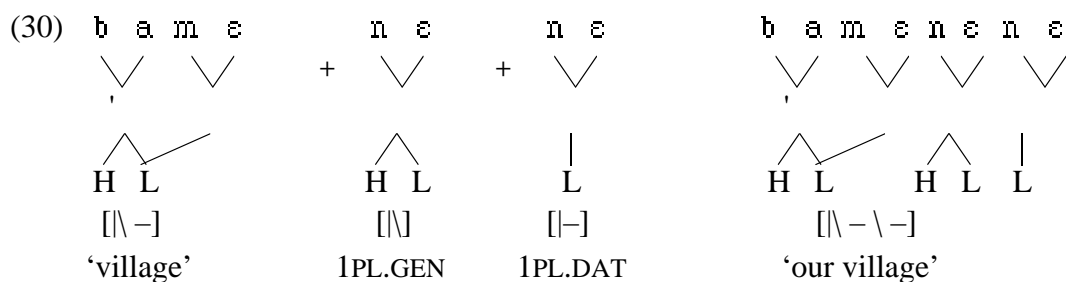


An underlyingly low-toned noun root, in this environment, is realised with a high pitch, as seen in the following example. This seems to imply strongly that the pitch of the genitive marker is spreading over the whole word:



This analysis of tonal overwriting, such as has been attested in compounds, can be falsified by examining a possessed noun with a HL melody associated with the disyllabic noun root, however. We can see that two tone contours can exist on the same syntactic word. The same HL contour that was modified by tone sandhi in (27) to a simple H is allowed in (29) and (30), because the syllable that appears in the sandhi environment, the one immediately preceding the HL on *nì* and *nè* in (29) and (30) respectively, is a low tone, not a high tone.





What are we to make of these data? Clearly the only viable solution is to assume that there are two phonological words within the one syntactic word. A mismatch between the phonological definition of word (‘the environment of tone-spreading’) and the syntactic definition (‘a syntactically indivisible unit’) is rare, but not unheard of, and has been reported for other languages (eg., within New Guinea Yimas, Foley 1991).

F₀ traces of the phrases *hangling-pè=pe* ‘its (=her) roots’, *bàme-nè=ne* ‘our village’, and *à-pè=pe* ‘her rope’ are given in the appendix.

9. The interaction of segmental and suprasegmental phonologies

So far we have considered only the assignment of tonal melodies to the tone bearing units of a word, treating all syllables as phonologically equivalent. In fact, there are several restrictions associated with the assignment of suprasegmental phonological features to the segments. As an example of this we can cite the restriction against the vowel /ɰ/ appearing with contrastive nasalisation. When this nucleus is called for phonologically (for instance, by the alternation of ɰ with ɰ̃ in a verbal paradigm), [ɰ̃], rather than the disallowed *[ɰ̃], is found.

Tonally the following two restrictions are found:

1. there is no contrast between high pitch and low pitch on syllables with voiced stop onsets. This reduces the number of contrasts found with *b*- and *j*-initial syllables.
2. Falling pitch does not occur on syllables with an initial [+back] consonant or backing gesture; this bars falling pitch from occurring in syllables with *k*, *j*, *w* or *y* as their onset.

The first of these restrictions is phonetically-motivated: initial voiced stops show a lowered F₀ with respect to their voiceless equivalents, and so there is less acoustic space for the putative contrast between a high pitch and low pitch to be realised: the average frequency of the vowel in a syllable with an initial voiced stop would be lower than expected. The actual pitch on these syllables is between that of low pitched and high pitched syllables (judged based on the pitch heard when the syllable has a nasal onset or is vowel-initial). The hypothesis is that the reduced F₀ (at least at the onset of the vowel) associated with the high pitch has been reinterpreted as in fact showing no contrast with the typical (non-voiced consonant onset) F₀ patterns found on

phonologically low-pitched words (see figures 2 and 3 in appendix 1 for an example of how close the initial F_0 of high pitched and low pitched words can be). This has then led to a reinterpretation of syllables with this voicing preconditioning of the F_0 as in fact not displaying a phonological, and not just phonetic, contrast between a high and a low pitch. Since the main part of the vowel in these syllables is still greatly higher than in a phonologically low-pitched word, they are still interpreted as being phonologically high, and the phonologically low syllables, having been reinterpreted as not showing a distinction with the high-tone syllables, have been reanalysed as also being phonologically high tone.

A phonetic explanation for the absence of falling pitch on syllables with initial [+back] consonants is more complicated, but a plausible account can nevertheless be motivated.⁴ While there are few, if any, acoustic motivations for the restriction, we can formulate a plausible explanation in terms of articulatory gestures (after the manner of Erikson 1993). Firstly, we need to motivate the classification of the consonants in question as [+back]. While this may be obvious and uncontroversial for *k*, and not particularly questionable for *w* ([g^w] is an allophone of / w / following nasalised vowels), it is less immediately apparent why *j* and *y* should be characterised in this way. Again, the allophonic behaviour of these phonemes provides the justification that we need. The palatal stop *j* shows dissimilatory phenomena with following vowels. When a low, back vowel follows, the realisation is palatal, but with a high front vowel a more backed articulation is heard: thus *já* ‘noose trap for a pig’ is heard as [j̠a], but *jíngpa* ‘fly (verb)’ is [g̠i(m)pa]. With *y* there is not velar allophone, but the typical pronunciation of this phoneme involves a complex gesture, especially when the following vowel is front (again a dissimilatory process). In these environments, we hear [d̠ɛj], [d̠ɛj], rather than [j]. While these are still not [+back] sounds, according to traditional feature assignments, they do involve a process of backing in their articulation: the muscles that are responsible for the raising of the tongue root in the articulation of [+back] sounds, such as velars and uvulars, are also involved in pulling the tongue root back from the alveolar or alveopalatal position towards the palatal, and thus the muscular gesture is the same, even though the target is quite different.

The [+back] articulation requires a muscular gesture in the sterno-hyoid muscle, which in turn would affect the muscle tension around the vocal cords. This would not restrict a specification for a falling pitch per se, but the higher F_0 that would be induced by the greater muscle activity involved in the tongue body raising has evidently been enough to mean that the overall fall is not sufficient for the phonologically HL syllables to be interpreted as showing a HL pattern, and not simply a H melody pattern, combined with intonational fall. (Compare figures 2 and 4 in appendix 1 for an appreciation of how much F_0 drop is associated with a phonologically high pitched syllable in any event.) In this case, too, the inherent phonetic characteristics have been reinterpreted and reanalysed as phonological constraints.

⁴ I am particularly indebted to Donna Erikson and David Odden, amongst other participants at the *Cross-linguistic Studies of Tonal Phenomena* symposium in December 2002, for help in this analysis.

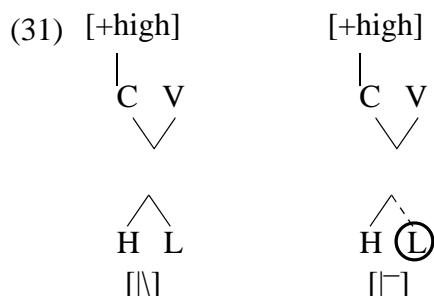
Evidence for the position that this is a productive rule, not a lexical or historical accident, is found in the lack of falling pitches on syllables with a [+back] onset. When marking the genitive, the 3SG.NF pronoun is heard with a high pitch: *ké* [↑], and not a falling pitch, as is found on the other genitives, such as 3SG.F *pè* [↘]. This indicates that there is more than just a frequency restriction on the appearance of falling pitch on syllables with a [+high] consonant in the onset, and that there is a principled rule at work that excludes falling pitches from appearing on syllables with initial [+back] consonants.

The pitch contrasts that are found following different stops are shown in summary in table 6. Note that, because /j/ belongs to both the class of [+voice] consonants and is also a member of the set of [+back] consonants, it is doubly restricted in terms of which pitch contours are eligible to appear in syllables with it as onset.

Table 6. Pitch contrasts and syllable onset

		Onset:			
		t, p, (rest)	b	j	k, ɣ, w
high	[↑]				
low	[↓]		–	–	
fall	[↘]			–	–

The examples in the previous section have already shown that where a falling pitch might be expected, a high pitch is realised on a consonant with a [+high] consonant in the onset. This implies a rule of the sort seen in (31).



This is a clear indication that, while demonstrably best represented autosegmentally, tone melodies clearly make reference to features present on elements of the segmental tier as well.

We have discussed the restrictions on the assignment of tonal melodies to various syllables, but should note that, of course, the domain of tone in Skou is not the syllable, but the word. What, then, are the restrictions, if any, on the realisation of tonal melodies on whole words, when they have more than one syllable?

While there is no contrast between high and low pitch in syllables with voiced obstruent onsets (and so, in monosyllables, there is only a two-way contrast between high pitch and falling pitch), syllables with these onsets are found with low pitches when they are part of a polymorphemic word. The constraint dictating the absence of contrastively low-pitched syllables with voiced onsets, is relaxed in polysyllabic words.

The restriction still applies, however, in that it is impossible for a word with a voiced onset not to have a phonologically affiliated tone, one of H, LH, LHL or HL. But it is acceptable for a syllable with a voiced onset to appear with the low pitch associated with part of a complex tone melody. For example, in the compound *balèng* ‘male’ [l-] the first syllable, with the voiced onset [b], may appear with low pitch, because the whole compound appears with a LHL melody. Thus the restriction is in a phonological sense absolute, in that words with a voiced onset must be phonologically assigned a tone melody bearing a non-L toneme, but phonetically these onsets are able to appear with a low pitch.

The restriction against [+back] onsets appearing with falling tones is more relaxed, and appears to be purely phonetic. Words like *kóko* ‘uncle (FyB, MyZH)’, and *wówo* ‘uncle (MB)’ are both assigned a HL melody phonologically, even though in both cases the words consists solely of syllables with [+back] consonants. These morphemes are allowed because the restriction is a phonetic one more than it is a phonological one, and the phonetic constraint against falling pitch appearing contrastively on syllables with [+back] onsets is maintained, since the HL melody is spread over two syllables.

10. The place of Skou in a typology of tone

What features distinguish the tonal system of Skou from other, better-known tone systems? The following points are the salient characteristics in the description of the Skou tonal system:

word-tone system	the domain of tone assignment is the word, not the syllable common to Mende, Shanghai, etc.
accent	in addition to a melody, there is a lexically assigned point which attracts all the tonal units similar to pitch-accent systems
tone sandhi	syllables with a H component to their pitch are always realised as just H when preceding a syllable with a H component more common than not in languages with syllable-tone systems; see Bao (1999), or Chen (2000)

In addition to these points of concurrence with more widely-reported features, we can note that there are two areas in where the Skou data suggests a major departure from most current models of tonology:

tonal root node	not only not required for an analysis of Skou tonology, but expressly ruled out by the accentual data and the restrictions on its appearance
segmental interference	while tone is clearly more adequately represented on an autosegmental tier, there is a lot more interaction

between the segments or a syllable and the pitch that is realised there than has been reported in languages outside New Guinea.⁵

11. Summary of tonal processes in Skou

The tonology of Skou is composed of the following units:

- five underlying melodies: H, L LH, LHL, HL, assigned at the word level;
- optional accent that pre-links tonal melodies to a particular syllable;
- restrictions apply to the LH and LHL melodies: they cannot link to a single syllable, and they bar the appearance of an accent;
- in compounds the right tone dominates, except that
 - L tone cannot overwrite another lexically affiliated tone in a compound, and
- morphological tone without segmental material of its own always overwrites lexical tone with associated segmental material
- tones associated with syllabic tone bearing units from right to left; phrasally, tonal spread also prefers rightward spreading over leftward spreading patterns

There are many issues remaining in the tonology of Skou. One of these, perhaps one of the most important, involves the lexical realisation of all of the tone melodies on monosyllables: to date no monosyllabic roots have been found that show evidence for a LH tone melody.

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⁵ Doug Marmion also reports significant segmental interaction with tone in Wutung, and Tida (2000) documents considerable interaction between segment and pitch in the Chimbu languages.

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Appendix 1: Illustrations of the contrasting pitch contours

Words illustrating the different pitch patterns shown in tables 1 and 2 are given below. The arrangement of the table is identical to that of the earlier tables.

Table 7. Examples (in orthography) of words exemplifying the different pitch contours realising the tonal melodies for one, two and three syllables

1-	2-	3-	
<i>pa</i> 'house'	<i>lengfi</i> 'black'	<i>lengbangbang</i> 'sandfly'	H
<i>pa</i> 'water'	<i>nongpong</i> 'four'	<i>rangwaue</i> 'axe'	L
*	<i>nake</i> 'dog'	<i>mabiri</i> 'twenty four'	LH
*	<i>pangbi</i> 'pig arrow'	<i>kungpaue</i> 'spider, octopus'	LHL
<i>pa</i> 'complete'	<i>hengtong</i> 'three'	<i>kukufa</i> 'quick'	HL
	<i>fungli</i> 'scorpion'	<i>apole</i> 'gnemon, tulip'	H'L
	<i>hingtung</i> 'two'	<i>nahipa</i> 'eight'	'HL

An idea of the difference in F_0 that characterises the different monosyllabic contrasts can be gained by examining the following F_0 traces of representative utterances of the three words given above as examples of monosyllables, *pá* 'house', *pa* 'water' and *pà* 'complete'.

Figure 2. A token of *pá* 'house', showing phonological high pitch

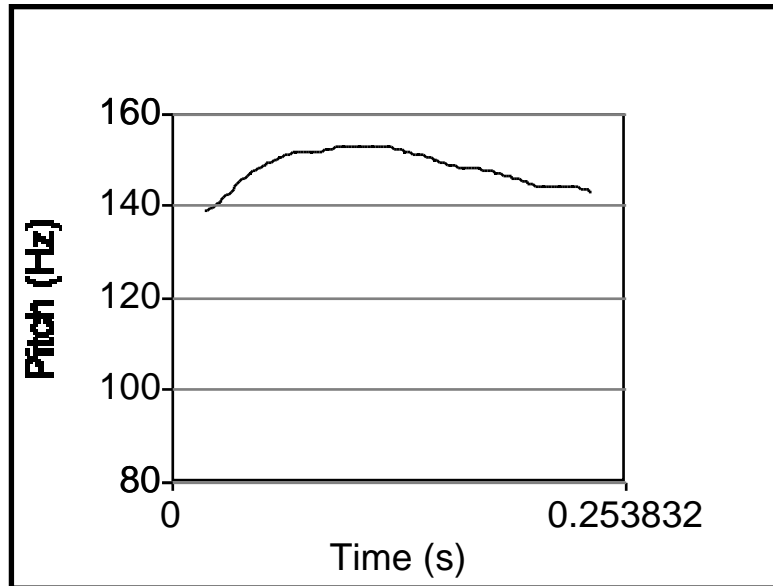


Figure 3. A token of *pa* ‘water’, showing phonological low pitch

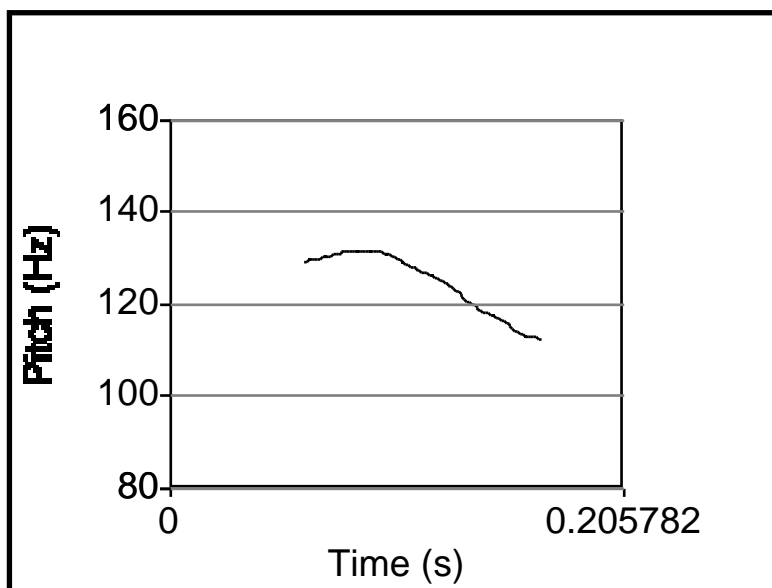
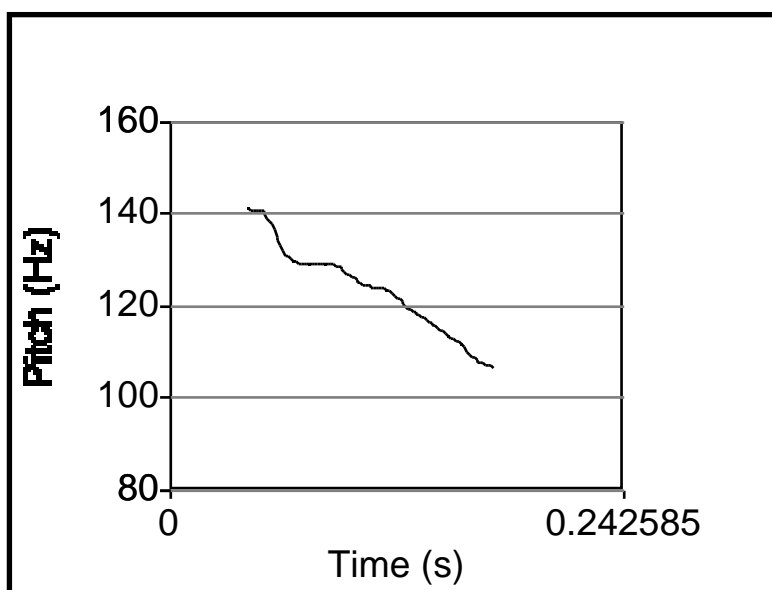


Figure 4. A token of *pà* ‘complete’, showing phonological falling pitch



The same lexical items (except that *pà*-HL ‘complete’ has been replaced with the homophone *pà*-HL ‘cult house’) are shown with the clitic =*ing a* ‘the, because’ attached, showing the effect of the same tone melody being realised over three syllables, [pã.ĩ.ã].

Figure 5. A token of *pá=ing a* 'the house', showing phonological high pitch spread over three syllables

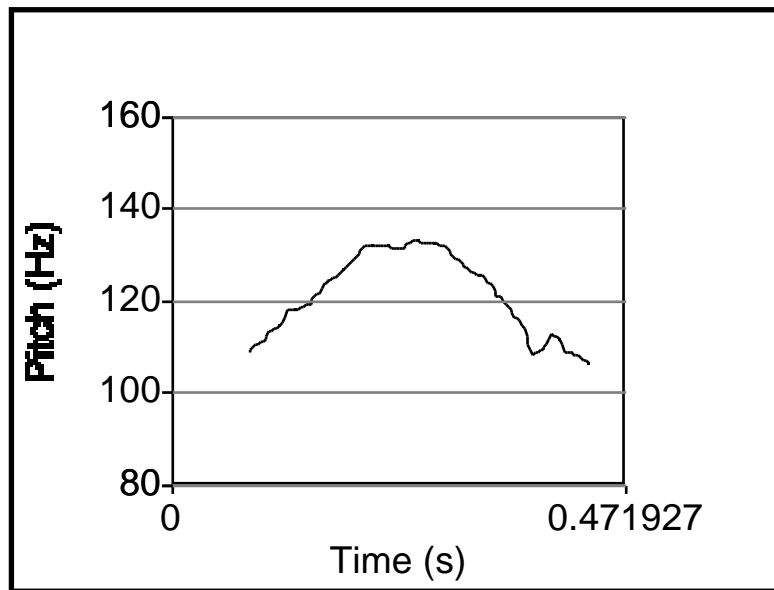


Figure 6. A token of *pa=ing a* 'the water', showing phonological low pitch spread over three syllables

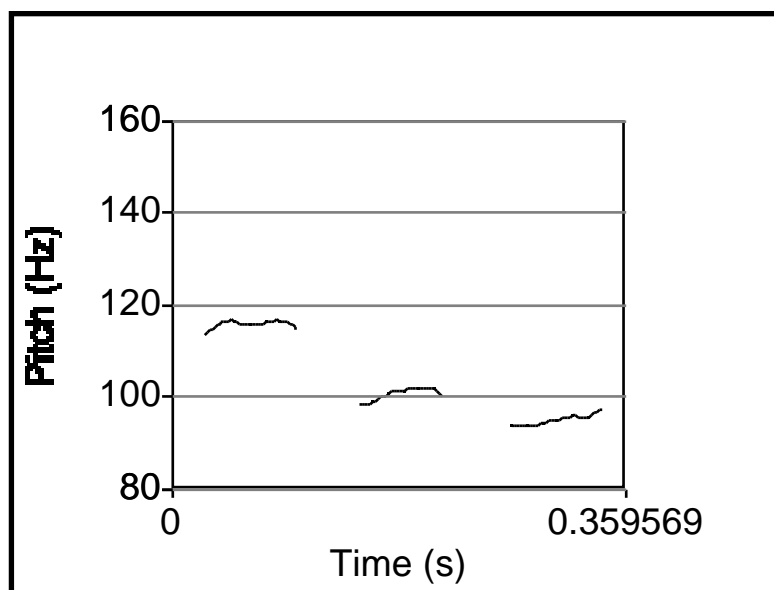
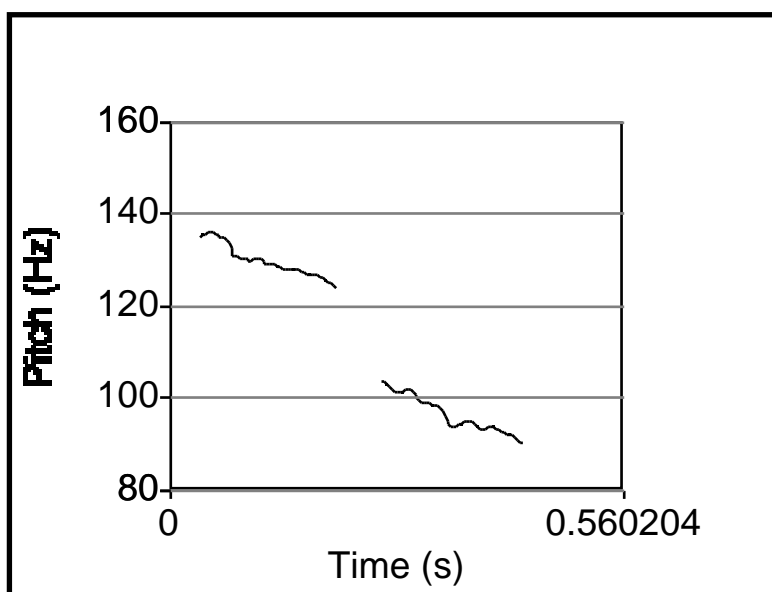


Figure 7. A token of *pà=ing a* ‘the cult house’, showing phonological falling pitch spread over three syllables



The segmental phonology of Skou is summarised in the following chart:

Figure 8. The Skou segmental system

p	t	k	i	ɤ	u	ĩ	ũ
b	j ~ gʲ		ø		õ		ũ
m	n		e	o	ẽ		õ
f		h		a			ã
	r l	y	w				

Appendix 2. Monosyllabic tone contrasts in related languages

The tonal systems of the other languages related to Skou, for which reliable data is available, are listed below as far as they apply to monosyllables.

Table 8. Monosyllabic pitch contrasts in Macro-Skou languages

	Leitre	Wutung	Rawo	Puare	Barupu	Sumo	I'saka
‘high’	4553	55	55	55	55	55	55
‘low’	22		22	22	22	22	22
‘rising’		35	35	35	35	45	35
‘falling’	52	53	51		51	51	51
‘slow falling’		42	43	553			
‘wavy - convex’	354				353		
‘wavy - concave’					535		

Noteworthy is the fact that in Wutung and Leitre there is a predominance of functional contrast in the upper half of the pitch range; Wutung, for instance, is reported (Marmion p.c.) as having a high, two falls, and a rising tone, but no low tone, a typologically highly marked state of affairs.

The system of Puare, when examined in the light of polysyllabic words, also demonstrates a HLH melody, and we also find evidence for the same sort of accentual phenomenon present in the final two syllables that has been demonstrated for Skou, strengthening the claim that these languages are related, since their phonological systems are extremely similar.

On this note, it is interesting to observe that the geographically separated Lakes Plains languages of the upper western Mamberamo, such as Kirikiri (Clouse and Clouse 1993) also show evidence for an analysis involving contrasting accents in the final two syllables, and five tone melodies, H, L LH, HL and LHL. This, along with a scattering of cognate lexical items, might indicate a distant genetic relationship. So far there is insufficient evidence for a conclusive statement of relatedness between these two language groups.

Appendix 3. F₀ traces for some examples of Skou tonal melodies realised across phrases

The following traces show various aspects of some of the more complicated phonological processes involving the re-organisation and spread of tonal melodies across phrasal constituents in Skou.

Figure 9. Fundamental frequency trace for *te=è=ko* ‘they cooked and later’, showing the spread of the HL contour over the word

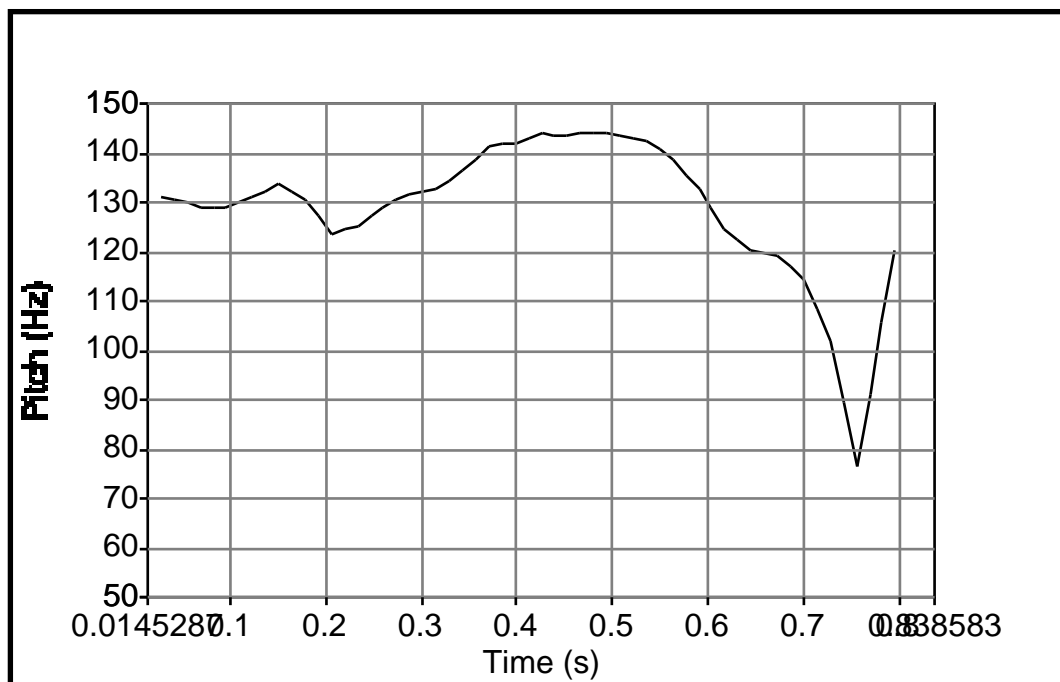


Figure 10. Fundamental frequency trace for *nì=e*, 'I go to the east', showing the HL of the proclitic *nì* spreading over both syllables, realised as a high pitch and a low pitch

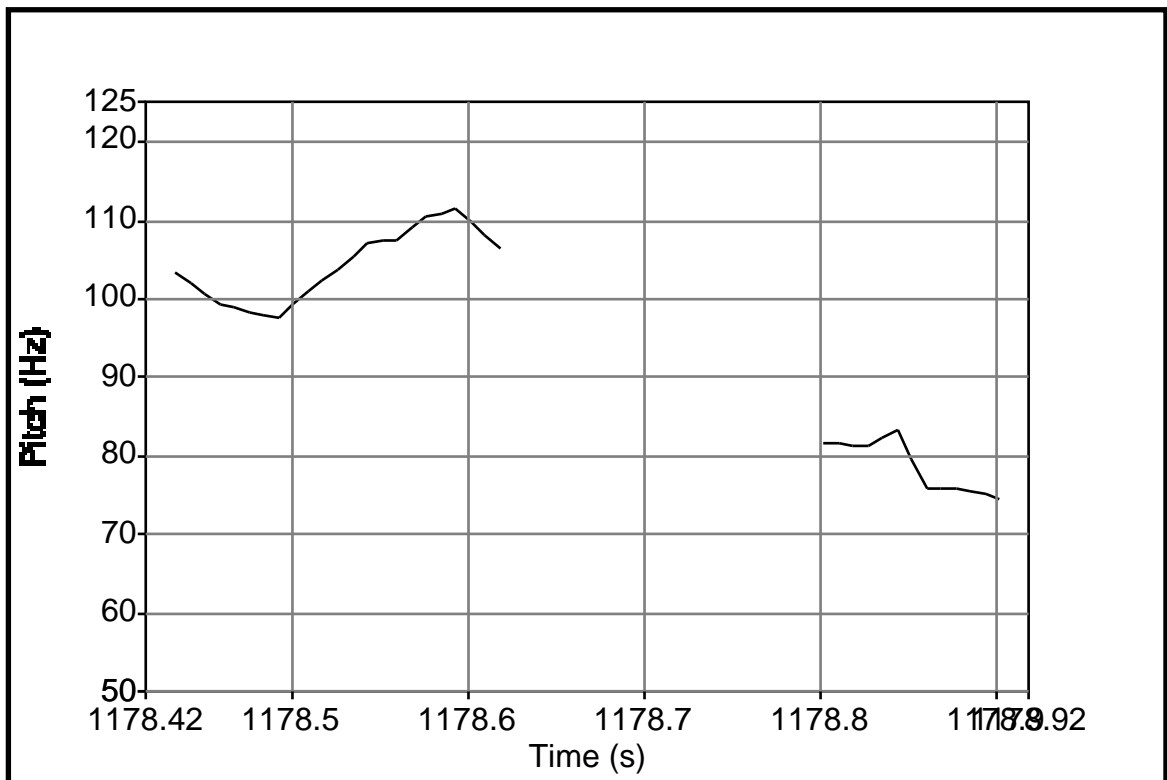


Figure 11. F₀ traces for *pá=ing a* ‘the house’, showing a rise to the H target followed by a fall, and *pà=ing a* ‘the cult house’, which shows an even fall over the word

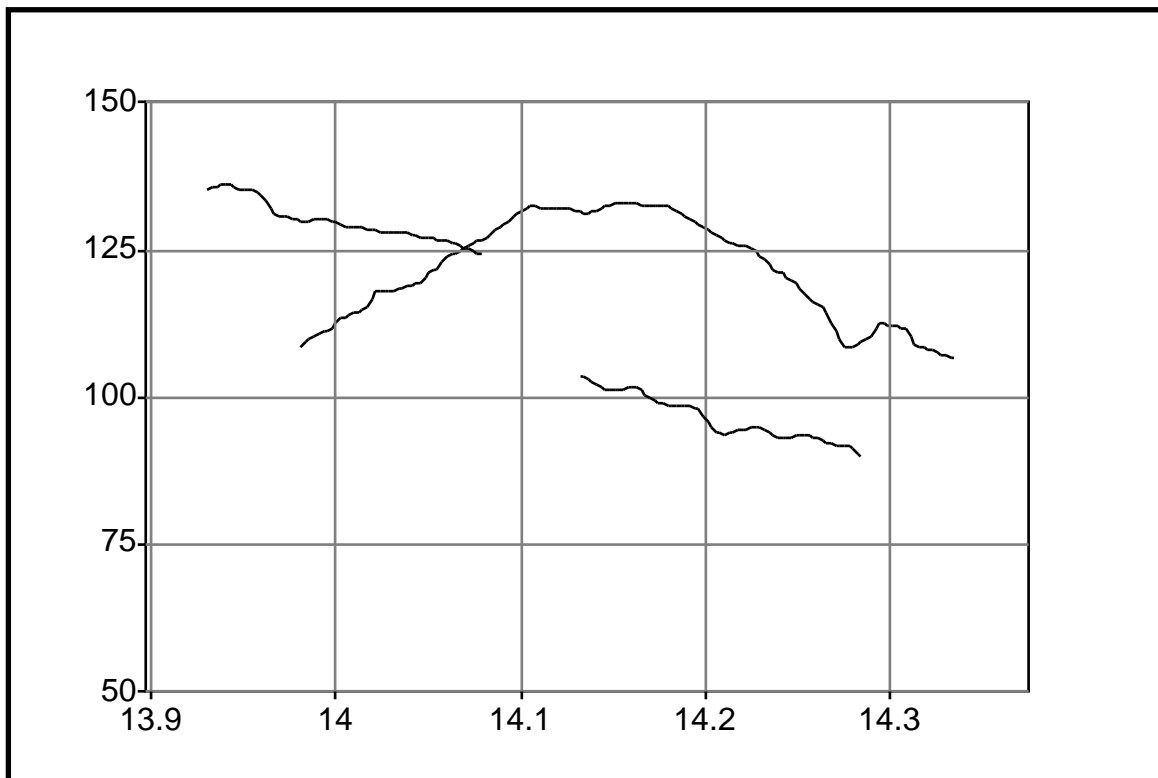


Figure 12. F₀ trace for *te=pèng* ‘they leave’, showing the spread of the HL contour over the entire word resulting in a stepped H and then L series of tones

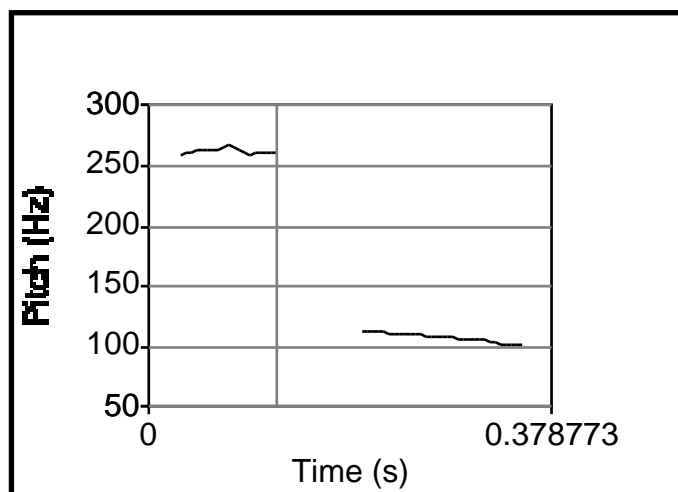


Figure 13. F₀ trace for *à-pè=pe* 'her rope', showing the realisation of a high pitch, rather than a falling pitch on the nominal root *à*, due to sandhi effects induced by the following HL on the genitive *-pè*

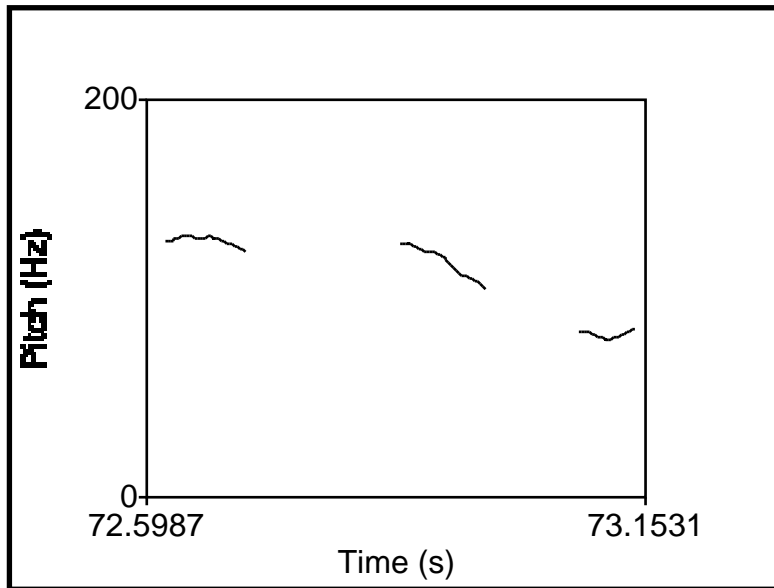


Figure 14. F₀ trace for *hanging-pè=pe* 'its (=her) roots', showing the spread of the HL contour associated with the genitive suffixes over the entire word

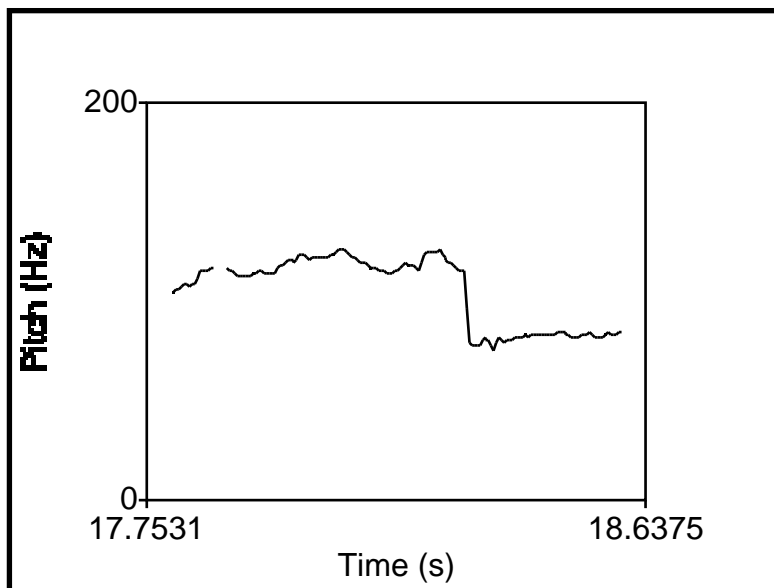


Figure 15. F₀ trace for *bàme-nè=ne* ‘our village’, showing the spread of the realisation of two independent HL contours in the one syntactic word

