A Grammar of the Skou language of Papua

Draft: comments welcome!

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18 September 2002

2. Phonology

The phonology of Skou has many points that are of interest to general phonological theory, involving two different suprasegmental tiers and an array of consonants and vowels with unusual properties, both allophonic and distributional. None of the segments or suprasegmental tiers are of themselves unusual, but they interact in several interesting fashions. The following sections detail the phonotactics and segmental phonology first, followed by a lengthy discussion of the tonal and nasalisation systems in the language. This is followed by a second examination of phonotactic constraints, taking into account both segmental and suprasegmental conditions. The chapter concludes with a discussion of orthographic choices, and the problems in identifying the nature of a tone system when tone sandhi masks other distributional factors.

2.1 Phonotactics - word

At a gross level, the language is phonotactically uncomplicated. The syllable in Skou does not allow for complex onsets, nor any segment (consonant or glide) in the coda. The rhyme may be nasalised, and contrastive tone is present. The shape of the syllable is as follows:

$$\sigma \rightarrow (C)\ V\ T\ (N)$$

That is, a syllable consists of a vowel, a choice of pitch contour (high, low or falling), and furthermore may optionally begin with a consonant. The rhyme is specified as displaying nasalisation on the vowel, or remaining oral.

Although the template above allows for both CV syllables and syllables consisting solely of a V, the CV structure is by far the more common, with only approximately 10% of syllables lacking an onset, irrespective of their place in a word. Owing to the lack of complex onsets, or any codas, there are no sequences of consonants in Skou,[1] and sequences of two vowels are syllabified as two separate syllables, each with their own timing, possibilities for pitch choice. This means that no non-phonemic glides in codas are formed. Most words are only one, or at most two, syllables long. The relative frequencies of roots of different length are given in table xx. Only slightly more than half the free roots are monosyllabic, but less than 10% consist of three or more syllables, and this count includes words which are recognisably multi-morphemic, though constituting a single lexical item, such as the names of many animal species (*móehábá*

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[1] Historically a range of complex onsets was possible, and indeed many complex onsets are preserved in the other Skou languages (except Leitre, which has also reduced CC clusters to monoconsonantal onsets, though by a different process of simplification to that found in Skou). See Donohue (2002) for a discussion of historical processes in Skou phonology. The one exception to this generalisation is discussed in 8.2.2.

'whale', for instance, is composed of the generic *móe* 'fish, water creature that swims' and the specific *hábá* 'whale').

Table 13. Length of all words

Words	All	1-σ	2-σ	3-σ	4-σ	5-σ	TOTAL	%AGE
TOTALS		256	193	45	2	1	497	100
%AGE		52	39	9	0.4	0.2		

We shall deal with the segmental phonology of Skou based on the syllable, since there do not appear to be restrictions on the segments found in second or third syllables. Similarly, the identity of the segments in one syllable of a word does not appear to influence the choice of phonemes in other syllables of the same word, though there are certainly allophonic differences, mainly suprasegmentally. There are not enough examples of four or five syllable words for us to be able to draw significant conclusions about any possible restrictions. Following the discussion of the suprasegmental features of Skou phonology we will return to the subject of phonotactics, discussing co-occurrence restrictions.

2.2 Segmental phonemes

The segmental phonemes in Skou are made up of seven vowels and thirteen consonants. Both the arrangement of the vowels and the consonants are unusual typologically.

2.2.1 CONSONANTS

The thirteen consonants of Skou show a rather unusual arrangement, the result of competing areal changes and abrupt historical repairs effected to recover from these changes. Most notable is the almost complete absence of contrastive voicing in the system. Unusual, both for New Guinea generally and for the Skou family, is the presence of two non-nasal sonorants, both l and r. Also unusual, both cross-linguistically and in the Skou family, is the absence of an s, either phonologically or phonetically, except in one suspected loanword.

Table 14. The consonants of Skou

	Bilabial	Labio-dental	Alveolar	Palatal	Velar	Glottal
Voiceless stop	p ~ pʷ		t		k	
Voiced stop	b			ɟ ~ gʲ ~ ɡ		
Fricative		f				h
Glide	w			j ~ ʒ ~ʤ		
Lateral			l			
Rhotic			r			
Nasal	m		n			

Phonetically, the phonemes conform closely to the prototypical IPA values associated with the symbols used, with little variation other than aspiration which is found on the voiceless stops, typically found word-initially by also heard word-internally. Of the consonants listed above, only the voiceless bilabial stop, the labio-velar glide the two palatal consonants and the non-nasal sonorants require comment.

2.2.1.1 /p/

The voiceless bilabial stop has two possible realisations, [p] and [pʷ]. The former is the most common allophone, heard in all environments and from all speakers. The rounded allophone is heard only from older speakers, and is found only preceding non-round vowels. It cannot thus be described as assimilation or dissimilation, but rather is more to do with the realisation of rounding on a syllable containing the /p/. When the rhyme realises this rounding, then it is not found on the stop, but if there is no rounding in the rhyme (that is, the rhyme consists of an unrounded vowel), then the rounding is realised on the onset.[2]

Table 15. Allophony of /p/

	Allophone	Environment
/p/	[p]	/ __ ɯ, ø, ɔ, u
	[pʷ]	/ __ i, ɛ, a

The rounding effects on a /p/ the precedes an unrounded vowel are perhaps more accurately represented as [ʷpʷ], since there is a noticeable [-ʷ] off-glide to any preceding vowel. For instance, /lɔpa/ 'earlier' is heard as [lɔʷpʷa], with rounding audible on both sides of the plosive. Here the unroundedness of the following [-a] provides the environment for the rounding of the /p/, which is then in addition heard on the preceding syllable.

Another interesting fact about the voiceless bilabial stop is that, in the speech of some Skou Mabo people, it is frequently omitted in discourse: in running speech it is not unusual for a /p/ to be omitted, especially at the beginning of a clause. For instance, in the following segment from a text the proclitic on the verb (in bold) was pronounced without the /p/ by the speaker giving the text:

[rãl̃ɛ̃mpa ɛ̀wakɔ rãlɛ̃pa]
[|¯ ¯ – • ¯ – ¯ ¯ –]

(1) … *rángléng=pa,* ***(p)e=w-á=ko*** *rángléng=pa,* …
afternoon=INSTR 3SG.F=3SG.F-pound=OBV afternoon=INSTR
'… until afternoon, she pounds (it) until it's afternoon, and then …'

While this allophone is not common, it does occur frequently enough to be noticeable when listening to people speaking quickly. Skou speakers seem oblivious to this dropping.

2.2.1.2 /b/

The only unambiguous voiced stop is usually realised simply as [b], but is occasionally heard as [β] when intervocalic in a word or a compound, such as [tɛβapubi] for /tɛbapubi/ *Te Bapúbi* 'Skou Sai'. Overwhelmingly, [b] is heard in all positions.

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[2] A similar dissimilation, not motivated by any obvious articulatory factors, is found in the Balig varieties of Bontoc, in the northern Philippines. In this language consonants palatalise before the low vowel /a/, but not before high vowels (Lawrie Reid pers. comm. 2002). Similarly, Blust (2000: 307) notes that Reid's (1971) data on Kakiduge:n Ilongot 'shows raising of *a to a high central vowel (presumably [ɨ] -MD) after voiced construents (obstruents? -MD) other than velars', suggesting a similar dissimilation for the feature [high] in the syllable.

2.2.1.3 /w/

The glide /w/ shows one unusual allophone, a rounded voiced velar stop [gʷ], when it is preceded by a nasalised vowel. The stopped allophone is more common when the pitch rises from a low to a high level over the two syllables, as can be seen in the examples following. The first three examples in table 17 do not show an upstep in pitch from the first (nasalised) syllable to the second, and also do not usually show prestopping of the /w/. The following three words are all characterised by an upstep in pitch, and a not unusual stopped allophone of /w/. (For the prenasalisation of the pre-stopped w, see section 2.3.2.1.)

Table 18. Pre-stopped allophones of /w/ following V

Pitch		
[|– \]	[rãwi]; #[rãŋgʷi]	‘lamp’
[|¯ \]	[tãwa]; #[tãŋgʷa]	‘tern’
[|– – –]	[rãwau]; #[rãŋgʷau]	‘axe’
[|–¯–]	[kɨ́ŋgʷou] ~ [kɨ́wou]	‘hermit crab’
[|–¯–]	[tãŋgʷau] ~ [tãwau]	‘bush turkey’
[|–¯–]	[tãŋgʷato] ~ [tãwato]	‘tongue’

The tendency to pre-stopping suggests either a consonantal origin for the nasalisation on the vowel (as suggested by Voorhoeve 1971 – see 1.5 for a discussion of some problems with this notion), or a more stopped origin for the /w/. Given that proto-Skou had a *gʷ phoneme (Donohue 2002), since lost in Skou, this might reflect the reintroduction of that phonetic sequence to some extent. Regardless of these diachronic speculations it is clear that /w/ is a phoneme in Skou, and that the major realisation of that phoneme is as a labio-velar glide.

2.2.1.4 /m/, /f/, /n/

No special allophony has been noted.

2.2.1.5 /t/

The voiceless alveolar stop is almost always realised as a simple stop, [t]. Occasionally, when intervocalic and preceding a high front vowel, it is heard as a fricative [s]; this seems to occur more frequently when the syllable is low-pitched (though the paucity of data makes this an impressionistic, and not statistic, observation). This is found in the speech of all ages of Skou speakers, and in all cases is a very infrequent allophone, which, if pointed out to someone, will inevitably result in either denial that an [s] was produced (if it occurred in their own speech), or else condemnation of the speaker as someone who cannot speak the language ‘properly’. In any case, it is a highly infrequent allophone, which nevertheless is found scattered about the language.

Some examples of words that have been heard with alternations between [t] and [s], and some other words that have not been observed with an [s] because of the wrong pitch environment.

Table 16. Fricativisation of /t/

Phonemic form	Pitch		Phonetic form
/nati/	HL	‘new’	[nati] ~ [nasi]
/fati/	HL	‘hut’	[fati] ~ # [fasi]
/hâti/	FL	‘coconut rope’	[hâti] ~ *[hâsi]
/bati/	LH	‘devil, demon’	[bati] ~ *[basi]
/tâti/	HH	‘cicada’	[tâti] ~ *[tâsi]

The fact that even a word like *hàngti* ‘coconut rope’ never shows an alternation might mean that the nasalisation on the preceding vowel is also a (negative) conditioning factor in the realisation of the [s], but the infrequency of this allophone makes this speculative.

Another, and even more rare, allophone of /t/, is found word-internally preceding a /u/, provided that the preceding vowel is not rounded. We might formalise the conditions governing this allophone as

(99) /t/ → [tʷ] / $V_{[-\text{round}]}$ __ u

In this environment the /t/ is strongly rounded, to the point that it is not difficult to perceive the sound as a [p]. Some examples of words that do and do not show rounded allophones are shown in table 17.

Table 17. Rounding of /t/

Phonemic form		Phonetic form
/tutu/	‘white’	[tutu] ~ [tutʷu]
/balɛ̃tũ/	‘demon’	[fati] ~ # [fasi]

Both these allophones are rare, partly because of the rather specific conditioning environments that each of them require, and partly because there are also very few word-internal /t/s in the language.

2.2.1.6 /l/

The lateral is sometimes realised as a nasalised lateral, [l̃], when it follows a syllable with nasality. This is most common, and most auditorily prominent, following nasalised vowels, but also occurs to some degree following a syllable with a nasal onset even if the vowel is not contrastively, but merely phonetically, nasalised. This is described in section 2.3.2.1. Examples of this allophone are not common, but are listed in table 20.

Table 20. Nasalised lateral allophones

Phonemic form		Nasalised lateral
/kɔ̃lɔ/	‘below’	[kɔ̃l̃ɔ]
/malɔ/	‘(clan name)’	[mal̃ɔ]
/tâlu/	‘eagle species’	[tâl̃u]
/tâlɛ/	‘lorikeet’	[tâl̃ɛ]
/tâlɯ/	‘fishing spear’	[tâl̃ɯ]

I have noted that there are not a lot of unambiguous examples of this nasal spread. It is interesting that sequences of the form /-VlV/ or /(m, n)VlV/ are greatly outnumbered by words with /-VlV/ and /(m, n)VlV/ or /(m, n)VlV/, respectively, implying that this rule has some diachronic, as well as synchronic, validity. The fact that in the related language Leitre *l has shifted to /n/ when it occurs in a syllable with a nasalised vowel is further evidence that this rule was productive at an earlier stage in the language's history.[3]

2.2.1.7 /r/

The trill has been reported as displaying preaspiration when it occurs initially. As noted in 1.5, the Dutch linguists Cowan, Galis and Voorhoeve reported this, and wordlists taken in 1985 by members of the Summer Institute of Linguistics also show initial [h ~ x ~ k] preceding an /r/. This is not prominent in the speech I have heard, some of it from the same informants used by Moxness and Kalmbacher in 1985. For example, the word which is here transcribed as /rəbi/ 'head' is recorded in 1985 as xr̃ə̃bì / hr̃ə̃bì (Moxness) and 'kr̃əbi (Kalmbacher). Similarly 'fire', /ra/, is listed by Galis as (g)ráh. The initial <g> may seem strange unless you recall that <g> is the grapheme used for a voiceless velar fricative [x] in Dutch. The brackets presumably indicate the optionality of the segment, thus yielding [xra] ~ [ra] (Galis uses a final <-h> to mark either nasality or high tone, not aspiration).

2.2.1.8 /j/ and /ɟ/

The palatal glide shows a range of allophony between a glide, an affricate and a fricative, with younger speakers more likely to select allophones towards the glide end of the range, in keeping with formal Indonesian norms, and older speakers more likely to select more affricated allophones (which, in addition to being presumably more 'original', also reflect Irian Malay forms, which has lost considerable prestige amongst the younger generation). The palatal stop is merging with the glide in the speech of many younger Skou people, but in more conservative speech they are clearly differentiated. The allophony here is driven by dissimilation, with the more back allophones appearing preceding front vowels, especially [i]. This creates maximal phonetic distance between the glide and the stop phonemes in identical contrasts, but also creates similar enough allophones for younger speakers to reinterpret the allophones as all belong to the one phoneme.

Table 19. Allophony of /ɟ/ and /j/

		Environment	
	Allophone	Older speakers	Younger speakers
/j/	[j]	/ __ front	(unconditioned)
	[ʒ]	(unconditioned)	(unconditioned)
	[dʒ]	(unconditioned)	/ __ back
/ɟ/	[ɟ]	/ __ back	n/a
	[gʲ] ~ [gj]	/ __ front	n/a
	[g]	/ __ front	n/a

[3] For instance, compare Leitre na 'mouth' with Dumo/Dusur lã, Skou lã-u. See Donohue (2002).

We can see that there is a process of dissimilation in operation in syllable with either the palatal stop or the voiceless bilabial stop. With the bilabial stop we can see that rounding is realised on the stop only when it is not present in the syllable nucleus, and with the palatal stop we observe that the more back allophones of the stop are realised only when the nucleus contains less back vowels. Examples of these processes are shown in the following pairs of allophonic minimal pairs.

Table 20. Allophones of /p̪/ and /ʈ/

	Onset					
Nucleus	/p̪/			/ʈ/		
i	[pʷ]	[pʷi]	‘mountain’	[gʲ]	[gʲĩ]	‘break’
ɛ	[pʷ]	[pʷɛ]	‘smoked’	[gʲ]	[gʲɛ̃]	‘place’
a	[pʷ]	[pʷa]	‘water’	[ɪ]	[ɪa]	‘sea’
ɔ	[p]	[pɔ̃]	‘edge’			
u	[p]	[pũ]	‘bamboo’			
ɯ						
ø	[p]	[pø̃]	‘tongue’			

Note that neither /p̪/ nor /ʈ/ is found with /ɯ/ in the nucleus, and there are in addition further restrictions on the vowels that may follow /ʈ/ (see 2.4.3), accounting for some of the gaps in the table above.

2.2.1.9 /k/

The high back consonant is noticeably more aspirated than the other consonants. No special allophony has been noted, but there is morphological variation between k and Ø. This is found in the 1SG subject prefix (xx.xx.xx), and in some lexical items, such as *ku* ‘child’, which is sometimes heard as *u* (such as in the fixed expression *tata u-ké* ‘Jesus’, literally ‘God’s child’, which is never heard as *tata ku-kê*). Further, *kung* ‘drink’ is sometimes heard as *hung*, though this might be contemporary sociolinguistic influence from the languages around Vanimo.

2.2.1.10 /h/

The /h/ phonemes is a relatively unexceptional voiceless segment, the only unusual aspect of which is its tendency to disappear between two adjacent vowels, as in *líhi* ‘garden’, which is often realised simply as [liː], though in careful speech [lihi] is heard. When this happens it appears that the whole second syllable, which has the /h/ onset, is omitted, as the tonal information associated with that syllable, as well as the [h], is not realised. The optional vowel lengthening found with this allophone is the only trace that is found of the elided syllable.

2.2.2 CONSONANTAL ANALYSIS

2.2.2.1 Consonantal analysis

The contrasts that we have seen for the consonants of Skou can be described with the features seen in table 16. This table presents the full specifications for all features on each distinctive consonant. Of course a greater range of features might also have been employed, but the set of eight used here suffices to differentiate all the vowels.

Table 21. Contrastive features of the consonants

	p	t	k	b	j	f	h	w	y	r	l	m	n
high	-	-	+	-	+	-	-	-	+	-	-	-	-
back	-	-	+	-	-	-	+	-	-	-	-	-	-
coronal	-	+	-	-	-	-	-	-	-	+	+	-	+
continuant	-	-	-	-	-	+	+	+	+	+	+	+	+
sonorant	-	-	-	-	-	-	-	+	+	+	+	+	+
nasal	-	-	-	-	-	-	-	-	-	-	-	+	+
lateral	-	-	-	-	-	-	-	-	-	-	+	-	-
voiced	-	-	-	+	+	-	-	+	+	+	+	+	+

Not all of these features bear the same functional load. Voice, for instance, is required only to allow the contrast between the two bilabial stops. There it is the sole distinguishing features, and so clearly necessary, but nowhere else is voice unpredictable from other features. We can make the following decisions about markedness hierarchies, based on observed cross-linguistic tendencies:

place	consonants are unmarkedly non-back;
	high (stop) consonants are unmarkedly back (and non-anterior);
manner	non-coronal sonorants are unmarkedly nasal;
	consonants are non-sonorant;
voicing	non-sonorants are unmarkedly voiceless;
	sonorants are unmarkedly voiced;
(Skou:	anterior sonorants are unmarkedly lateral;
	continuants are sonorant);

Applying these, we can stated that, unless expressly marked for [+ voice], a non-sonorant will be voiceless, and a sonorant will be voiced. Similarly, in Skou the basic continuant is, unless expressly marked to the contrary, a sonorant (and thus unmarkedly voiced). Taking these hierarchies into account redrawing of the feature system to reflect these markedness relationships is shown in table 22, in which the symbol *u* stands for ‘unmarked value (given the other features assigned)’.

Table 22. A markedness analysis of the Skou consonants

	p	t	k	b	j	f	h	w	y	r	l	m	n
high	*u*	*u*	+	*u*	+	*u*	*u*	*u*	+	*u*	*u*	*u*	*u*
back	*u*	*u*	*u*	*u*	–	*u*	+	*u*	*u*	*u*	*u*	*u*	*u*
coronal	–	+	*u*	*u*	*u*	*u*	*u*	*u*	*u*	+	+	*u*	+
continuant	–	–	–	–	–	+	+	+	+	+	+	+	+
sonorant	*u*	*u*	*u*	*u*	*u*	*u*	*u*	+	+	+	+	+	+
nasal	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	+
lateral	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	–	*u*	*u*	*u*
voiced	*u*	*u*	*u*	+	+	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*

Correlating this system with the observed frequencies of consonants in Skou we find that the most commonly occurring consonants are the ones with the least amount of featural specification. Compare the amount of specification in the table above with the following chart showing the relative frequencies of the different consonants of Skou.

Table 23. Frequencies of the Skou consonants

	p	t	l	n	h	k	r	f	b	m	w	y	j
Frequency (%age)	14	14	14	9	9	8	8	7	6	5	3	3	1

All consonants are specified as either plus or minus continuant. Apart from this, the least specified consonants are p and t, implying that specifying coronal is 'worth less' in terms of markedness than the other features. The next two most frequent consonants are also coronal, but sonorant. The most infrequent consonants are those that are sonorant but non-coronal, or else non-sonorant but voiced.

2.2.3.2 An alternative look at the consonants

The discussion above both describes and analyses the consonants of Skou. Some aspects of the distribution of the phonemes, and their allophones, suggests that an alternative view is possible.

The only voiced:voiceless contrast in the language is p:b; the dental, palatal and velar places lack this contrast, either phonetically or phonologically. Nevertheless, the fact that /w/ has the allophone [g] in some environments (see 2.2.1.4), and that there are two non-nasal sonorants in the alveolar place, a unique feature amongst languages in the Skou family and unusual in New Guinea generally, could lead to the following rearrangement of some of the phonemes:

Table 24. The consonants of Skou II

	Labial	Alveolar	Palatal	Back
Voiceless	p	t		k
Voiced	b	r	j	w
Continuant	f	l	j	h
Nasal	m	n		

The advantages of this arrangement are easy to see: the system is much more symmetrical, and there are less unusual gaps in the inventory. All the major places of articulation show a voicing contrast in the non-continuants, and all have a continuant. The fact that a /r/ is sometimes

realised as [d] following a nasalised vowel (eg., *fèng=ra* ‘just bad’ /fɛ̃ŋra/ appearing as [fɛ̃ⁿda])also suggests that this might be a valid analysis. While tempting, this analysis ignores the fact that historically the /ɾ/ is derived from *t, and that the voiced alveolar stop *d has developed into the /t/. While the arrangement does show a ‘neater’ picture of Skou consonants, it does not explain the borrowing of words with [s] into Skou with a [ɾ], whereas the historical scenario, in which *s > **t > /ɾ/ offers a perfect explanation (Donohue 2002).

It is interesting to reflect on the neat arrangements that can be made from a closed system in a language, and to ponder to what extent they reflect language-internal organisation, or a linguist’s striving for the ‘neater’ and ‘more elegant’ solution to a messy data set.

2.2.3 VOWELS

The vowel system of Skou can be described as consisting of seven contrastive vowels, including four rounded and three unrounded ones, and containing the typologically unusual high and mid front rounded vowels. The number and nature of vowel contrasts varies depending on the suprasegmental environment in which the vowels appear. Ignoring constraints imposed by the choice of onset, if present (see 2.4.3), we find the following contrasts in different tonal environments.

Firstly, in syllables with a high pitch there are seven contrasts, arranged as follows.

Table 24. Vowels encountered in high or falling pitch syllables

i		ɯ	
	ʏ		ʊ ~ u
e			o
		a	

Examples: fi ‘louse’, fe ‘tomorrow’, fʏ ‘spittle’, fɯ ‘afraid’, fa ‘sleepy’, fʊ ‘blind’, fo ‘corner house post’.

In syllables which have a falling pitch or a low pitch there is still a seven-way contrast, but it is composed of different phonetic vowels. The contrasts found in these environments are in most cases made by different vowels to those seen in high pitched syllables.

Table 25. Vowels encountered in syllables with low and falling pitch

ɪ			
	ø	ɯ˞	o ~ ʊ
ɛ			ɔ
		a	

Examples (falling tone unless stated): ɪ ‘no’, ɛ ‘cooked’, ø ‘ripe (fruit)’, ɯ˞ ‘marry’ (low tone), a ‘rope’, o ‘rotten’, ɔ ‘smell bad’.

It is clear that, rather than acknowledge twelve phonetically different vowel contrasts, there are only seven distinctions operating here, but with both somewhat overlapping allophones. Alternations in tone on words when they precede high or falling tones show the alternations.

When we extend the data set to include nasalised vowels, yet more phonetic vowel qualitites are found, though the total number of contrasts in each set is reduced. In all cases there is no highish- centralish- rounded vowel in a nasalised environment. When the syllable is nasalised

and has high or falling pitch, the vowel qualities are lower than would be expected for vowels in a non-nasalised syllable.

Table 26. Vowels encountered in high and falling pitched nasalised syllables

ɪ		
	ɵ̞	o
ɛ		ɔ
	a̠	

When the pitch of a syllable is low, then the vowel qualities are even lower, as seen in table 27.

Table 27. Vowels encountered in low pitched nasalised syllables

e		oˠ
ɛˠ	œ	ɔ
	a̠	

The total range of phonetic vowel qualities found is shown in figure 4, which contains sixteen different vowel types.

Figure 4. Phonetic vowel qualities found in Skou

i	ʏ	ʉ̠	u̠
ɪ	ø	ʉˠ	ʊ
e	ɵ̞		o
ɛ	œ		oˠ
ɛˠ			ɔ
	a̠		

Again, we would not want to posit sixteen underlying vowel contrasts, since no tonal or nasalisation environment allows all these vowel qualities contrastively. On the basis of the data above, we can assume the following underlying set of vowel contrasts in Skou, with four degrees of phonetic height, and at least five phonetic positions on the front-back axis, which are described phonemically in 2.2.2.1 in terms of a simply binary opposition in each direction.

Table 28. The underlying vowels of Skou

	front ←¾¾¾¾¾¾¾→			back
high	i		ʉ̠	u̠
↑		ø		
↓	ɛ			ɔ
low		a̠		

These vowels show allophones in different suprasegmental environments according to the forms shown in the preceding tables (tables xx - xx). For instance, the variation in the back vowels can be summarised in (99):

(99) /ʉ/ → [o] / low pitch (→ [ʉ] elsewhere)
/ɔ/ → [o] / high pitch (→ [ɔ] elsewhere)
(a similar analysis can be developed for the front vowels and the non-back rounded vowels)

It could be argued that the fact that the same phonetic quality (in this example, [o]) is being assigned to different phonemes based on the pitch environment is an unnatural stipulation. That is, an alternative analysis would assign the identical [o] vowels to the one phoneme, and the alternation between [ɔ] and [ʉ] would be assigned to another phoneme, as in (99):

(99) /ʉ/ → [ɔ] / low pitch (→ [ʉ] elsewhere)
/o/ → [o] / everywhere

The advantage of this solution would be that the language learner has only one rule of allophony to acquire, that accounting for the variation between the extremes, and one vowel remains constrant. The practical differences between the analysis in (99), with one varying vowel and one unchanging vowel, and the one proposed in (99) can be seen in the data in table xx:

Table xx. Two analysis of vowel contrasts

Phonetic form			Analysis: (99)	(99)
[kɔ]	[|–]	'east'	/kɔ/	/kʉ/
[ko]	[|–]	'child'	/kʉ/	/ko/
[ko]	[|¯]	'kind of armband'	/kɔ/	/ko/
[kʉ]	[|¯]	'dew'	/kʉ/	/kʉ/

We can show that the alternations shown here as allophonic, summarised in (99), are in fact dynamic allophones of the same vowels. This can be demonstrated by examining the allophones of the vowel /ɛ/ when the syllable in which it is appeared changes pitch. For instance, the genitive pronouns (see xx.xx) are derived from the basic pronouns by changing the pitch to a falling one (or in one instance high – see xx.xx), regardless of what the lexical pitch for that pronoun is. When this happens, the allophone of /ɛ/, the vowel of most pronouns, is raised:

Table 19. Allophony of /ɛ/

		Environment: basic pronoun; low pitch		genitive pronoun; high or falling pitch	
/pɛ/	3SG.F	[pɛ]	[|–]	[pe]	[|\]
/tɛ/	3PL	[tɛ]	[|–]	[te]	[|\]
/kɛ/	3SG.NF	[kɛ]	[|–]	[ke]	[|¯]

Clearly the only difference between the basic and the genitive pronouns is the pitch, and there is a clear relationship between the two. This is suggestive that the differences in vowel quality do reflect actual allophony. Furthermore, speaker preferences for orthographic representation are also supporting evidence for the analysis here (with the orthographic forms ko 'east', ku 'child', kó or ko 'armband' and kú or ku 'dew'

The allophones that have been reported for vowels in different pitch environments in the various tables of this section are summarised in table 29.

Table 29. Vowel allophones in Skou conditioned by pitch or nasalisation (summary)

	Non-nasalised		Nasalised	
	High pitch	other	High pitch	other
/i/	i	ɪ	ɪ	e
/ɛ/	e	ɛ	ɛ	ɛˠ
/a/	a	a	a	a
/ɔ/	o	ɔ	ɔ	ɔ
/u/	u,ʊ	ʊ,o	o	oˠ
/ɯ/	ɯ	ɯˠ	–	–
/ø/	ɤ	ø	ɵ	œ

Note that there is no low front [æ] phone in Skou. While this is not surprising cross-linguistically, it is striking compared to the other languages closely related to Skou (see 1.2), all of which show this phone, as a nasalised allophone of /ɛ/. The lack of this sound in Skou is something that visitors from Papua New Guinea remark upon as a salient quality of Skou.

The list in table 29 does not exhaust the allophonic possibilities for vowels in Skou, as the form of the vowel in a preceding syllable of the same phrase also has an effect, as described in the following section. Additionally, there is one non-syllabic allophone of a vowel. The vowel /i/ is realised as a nasal in one environment. While there is only one morphophonological environment for this unusual allophone, it does occur extremely frequently. The determiner / demonstrative clitic =/ĩ a/, orthographically =*ing a* 'the', is low-toned and in an unstressed position in whatever word it occurs in. As such, it is not surprising that it is often pronounced as a single syllable, with the high vowel pronounced as a glide, =[j̃a]. A further development of this desyllabification is for the nasalised palatal glide to unsurprisingly be realised as a palatal nasal, =[ɲa]. This is particularly common after a /u/ vowel, and less common after a nasalised vowel. Some examples of these allophones are shown in (99) - (99). Note that in (99) the presence of phonemic nasalisation on the last vowel of the noun decreases the likelihood of the [ɲ] allophone appearing.

(2) /pɛãku ĩ a/ 'the girl' {*pe=angku ing a*}
[pɜãŋku ĩa] ~ [pɜãŋkuj̃a] ~ [pɜãŋkuɲa]

(3) /ha ĩ a/ 'the bag' {*ha ing a*}
[ha ĩa] ~ [ha j̃a] ~ [ha ɲa]

(4) /hã ĩ a/ 'the coconut' {*ha ing a*}
[hã ĩa] ~ [hã j̃a] ~ ±/# [hã ɲa]

Only two words are known with to have the syllable /$ĩ$/ with no onset, and one of them, the one without stress on that syllable and with vowel in the following syllable, also has the palatal nasal allophone.

(5) /taĩbɛ/ 'money' {*taíngbe*}
[taĩbɛ] ~ [taĩmbɛ]

(6) /ɲɛɔ̃/ ‘cat’ {*ingéong*}
[ɲɛ̃ɔ̃] ~ [jɛ̃ɔ̃] ~
[ɲeɔ̃]

2.2.3.1 Further allophony

We have seen above that the pitch of the syllable affects the quality of the vowel, as does the presence of nasalisation on the syllable rhyme. In addition to this, the quality of vowels in neighbouring syllables, particularly preceding syllables, affects the quality of the vowel (though there is no observed correlation between position in a word and vowel quality). The following table lists some common examples of vowel allophony influenced by the quality of the vowel in the preceding syllable, when there is an intervening consonant. For instance, the vowel [e] is heard in the second syllable when any of the sequences (C)iCɛ, (C)ɯCɛ, or (C)ɤCɛ (< (C)øCɛ) are found

Table 30. Vowel allophony and preceding vowels in V_bCV_a template

	Vowel in preceding syllable (V_b)						
V_a:	i	ɪ, e, ɛ	a	ɔ, o	ʊ	ɯ, ɤ	ø, œ
i	i	i	i	i	i	i	ɪ
ɛ	e	ɛ	ɛ	ɛ	ɛ	e	ɛ
a	ạ	a	a	ɑ̣	a	a	a
ɔ	ɵˠ	ɵˠ	ɔ	ɔ	ɔ	ɔ	ɔ̣
ʊ	ɯ	ɯ	ʊ	ʊ	ʊ	ʊ	ʊ̣
ɯ	ɤ	ɵ	ɯ	ɯ̣	ɯ̣	ɯ	ɯ
ø	ø	ø	œ	œ	ø	ø	ø

In addition to this, vowels can be substantially changed by a following vowel if there is no intervening consonant. This mainly involves assimilation in terms of rounding, and dissimilation in terms of height.

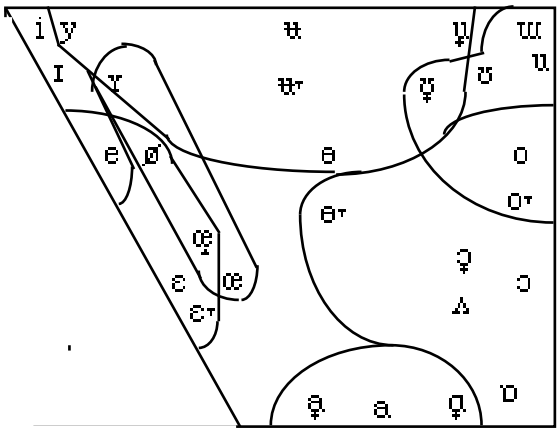
Table 31. Vowel allophony and preceding vowels in V_bV_a template

	Vowel in preceding syllable						
V_a:	i	ɛ	a	ɔ	ʊ	ɯ	ø
i	e	i	i	i	i	(i)	ɤ, ø
ɛ	ɛ	e	ɛ	ɛ	ɛ	ø	œ̣
a	a	a	a	a	a	a	a
ɔ	ʌ	ʌ	ɔ	ɒ	ɔ	ɔ	ɔ
ʊ	ɯ	ɯ	ʊ	ʊ	ʊ	ʊ	ʊ̣
ɯ	y	ɤ	ɯ	ɯ	ɯ	ɵ	ɯ
ø	ɤ	ø	ø	ø	ø	œ	œ

Combining the allophones in the preceding two tables with the pitch- and nasalisation-induced allophonic variants described in the preceding section we can easily see that many of the environments are compatible. The allophones listed in the above tables should thus be taken not as providing an absolute prediction of the realisation of a vowel, but a list of the most common variants that will be encountered. For instance, in the phrase ‘the burp’, *oe=ing a*, we find two competing environments that could determine the quality of the /i/ vowel, the preceding /ø/ and the nasalisation. The first of these would suggest a [ɤ] or [ø] vowel, and the second a [e] vowel.

In fact the vowel can be realised as any of these: the phrase may be heard as [œøa], or equally [øɛɑ], and several other variants besides. A full list of the qualities associated with each phoneme, assembled from the tables preceding in this and the previous section, is given in figure 5, which shows the different vowel qualities and is divided by lines indicating the regions of allophony of each phoneme.

Figure 5. Vowel spaces and overlap of allophones



This same data is summarised in table 32, showing more clearly the points at which the allophones of different phonemes overlap. In this table not all phonetically distinct forms have been assigned to a separate column, but rather some compromises have been made. The table shows the allophones from high front running through the low allophones to the high back, and then mid- and front unrounded qualities.

Table 32. Vowel allophones (complete)

	— Possible allophones —																						
i	i	ɪ	e																ɤ		ø		
ɛ			e	ɛ	ɛ˞																ø	ɐ̝	
ɑ						ɑ̟	ɑ	ɑ̠															
ɔ								ɒ	ʌ	ɔ	ɞ	o									ɵ˞		
u											o˞	o	ʊ	ɯ	ʉ	u							
ɯ																ɻ	ɯ	ɯ˞	ɤ	ʏ	ɵ		
ø																			ɤ		ø	ɐ̝	œ

Another point of note that is immediately obvious from figure 5 and table 32 is that many of the vowel phonemes show allophones that are identical or near-identical to those found for other phonemes, in different environments. More relevantly, many of the allophones of some vowels overlap with the allophones of other vowels in tonal environments. This creates some difficulty for an outsider hearing the language for the first time, and is probably responsible for Voorhoeve's (1971) analysis of the language as having nine vowels.

The phonetic data can be modelled phonologically without recourse to extreme specification, and accounting for the allophones of the underlying vowels is easily accomplished by using the following set of features to describe and separates these vowels.

Table 33. Features of vowels in Skou

	i	ɛ	a	ɔ	u	ʉ	ø
high	+	–	–	–	+	+	–
back	–	–	–	+	+	–	–
front	+	+	–	–	–	–	+
round	–	–	–	+	+	+	+
(low	–	–	+	–	–	–	–)

The feature [low] has been included in the table not because it is necessary to distinguish any vowels in Skou, but because it is a reminder of the low status of /a/. As with the consonants, we can redraw this table in terms of marked and unmarked categories. The following principles are applied, none of them specific to Skou.

frontness	vowels are unmarkedly non-back;
	non-back vowels are unmarkedly front;
height	non-back, non-high vowels are unmarkedly low
rounding	back vowels are unmarkedly rounded;
	non-back vowels are unmarkedly unrounded

This results, along with the removal of the redundant feature [low], with only seven 'plus' values in the chart, which is shown below.

Table 34. A markedness analysis of the Skou vowels

	i	ɛ	a	ɔ	u	ʉ	ø
high	+	–	*u*	–	+	+	–
back	*u*	*u*	*u*	+	+	*u*	*u*
front	*u*	*u*	*u*	*u*	*u*	–	*u*
round	*u*	*u*	*u*	*u*	*u*	+	+

Again we can examine these features in terms of the predictions that they would make about the relative frequencies of vowels in the lexicon. Again, as with the consonants, these frequencies match up well with the amount of feature specification we have posited.

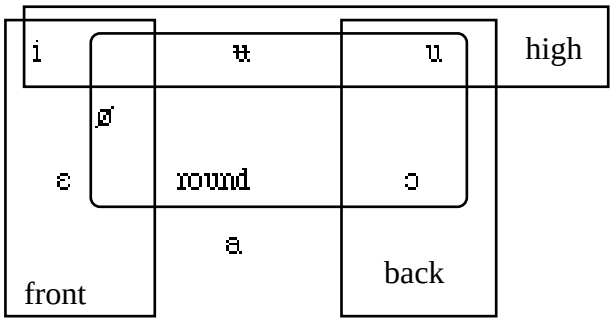
Table 35. Frequencies of the Skou vowels

	a	i	ø	ɛ	u	ɔ	ʉ
Frequency (%age)	29	24	16	13	7	7	3

Here too we can see that the features we have used to specify the vowels correspond to the frequencies with which the vowels are represented. The vowel a is overwhelmingly common, and is the least specified vowel. i is specified only for [+high], and is second in frequency. A significant drop later ø and ɛ appear, followed by the back vowels and finally the highly specified high mid rounded vowel ʉ.

This feature system establishes the following set of natural classes:

Figure 6. Simple natural classes



Additionally, it is useful to recognise some other classes of vowels, which are defined by a combination of features. These are described in table 36.

Table 36. Classes of vowels

Class	Defining features	Includes	Referred to by:
non-front round	+ round, - front	ʉ u ɔ	marking feminine
front, low	α front, - α low	i ɛ ø ɑ	co-occurrence with voiced stops
front unrounded	+ front, -round	i ɛ	marking plural
non-back, rounded	- back, + round	ø ʉ	non-occurrence with [j]

The marking of feminine and plural is dealt with in the following section. Section 2.4 documents the co-occurrence restrictions that pertain between consonants of different types and vowels.

2.2.3.2 Changes in vowels for number or gender of argument:

The following rule describes the changes that are found in the vowels of a number of verbs when feminine is marked:

é α front ù	→	é - front	ù
ë β back û		ê - α back	ú
		ë - β high	û

This rule backs and rounds vowels when the feature feminine is marked on a predicate. The following vowels are regularly affected:

i → ʉ	ʉ → u	li ‘do’	ʉʉ ‘she does’	fʉ ‘see’	fu ‘she sees’
ø → ʉ	u → ɔ	lø ‘shave’	rʉ she shaves’	fu ‘fear’	fɔ ‘she fears’
ɛ → ʉ		lɛ̃ ‘give’	nũ ‘she gives’		

(the consonant changes are regular and semi-regular alternations found with most verbs; see 8.2.2)

The operation of this rule is discussed in more detail in 8.2.3. When the feature plural is marked on the verb, the vowels change in a different pattern, as described in the following rule:

[α back]	→	é + front	ù
		ê (- back)	ú
		ê (- round)	ú
		ë - α high	û

This rule serves to front and raise a vowel; it creates the following alternations:

ʉ	→ i	ʊ	→ ɛ
ø	→ i	ɔ	→ ɛ
ɛ	→ i		

This rule is also discussed in more detail in xx.xx, and data on the irregular forms that are partly covered by this rule can be found in appendix xx.xx.

2.2.3.3 Vowels and syllabification

We have mentioned that the shape of the syllable in Skou does not allow for a coda position. This means that any sequences of vowels must necessarily involve a sequence of two syllables; in no cases are two adjacent vowels interpreted as belonging to the same syllable. This can be demonstrated by the ability of the two vowels to appear with different pitch contours, and more importantly with different specified values for nasality (though through the process of nasal spreading (xx.xx) the second vowel in a sequence of two vowels will be somewhat nasalised phonetically, even if not specified for nasalisation phonologically). Thus, for instance, in the word [fɛʊ̃] 'tomorrow', the two vocalic segments will never be realised as *[fɛʊ̃] or *[fɛ̃ʊ̃]; the nasalisation is a property of the rhyme of the second syllable, and can only spread rightward.

2.3 Suprasegmental phonology

In addition to the vowel and consonant segments, Skou also displays suprasegmental contrasts in both tone and nasalisation. There are three different pitch contrasts on monosyllables, and, although there are regularly three degrees of phonetic nasalisation, only two phonologically contrastive levels, nasalised and oral. These contrasts are illustrated in the following six-way matrix:

Table 37. Tonality and nasality contrasting on monosyllables

		Nasalisation	
Pitch		**oral**	**nasal**
low	[|–]	ta	tã
		'hair'	'canoe'
high	[|¯]	ta	tã
		'grass'	'bird'
falling	[|\]	ta	tã
		'arrow'	'machete'

A more detailed description of the realisation of these suprasegmental features is given in the following sections, first describing the tonal melodies and tone sandhi processes, and then the realisation of nasalisation and the differences between phonological and phonetic nasalisation.

2.3.1 TONE

Tone plays a high functional load in Skou, serving both lexical and grammatical functions. An example of a tonal minimal pair in a context-ambiguous environment can be seen in the following pair of sentences, in which the tone of the verb is the only possible means of disambiguating the words and the clauses.

(7) *Hòe nì=há i li.*
sago 1SG=pound be do
'I am pounding sago (to make flour).'

(8) *Hòe nì=hà i li.*
sago 1SG=weave be do
'I am weaving sago (into thatch).'

Skou contrasts three different pitch melodies on monosyllables, namely high, a 44 tone, low, 22, and falling, 41; these categories are recognised by Skou people, who describe the different pitch melodies, using Indonesian, as *logat tarik* (or *logat tinggi*) 'pulled tone' (or high tone), *logat tengah* 'middle tone' or 'average tone', and *logat tekan* 'pressed/stressed tone', respectively. Tone is independently assigned to each word, not to each syllable, as has previously been thought (Voorhoeve 1971, Donohue 1997) (see 2.6 for discussion). This section shall deal with the realisation of tone as pitch contours on syllables, and the contrasts thus presented, as well as the methodology of determining the phonological rules underlying the different pitch contours. As an aid to understanding the system quantitatively, fundamental frequency tracings of syllables representative of the different pitch envelopes described here are presented in appendix 4 (though see Rose 1988 for a caution against directly equating pitch, one of the perceptual correlates of linguistically significant tone, and fundamental frequency, an acoustic measure).

2.3.1.1 Tone Sandhi

Ross (1980) describes a process of tone sandhi in Vanimo. The same process of tone sandhi, which operates such that adjacent sequences of falling and then either falling or high are realised as a sequence of high tones, can be observed in Skou:

F → H / __H, F

This rule applies both word-internally and across words within the phrase. Examples of the application of this rule are given below, with the numbers in square brackets representing the pitch contour of the phrase, syllable by syllable (after Chao 1920), with 1 standing for the lowest pitch value and 5 the highest. The first set shows the tones in forms closest to their lexically specified form, as they appear preceding a low tone on the prominence clitic *a*. Note that even in this environment there is some change, with a grammatical word such as the clitic *a* following a falling pitched-syllable optionally appearing with the fall spread over the two syllables.

(9)	hø a [42 22] / [42 21]	pa a [44 22]	fɛ a [22 22]
	fall-low	high-low	low-low
	'the sago'	'the house'	'the chopstick(s)'

If these same roots appear with a falling tone following them, the pitch contour is in some cases substantially altered:

(10)	hø ni [44 41]	pa ni [44 41]	fɛ ni [22 41]
	fall-fall	high-fall	low-fall
	'my sago'	'my house'	'my chopstick(s)'

This gives clear evidence for the existence of a productive tone sandhi rule, with clear phonetic motivation. Further processes of tonal modification apply when a syllable appears phrase-finally, in which case the tone shows a slight falling off-glide (which can make the high

and the falling pitches hard to distinguish), and phrase-initially, in which case there is often a slight up-glide. The different allotones are shown in table xx.

Table 38. Tonal contours associated with the phonological tones

	__L	__H, F	##__	__##
High	44	44	33, 3(4)4	43, 42
Low	22	22	22	21, 11
Fall	41	44	341	41

Further tonal complications are due to the fact that different dialects maintain the tonal contrasts with different tone melodies. The description above applies to the variety of Skou spoken in Skou-Mabo. In Skou-Yambe, however, the following melodies are prominent:

Table 39. Tonal contours in Skou-Yambe

	__L	__H, F	__##
High	45	44	43
Low	22	22	21
Fall	342	34	41

We have seen examples of tonal contrasts on monosyllabic roots in section 2.3. Pitch is assigned to the syllable in Skou, and given that at least some roots are polysyllabic, we can also monitor the appearance of different tonal melodies on polysyllabic roots. This is taken up in the following sections.

2.3.1.2 Pitch contours on disyllabic roots

We would predict there to be seven contrastive tone patterns on disyllabic words (because there is no contrast between HH and FH, or between HF and FF), and this is in fact attested.

Table 40. Pitch contrasts on disyllabic roots

Length of word	Tonal melody	Example	
2-σ	HH	lɛ̃fi	black
	HL	kĩʉ	green tree frog
	HF	fũli	scorpion
	LH	nɛkɛ	dog
	LL	pɛ̃rɔ	lip
	LF	pɛ̃bi	bamboo pig-arrow
	*FH	-	
	FL	lɛʉ	ketapang fruit, peanuts
	*FF	-	

The simplest account of this data from disyllabic roots involves one of two possible hypotheses about the lexical assignment of tone in Skou. Either

- there are restrictions on the tone combinations that can appear on multisyllabic roots, with *FH and *FF being proscribed; the same proscription results in tone sandhi when two (or more) monosyllabic roots with these tones come together;

OR

- there are no restrictions on the tones that can be assigned to each syllable in a multisyllabic root, but automatic tone sandhi processes neutralise absolutely the difference between the unattested *FH and the attested HH, and similarly with the unattested *FF and the attested HF.

Based on the data available we cannot decide between these two alternatives. When we examine trisyllabic roots, however, we find that neither of these hypotheses completely adequately accounts for the facts of Skou tonology, and that a third hypothesis presents itself.

2.3.1.3 Pitch contours on trisyllabic roots

With trisyllabic roots there is a smaller corpus of words - most lexical items of three syllable length are transparently compounds, such as mømóá HHH 'dolphin', composed of the specifier mø H 'fish', and the genus name móá HH 'dolphin'. Many examples of this sort of specifier-specific compounding can be found, and only a few examples are given below.

Table 41. Specifier + specific trisyllabic lexemes

Specifier			Specific type		
mø	H	fish	møbi	HH	flying fish
			møhaba	HHH	whale
			møhi	HH	eel
			møi	HH	turtle
			møli	HF	stingray
			mølie	HHH	dolphin
			møma	HL	shark
			møné	HF	crocodile
			møyã	HH	catfish
tã	H	bird	tãberɔ	HHL	butterfly
			tãɛ	HH	eagle
			tãfɛmu	HFL	dragonfly
			tãfi	HF	black bird (species)
			tãkɛ	HL	sunbird
			tãpa	HH	heron
			tanẽ	HL	praying mantis
			tãre	HF	cassowary
			tãũ	HL	hornbill
tã	F	blade	tã	F	machete
			tãlilɔ̃	FHL	scissors
			tãmiɔ	FLL	axe (< Tok Pisin *tamiok*)
			tãnɔfɔ	FLL	knife
			tãre	FL	handle of a machete

In these cases the obvious segmentability allows the items to be elicited one syllable at a time, and also in paradigms, and so the underlying F on the first syllable of 'scissors' can be discerned. When we have a polysyllabic, non-segmentable root, this is not the case. With a form such as ifãfɔ̃ HHL 'spit(tle)', or pirara LHH 'scar', there are not any morpheme breaks, and so no paradigmaticity: the first syllable of ifãfɔ̃ cannot be heard in any context other than a

following high tone, and so (keeping the two hypotheses presented for tonal melodies on disyllabic roots above in mind) we would not be able to determine whether this was underlyingly ‘FHL’, for instance. Examining trisyllabic roots would allow us to see if the pattern observed in disyllables, that of disallowing a F before another F or a H, holds. Of the 27 logical possibilities for trisyllables, illicit sequences of *FH or *FF would occur in ten, predicting that we should find seventeen contrastive melodies. The following results emerge; putatively illicit melodies have been marked with an asterisk.

Table 42. Tonal melodies on polysyllabic roots

Length of word	Tonal melody	Example	
3-σ	HHH	lɛ̃bɑ̃bɑ̃	sandfly
	HHL	hahafa	slow
	HHF	-	
	HLH	-	
	HLL	piøʉ	wound
	HLF	-	
	*HFH	-	
	HFL	nahipa	eight
	*HFF	-	
	LHH	mabiri	twenty-four
	LHL	kũpaʉ	spider, octopus
	LHF	-	
	LLH	paao	earthworm xxx
	LLL	rɑ̃waʉ	axe
	LLF	-	
	*LFH	-	
	LFL	-	
	*LFF	-	
	*FHH	-	
	*FHL	-	
	*FHF	-	
	FLH	-	
	FLL	-	
	FLF	-	
	*FFH	-	
	*FFL	-	
	*FFF	-	

While it is true that the predicted gaps do not occur, we must also note that seven of the remaining seventeen possible melodies are also not found. Most interestingly, these gaps are not random. The following sections presents an alternative, better analysis of pitch in Skou as a word-level phenomenon.

2.3.1.4 Tone melodies and pitch contours

In the previous section, we saw that for trisyllabic roots the following melodies are attested:

Table 43. Melodies associated with trisyllabic roots

Attested:					Not attested
[¯ ¯ ¯]	[¯ ¯ _]	[_ _ _]	[_ ¯ ¯]	[_ ¯ _]	[¯ ¯ \], [¯ _ ¯],
	[¯ _ _]		[_ _ ¯]	[_ \ _]	[¯ _ \], [_ ¯ \],
	[¯ \ _]				[_ _ \], [\ _ ¯],
					[\ _ _], [\ _ \]
high	fall	low	rise	rise-fall	

It can be seen that the patterns of allowed tone melodies are clear: there are five word-melodies, which have different points of inflection (Donohue 1997) for the complex tones. A melody of the sort HLH or HLHL, which would underlie a (predicted, but not attested) pattern such as *[\ _ ¯] and *[¯ _ \], respectively, is not a member of the five word-melodies allowed in Skou. The patterns which were not predicted by virtue of being ruled out on the automatic tone-sandhi analysis all involve HLH or HLHL melodies (or worse).

Before abandoning the syllable-tone analysis we should examine the disyllabic data in the light of this word-tone analysis. If there is no correlation between the disyllabic word-melodies and those seen in trisyllables, then the analysis would lose credibility. Rearranging the disyllabic data in terms of the categories discovered for trisyllabic roots, we find the following patterns:

Table 44. Melodies associated with disyllabic roots

Attested:					Not attested
[¯ ¯]	[¯ _]	[_ _]	[_ ¯]	[_ \]	[\ ¯], [\ \]
	[¯ \]				
	[\ _]				
high	fall	low	rise	rise-fall	

Again the non-occurring patterns involve HLH or HLHL melodies, and the allowed patterns all fit into the five word tone patterns discovered for trisyllabic roots. It remains only to compare the apparently simple three-way distinction on monosyllabic roots with this analysis. Since only three tones are contrastive on monosyllables, we need to develop a careful methodology in order to detect traces of a five-way contrast. Two factors can assist us:

- although rise and rise-fall are found as word melodies, there are no cases, in either polysyllabic or monosyllabic words, of a LH being associated with a single syllable;
- while no homophones exist in polysyllabic words, there are many homophones on monosyllables.

The first of these factors suggests that there is a universal constraint in Skou against the sequence LH associating to a single syllable. This would bar the direct realisation of either a LH or a LHL melody on monosyllables, which is the observed pattern.[4]

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4 Parenthetically, we can note that this restriction, combined with the observed restrictions on the data, would also argue strongly against the need for a tonal root node construct in Skou.

The second factor is also suggestive of a tonal contrast collapsing on monosyllables. While some degree of homophony is to be expected (the phonological resources of Skou only allow for 149 segmentally contrastive syllables,[5] not an high total), we can examine the frequency of homophones, arranged by the phonetic tone observed. We would predict that, all else being equal, if there was a tonal category collapse, there should be a greater number of homophones present on these syllables representing the many-to-one collapse than for a phonetic tone which only represents one underlying tone. This is shown graphically in table xx.

Table 45. Predictions of homophones with absolute neutralisation

Underlying tones:	X	Y Z
	|	\ /
Surface tones:	X	Y
Homophones?	*n*	*2n*

We can then examine the homophones found on monosyllables, and compare that with the prediction that both of the above factors have led us to: that LH and LHL melodies would be realised as one of the other melodies (phonetically [¯], [_] or [\]), with a concomitant increase in the incidence of homophony in these tonal categories. The results of a homophone search on a mini-dictionary file of approcimately 700 words are presented in table xx. The lexemes are arranged by tone, with the total number of syllables that show more than one meaning listed in brackets under the heading for the tone category. Thus, in the table below, we can see that the monosyllable [ø] is ambiguous between the meanings 'black ant (species)' and 'yam'. [ha], on the other hand, is four-ways ambiguous, with the meanings '(I/you(PL) close', 'nose', '(I/you(PL) walk', and '(I/you(PL) pound (sago)' (different conjugations means that some of the verbs are differentiated in other person/number/gender combinations; 'close' is *yá* in 3PL, whereas 'walk' is *tá*, for instance.

Table 46. Homophones in monosyllabic roots: high tone

Tone	Homophones							
High (26)	bi	tree sp.	bi	empty				
	fi	louse	fi	meet				
	ha	close	ha	nose	ha	stand	ha	pound
	hɛ̃	yawn	hɛ̃	oSpSi				
	i	snake	i	SpF, CH				
	ja	cup, glass	ja	sea	ja	wet place	ja	noose
	ka	hit	ka	armband				
	kã	I eat	kã	tusk				
	kɛ	catch	kɛ	k.o. rope				
	kɛ̃	ask	kɛ̃	shaman				
	kø	beetle sp.	kø	fence				
	kõ	thorn	kõ	under				
	ku	frog	ku	k.o armband	ku	fall		

[5] Given tonal restrictions and C-V restrictions, the total number of phonetically contrastive monosyllables is only 413.

la	roast	la	exterior wall				
lɔ	wash	lɔ	bud				
lø	shave	lø	ear				
lu	release	lu	cough				
lɯ	hear	lɯ	chop branch	lɯ	blow	lɯ	ashes
na	splash	na	sago bundle				
ɔ	big wave	ɔ	lime	ɔ	sago grub		
ø	black ant	ø	yam				
pã	bedbug	pã	chop.PL	pã	H, DH		
pi	full	pi	half-ripe	pi	language		
pø	endure	pø	thick				
rɔ	cloth	rɔ	matoa tree				
tø	beads	tø	hot ashes				

With low tones we again see an impressive range of homophones, and again there are some syllables that are up to four-ways ambiguous.

Table 47. Homophones in monosyllabic roots: low tone

Tone	Homophones							
Low	a	cloud	a	blackpalm				
(19)	fa	betelnut	fa	inner wall				
	fu	rain	fu	see.F				
	fɯ	see	fɯ	that				
	ha	bag	ha	star				
	hã	coconut	hã	peel				
	hũ	drink	hũ	edge				
	i	well	i	young	i	pool	i	line
	ku	dew	ku	stab	ku	child		
	lã	clay	lã	mixing bowl	lã	tuber meal	lã	hit.F
	lø	work	lø	ant				
	lu	full	lu	narrow				
	ø	burp	ø	bamboo sp.				
	pa	water	pa	instrumental				
	põ	edge	põ	blow at fire				
	tã	canoe	tã	fish net	tã	gall	tã	last night
	ti	hot	ti	arrow shaft				
	ya	grass	ya	sister				
	yu	cousin	yu	brother				

Falling tone monosyllables also present homophones, but in no cases are there four-way homophones, and the number of homophones is in any case much less than with the other two tones.

Table 48. Homophones in monosyllabic roots: falling tone

Tone	Homophones					
Fall	ɛ̂	cooked	ɛ̂	wife		
(10)	la̋	help	la̋	prawn	la̋	HM
	lã̋	chop	lã̋	foot		
	lɛ̃̋	red ant	lɛ̃̋	fin		
	na̋	flesh	na̋	left(hand)		
	ø̋	ripe	ø̋	house part	ø̋	penis
	pa̋	scratch	pa̋	right(hand)		
	pã̋	flower	pã̋	steam		
	pi̋	dry in sun	pi̋	mountain		
	ta̋	bow	ta̋	SpM, SW		

Some caveats need to be attached to the data in this table. Firstly, there is no contrast between high and low tone for voiced onsets, so m̀ and ǹ could equally well have been listed as low tone homophones rather than high tone homophones. Further, several of the putative homophones are probably simply semantic extension; ‘ripe’ might well be a further, metaphorical extension of the same concept. For instance, the part of a house designated by [ø̋] [\] is a small dowel that joins two planks together in the flooring of a room; the homophony with ‘penis’ is likely to be a semantic extension, especially given that house building is an exclusively male affair. The range ‘sea’, ‘wet place’ and ‘cup, glass’ for [ja̋] [¯] is a very obvious extension of a core meaning involving liquid and its containment, as is the range ‘clay’, ‘pot’ and ‘pounded tuber dish (prepared in a pot)’ for [lã̋] [_]. Nonetheless, we have a significant difference in the number of homophones. These are arranged for easy comparison in table 31. Quite clearly, [¯] and [_] show twice as many homophones as does [\].

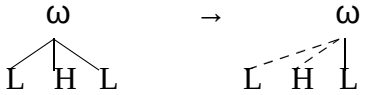
Table 49. Frequency of homophones on monosyllables

Tones:	H	L	F
Raw homophones:	26	19	10
Revised homophones:	21	20	9

The simplest conclusion, given the suggestion that we are actually dealing with five underlying tonal melodies, is that phonetic [¯] and [_] are each used to realise two underlying tones. Is there a principled method of determining which of LH and LHL are realised on which of [¯] and [_]?

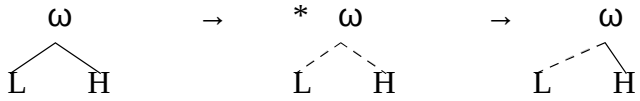
Given that the LH sequence is barred from appearing on the one syllable, we can propose a rule that dissociates LH from a syllable when it is assigned to it. This would operate as follows:

(11)



This would predict that an underlying LHL tone melody would be realised as [_] on a monosyllable. The other ‘missing’ melody, LH, is slightly more complicated. Simply

dissociating the LH part of the melody is not a sufficient explanation, since that would leave no tone for assignment to the lexeme. Since a word is not phonologically well-formed without an assigned tone, the rule of dissociation is blocked form applying completely, and only the first component of the melody is dissociated, leaving H free to associate with the syllable.

(12) 

We can then update table xx to reflect our understanding of the mechanics of Skou tone assignment on monosyllables:

Table 50. Homophones and absolute neutralisation in monosyllables

Underlying tones:	LH H	LHL L	HL
Surface tones:	[¯]	[_]	[\]
Homophones?	*20*	*20*	*10*

We can then see that, despite appearing initially to be a language with three contrastive tones, and having a productive tone sandhi rule that does satisfactorily account for the melodies found on disyllabic roots, the language does in fact contrast five tone melodies which are assigned at the word level (Donohue 1997), and which show reduced contrasts in monosyllables. While a substantial reanalysis of the data in Skou, this new analysis is not without support. Skou is related distantly to the languages of the Serra Hills and Piore River families. While no detailed phonological work has been carried out on the Serra Hills languages, it is known that they possess tone systems with five contrastive tones. In the Piore River family Barupu has received treatment from Crowther (2000), who shows that there are five tone melodies (L, H, HL, LH and LHL) that are assigned at the word level – the same melodies, and the same assignment principles, that we have just discovered in Skou.[6] In the light of this information from other members of the Macro-Skou family, the reanalysis does not seem so surprising.

It is also in striking accord with speakers' reactions when checking tonal minimal pairs. Many speakers, when confronted with, for instance, ha [_] 'bag' and ha [_] 'star', or ku [_] 'child' and ku [_] 'dew', would insist that they are not the same sounds, even though they 'normally' sound the same. If, for instance, 'bag' had the tone melody LHL and 'star' was simply L, we could account for speakers claiming non-similarity of sound (= different underlying phonological structure), while acknowledging that the sound of the words was the same (= identical surface phonetic form).

The reader should not conclude from this that speakers are unaware of homophones. All speakers recognised the identity through semantic extension of, for instance, ø 'penis, dowel in floorboards', and the phonetic identity of the semantically unrelated set tõ 'canoe' / tõ 'gall bladder' / tõ 'last night' was also acknowledged by some. But with some words speakers would insist on the distinction, even though they admitted that they were pronounced in the same way when you speak. Some sophisticated speakers, while insisting that the words in question did sound the same, would invent ad-hoc tonal distinctions in order to prove that they were really

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6 Crowther reports that in Barupu, which also has a process of tonal simplification on monosyllables (unlike Skou, this simplification is in Barupu), the tonal melodies are also dissociated from the left, matching the Skou analysis presented here.

different. These distinctions were not consistent from speaker to speaker, or from the same speaker at different times.

It remains to account for the differences in tonal association: an overall falling pitch on a disyllabic word is, for instance, supposed here to reflect an underlying HL tone melody associated with the word as a whole. The differences between the melodies [¯ _], [¯ \] and [\ _], attested in the words [kɪ̃ʉ̃] [¯ _] 'green tree frog', [fʊ̃ʊ̃ɪ̃] [¯ \] 'scorpion' and [ɔʉ̃] [\ _] 'peanut' has not yet been explained. It seems that there is, in addition to the tonal melody, a further phonological stipulation, that of the inflectional point for a contour tone (similar to the analysis of Usarufa in Donohue 1997). The words mentioned here would be differentiated as follows, with the asterisk indicating the inflection point.

Table 51. Homophones and absolute neutralisation in monosyllables

		Syllable	Tone association	Pitch contour
'frog'	[kɪ̃ʉ̃]-HL	σ σ	σ σ H L	[¯ _]
'scorpion'	[fʊ̃ʊ̃ɪ̃]-HL	σ σ *	σ σ H L	[¯ \]
'peanut'	[ɔʉ̃]-HL	σ σ *	σ σ H L	[\ _]

Since it is impossible to determine the tone melody underlying a monosyllable with a high or low phonetic tone, and since the notational diacritics ´ and ` adequately describe the patterns found in Skou (both the underlying tone melody, where it can be determined, and the inflection point for tonal association), they alone shall be used to represent tones in the description that follows.

2.3.1.5 Grammatical uses of tone/pitch

In addition to lexical distinctions being marked by tone, at least one grammatical category, tense, is marked by tone. In past tense the tone of any verb is always realised as low, regardless of the lexical tone associated with that word.

Non-past tense forms

(13)	ni hu [44 41] fall-fall 'I sew'	ni ha [44 41] fall-high 'I stand'	ni hʊ̃ [44 41] fall-low 'I drink'

Past tense forms

(14)	ni hu [41 22] fall-low 'I sewed'	ni ha [41 22] fall-low 'I stood'	ni hʊ̃ [41 22] fall-low 'I drank'

The following section deals with the phonetic effects of phonological nasalisation, and the differences between phonetic and phonological nasalisation.

2.3.2 NASALISATION

Nasalisation is contrastive at the segmental level in Skou. In addition to being specified on a particular consonant or vowel, nasalisation also influences other segments in several ways:

- it changes vowel quality;
- it affects the production of neighbouring consonants;
- it affects the production of neighbouring vowels

We shall address these points one by one in the following sections.

2.3.2.1 Segmental effects of phonological nasalisation

We can first note that nasalisation serves to lower the first formant of the vowels on which it occurs, and also shows a collapse in the vowel system in that ʉ does not occur as a nasalised vowel. We can contrast the two vowel systems as follows:

Table 52. Oral and nasalised vowel systems in Skou

Oral	Nasal
i	ĩ
e̞	ẽ
a	ã
o̞	õ
u	ṵ̃, ŋ
ʉ	–
ø	œ̃

Historically *ʉ merged with *ø in nasal syllables, so a proto-Skou *ʉ̃ has as its reflex in modern Skou the rhyme ø̃. Synchronically, however, where we would expect ʉ̃ we in fact find ṵ̃. The synchronic alternation is apparent in the case of predicates with the vowels ɛ or ø, which show inflection by vowel alternation for feminine. When not nasalised, these vowels show feminine with ø, but when nasalised the resulting feminine form is ṵ̃. This is discussed in context in section xx, but the following examples illustrate the point. With lø we see that the regular feminine form simply involves raising the vowel to ʉ. 'Speak', however, starts with the same vowel, but shows a high back vowel in the feminine, which is what we would expect for a verb with ʉ as its lexical vowel. The irregular vowel alternation for 'speak' follows from the more important constraint against the coda *ʉ̃.

	plain	feminine	
(15)	lø	rʉ	'shave'
	lø̃	rṵ̃	'speak'
	lʉ	rṵ	'hear'

This simply serves to illustrate the fact that historical processes are not the same as synchronic processes. Historically, when ʉ̃ became dispreferred, the vowel was lowered, in keeping with the general tendency for vowels to appear lower in nasalised rhymes. In modern morphophonemic alternations, however, the markedness relationship between the vowels has changed, and the height of ʉ is preserved, and the vowel simply appears as the most unmarked vocalic element that is both [+ high] and [+ round], which is u. Note that a common allophone of the nasalised u is, in addition to ṵ̃, also a syllabic velar nasal, ŋ. This is quite a striking allophone, with words such as 'she speaks' appearing as [rŋ]. The nasal stop allophone is most common following h or the nasals m and n: 'drink' [hŋ], 'deep' [mŋø], and 'kind of hand net' [nŋ].

While there is, synchronically, a restriction on the identities of the vowels that may appear nasalised, there are no such restrictions on the identity of the consonant in the onset of a syllable that has a nasalised vowel: all consonants may be present, and nasalisation contrasts may be found on syllables with any onset. Examples of contrastive nasalisation on vowels with different consonantal onsets are shown in table xx.

Table 53. Nasalisation contrasts with different onsets

Onset	Oral			Nasal		
p	pa	‘water’	[|–]	pã	‘pus’	[|–]
t	ta	‘hair’	[|–]	tã	‘canoe’	[|–]
k	kø	‘baked sago’	[|¯]	kø̃	‘tooth’	[|¯]
b	ba	‘who’	[|¯]	bã	‘beach’	[|¯]
j	ji	‘break’	[|¯]	jĩ	‘fly’	[|¯]
f	fa	‘wall’	[|¯]	fã	‘wing’	[|¯]
h	ha	‘bag’	[|–]	hã	‘coconut’	[|–]
w	wa	‘basket’	[|¯]	wã	‘sail’	[|¯]
y	ya	‘grass’	[|¯]	yã	‘sick’	[|¯]
r	ra	‘fire’	[|–]	rã	‘ironwood’	[|–]
l	la	‘outside wall’	[|–]	lã	‘clay’	[|–]
m	mɔ	‘season’	[|¯]	mɔ̃	‘sit (feminine)’	[|–]
n	nu	‘tree species’	[|¯]	nũ, nɥ	‘kind of net’	[|¯]

In addition to lowering formants on vowels, nasalisation is also phonetically prominent on consonants that are found in its immediate environment. A stop that immediately follows a phonologically nasalised vowel is often realised with some degree of homo-organic prenasalisation:

(16) /tãbɛrɔ/ ‘butterfly’ {*tangbéro*}
[tãbɛrɔ] ~
[tãmbɛrɔ]

This is not found when the following segment is a fricative or the trill r:

(17) /lɛ̃fi/ ‘black’ {*léngfí*}
[lɛ̃fi]
*[lɛ̃ŋfi]

Interestingly, when a semivowel follows a nasalised vowel, there is sometimes both prensalisation and stopping. This is shown in the following examples:

(18) /tãwatɔ/ ‘name of a seacape’ {*tangwáto*}
[tãwatɔ] ~
[tãŋgwatɔ]

(19) /yãyã/ ‘vomit repeatedly’ {*yangyang*}
[ɟãɟã] ~
[ɟãɲdɟã]

When the following consonant is the lateral ɹ the lateral is sometimes somewhat nasalised, although this is rare, but more commonly the vowel following the lateral is somewhat nasalised. Note that the vowel following a semivowel is not nasalised by spread: note the vowel in the second syllable of *tangwáto* above, and also the second syllable in *tangyúpa* ‘blue’ [tãɲdʒupa],

neither of which will occur nasalised, regardless of whether stopping occurs or not: *[tã(ŋg)wãtɔ], *[tã(ɲd)ʂũpa].

(20) /kɔ̃lɔ/ ‘below’ {*konglo*}
[kɔ̃lɔ] ~
[kɔ̃lɔ̃] ~ [kɔ̃l̃ɔ̃]

Prenasalisation of a following stop is of course undetectable when the following stop is a nasal, so the status of the n in ɲɲɔ ‘banana’ cannot be determined; it is certainly not perceptibly lengthened.

2.3.2.2 Nasal spread

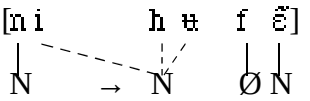
Nasalisation spreads from phonologically specified segments to segments to their right.[7] Nasalisation is phonologically present only on vowels (other than a) and the onsets ŋg and n (the first might arguably be g with a nasal tier attaching to it, but the absence of either phonological or phonetic ŋ in Skou makes the analogy with n less transparent). Despite this, we often find weakly nasalised pronunciations of segments that are not (and cannot be) contrastively nasalised phonologically. For instance, the nasality found in the final syllable of

(21) kɛ hʉ fɛ̃
3SG.NF stomach bad
‘He’s angry.’

is only specified on the last vowel, and all the preceding segments remain oral. If the first syllable contains a segment that is phonemically nasalised, however, this changes. The phonological specification is as follows, with only the first stop and the last vowel nasalised.

(22) ni hʉ fɛ̃
1SG stomach bad
CV CV CV
N N
‘He’s angry’

Because of the process of nasal spread, however, weak nasalisation is also found on segments to the right of the strongly-nasalised n (solid lines indicate strong nasalisation, and dashed lines show weak nasalisation).



After the fully specified nasal onset in *nì*, weak nasalisation spreads rightward until interrupted by an oral consonant, in this case the f. Despite the weak nasalisation spreading until interrupted by an oral non-sonorant, we can and must distinguish strong and weak nasalisation: weak nasalisation does not affect the quality of vowels to the same degree, and is not sufficient to induce prenasalisation on a following stop. Additionally, the weak nasalisation is found on all segments following the nasal stop, including the a, which cannot be strongly nasalised

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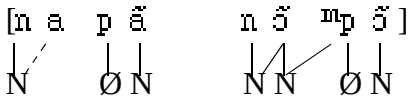
[7] This contrasts with the widespread appearance of leftward spreading of nasalisation in the other Skou languages. This typological difference is the result of the Eastern Skou languages losing the full contrast in nasalisation that is seen in Skou, where both the onset and the rhyme in a syllable may be independently specified for nasalisation; in the eastern Skou languages nasalisation is contrastive on the rhyme only if the onset is not specified as nasal.

phonologically. Other examples of the spread of nasalisation, resulting in weakly nasalised vowels and no prenasalisation, which contrasts with strongly nasalised vowels and prenasalised stops, can be seen in (99), in which the weakly nasalised vowel in the first syllable of 'five' does not induce prenasalisation on the following stop, whereas the phonologically nasalised vowel in the first syllable of 'four' does.

(23)

napã̌	nɔ̃pɔ̃
five	four
'five'	'four'



*[nãmpã̌]

Some other examples of the assignment of phonologically contrastive nasalisation, and its spread and blocking in adjacent syllables, is given in the following tables. the first shows the spread of phonetic nasalisation through a non-oral consonant.

(10) *nì ha tà*
'I run'

Segments:	n	i	h	a	t	a
Phonological nasalisation:	+	-	-	-	-	-
Phonetic nasalisation:	++	+	+	+	Ø	Ø

[nĩ̃hã̃ta]

In (11) we see the same spread of nasalisation to the right, but also see that the adjacent, yet preceding, segment [h] is not nasalised. This is clear evidence that nasalisation is not spreading simply through adjacency.

(11) *hang e ang*
'You all ate a coconut'

Segments:	h	ã̌	ɛ	ã̌
Phonological nasalisation:	-	++	-	++
Phonetic nasalisation:	Ø	++	+	++

[hã̃jɛ̃ã̌]

In (12) we again see the rightward spread of nasalisation, from the consonant *n* to the following vowel, and the absence of prenasalisation on a non-nasal stop following a weakly nasalised vowel.

(12) *tang nì ká*
'I shot a bird'

Segments:	t	ã̌	n	i	k	a
Phonological nasalisation:	Ø	++	++	-	-	-
Phonetic nasalisation:	Ø	++	++	+	Ø	Ø

[tã̌nĩ̃ka]

When a phonologically nasalised (that is, phonetically strongly nasalised) segment precedes an oral stop, that stop is realised with slight prenasalisation. The intrusion of the oral consonant blocks the further rightward spread of phonetic nasalisation.

(13) *tang ke ká*
'He shot a bird'

Segments:	t	ã́	k	ɛ	k	a
Phonological nasalisation:	Ø	++	-	-	-	-
Phonetic nasalisation:	Ø	++	+/-	Ø	Ø	Ø

[tãŋkɛ:ka]

(14) below illustrates the same process as (13), but with a different subject clitic further shows that the induced nasalisation is homo-organic with the following stop.

(14) *tang pe wá*
'She shot a bird'

Segments:	t	ã́	p	ɛ	w	a
Phonological nasalisation:	Ø	++	-	-	-	-
Phonetic nasalisation:	Ø	++	+/-	Ø	Ø	Ø

[tãmpɛwa]

2.4 Phonotactics revisited

We have now seen the segmental (consonantal and vowel) and suprasegmental (tone and nasalisation) features described individually. If we were to examine the permutations of these as they combine to produce syllables, we would naively expect the following number of potentially contrastive syllables:

Position	Onset		vowel		tone		nasalisation		
Contrasts	14	x	7	x	5	x	2	=	980
Examples	p, t, k, b, j, f, h, w, y, l, r, m, n, Ø		i, ɛ, a, ɔ, u, ʉ, ø		H, L, HL, LH, LHL		Ø, N		

In fact the number of contrastive syllables is significantly less than this (413). Some of the reasons for this have already been discussed:

- ɲ cannot appear nasalised;
- the melodies LH and LHL cannot be instantiated on a single syllable

Even taking these restrictions into account, we would still expect

$$14_{\text{onsets}} \times (7_{\text{oral Vs}} + 6_{\text{nasal Vs}}) \times 3_{\text{pitches}} = 546$$

different syllable types, which is still significantly greater than the number of possible syllables (30% greater). In this section I shall outline the other phonotactic restrictions that reduce the number of observed syllable types.

2.4.1 CONSONANT AND PITCH

There are two restrictions on pitch of syllable that are governed by the onset. Since they cover different categories which are not mutually exclusive, one consonant is doubly restricted.

1. Falling pitch does not occur on syllables with an initial [+high] consonant; this bars falling pitch from occurring in syllables with *ʎ*, *j* or *y* as their onset.
2. 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.

The second of these restrictions is phonetically-motivated: initial voiced stops show lowered F_0, and so the contrast between a high pitch and low pitch would be confused: the average frequency for a syllable with an initial voiced stop would be lower than expected. The actual pitch on these syllables is perceptually in between that of low pitched and high pitched syllables (judged based on the pitch heard when the syllable has a nasal onset or it vowel-initial).

No phonetically motivated explanation can be given for the absence of falling pitch on syllables with initial high consonants; it might be thought that the low frequency of palatal consonants (they total only 3% of the observed consonants) and falling pitches (only 15% of syllables) conspires to make this combination statistically unlikely in the language, rather than absolutely proscribed. Still, even with only 0.5% frequency we could expect to see some instances of this combination, whereas we do not.

2.4.2 VOWEL AND PITCH

There are no absolute restrictions on which vowels may occur with which pitch values: all vowels are found with all three syllable pitches. There are, however, striking skewings in the frequencies with which the vowels occur with different pitches. Table xx shows the overall frequencies of pitch contours found in all syllables, as well as a break down of the frequency of each vowel with each pitch contour. Values which are more than 10% deviant from the overall tendencies have been marked in bold.

Table 54. Pitch contour frequencies

	Pitch contour		
	low	high	fall
Overall:	47	37	16
Vowels:			
i	37	**48**	14
e	50	30	20
a	48	33	19
ɔ	**61**	31	8
u	51	35	14
ʉ	57	30	13
ø	**20**	**56**	24

Despite all vowels occurring in all pitches, there are clear preferences for high pitch to occur with i and ø, and for low pitch to occur with ɔ. This might be a reflection of the inherent frequency associated with vowels of different heights: low vowels show low frequencies, and

higher vowels higher frequencies (recall that in high pitched syllables, /ø/ is pronounced [ʏ]). While explanatory of the deviant frequencies observed, it does not explain the highly normal values found for u and ʉ. The normal values for a can be attributed to its very high frequency, and subsequent skewing of the overall pattern.

2.4.3 CONSONANT AND VOWEL

There are some very pronounced patterns of co-occurrence between the onset of a syllable and its nucleus. The voiceless consonants show no restrictions, nor do the non-nasal coronal sonorants *l* and *r*. The occurrence of *l* and *r* with the different vowels is shown in table xx, and typifies the frequencies found both with these two segments and the voiceless consonants.

Table 55. Non-nasal sonorant and vowel frequencies

Vowels:	i	e	a	o	u	ʉ	ø	Total
l	3	11	16	6	6	5	12	59
r	1	4	5	3	4	2	2	21

The non-occurrence of *[ʉ̃] has already been mentioned (xx.xx). Additionally, there is an absolute restriction that roots may not appear with a nasal onset and ɑ in the rhyme; this is a phonotactic reflection of the presence of non-contrastive nasalisation in these environments, given that vowels are nasalised when they occur after a contrastively nasalised segment, namely *m* or *n*. The frequencies of vowels after nasal onsets are skewed far from the overall frequencies, as can be seen in table xx.

Table 56. Nasal consonant and vowel frequencies

Vowels:	i	e	a	o	u	ʉ	ø	Total
m, n	3	5	23	7	4	–	5	48

The remaining sonorants, w and y, show even more restrictive patterns with respect to vowel co-occurrence. Neither of them may appear with the non-back rounded vowels ʉ or ø (This is true of roots, though some verbs with a ʉ or ø vowel allow these sequences to occur in the 3SG.F or 3PL inflections). Additionally, y may not occur with the other front vowels. Both of the glides show strong preferences for the low vowel, just as do the nasals.

Table 57. Glides and vowel frequencies

Vowels:	i	e	a	o	u	ʉ	ø	Total
w	2	4	5	2	3	–	1	12
y	–	–	9	2	2	1	–	14

Finally, the voiced stops b and j are both restricted to appearing only next to either low or front vowels. This, and the other restrictions, are all shown in table xx.

Table 58. Consonant and vowel restrictions

Consonants:	i	e	a	o	u	ɯ	ø
p, t, k, f, h	√	√	√	√	√	√	√
l, r	√	√	√	√	√	√	√
m, n	√	√	√	√	√	–	√
w	√	√	√	√	√	–	√
y	–	–	√	√	√	√	–
b, j	√	√	√	–	–	–	√

The layout of the table reflects both the fact that the restriction that apply to voiced stop onsets are not in the same 'continuum' as those that are found with the other onsets, and also that there is a track of sonority operating in the co-occurrence restrictions: the more sonorous the onset, the smaller the number of nuclei that may appear with it.

2.4.4 VOWEL AND NASALISATION

The only restriction of vowels cooccuring with nasalised syllables is the absolute ban on the appearance of *[ɯ̃]. When called for by synchronic rules, [ũ] is heard instead. Historically, roots with *ɯ̃ show reflexes with ø̃. Clearly, there has been a reinterpretation of the rules governing the non-appearance of *[ɯ̃]; historically the feature [-back] was preserved over [+high], and synchronically [+high] is favoured over [-back].

2.4.5 CONSONANT, VOWEL AND NASALISATION

There is a complex restriction that constrains the high front vowel from appearing nasalised with other than a bilabial onset, ∅, or no onset at all. That is, [pĩ], [bĩ], [kĩ] and [ĩ] are heard, but none of the other nine onsets that can occur with [i] appear with this vowel when nasalised.

Table 59. The vowel [ĩ]

Consonant:	p	t	k	b	j	f	h
[ĩ]	√	–	√	√	–	–	–
Consonant:	l	r	m	n	w	y	
[ĩ]	–	–	–	–	–	(–)	

This unusual restriction has a historical basis. The ability to appear with a nasalised [ĩ] applies to voiceless stops and bilabials, the same group of stops that could appear as part of an initial cluster in proto-Skou, and still can in more eastern languages (see Donohue 2002). Modern reflexes of these same stops (*p *t *k *b *m) can appear with a nasalised [ĩ] in their nucleus in Skou; the absence of a contemporary [tĩ] can be accounted for by noting that all modern occurrences of [t] reflect proto-Skou *s, *d or *j, and not a proto-Skou voiceless stop or bilabial. Just why this restriction should apply to one nasalised vowel is unknown.

A second restriction that involves consonantal and vocalic identity as well as the dimension of nasalisation. Although both [te] and [tø] are acceptable in oral syllables, there are no occurrences of *[tẽ] or *[tø̃].

2.4.6 PITCH AND NASALISATION

There are no correlations between pitch on a syllable and the nasalisation setting for the vowel; all pitches occur with nasalised and non-nasalised vowels.

2.4.7 CONSONANT CLUSTERS AND UNUSUAL SEGMENTS

In 2.1 we described the syllable structure of Skou as not allowing complex onsets. This is almost true – there are no lexical items that must unambiguously be specified as having consonant clusters. Nonetheless there are some cases of consonant clusters appearing in the language.

The first of these involves the inflection of the verb *oeng li* 'remember'. There is a regular inflection, and also an alternative inflectional paradigm which involves the cluster *pl* for 3SG.F; both of these are shown in (99) and (99) below.

Regular paradigm

(99)	ø̃	mø̃	kø̃	ɔ̃	ø̃	ø̃	ɛ̃
	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL

Alternative paradigm

(99)	ø̃	mø̃	ø̃	plɔ̃	ø̃	ø̃	ɛ̃
	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL

The second recorded instance of a consonant cluster involves the lexical item lópa 'earlier on', which has occasionally be recorded as [blɔpa]. This appears not to be random: the only cluster recorded is [bl], and never [pl], [tl], [kl], etc. This might, then, reflect an archaic form of the word, a relic from an earlier stage of the language. This view is be supported by the occasional record of /p/ pronounced as [kʷâ], reflecting proto-Skou *kʷ (Donohue 2002).

2.5 Orthography

The representation of the segments and supersegments of Skou will be described in the following sections (most of these conventions have already been seen in use, but without formal explanation). I shall present the conventions used for segments first, and then discuss the representation of tone and nasalisation.

2.5.1 SEGMENTAL ORTHOGRAPHY

The consonants are shown simply with graphemes that most closely represent their IPA norms, the one exception being that {y} is used for the palatal glide, in accordance with Indonesian orthographic norms. There is some support for the grapheme {j} to be used for this phoneme amongst younger speakers, but these are the ones who are collapsing the distinction between the glide and the stop. In order to give the best record of the most conservative variety of the language, the distinction between the glide and the stop has been maintained here.

The peripheral vowels are shown with the graphemes most closely corresponding to their IPA norms. The non-back rounded vowels are shown with digraphs, which initially attracted opposition from speakers, because they have no correspondence in Indonesian or Tok Pisin, the only written languages available to any Skou speakers. I shall discuss this and other socio-orthographic issues in xx.

The graphemes used to represent segments, and their phonological correspondences, are shown in table xx.

Table 60. Phoneme: grapheme correspondences

Phoneme	Grapheme	Phoneme	Grapheme
p	*p*	l	*l*
t	*t*	m	*m*
k	*k*	n	*n*
b	*b*	i	*i*
ɟ ~ gʲ	*j*	ɛ	*e*
f	*f*	a	*a*
h	*h*	ɔ	*o*
w	*w*	u	*u*
j ~ dʒ	*y*	ɯ	*ue*
r	*r*	ø	*oe*

Since there are very few sequences of adjacent syllables with no onset on the second syllable (less than one sixth of syllables lack a consonantal onset), the number of VV sequences in the language, particularly the number of ɔɛ or ɛɛ sequences, is very small. To differentiate these when they do occur, a dot or hyphen has been used to separate the syllables, as in *lo.e* / *lo-e* ‘north, deep sea’ and *tàru.e* / *tàru-e* ‘chest’, representing [lɔɛ] and [tarɯɛ] respectively, not *[lø] and *[tarɯ]. A sequence of any other two vowels, such as [ai] inn ‘father’, is not marked with a dot or hyphen, as there is no potential ambiguity: *ái*, not **á.i* or **á-i*.

2.5.2 TONE AND NASALISATION

Nasalisation is shown with the grapheme {-ng} at the end of the orthographic syllable. This was universally accepted by speakers, probably reflecting the pronunciation that many Skou people give to Indonesian words with final -ŋ, such as Indonesian pasaŋ {pasang} ‘high tide’, pronounced in Skou as [pasã]. Older speakers pronounce all final nasals in Indonesian as nasalisation on the vowel: Indonesian malam {malam} ‘night’, pronounced in Skou as [malã], Indonesian jantan {jantan} ‘male (animal)’, pronounced in Skou as [jãntã]. Younger speakers do not have this pronunciation habit, since they ahve received schooling in Indonesian, and acquired its phonology more thoroughly.

Tone is indicated by showing the pitch of the syllable: a high pitch is shown with an acute accent, low pitch with no marking, and falling pitch is marked with a grave accent. When the nucleus of the syllable is represented with a digraph, the tone mark for high or low appears on the first element of this digraph. Where a compound combines elements that undergo tone sandhi, the original, not the sandhi, pitch is marked. Similarly, the use of a low tone to mark past tense on verbs is not shown in the orthography. The principles of these orthographic choices are shown in table xx

Table 61. Graphemes used for tone and nasalisation: a selection

	Segments	Pitch	Nasalisation	Orthography
‘sleepy	fa	[¯]	Ø	*fá*
‘bad’	fɛ	[\]	N	*fèng*
‘far’	haba	[¯ ¯]	N, N	*hángbáng*
‘valley’	hø	[¯]	N	*hóeng*
‘green tree frog’	kiu	[¯ _]	N Ø	*kíngue*
‘heel	laitɔ	[¯ ¯ _] < F-HL	N Ø Ø	*làngíto*
‘peanut’	lɛu	[\ _]	Ø Ø	*lèue*
‘west’	lowɔ	[_ ¯]	Ø N	*lowóng xxxx*
‘I’	ni	[\]	Ø	*nì*
‘straight’	tulølø	[_ ¯ ¯]	Ø Ø Ø	*tuelóelóe*

The writing of tone by using one of the otherwise unutilised letters of the alphabet in the otherwise unoccupied coda position was mooted with some speakers. The fact that *c d q v x* and *z* are all free (*g* appearing in the nasalisation digraph *-ng*), and that no words end in codas, would make this an attractive choice (mirroring some Hmong orthographies). When presented with the possibility of orthographically distinguishing [ta] [_] ‘hair’ from [ta] [¯] ‘arrow’ by writing the first as *ta* and the second as (for example) *tac, taq,* or *tax,* the response I received was that, yes, you could write it that way, but that it would be wrong. The letters might indicate the pitch (a concept that was treated rather dubiously), but they would still result in the words [taʧ], [tak] and [taks]: familiarity with Indonesian orthography (in the case of {c}), awareness of the use of {q} in the Koran, and reports of {x} from Papua New Guinea, provided consonantal associations which were too strong to be shaken off for the purposes of tone marking.

An occasionally-used native orthography already used a diacritic to mark (amongst others) tonal distinctions, so the notion of diacritics was not too foreign.

2.5.3 RESOLVING CONFLICTS IN THE ORTHOGRAPHY

In section xx I mentioned that the use of the digraphs *oe* and *ue* initially encountered resistance amongst some Skou speakers, especially the more formally educated people who had experimented with an orthography for the language themselves. The received wisdom on the subject of a Skou orthography was that it was no problem to write the language, but that there was no point in doing so, since you could not then read what you had written. This paradox has its roots in the representation for the non-back rounded vowels, and suprasegmentals.

Allowing for the fact that ʉ does not occur, the following syllable nuclei are differentiated in Skou:

Table 62. Skou nuclei

	High pitch			Low pitch			Falling pitch		
Oral	i	ʉ	u	i	ʉ	u	i	ʉ	u
	ɛ	ø	ɔ	ɛ	ø	ɔ	ɛ	ø	ɔ
		a			a			a	
Nasal	ĩ		ũ	ĩ		ũ	ĩ		ũ
	ɛ̃	ø̃	ɔ̃	ɛ̃	ø̃	ɔ̃	ɛ̃	ø̃	ɔ̃
		ã			ã			ã	

The locally-developed orthography represented these nuclei in the following way:

Table 63. Local orthographic representation of Skou nuclei

	High pitch			Low pitch			Falling pitch		
Oral	*i*	*ê*	*u*	*i*	*ê*	*u*	*ê*	*ê*	*ê*
	e	*ê*	*o*	*e*	*ê*	*o*	*ê*	*ê*	*ê*
		a			*a*			*ê*	
Nasal	*ing*		*ung*	*ing*		*ung*	*ê*		*ê*
	ê	*ê*	*ê*	*ê*	*ê*	*ê*	*ê*	*ê*	*ê*
		ang			*ang*			*ê*	

Clearly the use of *ê* is not random. It serves to:

- mark the non-back rounded vowels in all environments;
- mark the falling tone in all environments;

and

- mark nasalisation on a non-low, non-high vowel.

While consistent, and certainly not hard to learn, this orthography does suffer from the fact that, of the 39 contrasting nuclei in Skou, 23 of them are represented by the same grapheme *ê*. this led, as Skou speakers described to me, to a writing system that is easy to learn, but pointless to apply: you can write things down with no difficulty, but noone can then read your composition. Compare this existent, but dysfunctional, system with the 100% of phonologically distinct forms that is found in the current orthography.

Table 64. Current orthographic representation of Skou nuclei
(aligned to match the previous two tables)

	High pitch			Low pitch			Falling pitch		
Oral	*í*	*úe*	*ú*	*i*	*ue*	*u*	*ì*	*ùe*	*ù*
	é	*óe*	*ó*	*e*	*oe*	*o*	*è*	*òe*	*ò*
		á			*a*			*à*	
Nasal	*íng*		*úng*	*ing*		*ung*	*ìng*		*ùng*
	éng	*óeng*	*óng*	*eng*	*oeng*	*ong*	*èng*	*òeng*	*òng*
		áng			*ang*			*àng*	

While 100% representative of all the contrasts, the orthography used here is inferior to the local one in some respects. The digraph representations *oe* and *ue* are not intuitive, although they are decipherable even to speakers with no instruction. The use of *oeng*, four letters, to represent a single nucleus is a lot to ask, especially when then required to apply a tone mark as well. Another problem with the current orthography is that vowel alternations in verbs are harder to represent. An alternation of any sort in a verb with falling tone needs no orthographic manipulation in the local orthography: the common alternation of ê to e in feminine verbs requires no change in the appearance of the written verb in terms of its nucleus (*ê* remains *ê*), which, given that the information about the gender of the arguments will be present in the form of, minimally, proclitic pronouns, is redundant anyway. In the current system we would need to mark *oe* and *ue* in the different forms of the verb (see xx.xx for details).

Another issue in the orthography is the representation of the palatal consonants, here shown as *j* /ʧ/ and *y* /j/. Since in the speech of younger people these two phonemes tend to collapse, there is an understandable tendency to collapse them (as *j*) if writing. While the differentiated spelling employed here has been judged acceptable, it is not intuitive for most people. This is a difference that is unlikely to survive in any fluently written Skou, since most younger people want to write both phonemes with a *j* (probably reflecting the fact that, for younger speakers, the two are collapsing to one phoneme), allowing the *y* only as a concession to the authority of the older Skou speakers.

The orthography, if any, which ultimately gains ascendancy in the Skou villages will be a product of locally-defined useability, not a linguist's notion of accuracy, and so will probably be a compromise between the archivally-correct form used here, and the functional system that was developed earlier. We can only wait and see.[8]

2.6 A note on problems in identifying tonal systems

The identity of the Skou tonal system as a word-based one, rather than a syllable-based one, has not been unproblematic, and needs some comment in the light of the previous classification of Skou as a model example of a syllable-tone language of New Guinea (Donohue 1997: 354), and the description of Skou tonal contrasts in Voorhoeve (1971), and a later, similar, description of tonal patterns in the closely related language of Vanimo by Ross (1980).

The methodology employed in Donohue (1997) was to examine not just the pitch contrasts that occur in the language, but also the contrasts in patterns of pitch. For example, given a contrast between H and L on monosyllables, we can say almost nothing about the tone system of the language, other than that there is use of pitch tol lexically differentiate words (which, it might be parenthetically noted, is not a requirement of a phonological system that is justifiably called 'tonal'). The appearance of two monosyllabic words in a language with a contrastive H and L could be

1 the appearance of two separate syllable level tones in the language, H and L, which show just this contrast in pitch;

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8 See San Roque (2001) for a detailed study of the marking of tone in the orthographies of two languages related to Skou.

2 the appearance of two separate word-level tone melodies in the language, H and L, which show this contrast on monosyllables, and an identical contrast on polysyllables;

3. the appearance of a pitch-accent system in the language, in which the pitch accent is distinguished by a higher pitch than the other syllables in a word.

To show the argument *in extremis*, each of the above hypothesis would yield very different predictions for the tonal behaviour of trisyllabic words. These predictions can be plotted as shown in table 65, which assumes that none of the potentially complicating factors for each type of system, such as tone sandhi and tonal restrictions that prevent certain logically possible combinations from appearing (Donohue 1997), are present.

Table 65. Predictions for trisyllabic words based on a H-L distinction in monosyllables

	Monosyllables	Trisyllables
Syllable tone	H *vs* L	HHH HHL HLH HLL LHH LHL LLH LLL
Word tone	H *vs* L	HHH LLL
Pitch accent	H *vs* L	HLL LHL LLH LLL

Clearly there are vastly different results, and the true nature of the tone system is easy to spot, although it was totally masked when we examined just monosyllables.

The complicating factors, such as tone sandhi, minimal word constraints, and variable inflection points, mask these differences, though it was thought that determining the scope of tonal assignment was still simply a matter of perseverance. This is indeed, so, though the example of examining tone in Skou has shown that the right tone sandhi can make a word tone system appear remarkably similar to a syllable tone system. Even when examining disyllabic words, where the total number of expected contrasts with three tones would exceed the trisyllable example above, the system is still adequately described as a syllable-tone system. Despite this, it is quite clear, when trisyllabic expressions are taken into account, that the language has a word-tone system, with five contrastive tone melodies. This might seem an unnecessary complication, but the fact that a word-tone system is just the same domain for tone assignment as is observed in other languages of the Macro-Skou family to the east, such as Barupu (Crowther 2000), and that five tones (or, in some varieties, six) are the number of pitch contrasts found on monosyllables in both the Piore River languages (which include Barupu) and the Serra Hills languages which lie in between the Piore River and the Skou languages, adds further support to the reanalysis of the tonal system.