

Tonogenesis in the North Huon Gulf chain

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1 Introduction

The Oceanic Austronesian languages of the North Huon Gulf chain are Yabem, Bukawa and Kela. Yabem and Bukawa are among the few Oceanic languages to have acquired a contrast in tone. This contrast is one of a number of phonological features which distinguish the North Huon Gulf languages: others are a tendency to monosyllabism, a reduction in the number of syllable-initial consonant contrasts, and a much grosser reduction in syllable-final contrasts.

Yabem, Bukawa and Kela are spoken in villages scattered along the shores of the Huon Gulf of Papua New Guinea,¹ but ethnographic evidence (Hogbin 1947, 1951) indicates that the chain has its origins on the northern shore of the Gulf. The close genetic relationship between Yabem and Bukawa has long been recognised (Capell 1949; Hooley 1971), but it is clear on the basis of shared innovations that Kela also belongs with them (Ross 1988: 148-152). Kela reflects the consonant changes which accompanied tonogenesis in the language ancestral to the chain, but data are insufficient to know whether tone survives in any of the modern Kela dialects. Capell described the tonal system of Yabem and Bukawa, and Bradshaw (1979) reconstructed the genesis of tone in Yabem using Dempwolff's (1939) description as a starting point. Ross (1988: 418-419) added some small refinements to Bradshaw's account. In this paper I will describe the phonological systems of Yabem and Bukawa with particular reference to tone, then attempt a reconstruction of tonogenesis in the language ancestral to them.

The first German Lutheran missionaries to New Guinea in 1886 started work at Simbang in the centre of the Yabem language area shown on the map. Yabem was then spoken by just nine hundred people living in coastal villages (Renck 1977). However, as the language of the first converts, Yabem was also the language of the first local evangelists and the language first reduced to writing by the missionaries. It was used wherever the mission worked among Austronesian speakers in what is now the Morobe Province, so that by 1939, the language had about 15,000 speakers and was understood as a lingua franca by as many as one hundred

¹ For the locations of the languages, see map 8 of Wurm and Hattori (1981), where Yabem is labelled 'Yabim' and Bukawa 'Bukawac'.

thousand (Zahn 1940: v). The mission established an extensive system of Yabem schools, and in the ten years after World War 2, about 30,000 students received Yabem-medium instruction (Streicher 1982: v). One result of this was that the Yabem orthography was adapted for many languages in the region and both the orthography and Yabem lexicon have had a substantial effect on many languages. Yabem-educated literates often write their own languages with Yabem's seven vowels, and one suspects that new contrasts may eventuate from this. Most Bukawa speakers also speak Yabem, and this has had some effect on Bukawa; the degree of this effect needs further study. The status of Yabem has also resulted in a number of studies of the language, surveyed in Ross (1991). The data on which the research reported here is based are drawn largely from my own fieldnotes, as well as from the works cited in the preceding paragraphs and, in the case of Bukawa, from materials kindly shared by William Eckermann.

2 The synchronic phonologies of Yabem and Bukawa

The taxonomic phonemic inventory of Yabem and Bukawa is set out below. Phonemes in braces occur only in Bukawa, although /h/ also occurs in borrowed items in modern Yabem.² In the interests of legibility the voiceless lateral and voiceless semivowels are marked with superscripted h rather than with a diacritic.

² The orthography used here differs from the 'practical' Yabem orthography used by speakers of both languages. The differences between the vowels in the two orthographies are as follows:

This paper	Traditional spelling
e	ê
ɛ	e
o	ô
ɔ	o

Among the consonants there are only two outright differences:

This paper	Traditional spelling
y	j
ʔ	c

In cases where a prenasalization is written with a superscript (^mb, ⁿd, ^ŋg, ⁿs) in this paper, it is written without superscription in the traditional orthography (*mb, nd, ŋg, ns*). Similarly, where a labialized velar is marked with a superscript (^{kʷ}, ^{gʷ}) here, the traditional orthography has no superscription (*kw, gw*). However, where a labialized labial is marked with a superscript (^{pʷ}, ^{bʷ}, ^{mʷ}) here, the traditional spelling writes a sequence of labial plus rounded vowel, the latter matching the following vowel in height. Some Yabem examples:

This paper	Traditional spelling	
<i>tem^{wi}</i>	<i>têmui</i>	'dirty'
<i>om^{wen}</i>	<i>omôêŋ</i>	'you (sing.) will come'
<i>kap^{wen}</i>	<i>kapôêŋ</i>	'big'
<i>lep^{wa}</i>	<i>lêpoa</i>	'rope'
<i>m^{wa}ʔ</i>	<i>moac</i>	'snake'
<i>sab^{wa}ʔ</i>	<i>saboac</i>	'potsherd; spleen'

My Bukawa informants had no consistent strategies for writing phonemes not found in Yabem.

(1)			Labial	Labialized labial	Alveolar	Velar	Labialized velar	Glottal
	Stops	voiceless	p	p ^w	t	k	k ^w	ʔ
		voiced	b	b ^w	d	g	g ^w	
	Prenasalized stops		^m b	^m b ^w	ⁿ d	ⁿ g	^ŋ g ^w	
	Nasals		m	m ^w	n	ŋ		
	Fricatives					s		{h}
	Prenasalized fricative				ⁿ s			
	Lateral	voiceless			{l ^h }			
		voiced			l			
	Semivowels	voiceless		{w ^h }	{y ^h }			
		voiced		w	y			
		Front	Central	Back				
	High	i		u				
	Mid	e	{ø}		o			
	Mid-low	ɛ		ɔ				
	Low		a					

The mid vowels /e/, /ɛ/, /ɔ/ and /o/ are phonetically higher than these symbols imply, and tend towards [ɪ], [e], [ʊ] and [o] respectively. This means that a non-native listener may find the distinction between /e/ ([ɪ]) and /i/ ([i]) difficult to hear. Since /u/ is somewhat centralized towards [ʊ], the distinction between /o/ ([ʊ]) and /u/ is more readily audible.

In taxonomic terms, the phoneme inventories of Yabem and Bukawa seem rather large by Oceanic Austronesian standards. However, they become quite simple if it is recognised that there are constraints on the co-occurrence of phonemes in a syllable or in a foot. In a prosodic or autosegmental account, several of the features which distinguish phonemes in (1) would become features of the syllable or the foot, with resulting economies. One of these constraints is an interesting vowel harmony system, described in Ross (1995), which includes an informal and partial approach to a non-linear phonology of Yabem.

For present purposes a stem with its affix (prefix or suffix), if any, will be referred to as a ‘simple word’, as opposed to a ‘compound word’, consisting of a stem plus a morpheme other than an affix (i.e. a clitic or another stem). Simple words usually have one or two syllables. A single-syllable word may be a plain stem, an inalienably possessed noun with its possessive suffix, or verb with its subject pronominal prefix, as in these examples:

- (2) Yabem
ŋaʔ ‘man’
sa-m ‘your mother’s brother’
 < *sa-* ‘mother’s brother’ + *-m* ‘your (singular)’
g-ɛŋ ‘s/he ate’
 < *g(ɛ)-* ‘third person singular subject, realis mood’; *-ɛŋ* ‘eat’

- (3) Bukawa

^ŋ <i>gaʔ</i>	‘man’
^{lʰ} <i>o-ŋ</i>	‘my tooth’ < ^{lʰ} <i>o-</i> ‘tooth’ + <i>-ŋ</i> ‘my’
<i>ge-ŋ</i>	‘I/you (singular)/s/he ate’
	< <i>g-</i> ‘singular subject, realis mood’; <i>-ŋ</i> ‘eat’

Two-syllable words are of the same three kinds

(4)	Yabem	Bukawa	
	<i>moyaŋ</i>	<i>mayεŋ</i>	‘possum’
	<i>tena-m</i>	<i>dina-m</i>	‘your mother’
	<i>ka-som</i>	<i>ga-som</i>	‘I spoke’

The only three-syllable forms which are clearly simple words are verb forms consisting of a subject pronominal prefix and a two-syllable stem:

(5)	Yabem	Bukawa	
	<i>ka-seleŋ</i>	<i>ka-seleŋ</i>	‘I walked’
	<i>e-toloŋ</i>	<i>e-ⁿdʰlʷŋ</i>	‘he will carry’

Word-initially and -medially Yabem and Bukawa syllables have the form C₀V. Word-finally, their form is C₀VC₀. Yabem has a single exception to this: the form *m̐* (grave accent indicates low tone), which has three meanings: ‘banana’, ‘base, stump’, and ‘turtle’. The last apparently occurs only in the compound *o-m̐* ‘large turtle’ (incorrectly recorded in Streicher 1982 as *òm*). The syllabic nasal is readily accounted for historically. The Proto Oceanic (POC) forms **pudi* ‘banana’, **puqun* ‘base, stump’ and **poñu* ‘turtle’ all became Proto North Huon Gulf (PNHG) **hùŋ*, and Yabem *m̐* represents a coalescence of the labiality and syllabicity of **u* and the nasality of **ŋ*. This interpretation is supported by Bukawa *hùŋ* ‘banana’ and *ŋa-hù* ‘stump’ (I have no record of a Bukawa cognate for ‘turtle’).

Any consonant except /ʔ/ may occur syllable-initially, but prenasalized stops occur word-initially only in Bukawa:³

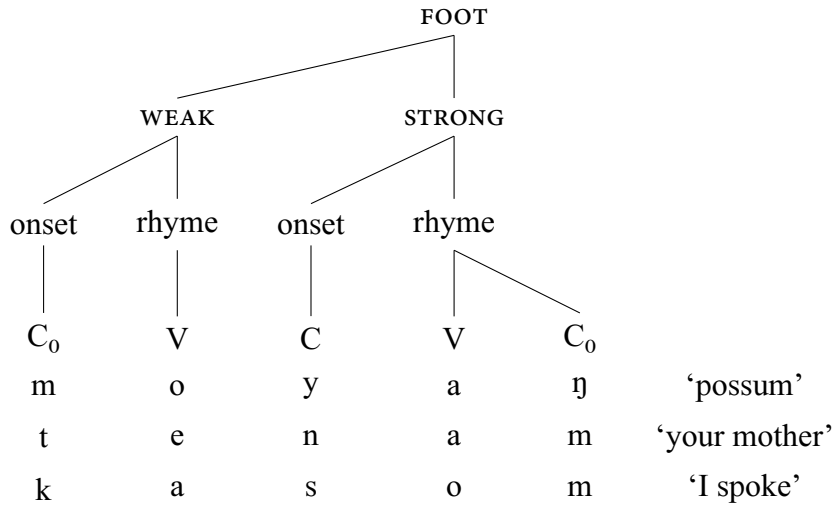
(6)	^m <i>báʔ</i>	‘bird’
	^m <i>bàʔ</i>	‘he dies’
	^m <i>bù</i>	‘wind’
	^m <i>bú</i>	‘he comes back’
	ⁿ <i>dè</i>	‘where?’
	ⁿ <i>dì</i>	‘he goes’
	ⁿ <i>díp</i>	‘coconut’
	ⁿ <i>dèp</i>	‘he urinates’
	^ŋ <i>gáʔ</i>	‘man’
	^ŋ <i>gò</i>	‘he hears’

³ Capell (1949) says that Bukawa also has (word-initial) consonant combinations, but these seem to be the result of incorrect elicitation. He gives, in his orthography, *hpaʔ* ‘they’, and includes a palatal nasal in his phoneme inventory, apparently to account for this item. However, I have been able to elicit only *ŋáʔ*. Capell, who transcribes Bukawa intervocalic /l/ as *r*, also gives *mbraʔlumŋga* ‘in the village square’. ‘Village’ here is *mbraʔ*. My informants give the Yabem form *malaʔ*; and its expected Bukawa cognate is ^m*balaʔ*. It was evidently this form which Capell heard, but with deletion of the vowel in the weak syllable. Similarly, in his text, Capell has *gliʔsu* ‘you know’ for *goliʔsu*.

Word-final consonants are limited to /p/, /b/, /m/, /ŋ/, and /ʔ/.

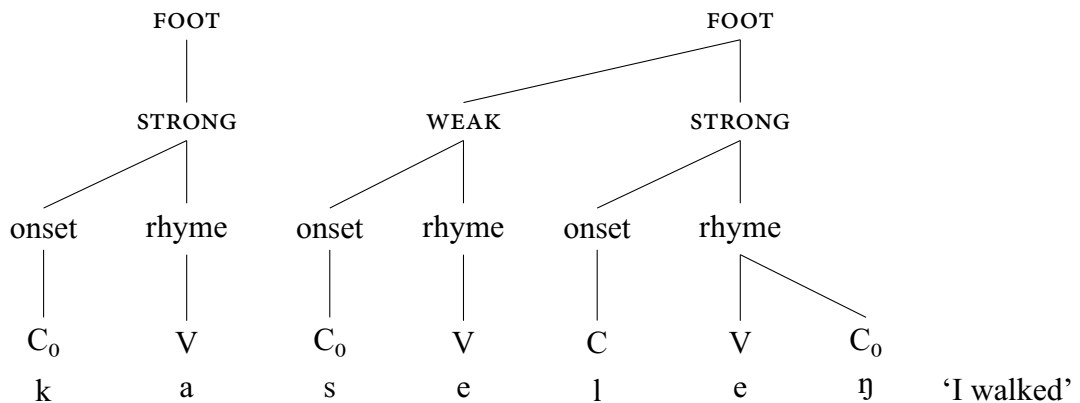
It is useful in both Yabem and Bukawa to recognise the foot as a phonological entity.⁴ The foot in both languages is iambic, i.e. in its full form it consists of a sequence of two syllables, the first weak, the second strong. Hence a two-syllable simple word consists of one iambic foot, as diagrammed below for the three Yabem items in (4) above:

(7)



A single-syllable word also has one foot, but lacks a weak syllable. A three-syllable simple word like those in (5) has two feet:

(8)



There is a simple binary distinction between high and low tone in both Yabem and Bukawa. Capell (1949) also claims a mid tone, which he says is probably ‘a weakening of a high tone’, and rising and falling tones, which appear to be intonational features, since his falling tone is always clause-final. These rises and falls in any case only occur on vowel sequences.

⁴ The account of Yabem phonology in Ross (1995) does not introduce the concept of the foot, as it is possible to describe Yabem in terms of simple words with different numbers of syllables. The foot is useful, however, for a comparison of the two languages, and is essential in an account of their historical phonology.

In both Yabem and Bukawa tone is a feature of the foot, such that the two syllables of a foot have like tone. In Yabem, tone also determines the voicing of stops. In a high-tone foot any stops are voiceless (*p, p^w, t, k, k^w*); in a low-tone foot any stops are voiced (*b, b^w, d, g, g^w, ^mb, ^mb^w, ⁿd, ⁿg, ^ŋg^w*). Consonants other than stops may occur freely in both high- and low-tone words, except ⁿs, which is derived historically from voiced *[ⁿz] and so patterns with the other prenasalised obstruents, occurring only with low tone (Milke 1968). From this point onwards, tone in both Yabem and Bukawa will be marked in this paper by an accent on the vowel of the strong syllable of a foot: an acute accent marks high tone, a grave low tone. A few Bukawa items have been recorded without tone, and in these cases no accent is given.

From the voicing condition on stops in Yabem, it follows that no stops occur in minimal pairs which are distinguished only by tone. Such pairs are:

- | | | | | |
|-----|-------------|-----------------|-------------|-------------------|
| (9) | <i>awá</i> | ‘valuables’ | <i>awà</i> | ‘(his/her) mouth’ |
| | <i>awé</i> | ‘outside’ | <i>awè</i> | ‘woman’ |
| | <i>olí</i> | ‘body’ | <i>olì</i> | ‘wages’ |
| | <i>yaó</i> | ‘prohibition’ | <i>yaò</i> | ‘emnity’ |
| | <i>wá</i> | ‘mango’ | <i>wà</i> | ‘crocodile’ |
| | <i>-sá?</i> | ‘hammer (verb)’ | <i>-sà?</i> | ‘put on top of’ |

When stops occur, the members of a minimal pair are distinguished (redundantly) by both voicing and tone:

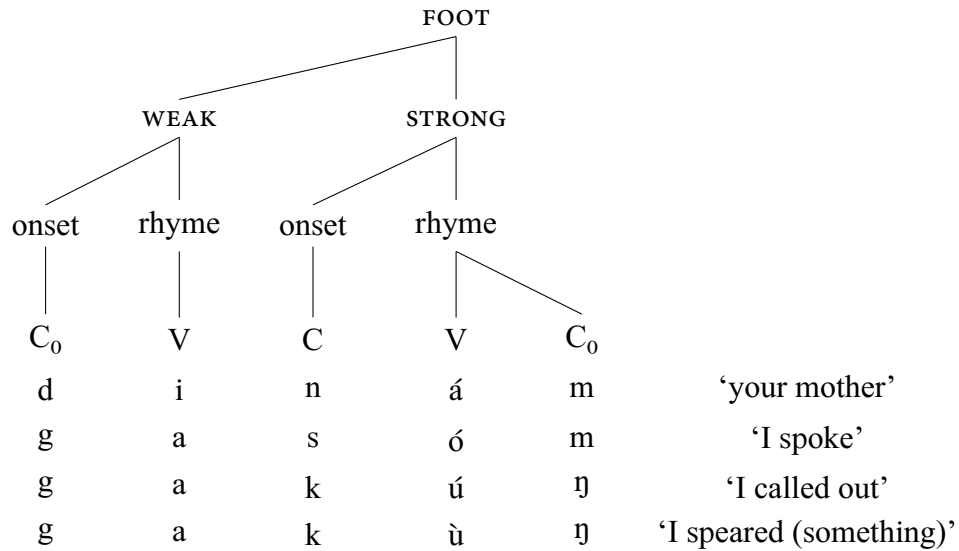
- | | | | | |
|------|--------------|---------------|--------------|-------------------|
| (10) | <i>palíŋ</i> | ‘careless’ | <i>balìŋ</i> | ‘far away’ |
| | <i>píŋ</i> | ‘shell’ | <i>bìŋ</i> | ‘speech’ |
| | <i>típ</i> | ‘all at once’ | <i>dìb</i> | ‘thud’ |
| | <i>sakíŋ</i> | ‘service’ | <i>sagìŋ</i> | ‘house partition’ |

Yabem tone and voicing largely reflects the situation as it was in PNHG. Bukawa is less conservative and has undergone consonant changes which have destroyed the correspondence between tone and stop voicing. As a result, Bukawa has minimal pairs containing stops but distinguished by tone only (Yabem forms are given below for comparison’s sake):

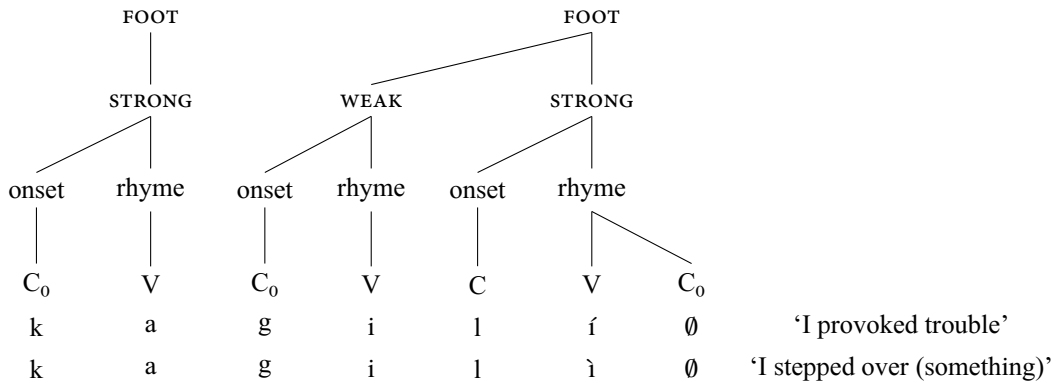
- | | | | |
|------|----------------|------------------------------|----------------|
| (11) | Bukawa | | Yabem |
| | <i>ga-kúŋ</i> | ‘I called out’ | <i>ka-kúŋ</i> |
| | <i>ga-kùŋ</i> | ‘I speared (something)’ | <i>ga-gùŋ</i> |
| | <i>ka-gilí</i> | ‘I provoked trouble’ | <i>ka-kilí</i> |
| | <i>ka-gilì</i> | ‘I stepped over (something)’ | <i>ka-gelì</i> |

The first of these changes affected stops in full (i.e. two-syllable) feet. If a stop formed the onset of a strong syllable, then it became voiceless; if it formed the onset of a weak syllable, it became voiced. This is illustrated with examples drawn from (4) and (16) above:

(12)



(13)



The only word-final stops in Bukawa are /p/ and /b/. Where this onset voicing rule affected the stop in the onset of a strong syllable, then a /p/ or /b/ in the rhyme was similarly affected. Hence we find *ga-pɔp* ‘I cut grass’, from earlier *ga-bɔb*, the form retained in Yabem.

It appears that onset voicing did not affect single-syllable feet. Thus we find Bukawa *gaʔ* ‘I hit’ (with voiced onset) but *taʔ* ‘we (inclusive) hit’ (with voiceless onset).

A second change which has undermined the correspondence between tone and stop voicing is the explosion of nasals. In a word of the form $(C_1V)C_2V$ or $(C_1V)C_2Vʔ$, if C_2 was a nasal in PNHG, it is replaced in Bukawa by the corresponding prenasalized voiced stop. For example, Yabem *ŋáʔ* ‘man’ has the Bukawa counterpart ^h*gáʔ*. The result is that in Bukawa we find minimal pairs containing prenasalised voiced stops which are distinguished only by tone.

It is important to note that onset voicing and nasal explosion are both diachronic changes. Although they have left a significant mark on modern Bukawa, it would be difficult to incorporate these rules into a synchronic account of the language.

The foot-related phenomena described above have had significant effects on verbal paradigms in both languages. As in many Oceanic languages, the verb in Yabem and Bukawa has

two moods, realis and irrealis, and the stem takes a subject pronominal prefix coreferential with the subject noun phrase (if any). The Yabem irrealis morpheme is prenasalisation, which (like tone) is a feature of the foot, applying to all available stops and to /s/. The paradigm of the Yabem monosyllabic stem *-dèŋ* ‘move towards’ is as follows:

(14) *-dèŋ* ‘move towards’

		realis	irrealis
Sing.	1	<i>ga-dèŋ</i>	<i>ya-ⁿdèŋ</i>
	2	<i>go-dèŋ</i>	<i>o-ⁿdèŋ</i>
	3	<i>ge-dèŋ</i>	<i>e-ⁿdèŋ</i>
Plur.	1 incl.	<i>da-dèŋ</i>	<i>da-ⁿdèŋ</i>
	1 excl./2	<i>a-dèŋ</i>	<i>a-ⁿdèŋ</i>
	3	<i>se-dèŋ</i>	<i>se-ⁿdèŋ</i>

This is a low-tone stem and, because the prefix and stem form a single foot, the prefix also has low tone and (where relevant) a voiced stop. A high-tone monosyllabic verb-stem, however, has high-tone prefixes with voiceless stops. Another Yabem example:

(15) *-táŋ* ‘weep’

		realis	irrealis
Sing.	1	<i>ka-táŋ</i>	<i>ya-táŋ</i>
	2	<i>ko-táŋ</i>	<i>o-táŋ</i>
	3	<i>ke-táŋ</i>	<i>e-táŋ</i>
realis/irrealis			
Plur.	1 incl.	<i>ta-táŋ</i>	
	1 excl./2	<i>a-táŋ</i>	
	3	<i>se-táŋ</i>	

When the verb stem itself has two syllables, i.e. forms a full foot, then the prefix forms a separate foot and falls outside the domain of the stem tone, as in (16). In each of these cases, the prefix is high-tone and its stop is voiceless, regardless of the tone of the stem.

(16) *-táŋ* ‘weep’

	realis	irrealis	
	<i>ka-letí</i>	<i>ya-letí</i>	‘run’
	<i>ka-katòŋ</i>	<i>ya-katòŋ</i>	‘make a heap’
	<i>ka-dam^wè</i>	<i>ya-ⁿdam^wè</i>	‘lick’
	<i>ka-saiʔ</i>	<i>ya-ⁿsaiʔ</i>	‘pull off, snap’
	<i>ka-madòm</i>	<i>ya-maⁿdòm</i>	‘break in two’
	<i>ka-lesù</i>	<i>ya-leⁿsù</i>	‘poke, stir’
	<i>ka-dabìŋ</i>	<i>ya-ⁿda^mbìŋ</i>	‘approach’
	<i>ka-gab^wàʔ</i>	<i>ya-ⁿga^mb^wàʔ</i>	‘untie’

As was noted above, the correlation between tone and voicing has been destroyed in Bukawa by diachronic changes. As in Yabem, a prefix and monosyllabic stem form a single foot. However, where the Yabem correspondence of tone and voicing ensures that prefix and stem agree in voicing, as in (14) and (15), the Bukawa onset voicing rule means that they disagree in voicing. As the examples in (12) show, if the prefix consonant is a stop, it is voiced because it forms the onset of the weak syllable of the foot, whereas the stem consonant—if

it is a stop is voiceless because it is the onset of the strong syllable. Tone generally remains unchanged. Thus the Bukawa cognates of (14) and (15) are as follows:

(17) *-tèŋ* ‘move towards’

		realis	irrealis
Sing.	1	<i>ga-tèŋ</i>	<i>wa-tèŋ</i>
		realis/irrealis	
	2/3	<i>Ø-tèŋ</i>	
Plur.	1 incl.	<i>a-tèŋ</i>	
	1 excl./2	<i>da-tèŋ</i>	
	3	<i>se-tèŋ</i>	

(18) *-táŋ* ‘weep’

		realis	irrealis
Sing.	1	<i>ga-táŋ</i>	<i>wa-táŋ</i>
		realis/irrealis	
	2/3	<i>Ø-táŋ</i>	
Plur.	1 incl.	<i>a-táŋ</i>	
	1 excl./2	<i>da-táŋ</i>	
	3	<i>se-táŋ</i>	

As the examples in (13) show, if the stem of a Bukawa verb has two syllables, the distribution of voicing is reversed. The stem-initial stop is now the onset of the weak syllable and is voiced, whereas the prefix-initial stop is the onset of the strong syllable of a separate foot and is therefore voiceless.

This brief account of Yabem and Bukawa verbs is very incomplete, as both languages show other patterns which have resulted from diachronic changes. It is sufficient, however, to show how tone and voicing have a systematic effect on the phonological shapes of both languages.

3 An account of tonogenesis

Yabem and Bukawa have two of the most complex and interesting phonological histories among Western Oceanic languages, but their details lie beyond the scope of this paper except insofar as they bear on the genesis of tone.

Yabem, Bukawa and Kela form the North Huon Gulf chain, which is one of three groups of languages making up the Huon Gulf family. The internal relationships of the family are described by Ross (1988: 132-160) and its external relationships in chapters 5 and 10 of the same work.

Initial and medial consonant correspondences for Yabem, Bukawa, Kela, and the most conservative Huon Gulf language, Numbami, are shown in the appendix, together with reconstructed phonemes for POC, Proto Huon Gulf (PHG), PNHG and two interstages between PHG and PNHG. The language labelled PNHG is reconstructed to incorporate all innovations common to Yabem, Bukawa, and Kela. The interstages labelled ‘Post-PHG’ and ‘Pre-PNHG’ are reconstructed to account effectively for the phonological changes which occurred to produce PNHG from PHG. Post-PHG represents the stage immediately before the development

of tone, Pre-PNHG the stage when tone had developed but voicing remained a phonologically significant feature, whilst in PNHG voicing had been replaced by tone as the significant feature and voiced fricatives had disappeared.

In Ross (1988: 149) I summarised the development of tone in PNHG as follows below. This account depends on the claim, documented in Ross (1988: 47-70), that POc *p and *k had a strong tendency to split into fortis (stop) and lenis (usually fricative) variants in daughter-languages. POc *p became PHG (fortis) *p and (lenis) *v; POc *k became PHG (fortis) *k and (lenis) *ɣ.⁵

Pre-PNHG evidently developed a form of consonant harmony in which the obstruents within a morpheme were either all voiced (PHG *v, *b, *d, *j, *ɣ, *g) or all voiceless (PHG *p, *t, *s, *k), whilst other consonants could occur with either voiced or voiceless obstruents. Where voiced and voiceless obstruents co-occurred in a morpheme, the voiceless became voiced. During the development of PNHG (and after the loss of PHG final vowels), vowels which followed voiced obstruents acquired low tone and those following voiceless obstruents high tone, and tonal harmony emerged such that all vowels in a morpheme carried the same tone. By the break-up of PNHG, as Table 22 [see Table 1] shows, PHG *v and *G had become respectively PNHG *h and *∅, but low tone on the following vowel and tonal harmony remained. The result of these developments was, for example, that PHG *tavuRi ‘Triton shell’ (< POc *tapuRi) became Pre-PNHG *davuri by obstruent harmony, then PNHG *dàhù? by consonant changes, resulting in Yabem *dàù?*, Bukawa *dàhù?* and Kela *dau*. Although available Kela data do not show a tonal contrast, the voiced initial *d-* of Kela *dau* reflects at least the PNHG development of obstruent harmony.

In a footnote, I added (418-419):

This account of obstruent harmony and tonogenesis is essentially similar to Bradshaw’s [1979], but differs from his on two points. Firstly, Bradshaw suggests that it was unpredictable for an etymon containing both a voiced and a voiceless consonant whether obstruent harmony would result in both obstruents becoming voiced or both becoming voiceless, whereas according to the account given here, both obstruents became voiced. The examples he gives of voiced consonants becoming voiceless have alternative explanations. For example, POc *tubu ‘grow’ became Pre-PNHG *tup before obstruent harmony occurred: hence Yabem *top* ‘grow’ is not a counter-example. One counter-example remains unexplained, namely Yabem *kasop* ‘spit’, for expected ***gàsòp*, from Pre-PNHG *kajup (cf. Numbami *kanzuwa*), where *j is expected to trigger obstruent harmony resulting in voicing of *k. Possibly subsequent regular devoicing of PNHG *-j- to Yabem -s- has also caused devoicing of ***g-* to *k-*.

The second point of difference between Bradshaw’s and my accounts is that Bradshaw believed that POc *k, as a voiceless obstruent, resulted in Yabem high tone. However, both high- and low-tone reflexes of POc *k are found, and the low-tone here reflects lenis PHG *ɣ. For example:

⁵ POc *s also underwent lenition in many daughter-languages, but not in PHG.

POc		PHG	<i>Yabem</i>
kuluR	‘breadfruit’	*yuluR	ùʔ
kani	‘eat’	*yani	èŋ
qeno	‘lie’	*yeno	èʔ

This is in keeping with Bradshaw’s basic assertion that voicing and tone are related and with his observation that the pre-Yabem reflex of POc *p (Yabem \emptyset) must have been voiced as it caused low tone: it is clear from section 3.5.1.2 of the present work that this voiced reflex was lenis PHG *v. However, what is puzzling is that in certain cases where PHG *y is reconstructible, Yabem has high tone.

The effects of tonogenesis are illustrated below:

(19)

POc	gloss	PHG	Pre-PNHG	PNHG	Yabem	Bukawa
POc *p > PHG *p > PNHG *p with high tone ⁶						
*pekas	defaecate	*peka	*-péʔ	*-péʔ	-péʔ	-péʔ
*para	shine	*pala	*-páʔ	*-páʔ ⁷	-páʔ	-péʔ
*pipi	squeeze	*pipi	*-píʔ	*-píp	-píp	-píp
*pani	shoot	*pani	*-péʔ	*-péŋ	-péŋ	-péŋ
POc *p > PHG *v > PNHG *f with high tone						
*patu	stone	*vatu	*fʔ	*fʔ	pʔ	hʔ
POc *p > PHG *v > PNHG * \emptyset with low tone						
*puqaya	crocodile	*i-vuyai ⁸	*iv ^w ài	*iw ^h à	iwà	w ^h à
*paqa(l)	thigh	*vaya- ‘leg’	*vayà-	*à	à	hà
*pose	paddle	*vose	*vòʔ	*hòʔ	òʔ	hèʔ ⁹
*lipon	tooth	*livo-	*lvò-	*l ^h ò-	lò-	l ^h ò-
*lopu	cross-sibling	*livu-	*lvù-	*l ^h ù-	lù-	l ^h ù-
POc *b > PHG *b > PNHG *b with low tone						
*borok	pig	*bol ¹⁰	*bòʔ	*bòʔ	bòʔ	bòʔ
*buaq	areca nut	*buak	*bùʔ	*bùʔ	bùʔ	bùʔ
*rabia	sago palm	*labi	*labì	*labì	labì	apì
POc *t > PHG *t > PNHG *t with high tone						
*tete	ladder	*tete	*téʔ	*téʔ	téʔ	teʔ
*taliŋa	ear	*taŋa-	*taŋá-	*taŋá-	taŋá-sùŋ	da ⁿ ga-launŋ
*taqe	faeces	*taye-	*táʔ	*táʔ	táʔ	táʔ
*qate	liver	*ate-	*até-	*até-	ŋ-até	ŋ-até

⁶ Cases where PHG *p gives rise to PNHG *p and high tone are all verbs, and it is difficult to see why lenition to *-v- did not take place. The probable reason is that irrealis forms in Pre-PNHG were formed with prenasalisation, e.g. *ya-^mpip ‘I would squeeze’, and that subsequent changes resulted in loss of prenasalisation (except with voiced stops and *z) and extension of the resulting *-p- to the realis.

⁷ The Yabem and Bukawa items mean ‘bake, roast’.

⁸ The prefix *i- of PHG *i-viyai ‘crocodile’ is derived from POc *ikan ‘fish’.

⁹ Bukawa *hèʔ* ‘paddle (N)’ but *hèʔ* ‘paddle (V)’. The history of this tonal alternation is not understood.

¹⁰ With regard to this form, see Ross (1988: 146-147).

POc *d > PHG *d > PNHG *d with low tone						
*draraq	blood	*dala	*dà?	*dà?	dè?	dà?
*driri	stand	*dili	*-dì?	*-dì	-dì	-tì
POc *s > PHG *s > PNHG *s with high tone						
*sipo	go down	*sivo	*-síf	*-síf	-sép	-síp
*saqit	sew	*sayit	*sa(x)í(?)	*-sí	-sí	-só
POc *j > PHG *j > PNHG *s with low tone						
*joŋi	stop up	*-joŋ	*-zòŋ	*-sòŋ	-sòŋ	-sòŋ
*jori	tie	*-jol	*-zò	*-sò	-sò	-sò
*geju	nape	*geju-	*gezù-	*gosù-	gesù-	ŋasù-
*lejan	nit	*lejan	*lezàŋ	*lesàŋ	lesèŋ	—
*kaija	left-hand	*kaje	*gazè	*gasè	gasè-ŋa	gasè
POc *k > PHG *k > PNHG *k with high tone						
*kurita	octopus	*kurit	*kulí?	*kulí?	kulí?	gulí?
*wakar	root	*wakac	*waká?	*waká?	ŋa-waká?	waká?
POc k/*q > PHG *ɣ > PNHG *x with high tone						
*kuron	clay pot	*ɣuloŋ	*xuló(ŋ)	*xulón	kú	lón ¹¹
*kiram	axe	*ɣila ¹²	*xí?	*xí(?)	kí	kí
*kaiu	tree	*ɣai	*xá	*xá	ká	á
*quma	garden	*ɣuma	*xúm	*xúm	kóm	óm
POc *k/*q > PHG *ɣ > PNHG *∅ with low tone						
*kuluR	breadfruit	*ɣulu ¹³	*ɣù?	*ù?	ù?	ú?
*kani	eat	*-ɣani	*-ɣèŋ	*-èŋ	-èŋ	-éŋ
*qenop	lie	*-ɣenop	*-ɣèŋ?	*-èŋ?	-è?	-yé?
*sake	rise	*-saye	*-zà?	*-sà?	-sà?	-sà?
POc *g > PHG *g > PNHG *g with low tone						
—	nasal mucus	*guluk	*gulù-	*gulù	gulù	sé?gulù
—	open (sg)	*gac	*-gà?	*-gà?	-gà?	-ká?
—	partition wall	*jaginjan	*zagìŋ	*sagìŋ	sagìŋ	akìŋ

As (19) shows, tonogenesis in PNHG occurred in association with a drift towards monosyllabism. First, PHG final consonants (themselves often reflexes of POc final consonants) were lost in most cases. then the resulting final vowels were lost, resulting in the Pre-PNHG forms. Finally, the resulting final consonants were reduced in PNHG to the present-day inventory of final consonants.

The account of tonogenesis given in earlier work is basically correct, but in need of some refinement. In the quotation above, a sequence is assumed of (i) voicing harmony, (ii) tonogenesis. However, this causes some difficulty when we reconstruct the sequence of events which resulted in the modern forms of the two Yabem verb classes exemplified in (14) and (15) above. If we posit this sequence for the outcomes of the POc verbs *pipi ‘squeeze’ and *driRi ‘stand, we obtain the reconstruction in (20) (where tone is marked on all syllables

¹¹ Yabem *kú* apparently reflects Pre-PNHG *xuló. Bukawa *lón* perhaps reflects a borrowing of a form in which a reflex of final POc *-n is retained.

¹² Unpredictable loss of POc *-m.

¹³ Unpredictable loss of POc *-R.

where it is posited, high with an acute accent, low with grave). We can reconstruct the subject pronominal prefixes Post-PHG *ga- ‘first person singular’, *ta- ‘first person inclusive plural’ and *a- ‘first person exclusive plural’ with reasonable confidence as they are well attested elsewhere in the Huon Gulf family (Ross 1988: 371).

(20) Incorrect sequence:

Post-PHG	*ga-pip	*ta-pip	*a-pip	*ga-dil	*ta-dil	*a-dil
(i) voicing harmony	*ka-pip	*ga-di?	*da-di?	*a-di?
(ii) tonogenesis	*ká-píp	*tá-píp	*a-píp	*gà-dì?	*dà-dì?	*a-dì?
(iii) tone harmony	—	—	*á-píp	—	—	*à-dì?

In order to generate the correct forms with *a- ‘first person exclusive plural’ in (20), however, we have had to posit an additional stage, (iii) tone harmony. But it seems rather unlikely that voicing harmony and tone harmony occurred separately, and it is therefore more economic to posit the following sequence of changes:

(21) Post-PHG	*ga-pip	*ta-pip	*a-pip	*ga-dil	*ta-dil	*a-dil
(i) tonogenesis	*gà-píp	*tá-píp	*a-píp	*gà-dì? ¹⁴	*tá-dì?	*a-dì?
(ii) Pre-PNHG harmony	*ká-píp	—	*á-píp	—	*dà-dì?	*à-dì?

whereby spreading of voicing and tone occurs together (the outcomes are those occurring in Yabem). ‘Tonogenesis’ in (21) means that a syllable with a voiced Post-PHG obstruent (e.g. *ga-, *-dil) acquires low tone, and a syllable with a voiceless Post-PHG obstruent (e.g. *ta-, *-pip) acquires high tone. ‘Pre-PNHG harmony’ means here that the weak (first) syllable of the foot is harmonised in tone and voicing with the strong (second) syllable.

There is, however, something odd about this formulation of tonogenesis. after its application, we are left with two-syllable verb forms, some of which have both syllables specified for tone whilst others (*a-píp and *a-dì?) have only one syllable so specified. This seems a most unlikely state of the language, and so *a priori* the derivation in (22) seems more likely.

(22) Post-PHG	*ga-pip	*ta-pip	*a-pip	*ga-dil	*ta-dil	*a-dil
(i) tonogenesis	*gà-píp	*tá-píp	*á-píp	*gà-dì?	*tá-dì?	*á-dì?
(ii) Pre-PNHG harmony	*ká-píp	—	—	—	*dà-dì?	*à-dì?

This entails reformulating tonogenesis as follows:

(23) tonogenesis:

- a. a syllable with a voiced Post-PHG obstruent in the onset acquires low tone;
- b. all other syllables acquire high tone.

Note that this reformulation alters the input to ‘Pre-PNHG harmony’ so that the latter has less work to do: where the weak and strong syllables differ in tone and voicing, the weak syllable acquires the tone and voicing of the strong.

However, these formulations do not yet account for all the facts. In addition to the high- and low-tone verb classes of Yabem exemplified above, there is a mixed-tone class:

(24) <i>-lù?/-lú?</i> ‘vomit’			
		realis	irrealis
Sing.	1	<i>ga-lù?</i>	<i>ya-lú?</i>
	2	<i>go-lù?</i>	<i>o-lú?</i>
	3	<i>ge-lù?</i>	<i>e-lú?</i>
		realis/irrealis	
Plur.	1 incl.	<i>ta-lú?</i>	
	1 excl./2	<i>a-lú?</i>	
	3	<i>se-lú?</i>	

The members of this class are verbs whose stems did not contain a Post-PHG obstruent to determine tone when tonogenesis occurred. Tone here was determined by the voicing of the consonant (if any) of the Post-PHG prefix. Hence low tone occurs with first, second, and third person realis prefixes, as these had a Post-PHG voiced stop *g-, and high tone occurs elsewhere (supporting the formulation of tonogenesis in (23)). But if we apply the formulation of Pre-PNHG harmony given below (21), it gives Pre-PNHG **ká-lú?, where Yabem *ga-lù?* indicates that we should have *gà-lù?.

(25)	Post-PHG	*ga-luk	*ta-luk	*a-luk
	(i) tonogenesis	*gà-lú?	*tá-lú?	*á-lú?
	(ii) Pre-PNHG harmony	**ká-lú?

To give the right output, ‘Pre-PNHG harmony’ also needs to be reformulated. Note that tonogenesis as defined in (23) results in a disagreement in tone between the weak and the strong syllables of a foot only where at least one syllable has a voiced Post-PHG obstruent (which results in low tone). Hence Pre-PNHG harmony can be reformulated as follows:

- (26) Pre-PNHG harmony:
Where the weak and strong syllables of a foot differ in tone and voicing,
- a. if the onset of the strong syllable is a Post-PHG obstruent, the weak syllable acquires the tone and voicing of the strong;
 - b. otherwise, if the onset of the weak syllable is a Post-PHG (voiced) obstruent, the strong syllable acquires the tone and voicing of the weak.

A diachronically slightly puzzling subset within the mixed-tone class consists of Yabem verbs whose final bilabial stop agrees in voicing with the tone of the stem. For example, we find *ga-lob* ‘I flew’ but *a-lop* ‘I will fly’. Under the sequence of changes exemplified in (20) we would have to account for this alternation under consonant harmony, in such a way that voicing made an unmotivated jump from *g- to *-p. However, under the sequence in (22) it is readily accounted for as an effect of the simultaneous spreading of tone and voicing under ‘Pre-PNHG harmony’. POc *Ropok ‘fly’ gave rise to PHG *lovok > Post-PHG *lofk.

(27)	Post-PHG	*ga-lofk	*a-lofk
	(i) tonogenesis	*gà-lóp	*á-lóp
	(ii) harmony	*gà-lòb	...

The rules of tonogenesis and harmony given as (23) and (26) above were formulated by reconstructing the development of Yabem verbal paradigms. If we examine single-morpheme

two-syllable words, we find that they have also developed in accordance with (23) and (26), as is clear from the examples in (19). All the non-verb examples in the data for which a POc reconstruction can be provided and which have just one Post-PHG voiced obstruent—that is, where tonogenesis leads to a disagreement in tone between the two syllables—have their voiced obstruent in the strong syllable, resulting in low tone for the whole foot:

(28)	POc	gloss	PHG	Pre-PNHG	Yabem	Bukawa
	tapuRi	‘triton shell’	*tavul	*davù?	<i>daiù?</i>	<i>dahù?</i>
	tubu-	‘grandparent’	*tubu-	*dubù-	<i>debù-</i>	<i>abù</i>
	kaija	‘left-hand’	*kaje	*gàzè	<i>gasè</i>	<i>gasè</i>
	kadiuC	‘bamboo tube’	*kajuC	*gàzù?	<i>gasù?</i>	<i>gasù?</i>

This leaves one diachronic puzzle, referred to above, namely that in certain cases where PHG *ɣ is reconstructible, Yabem has high tone. My explanation of this is somewhat *ad hoc*, in that it entails an unconditioned split, but it is the best I can offer. PHG *ɣ is the lenis reflex of POc *k and *q. As the examples in (19) show, I have reconstructed two outcomes of PHG *ɣ. They are PNHG *x (and high tone) and zero (and low tone). PHG *ɣuroŋ ‘clay pot’, *ɣiram ‘axe’, *ɣai ‘tree’ and *ɣuma ‘garden’ are reconstructed with *ɣ because cognates in other Huon Gulf languages require it; the Numbami cognates, for example, show initial zero (*ulaŋa, ilama, ai, uma*), reflecting *ɣ, not *k. Yabem, however, reflects this PHG *ɣ with *k*- and high tone, where we might expect zero and low tone (as in the reflexes of PHG *ɣulur, etc). Borrowing is not a good explanation of these forms, as they have otherwise undergone the expected North Huon Gulf sound changes, and it seems that an unexplained split of PHG initial *ɣ- into Pre-PNHG (lenis) *ɣ- and (fortis) devoiced *x- occurred before tonogenesis. After tonogenesis, Pre-PNHG *ɣ- was lost but left its low tone in PNHG, whilst *x- remained, becoming Yabem *k*-, Bukawa and Kela zero (this assumes that Bukawa *ki* ‘axe’ is a Yabem borrowing).

If there was indeed such a split in PHG *ɣ into Pre-PNHG lenis *ɣ- and fortis *x-, we might expect a corresponding split of PHG *v into Pre-PNHG lenis *v- and fortis *f-. such a split is weakly supported—by just one example, PHG *vatu ‘stone’, listed in (19).

Appendix

The table below sets out the initial and medial reflexes of Proto Oceanic consonants in North Huon Gulf languages and in the putative interstages that preceded them.

The revised POC notation used here and the division of reflexes of POC stops into fortis and lenis are presented in Ross (1988). The labels high and low indicate the tone associated with the reflexes listed below them. Strong and weak refer to the syllables of the PNHG foot (see text of paper). POC = Proto Oceanic, PHG = Proto Huon Gulf, PNHG = Proto North Huon Gulf.

The notes below match superscript numerals in the table.

1. POC *k and *q merged as Pre-PHG *k, then split into a fortis PHG *k and lenis *ɣ and *∅. *k tends to be word-initial, *ɣ word-medial. Word-initial PHG *ɣ tends to become Pre-PNHG *x.
2. There is no identifiable conditioning to explain why the lenis reflex of POC *k and *q is lost in some PHG items and reflected as *ɣ in others.
3. The origins of the contrast between PHG /p/ and /v/ are not clear, but most cases of /p/ are verbs, whilst no verbs have /v/ (other than /v^w/cases). This suggests that lenition was blocked for verbs, perhaps by the presence of *N ‘irrealis’.
4. Yabem *pɔʔ* ‘stone’ is the only piece of evidence for this correspondence set. However, it appears that this is the bilabial equivalent of the devoicing of PHG *ɣ to PNHG *x.
5. Tone, not voicing, was significant, at least in the case of fricatives, in PNHG. Hence Pre-PNHG is posited to accommodate the stage of *vl/*lv etc.
6. The only example is PNHG *-zùgu ‘bathe’, which reflects voicing of *s before voiced stop *g.
7. Yabem /^mb/ seems to reflect the presence of a nasal autosegment, often also reflected elsewhere in word: male^mbom, da^mbe (since Bukawa *apì* seems to reflect PNHG *la^(m)bi).
8. PHG initial /w-/ always occurs before /-a-/, but is otherwise unexplained. It does not occur in PNHG *pale ‘child’.
9. It appears from the identical treatment of PHG *vVl and *IVv in Yabem, Bukawa and Kela that mergers as PNHG *l^h had already occurred, so Pre-PNHG *lv and *vl are posited. It follows from this that *v (and perhaps *ɣ) must be posited for Pre-PNHG but not for PNHG itself, where tone was distinctive with fricatives.

Table: Initial and medial reflexes of Proto Oceanic consonants in North Huon Gulf languages

POc	*p <i>fortis</i>	*t	*k/*q ¹ <i>fortis</i>	*s/*c	*b	*dr	*g	*j	*p <i>lenis</i>	*k/*q ² <i>lenis</i>
PHG	*p ³	*t	*k	*s	*b	*d	*g	*j	*v	*y
Numbami	p	t	k/∅	s	b-b ^m b-	d-d ^m d-	g-g ⁿ g	d/z-	w/∅	...
								-d ^m d/z ^m z-		
Post-PHG	*p	*t	*k	*s	*b	*d	*g	*z	<i>fortis</i>	<i>lenis</i>
<i>Tone</i>	<i>high</i>	<i>high</i>	<i>high</i>	<i>low</i>	<i>low</i>	<i>low</i>	<i>low</i>	<i>low</i>	<i>high</i>	<i>low</i>
Pre-PNHG ⁵	*p	*t	*k	*g	*z ⁶	*d	*g	*z	*f	*x
PNHG	*p	*t	*k	*g	*s	*d	*g	*s	*f	*x
Yabem	p	t	k	g	s	d ^m d	g ⁿ g	s	p	∅
Bukawa	<i>strong</i>	t	k	k	s	t	k	s	h	k/∅
	<i>weak</i>	d	g	g	s	d	g	s	h	k/∅
Kela	p	t	k/∅	g	s	d	g	s	∅	∅
										...
POc	*p/*a	*l/*r/*R	*m	*m ^w	*n	*w	*y			
PHG	*w ⁸	*l	*IVp/*pVI	*m	*n	*w	*y			
Numbami	w	l	—	m	n	w	y			
Post-PHG	*w	*l	*IVp/*pVI	*m	*n	*w	*y			
	<i>high</i>		<i>low</i>							
Pre-PNHG	*w	*l	*IV/vI ⁹	*m	*n	*w	*y			
PNHG	*w	*l	*l ^h	*m	*n	*w	*y			
Yabem	w	l	l	m	n	w	y			
Bukawa	w	<i>strong</i>	l ^h	m ^b	n ^d	w	y			
		<i>weak</i>	∅	m	<i>otherwise</i>	w	y			
Kela	w	l	r	m	n	w	y			

References

- Bradshaw, Joel, 1979. Obstruent harmony and tonogenesis in Jabêm. *Lingua* 49: 189–205.
- Capell, Arthur, 1949. Two tonal languages of New Guinea. *Bulletin of the School of Oriental and African Studies* 13: 184–199.
- Dempwolff, Otto, 1939. *Grammatik der Jabêm-Sprache auf Neuguinea*. Hamburg: Friederichsen, de Gruyter.
- Edmondson, Jerold A. & Kenneth J. Gregerson, eds, 1993. *Tonality in Austronesian languages*. Honolulu: University of Hawaii Press. (*Oceanic Linguistics Special Publications* 24).
- Hogbin, H. Ian, 1947. Native trade around the Huon Gulf, north-eastern New Guinea. *JPS* 56: 242–255.
- , 1951. *Transformation scene: the changing culture of a New Guinea village*. London: Routledge & Kegan Paul.
- Hooley, Bruce A., 1971. Austronesian languages of the Morobe District, Papua New Guinea. *Oceanic Linguistics* 10: 79–151.
- Milke, Wilhelm, 1968. Proto-Oceanic addenda. *Oceanic Linguistics* 7: 147–171.
- Renck, G.L., 1977. *Yagaria dictionary*. Canberra: Pacific Linguistics. (*Pacific Linguistics* C-37).
- Ross, Malcolm, 1988. *Proto Oceanic and the Austronesian languages of western Melanesia*. Canberra: Pacific Linguistics. (*Pacific Linguistics* C-98).
- , 1995. Yabem. In Tryon & Tryon, 1995:
- Streicher, J.F., 1982. *Jabêm-English dictionary*. Canberra: Pacific Linguistics. (*Pacific Linguistics* C-68).
- Tryon, Darrell & Darrell Tryon, eds, 1995. *Comparative Austronesian Dictionary*. Berlin: Mouton de Gruyter.
- Wurm, S.A. ed., ed., 1977. *New Guinea area languages and language study*. Vol. 3: *Language, culture, society and the modern world*. Canberra: Pacific Linguistics. (*Pacific Linguistics* C-40).
- Wurm, S.A. & Shirô Hattori, eds, 1981. *Language atlas of the Pacific area, Part 1*. Canberra: Pacific Linguistics. (*Pacific Linguistics* C-66).
- Zahn, Heinrich, 1940. *Lehrbuch der Jabêmsprache (Deutsch-Neuguinea)*. (*Beihefte zur Zeitschrift für Eingeborenen-Sprachen* 21).