Hewa Phonemes*
A Tentative Statement

Paul W. Vollrath
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1.   Introduction

1.1   General Information

     The Hewa people of Papua New Guinea speak a non-Austronesian language
of the Sepik-Ramu Phylum, Sepik Hills Stock, Sanio Family (Bruce 1979). The
dozen or more other languages of this stock are all situated along southern
tributaries of the middle Sepik River and extend southward into the
foothills of the Central Ranges.

     Those very ranges, however, are a physical barrier, causing the Hewa
people to be cut off from the related languages and cultures. The entire
group of Hewa people lives south of the Central Ranges in an east-west band
along the last 100 kilometres of the Lagaip River and its tributaries, a
part of the Strickland-Fly river system. This band varies in width from 10
km. in the east to 35 km. in the centre and 20 km. in the west, with no one
living more than 8 km. north of the Lagaip River. The people live at
altitudes up to 1600 metres above sea level in the east, and as low as 500

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metres above sea level in the west. Typically, the people reside 150-300
metres above the river in their valley.

There appear to be three dialects among the 2000 Hewa speakers,
largely based on lexical and grammatical changes with no known phonological
changes. These dialects also lie in an east-to-west order. The eastern
dialect roughly includes that area of the language which lies within Enga
Province, and numbers approximately 500 speakers. The central dialect lies
wholly within the Southern Highlands Province, centring in the lower Pori
River valley and the immediately adjacent valleys, both east and west.
This dialect has approximately 900 speakers. The western dialect has
approximately 600 speakers who live in the Southern Highlands and into the
West Sepik Province (known there as the Sisimin people (Cochran 1968)).

2.   Outline of Phonemes

2.1 Chart of phonemes

2.1.1 Work chart of contoids[1]

p	t	k
[p pʰ pʼ b]	[t tʰ tʼ]	[k kʰ kʼ ķ g ǥ]
β	s	x
[β ƀ]	[s z]	[x ẋ ǥ]
m	n	
	ļ	
	[l ĺ ř]	
ʉ	y	

2.1.2 Work chart of vocoids

i		u
[i ɩ]		[u ʉ]
e		o
ɛ	ʌ	ɔ
	ɑ	

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[1] Notice that there is no /h/ phoneme, even though the people and their
language are called [ˈhewɑ]. This is a Duna word meaning 'sun'. (The Hewas
all live at lower altitudes than the Dunas.) All significant government
contact has come through the Lake Kopiago post in the Duna language area.

3. Interpretation of Ambivalent Segments and Sequences

3.1 Status of vocoid segments

3.1.1 Word-final vocoids--lost or non-existent?

     The question of whether some words were losing their final vowels or
whether there were in fact closed syllables was a major concern throughout
the early analysis. After much reading, especially Hooper (1976) and
Lehiste (1970), a pattern emerged from the data. Native speakers also
recorded comparative data which was analysed with the aid of an
oscilloscope and its printed record. A pattern became clear showing Hewa at
present still has word final vowels, although phonetically some words
regularly end in a consonant, even in isolation.

     Basically, the data showed that /i/ and /ɛ/ were being dropped
word-finally following /m n l s/. Since /i/ and /ɛ/ are two of the shortest
vocoids in intrinsic duration (Swadesh 1947:139; Lehiste and Peterson
1961:275; Lehiste 1970:18; de Chene 1979:21), any process that shortens or
absorbs any of their duration would tend to cause their complete
disappearance. Lax allophones [ɪ u] already cannot occur word-finally in
Hewa. The vowel /ʌ/ is already a lax vocoid and is easily dropped
word-finally. Section 3.1.2 attests to this loss of features as a general
pattern word-finally in Hewa. (Hooper (1976:235-40) discusses vowel
deletion as a historical process of losing features until finally becoming
unnecessary altogether.)

     Two additional items serve as supporting evidence. One is that Hewa
as a stress language would tend toward such a pattern of deletion (Hooper
1976:227, 236). Regular word stress on the first syllable aids such a
word-final deletion tendency. Being far from one stress, but needing to
appear weak in relation to the stress on the next vowel spoken, the
word-final vowel devoices, or becomes aspiration on the preceding
consonant, or deletes altogether. The other item is that some of the most
common vocabulary appeared to be most consistently affected--words such as
['mɛan] 'boy', ['eman] 'girl', ['wam] 'wild animal', ['tɪliam] 'cassowary',
['wip] 'pig', ['ɛl] 'he', ['ɪniɛl] 'sickness', ['mis] 'long, tall', ['yis]
'smoke'. Hooper (1976:104) states, "Phonological change works its way
through the lexicon, moving from item to item....the frequency of use of a
lexical item plays a part, i.e., more frequent items undergo change before
less frequent items." She indicates that an e-deletion word-finally has
occurred in Spanish in this way.

     Part of the early confusion was caused by /i/ and /ɛ/ very rarely
being lost at the end of the past tense verbal suffixes /-mɛ/ [-mɛ] 'far
past, realis' and /-yɛ/ [-yɛ] 'recent past, realis'. It wasn't until the
pattern of vocoid sequences began to be clarified in the verbs, and
limitations seen on sequence length there (section 3.2.4), that I realized
each vowel or vowel sequence in the verb carried meaning, even the final
vowel. Therefore, it could not be dropped, as occurred in other parts of
speech being composed of single morphemes as words.

     The consonants mentioned above (/m n l s/) also pattern to facilitate
this deletion word-finally. As continuants they more readily are capable
of absorbing a very short vowel's voicing or duration into their own. This

is seen to be a universal tendency by Hooper (1976:206-29) as she details
her Universal Strength Hierarchy for consonants.

   This loss of word-final vowels occurs with all vowels in the normal
flow of speech, especially when the preceding consonant is one of those
mentioned above, or when the next word begins with a vowel--especially one
which is phonetically close to it in its formation in the mouth, or when
the last consonant of one word is phonetically similar to the consonant
beginning the next word.

1. /'ɑnɑ 'ɓɑu/   ['ɑn 'ɓɑu]   'I have none.'
     I   neg.

2. /'ɛlɛ ʌ'ɓu/   ['ɛl ʌ'ɓu]   'Where is he?'
     he   where

3. /'nɑpɑ 'ɑtɑpɑ 'ʍɑsi/ ['nɑp' 'ɑtɑpɑ 'ʍɑs]   'Let's all go!'
     we.pl all   hort.go

4. /'nɑpɑ 'no   'ɔlo 'motoyɑi   'nɛlɛ/
     we.pl place there stay.cont.past that

        ['nɑpɑ 'nɔlo 'motoⁱyɑi 'nɛlɛ]   'That is where we were staying.'

5. /'moɓi 'ɓilɛ 'ʍi ʌ'ɓɛ/   ['moɓ 'ɓilɛ 'ʍi ʌ'ɓɛ]
     man   that   name what   'What is that man's name?'

   As vowel loss is predictable, all words shall be interpreted as having
a final vowel.

3.1.2 Voiceless vocoids and aspirated stops

   Voiceless vocoids occur in the word-final position particularly when
the preceding consonant is a stop. This is due to the normal stress
pattern, as mentioned above. In addition, as pitch drops lower and lower
following the highest pitch on the stressed syllable, it compounds the
problem of speaking or hearing final vowels. All the vowels have been
recorded as voiceless word-finally. They will be represented as the voiced
vowels with which they vary, but never contrast.

    /'mɑsi/   ['mɑsI] ~ ['mɑs]   'must go'
    /ʍipɛ/   ['ʍipƐ] ~ ['ʍipɛ] ~ [ʍip]   'domestic pig'
    /'ʍɑse/   ['ʍɑsE] ~ ['ʍɑse]   'Let's do it!'
    /'tiumʌ/   ['tiumʌ] ~ ['tium]   'place name'
    /'mɑpɑ/   ['mɑpɑ] ~ ['mɑpɑ]   'forehead'
    /'mɑʍɔ/   ['mɑᵘʍɔ] ~ ['mɑᵘʍɔ]   'intend to eat'
    /'topo/   ['topO] ~ ['topo]   'Put it (there)!'
    /'tɑpu/   ['tɑpU] ~ ['tɑpu]   'clouds'

   Aspiration of voiceless stops [Cʰ] in the word-final position occurs
infrequently, but varies with silent vocoids or voiced vocoids. The
aspiration will be represented by the voiced vowel with which it varies.

    /'ʍolɑpi/   ['ʍolɑpʰ] ~ ['ʍolɑpI] ~ ['ʍolɑpi] 'all right'
    /'lɑti/   ['lɑtʰ] ~ ['lɑtI] ~ ['lɑti]   'arm'

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/'tite/      ['tith] ~ ['titɛ] ~ ['tite]           'this'
/'wisɛtɛ/    ['wisɛth] ~ ['wisɛtɛ]                  'cold'
/'nokɛ/      ['nokh] ~ ['nokɛ]                      'bird'
```

All voiceless vocoids and aspirated word-final stops will be
represented phonetically hereafter as voiceless vocoids, but phonemically
as voiced vowels.

3.2 Status of vocoid sequences

Although eight vowels are being proposed in this analysis, only seven
co-occur regularly in sequences. The vowel /ʌ/ has not been found to occur
in sequences other than [iʌ] and [uʌ].

Seven vocoids can theoretically combine into forty-two pairs (not
including geminates). Thirty-four of those pairs have been recorded in
Hewa speech and are listed in Figure 1 in descending order of the number of
actual sequences occurring.

Following Vocoid

		-i	-u	-o	-ɑ	-e	-ɛ	-ɔ
P	i-	--	iu	io	iɑ	ie	iɛ	iɔ
r	u-	ui	--	uo	uɑ	ue	uɛ	
e	o-	oi	ou	--	oɑ	oe	oɛ	
	ɑ-	ɑi	ɑu	ɑo	--			
V	e-	ei	eu	eo	eɑ	--	eɛ	eɔ
o	ɛ-	ɛi	ɛu	ɛo	ɛɑ		--	ɛɔ
c	ɔ-	ɔi	ɔu	ɔo	ɔɑ			--

Figure 1. Vocoid Pairs Heard in Hewa

3.2.1 Sequences of mid and low vocoids

No more than two vocoids articulated with mid and low tongue height
are ever found together at any one time within a word. Thirteen of the
twenty possible combinations from Figure 1 have been recorded. Each pair
takes the timing of two syllables. Primary or secondary stress may apply
to either member of a pair.

```
[oɑ]    /'loloɑpɑ/       ['¹lolo²ɑpɑ]        'male name'
[oe]    /o'e/            [o'e]               'affirmative response'
[oɛ]    /'koɛ/           ['koɛ]              'vomit' (noun)
[ɑo]    /'yɑo/           ['yɑo]              'the Raggiana Bird-of-Paradise'
[eo]    /'mɑseo/         ['mɑseo]            'must regularly do'
[eɑ]    /'kɛleɑmɛ/       ['¹kɛle²ɑmɛ]        'therefore'
[eɛ]    /'leɛmɑ/         ['leɛmɑ]            'female name'
[eɔ]    /'peɔ/           ['peɔ]              'have not done'
[ɛo]    /'tɑwɛleɔ/       ['tɑuwɛleɔ]         'Wake (him)!'
[ɛɑ]    /sɛ'ɑ/           [sɛ'ɑ]              'Come!'
[ɛɔ]    /mɛ'ɑnɛɔlopi/    [mɛ'ɑnɛ²ɔlopi]      'already assembled'
[ɔo]    /'mɔo/           ['mɔo]              'knows how to carve'
[ɔɑ]    /'ɓɔɑpɑ/         ['ɓɔɑpɑ]            'from the centre, in the middle'
```

These pairs are interpreted to be two syllables phonemically.

3.2.2 Sequences beginning with high vocoids

Other vocoids which combine regularly in pairs are those where the
first is articulated with high tongue height and the second may be any
vocoid. Eleven of the twelve possibilities from Figure 1 have been
recorded. The only two sequences with [ʌ] found to date are of this type.

```
[iu]    /'tiumʌ/         ['tiumʌ]           'place name'
[io]    /'mɛkio/         ['mɛkio]           'customarily sl
[iɑ]    /ti'ɑmɛne/       [ti'ɑmɛne]         'slowly'
[ie]    /'lieɑpɑ/        ['¹lie²ɑpɑ]        'male name'
[iɛ]    /'siɛ/           ['siɛ]             '(I) don't know'
[iɔ]    /'tiɔ/           ['tiɔ]             'ours (dual)'
[ui]    /'suimɑ/         ['suimɑ]           'female name'
[uo]    /mʌ'nɑluo/       [mʌ'nɑluo]         'customarily speaks'
[uɑ]    /'luɑ/           ['luɑ]             'wife'
[ue]    /'ɔpuenɑmɛ/      ['¹ɔpʷe²nɑmɛ]      'dragonfly'
[uɛ]    /'mɑluɛniɑ/      ['¹mɑlu²ɛniɑ]      'six (adj.)'
[iʌ]    /'ɔpitiʌpʌ/      ['ɔpɪtiʌpʌ]        'male name'
[uʌ]    /'nukuʌpe/       ['nukʷʌpe]         'morning'
```

Stress occasionally falls on the second vocoid of such pairs, showing
the independence of each of the vocoids, as for example,

```
/kɑpi'umɑ/     [kɑpi'umɑ]     'male name'
/tili'ɛpi/     [tɪli'ɛpi]     'afternoon'
/u'ɑsi/        [u'ɑsi]        'owner'.
```

In addition, most words of four syllables or longer have a secondary
stress which falls on the third syllable when counting the primary stress
as the first syllable. Often this secondary stress splits pairs of
vocoids, as marked above. On this basis, these vocoid pairs are also
interpreted as two vowels being peaks of two syllables.

3.2.3 Sequences ending with high vocoids

All ten pairs of a mid or low vocoid followed by a high vocoid have
been recorded (Figure 1). Those written phonetically as [Vᵛ] generally
take the timing of only one syllable, but those written [VV] generally take
the timing of two syllables. (The key difference between ['mɔu] 'descend'
and [mɔ'u] 'swim', or ['yɑu] 'dog' vs. [yɑ'u] 'sun', is not contrasting
timing, but contrasting stress.)

```
[oⁱ]    /'ɑxoi/          ['ɑɡoⁱ]            'sweet potato'
[oᵘ]    /'mɔpou/         ['mɔpou]           'will wrap/bind'
[ɑⁱ]    /'pɑikoɑ/        ['pɑⁱkoɑ]          'tapioca'
[ɑᵘ]    /'tɑnumɑune/     ['¹tɑnu²mɑᵘne]     'Pull!'
[eⁱ]    /'lei/           ['leⁱ]             'jungle vines'
[eu]    /'mɑneu/         ['mɑneu]           'will get'
[ɛⁱ]    /'mɛiwɔ/         ['mɛⁱwɔ]           'intend to see'
[ɛu]    /'mɛu/           ['mɛu]             'will have'
[ɔⁱ]    /'tɔimɛ/         ['tɔⁱmɛ]           'strong'
[ɔᵘ]    /'ɔunɑ/          ['ɔᵘnɑ]            'dip food in sauce'
```

As these are basically the reverse patterns of the pairs discussed immediately above (3.1.2), and since no two-vocoid pairs having the same stress pattern contrast their timing as one syllable vs. the timing as two syllables (e.g. [ɑⁱ] vs. [ɑ.i]), these pairs ending in high vocoids shall be regarded as the phonetic manifestations of the two vowels in sequence.

3.2.4 Sequences of three or more members

There seems to be a limitation on the duration of vowel sequences, causing them to be pronounced as closely as possible to the timing of two mid or low vowels in sequence as two syllables, e.g. [e.ɑ]. (See 4.3.3.)

When three or more vocoids are heard together, at least one is a high vowel. Its duration is always brief and is always tied to the preceding segment. When it follows a consonant it causes the consonant to sound labialized or palatalized, e.g. /'kueɑlɑ/ [¹kʷe²ɑlɑ] 'male name' (3.2.3). When the high vowel follows another vowel, it is pronounced as the off-glide, e.g. /'tiliɑu/ [¹tɪli²ɑᵘ] 'bat' and /'mouɑnu/ [¹moᵘ²ɑnu] 'deep, well-anchored (roots)'. Secondary stress also breaks the sequence as a consistent feature.

When a sequence of three or more vocoids is potentially formed by morphemes joining within words, a semivowel is inserted to break up the string or to replace a high vocoid. Since all Hewa verb roots end in a vowel or vowel sequence, and since six vocoids are each a verbal suffix morpheme, this insertion occurs regularly.

```
    /'miɑ/ 'is going'  ['miɑ] < {mi-ɑ}
                                 go continuous

    /'miu/ 'will go'   ['miu] < {mi-u}
                                 go future

    /'miyɑu/ 'will be going'  ['miyɑᵘ] < {mi-ɑ    -u}
                                           go cont fut

    /'miyɛ/ 'recently went'   ['miyɛ] < {mi-i      -ɛ}
                                           go nr.pst realis

    /'miwɔ/ 'intend to go'    ['miwɔ] < {mi-u   -ɔ}
                                           go fut irrealis

    /'miyɑwɔ/ 'intend to be going' ['miyɑᵘwɔ] < {mi-ɑ    -u    -ɔ}
                                                  go cont fut irrealis
```

Examples where geminates are created across morpheme boundaries are given in Section 8.1.

Since the meaning is carried heavily in the vowels of the adjoining morphemes, Hewa speakers separate potential squeezes and possible loss of a vowel. The insertion of /y/ fits a universal pattern in handling such cases (Hooper, 242).

3.3 Status of contoid clusters

No unambivalent contoid clusters are to be found within the onset or coda slots of Hewa syllables. Therefore, all phonetic clusters heard in such positions are to be reinterpreted. (Clusters across morpheme boundaries are discussed below in Sec. 6.2).

3.3.1 Word-initial clusters

Contoid clusters are found only when the first syllable is unstressed, and consist of a stop or fricative plus lateral. Such contoids will be separated by re-inserting [ɩ], which appears to have weakened in the unstressed syllable to the point of being lost. (Hooper (1976:235,39) states, "Stress languages which usually have vowel reduction processes, insert or delete the minimal vowel.")

```
/'pile/         ['pɩle] ~ ['pile] ~ ['pɛle]  'mouth'
   (The Sepik Hill Stock root for mouth/teeth is [pi-bi].)
/pile'ka/       [ple'ka]      'teeth' (mouth's appendages)
/pili'paiapa/   [pli'paiap˺]  'male name'
/ti'li/         ['tři]        'the Blue Wren Warbler'
```

3.3.2 Labialized stops, fricatives and nasal

All stops and fricatives (except /x/) and the nasal /m/ can be found in /Cu/ syllables when not followed immediately by another vowel. Since pairs of vowels occur in all environments, these [CʷV] will become /CuV/.

```
/'ɔpuenamɛ/    ['ɔpʷenamɛ]   'dragonfly'
/'nukuʌpe/     ['nukʷʌpe]     'morning'
/'tutuapa/     ['tutʷapʌ]     'from that far (place)'
/'kui/         ['kʷi]         'the Huli people'
/'puɛ/         ['ɓʷɛ]         'outer wrapping'
/'muɛmɛ/       ['mʷɛmɛ]       'wove'
```

4. Description of Phonemes

4.1.1 Description of consonantal phonemes

/p t k ɓ s x/ Apart from /t/ the obstruents vary freely with their voiced allophones in initial and intervocalic positions.[2] The stops also vary freely with their aspirated allophones in both of those positions.

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[2] Some secondary evidence for [b] not being a full phoneme was noted when words from Tok Pisin which begin with /b/ were generally pronounced by Hewa speakers with /m/ or /k/ or /p/.

```
['mɩsɩkɩs]   biskit     'biscuit, cracker'
['mɩnʌtaŋ]   binatang   'insect'
['kusboi]    bosboi     'government representative'
['poi]       boi        'boy, male'
['pɩs]       bis        'beads'
    and/or   pis        'tinned fish'
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```
/'pukɔ/        ['pukɔ] ~ ['bukɔ]           'male name'
/'napɑ/        ['nɑpɑ] ~ ['nɑbɑ]           'we (plural)'
/'pulu/        ['pulu] ~ ['pʰulu]          'hunting bow'

/'tɑpu/        ['tɑpu]                     'clouds'
/'atɛte/       ['atɛte]                    'work' (n.)
/'tito/        ['tʰito] ~ ['tʰitʰo] ~ ['tito] 'here'

/'kɑmu/        ['kʰɑmu] ~ ['kɑmu]          'frog'
/'nikɑi/       ['nikɑⁱ] ~ ['nigɑⁱ]         'eye'
/'kɔkopɑ/      ['kɔkopɑ] ~ ['kɔgopˈ]       'nose'

/'ꞵɛne/        ['ꞵɛne]                     'you (dual)'
/'moꞵi/        ['moꞵi] ~ ['mobi]           'married male'
/ʌ'ꞵu/         [ʌ'ꞵu] ~ [ʌ'bu]             'where?'

/'mɑsio/       ['mɑsio] ~ ['mɑzio]         'must go'
/'sunɛ/        ['sunɛ]                     'Snap it!'
/'sisɑle/      ['sɪsɑle]                   'ferns'

/'xoipɑ/       ['xoⁱpɑ]                    'gourd'
/'ɑxɑ/         ['ɑxɑ]                      'mountain range'
/'sɔxɔ/        ['sɔxɔ]                     'bone spoon'
```

The velar consonants are backed further when preceded or followed by a low or back vowel.

```
/'nokɛ/        ['nokʰ] ~ ['noɣɛ]           'bird'
/'kɔnɑ/        ['kɔnɑ] ~ ['ꝁɔnɑ]           'banana'
/'pɑkʌmɑ/      ['bɑkʌmɑ] ~ ['bɑꝁʌmɑ]       'heel of foot'

/'ɑxoi/        ['ɑxoⁱ] ~ ['ɑɣoⁱ]           'sweet potato'
/'ɔxɔlɔnɛ/     ['ɔxɔlɔnɛ] ~ ['ɔχɔlɔnɛ]      'new'
```

The stops may be unreleased word finally when the final vowel is dropped.

```
/'wolɑpi/      ['wolɑpɪ] ~ ['wolɑpˈ]       'It's all right'
/'wipɛ/        ['wipɛ] ~ ['wipˈ]           'domesticated pig'

/'iwitɛ/       ['iwɪtɛ] ~ ['iwɪtˈ]         'down lower on mountain'
/'tiɔtɑ/       ['tiɔtɑ] ~ ['tiɔtˈ]         'immediate vicinity'

/'pɑpɑkuku/ [ˈpɑpɑ²kukʊ] ~ [ˈpɑpɑ²kukˈ] 'area name'
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It is difficult to find many pairs of words where /x/ and /k/ phonemes contrast clearly, yet there are a number of other reasons, including the pattern pressure and my own "feel" of the language, for positing /x/ as a full phoneme with limited distribution. Some of my reasons are:

1. [k kˈ g ꝁ ɢ x ɣ χ] as allophones of one phoneme is to overload the single phoneme /k/.

2. To group [k kˈ g ꝁ ɢ] as /k/ and [x ɣ χ] as /x/ follows the clear pattern of the allophones of /p/ vs. /ꞵ/ and /t/ vs. /s/.

3. Cochran (1968) proposed multiple phonemes /k x g/ for the western dialect of Hewa.

4. Hepburn (1980) proposed multiple phonemes /k ʔ h/ for Sanio, the only other language within the Sanio Family to have been analysed.

5. Dye and Dye (1965) proposed /k g ʔ h/ for Bahinemo (Gahom), the next language eastward from Sanio in the Sepik Hill Stock to have been analysed.

6. Bruce (1979:36) proposed /k g h/ for the far eastern end of the Sepik Hill Stock. He also proposes a proto-Sepik Hill sound system including /*k *g *h *ʔ/ (1979:494).

On the basis of all these factors supporting an analysis of there being more than one back consonant phoneme, I am positing /x/ as a full phoneme.

/m n/ The voiced nasals occur in all positions in a word.

/'mɛɑnɛ/	['mɛɑnƐ]	'unmarried male'
/'pisɑmɑ/	['pɩsɑmɑ̈]	'sugar cane'
/'ɑnɛ/	['ɑnƐ]	'me'
/'nokɛ/	['nokƐ]	'bird'

/l/ [ř] (infrequently) and [ɪ] vary freely with [l] in intervocalic position.

/'ɑle/	['ɑɪe] ~ [ɑře]	'shoulder'
/ɑ'lɑpɛni/	[ɑ'ɪɑpɛnɪ] ~ [ɑ'řɑpɛn]	'upper arm'
/ti'li/	[tɩ'li] ~ ['tři]	'Blue Wren Warbler'
/tʌ'nɑlu/	[tʌ'nɑlu] ~ [tʌ'nɑɪu]	'Speak!'
/'nilimɑ/	['nɩlimɑ] ~ ['nɩɪimɑ]	'two days away from today'
/'luɑ/	['luɑ]	'wife'

/w y/ The voiced semi-vowels occur word initial and medial in non-peak slots of syllables. [w] tends to follow a back vowel (69% of word medial examples in the data); [y] tends to follow a front vowel (80% of word medial examples in the data); this is characteristic of Sepik River basin languages (Pike 1964:130; Hepburn 1980:7).

/'wolɑpi/	['wolɑpɪ]	'all right, O.K.'
/'wiwɑ/	['wiwɑ]	'bark rope'
/'towɑi/	['towɑⁱ]	'Hang (it) up!'
/'yiliwɑ/	['yɩliwɑ]	'male name'
/ɑme'yɑ/	[ɑme'yɑ]	'fruit bat'

4.1.2 Free variation between full phonemes

Some words have been heard where there appears to be free variation between pairs of full phonemes in certain words, not as a general pattern

across all words. These variations are generally intervocalic, but occasionally word initial. The predominant form is listed first in each example.

/p/ ~ /ɓ/

    /'ɓokole/ ~ /pokole/   'grass'
    /'yaiapa/ ~ /yaiɓa/   'male name'

/t/ ~ /s/

    /'takupa/ ~ /'sakupa/   'white haired possum'
    /'yakasonɛ/ ~ /'yakatonɛ/   'area name'

    (This place is at the edge of the language area, towards the Duna language. Some people there are bilingual with Duna. The government from Kopiago uses the /s/ form of the name. Duna has no /t/ vs. /s/ distinction. (Cochrane 1966))

    Part of the reason for the /t/-/s/ variation may be the influence from Duna, where the three major areas of that language correspond to a split partially along a /t/, /s/, /ts/ variation. The Lake Kopiago dialect, which borders Hewa, uses /s/. Many loanwords from Tok Pisin with /t/ in them are pronounced by Hewa speakers with /s/ or varying /t/ ~ /s/ because those words entered via Duna speakers.

/l/ ~ /y/

The choice of /l/ or /y/ seems to be a matter of personal preference.

    /'yati/ ~ /'lati/   'male rope belt'
    /'nɔpili/ ~ /'nɔpiyi/   'dark-furred possum (phalanger)'

/k/ ~ /x/

    /'kaiɓa/ ~ /'xaiɓa/   'breadfruit'
    /'paxo/ ~ /'pako/   'sugar cane pith'

4.2   Description of vowel phonemes

All vowels are found word initial, medial, and final.

[ɪ] is an allophone of [i] and occurs when followed by a nasal or when the vowel of the following CV syllable is a high vowel.

[u] is an allophone of [u] and occurs word medially in the environment of /p/.

    /'iwɛli/   ['iwɛli]   'sleeping mat'
    /'niapa/   ['niapa]   'age mate of the same sex'

    /'ilipa/   ['ɪlipa]   'bone'
    /'sinu/   ['sɪnU]   'Go up (into the house)!'
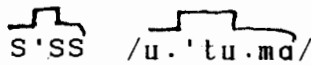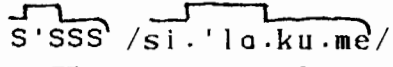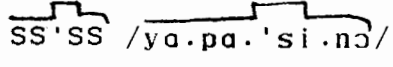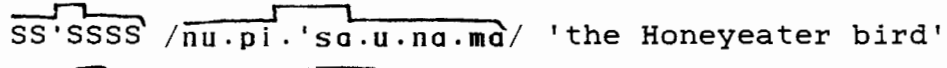   /'inɛɓe/   ['ɪnɛɓe]   'weapon'
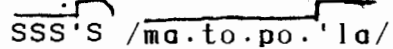
/ˈenɑpɑ/	[ˈenɑpɑ]	'heart'
/ˈmewɔ/	[ˈmewɔ]	'intend to do'
/ˈmɑneu/	[ˈmɑneu]	'will get, hold'
/ˈɛpimɛ/	[ˈɛbɩmɛ]	'already announced'
/pɛˈtɛnɛ/	[pɛˈtɛnᴇ]	'young'
/mɛˈɑnɛɔloɓi/	[mɛˈɑnɛ²ɔloɓi]	'already assembled'
/ˈʌnɑ/	[ˈʌnɑ]	'do like that, is like that'
/ˈtʌmɛlɔ/	[ˈtʌmɛlɔ]	'roof'
/ˈmʌxʌli/	[ˈmʌxʌli]	'to hollow out, bore a hole'
/ˈɑluɑlu/	[¹ɑlu²ɑlu]	'fruit dove'
/ˈɑtɑpɑ/	[ˈɑtɑpɑ]	'all'
/ˈyɑo/	[ˈyɑo]	'Raggiana Bird-of-Paradise'
/ˈule/	[ˈule]	'head covering'
/ˈkusiɑu/	[ˈkusiɑᵘ]	'Ecclectus Parrot'
/ˈpupɛtɛ/	[ˈpupɛtɛ] ~ [ˈpupɛtɛ] 'pain'	
/ˈwupɛ/	[ˈwupɛ]	'yesterday, tomorrow'
/ˈopɑ/	[ˈopɑ]	'hole/den in a tree'
/mɑtoˈto/	[mɑtoˈto]	'must gather'
/ˈɔxɔlɔnɛ/	[ɔxɔlɔnᴇ]	'new'
/ˈyɔkɔle/	[ˈyɔkɔle]	'testicle'
/ˈlɔpɔ/	[ˈlɔpɔ]	'theirs (plural)'

4.3   Suprasegmental Items

4.3.1   Pitch

Pitch is the most important factor of the suprasegmental features in recognising the stressed syllable, although intensity and length are interrelated. Only one syllable per word carries the highest pitch and normally it is the first syllable. The final syllable has a low, fading pitch. All other syllables have an intermediate pitch regardless of whether they follow the high pitch or occasionally precede it. Absolute pitch is not important. What is significant is the relationship of syllable pitch within one word.

ˈSS	/ˈwi.pɛ/	'pig'
	/ˈyɑ.∂/	'Raggiana Bird-of-Paradise'
	/ˈɑ.le/	'shoulder'
ˈSSS	/ˈmo.lu.ɑ/	'married woman'
	/ˈi.li.pɑ/	'bone'
ˈSSSS	/ˈku.ku.tɛ.tɛ/	'spider'
	/ˈpi.ɓɑ.lɑ.le/	'a hawk species'

S'SS /u.'tu.mɑ/   'elbow, knee'

S'SSS /si.'lɑ.ku.me/   'black'

SS'SS /yɑ.pɑ.'si.nɔ/   'lizards'

SS'SSSS /ñu.pi.'sɑ.u.nɑ.mɑ/ 'the Honeyeater bird'

SSS'S /mɑ.to.po.'lɑ/   'must dispose of (something)'

    Contrastive pitch patterns occur only when location of the stressed syllable contrasts within a single string of phonetic segments. These patterns are overlaid on the next examples below (Sec. 4.3.2) to avoid repetition of data and to show the close relationship between the suprasegmental features.

4.3.2 Intensity

    Within a word there is one syllable which carries slightly greater intensity than the rest. In the data under analysis more than 88% of the words have that syllable first. The other syllables within the word are heard with an intermediate intensity, generally decreasing as the word progresses. The final syllable has the least intensity, often being decreased to the point that distinctive features of the final vowel are lost. (See Sec. 3.1 above.) This is particularly true of final syllables of the shape

$$
\begin{vmatrix} m- \\ n- \\ l- \\ s- \end{vmatrix} \begin{vmatrix} -i \\ -\varepsilon \\ -\Lambda \\ -\alpha \end{vmatrix}
$$

where the vowel has disappeared almost completely in the speech of a large percentage of the Hewa speakers.

    Even with the high predictability of the first syllable having greater intensity, some words contrast only on the basis of which syllable carries both the greater intensity and highest pitch. This combination of greater intensity and highest pitch creates the stressed syllable and will be symbolised by /'/ phonemically.

/'mɑtɑno/	['mɑ.tɑ.no]	'bean'
/mɑ'tɑno/	[mɑ.'tɑ.no]	'must listen'
/'tɛlɛ/	['tɛ.lɛ]	'that distant (thing)'
/tɛ'lɛ/	[tɛ.'lɛ]	'Scrape it!'
/'ɑpolɛ/	['ɑ.po.lɛ]	'grave'
/ɑ'pɔlɛ/	[ɑ.'po.lɛ]	'Where?'

/'yɑu/   ['yɑ͡ᵘ]   'dog'

/yɑ'u/   [yɑ͡·'u]   'sun'

/'siɛ/   ['si͡·ɛ]   '(I) don't know'

/si'ɛ/   [si͡·'ɛ]   'Shoot!'

Of those words where stress is not on the first syllable, it is more often on the second than on another syllable. Examples of this as well as stress on the third or fourth syllables are given in section 4.3.1.

A secondary intensity (²) may be heard in words of four or more syllables, and falls two syllables behind the one with primary intensity (¹). Being predictable, this secondary intensity will not be written phonemically.

/'piɓɑlɑle/   [¹piɓɑ²lɑle]   'a hawk species'
/ke'ɑluʌpʌ/   [ke¹ɑlu²ʌpʌ]   'a male name'
/'piɓiɛmɛ/   [¹pɩɓi²ɛmɛ]   'sharp, pointed, tapered'

4.3.3 Length

Length has been recorded with vowels but not with consonants. Lengthened vowels occur only in the first syllable and only when that syllable is stressed. Such lengthened vowels vary with regular length vowels in the same word and will not be represented phonemically. Only two words have ever been heard consistently with length and not the variation mentioned. They are both personal names and will be written without length for the present.

/'tipɑ/   ['ti·pɑ]   'a male name'
/'kɑpi/   ['kɑ·pi]   'a male name'

5.   Non-contrastive Features

5.1 Onomotopoea

The words heard to date are related to animals and the natural elements. These include the following:

/'pɔpolo/   'bubbles, boiling action, gurgling stream'
/'noɓuɓu/   'a strong wind (associated with rain)'
/'u/   'high-pitched howl of a dog'
                    (Hewa dogs don't bark.)
/'eyɔ/   'a bush fowl which makes this cry'
/'wɛlɑ/   'cicadas, the time when they screech (approx. 6:30 pm)'
/'wolɑwolɑ/   'a bird which makes this cry (Black-headed Pitta)'

5.2 Reduplication

Examples include single morphemes which have no meaning associated with only the portion which is repeated. Others that do have meaning will be broken down for clarity.

```
/'alualu/        'a fruit dove'
/'malɛmalɛ/      'pleasant'
/'loβɛloβɛ/      'a draft or gentle air movement'
/'mama/          'dance leader'      (/ma/ 'beat drum')
/'ɔβiɔβi/        'small portions or pieces'  (/ɔpi/ 'part')
/'ɔliɔli/        'on top'            (/ɔli/ 'on')
/'kukuemɛ/       'chatted'           (/kuɛ/ 'words')
/'itutuapa/      'from very far down the mountain' (/tua/ 'far')
```

5.3. Nasalisation

Nasalisation has been heard consistently only on the words which are the last three examples in section 5.1 above, all animal sounds. It is interpreted as non-phonemic.

6. Unsolved Issues

6.1 Consonant clusters in Duna names

Less than thirty words with consonant clusters of apparent Duna origin have been recorded. These clusters occur word medially, and consist of a nasal plus a stop of the same point of articulation. In Duna, they are prenasalised stops, but are pronounced by Hewa speakers as consonant clusters with a syllable boundary between the two members.

Of these, twenty-one are personal names. These individuals are of all age groups and were born or raised on the edges of the Hewa language area bordering the Duna language area. They have at least one Duna grandparent and/or a parent bilingual with Duna.

```
[mb]    ['kɛmba]        'male name'
        ['ambilai]      'female name'

[nd]    ['tɪndiawa]     'male name'
        ['anduku]       'female name'

[ŋg]    ['pawiaŋgo]     'male name'
        ['laβaŋgi]      'female name'
```

Of the remaining words, one is a food which comes only from altitudes higher than the Hewa language area, i.e., the Duna and Ipili language areas, ['aŋga] 'pandanus nuts'.

Another plant name is [kampe] 'reed'.

One word of unknown origin is a beetle name, ['kombatio] 'rhinocerous beetle'.

The last words are related to seeing:

['ɩŋgaⁱ] ~ ['nikaⁱ]   'eye'
[ɩŋ'kikai]   'vision, eyesight'

    Hewa speakers appear to have no problem pronouncing these names for
two reasons. One is the adaptation of making voiced stops voiceless or
accepting the voiced form as the variant allophone normally found between
voiced segments (see 4.1.1). The other reason is that nasals word-finally
(perhaps it is morpheme-finally) regularly lose the following vowel,
especially in the flow of speech (see 3.1.2 and 4.3.2). That process
regularly brings consonants together across word boundaries or morpheme
junctions (6.2).

/'wamɛ   tili'amɛ/   ['wam tɩli'am]   'the wild cassowary'
wild.animal cassowary

/'wamɛ   'sua/   ['wam 'sua]   'the wild bandicoot'
wild.animal bandicoot

/'emanɛ pɛ'tɛnɛ/   ['eman pɛ'tɛn]   'young girl'
girl   young

/'anɛ tɔ'nɔ/   ['an tɔ'nɔ]   'Give it to me!'
me   give!

    As it appears that Hewa speakers sense a break coming between such
adjoining consonants, it will be assumed that the borrowed names from Duna
have been Hewa-cised and can honestly be represented with Hewa phonemes.

/mp/ from [ᵐb]
    /'kɛmpa/   [kɛmba]   'male name'
    /'ampilai/   ['ambilaⁱ]   'female name'
    /'kompatio/   [kombatio]   'rhinocerous beetle'
    /'kampe/   ['kambe]   'reed'

/nt/ from [ⁿd]
    /'tintiawa/   ['tɩndiawa]   'male name'
    /'antuku/   ['anduku]   'female name'

/nk/ from [ᵑg]
    /'pawianko/   ['pawiaŋgo]   'male name'
    /'lapanki/   ['lapaŋgi]   'female name'
    /'anka/   ['aŋga]   'pandanus nuts'
    /in'kikai/   [iŋ'kikaⁱ]   'vision, eyesight'

6.2 Consonant clusters across morpheme boundaries

    Hewa has very few words which are composed of two or more morphemes.
These appear to be limited to the pronouns, where a final vowel changes;
the verbs, where all roots end in a vowel; and the locatives. Only in the
locatives do consonants appear to cluster across morpheme boundaries, as
some 'location'-morphemes end in a nasal and all 'direction'-morphemes
begin with consonants, as shown below.

Loc Morpheme	Dir Morpheme
ɑm- upstream	⁻su towards
ɪm- downstream	-tutʷɑpɑ̃ far-from
wɔn- across	-ꞵiɔlƐ there nearby
ɔ- higher	-pulɑpɑ̃ from
i- lower	-wɪtI at

Any 'location'-morpheme of the first column must join with any one of the 'direction'-morphemes in the second column to form a locative word. All combinations are possible. Of all the morphemes indicated the first three 'direction'-morphemes have been found to stand free. There is no known association or borrowing from Duna here.

```
/ (?) /   ['ɑmsu]          'in the direction of upstream'
/ (?) /   ['wɔntutʷɑpɑ̃]    'from far across (the valley)'
```

The patterns of pitch and intensity function as if each locative is one word. The time given to pronounce the word ['ɑmsu] is the same as other two-syllable words. To leave the analysis with this as the conclusion would appear to require positing two additional syllable types, viz. VC and CVC, both being found only as first syllables of locatives or in borrowed Duna names. This does not seem justified. The cluster appears to be sufficient clue to the Hewa speaker and hearer to mentally divide the word between the two members of the cluster on the basis of morphemes.

If the word-final vowel loss is regarded as morpheme-final instead, then the earlier solution would apply here.

An alternative would be to insert the minimal vowel /ɛ/ behind the nasal in the 'location'-morpheme creating */'ɑmɛsu/. However, when later written, this may be pronounced *['ɑ.mɛ.su] after the manner of /ɑme'yɑ/ [ɑ.me.'yɑ] 'fruitbat', as a three-syllable word. This would have to be watched when a practical orthography is taught.

Some examples are set out here:

```
/'ɑmɛsu/        ['ɑmsu]        'in the direction of upstream'
/'imɛꞵiɔlɛ/     [ɪmꞵiɔlƐ]      'nearby on the downstream side'
/'wɔnɛpulɑpɑ/   ['wɔnpulɑpɑ̃]   'from across on the mountain'
/'ɔtutuɑpɑ/     ['ɔtutwɑpɑ̃]    'from far up the mountain'
/'iwiti/        ['iwɪtI]       'low on the mountainside'
```

The better solution, I feel, is to regard the 'direction'-morphemes as unstressed clitics which are not bound, but purely are unstressed words

causing a locative phrase to phonetically sound like one word. The word-final vowel loss pattern would thus still be applicable. The examples immediately above would be represented like this phonemically and phonetically:

```
/'amɛ su/          ['amsu]
/'imɛ piɔlɛ/       ['ɪmpiɔlɛ]
/'wɔnɛ pulapa/     ['wɔnpulapɑ]
/'ɔ tutuapa/       ['ɔtutʷapɑ]
/'i witi/          ['iwɪtI]
```

7.   Distribution of Syllables and Phonemes

7.1   Syllable patterns

Hewa syllable structure may be summarized by the formula:

$$S = (C) \, V$$

Two types of syllables may be generated from this formula and both are found in use. These are CV and V. Initial, medial and final positions within a word are open to either syllable type. Words may be from one to eight syllables in length. Some examples are given below.

One-Syllable Words - 2 of the 2 possible patterns occur.

V.	/'ɔ/	'skin, leaf'
CV.	/'wa/	'handheld drum'

Two-Syllable Words - 4 of the 4 possible patterns occur.

V.V	/'ɔo/	'string bag'
V.CV	/'aki/	'chin'
CV.V	/niɔ/	'eye area'
CV.CV	/'tɔlɛ/	'tongue, flame'

Three Syllable Words - 7 of the 8 possible patterns occur (there are no V.V.V patterns).

V.V.CV	/'aita/	'father'
V.CV.V	/'axoi/	'sweet potato'
V.CV.CV	/'alɛlo/	'hunger (n.)'
CV.V.V	/'koai/	'the Friar Bird'
CV.V.CV	/'niɛpa/	'hair, fur, feathers'
CV.CV.V	/'lipiɔ/	'theirs (dl.)'

CV.CV.CV   /'kɑmɛni/ 'mosquito'

Four-Syllable Words - 15 of the 16 possible patterns occur (CV.V.V.V does not occur). The incidence of this word type is much higher when there are 2 or more CV syllables in the pattern.

V.V.V.V.   /'ɑiɑi/   'fight, argument'

V.V.CV.CV   /'ɑipɛsɛ/ 'trunk of tree'

V.CV.V.CV   /'iniɛlɛ/ 'sickness'

V.CV.CV.CV   /ɑ'lɑpɛnɛ/ 'upper arm'

CV.V.V.CV   /'lieɑpɑ/ 'male name'

CV.V.CV.CV   /'miɛsimɛ/ 'dead'

CV.CV.V.V   /'tɑneɑu/ 'Hand it (to me)!'

CV.CV.CV.CV   /yɑpɑ'sinɔ/ 'lizards'

Five Syllable Words - 16 of the 32 possible patterns occur. Those patterns which do occur must have a minimum of two CV syllables. If only two such syllables are present, they cannot be adjacent to each other. Examples are nearly all personal names or verb forms.

Six-or-More-Syllable Words - Very few of the vast number of possible patterns occur. As in the five-syllable words above, there must be 2 CV syllables in a six-syllable word, and more in seven and eight-syllable words, but they cannot all be adjacent to each other. Many verb forms are six syllables, but the few longer verb roots create seven- and eight-syllable words. The longest word recorded is /mɛ'ɑnɛɔlopiɑmɛ/ '(people) already were gathered'.

7.2   Co-occurrence of consonants with vowels in syllables

All the consonants may fill the onset slot and all the vowels may fill the peak slot of either syllable type. Of the eight possible V syllables and the 88 possible CV patterns, only eight CV syllables do not occur. These involve combinations with /x/, and /e/ and /ʌ/. Front vowels and high vowels are not found following /x/ (*/xi/, */xe/, */xɛ/, */xu/, */xʌ/). The other syllables not found are */sʌ/, */yʌ/ and */ye/.

7.3   Vowel Clusters

When three vowels come together they consist of arrangements of seven of the vowels, but not /ʌ/. At least one vowel in a string of three must be a high vowel, and it may be in any of the three positions. Two vowels of the three may be high ones. The combinations heard are as follows:

```
i e ɑ        ɛ i ɑ        ɑ i o        o ɑ i
i ɑ i        ɛ i u        u e i        ɔ u i
i ɑ u        ɛ i o        u e ɑ        ɔ u ɑ
e ɑ i        ɑ i ɑ        u ɑ i        ɔ u o
e ɑ u        ɑ i u        u ɑ u
```

When four vowels come together they consist of arrangements of only
three of the vowels (/i u a/). At least two of the vowels must be high
vowels, but are never adjacent to each other. The combinations heard are
as follows:

```
ɑ i ɑ i
ɑ u ɑ u
i ɑ i ɑ
```

As discussed above in Section 3.2.4 the high vowels always are
pronounced with the preceding phoneme, generally as the off-glide of the
preceding vowel with total timing of the entire vowel sequence approaching
the timing of two unambiguous vowels.

7.4   Distribution of phonemes in words

All the consonants occur in initial, medial and final syllables of
words. All the vowels occur in initial, medial and final syllables of
words in both V and CV configurations. There is no restriction on the
location of any phoneme within a word.

8.   Morphophonemics

8.1   Review of areas already discussed

One area of morphophonemics has been discussed above in Section 6.2
regarding phonetic consonant clusters across morpheme boundaries. This
problem is the chief ongoing concern left in morphophonemic analysis.

Another area already mentioned (Section 3.1.1) discussed word-final
vowel loss when the following word began with a vowel which was exactly the
same or very similar phonetically to the final vowel of the preceding word.
This also occurred when the consonant beginning the next word was exactly
the same or very similar phonetically to the last consonant of the
preceding word.

In Section 3.2.4 sequences of three or more vocoids were discussed.
Some verb roots, however, end in the same vocoid as the attaching suffix
and should create geminates or y-insertion. It appears that geminates of
the high vocoids collapse into one, but other geminates are separated with
a semivowel. The collapsed geminates create two definitions for one
phonetic utterance.

```
/'mi/   'go/recently went'  ['mi]  < {mi-i}
                                      go nr.past

/'moβu/ 'stand/will stand' ['moβu] < {moβu -u}
                                       stand fut
```

/moɓoˈlaya/ 'is disposing of' [moɓoˈlaⁱya] < {moɓoˈla   -a}
                                                         dispose.of cont

/muluˈanoyo/ 'repeatedly asks' [muluˈanoyo] < {muluˈano-o}
                                                         ask   habitual

8.2   Clitics

There is one more category of phonological change which occurs.   The
pitch pattern changes when clitics are attached to either end of a word.
The normal pitch pattern (Section 4.3.1) was described as having highest
pitch on the first syllable and following syllables being at a lower pitch,
the word terminating with a fading, falling pitch before silence.

8.2.1   Contraction of the first person singular pronoun

Often the first person singular pronoun /ˈana/ 'I' is contracted to
/a/, loses its stress, and becomes phonologically bound to the beginning of
the next word.   Though the combination of contraction and word sounds like
one new word, the word to which the contraction attaches still retains its
normal stress pattern.   For example,

  /ˈana ˈmau/   [ˈana ˈmaᵘ]   'I will eat' (Full form pattern)
   I   eat.future

  /aˈmau/   [aˈmaᵘ]   (Frequent contraction pattern)

It sounds as if the stress has shifted to the second syllable, but in
reality, the word 'eat' has not changed.   Representing the combined words
phonemically as one word will allow the word 'eat' (or other verb) to
retain its normal pronunciation, but it will still be distinguishable from
/ˈamau/ [ˈamaᵘ] 'food' by the stressed syllable.

8.2.2   Vocative

The same type of thing occurs in the pitch pattern when the vocative
marker /o/ is added as a suffix to a word or message being spoken across
the room or called across a greater distance, and is intended to draw the
hearer's attention.   Some examples follow.

    /ˈyɛnɛ/   'son'   /ˈyɛnɛo/   'Son,...'

    /ˈinai/   'daughter'   /ˈinaio/   'Daughter,...'

    /ˈapia/   'male name' /ˈapiao/   'Oh, Apia,...'

The pitch on the added final syllable does not fall and fade, but carries
on at the unstressed syllable pitch level.

In the following examples the contrast is the pitch level only. In the
first sentence the /o/ is integral to the word meaning; in the second it is
at the utterance (sentence) level of meaning.

/'ɑnɑ 'mio/   'I often go'
  I   go.habitual

/'ɑnɑ 'mio/   'I'm letting you know that I'm going now.'
  I   go-voc.marker

I propose using the space to indicate the levelling of the pitch by
regarding the vocative marker as an unstressed word, the same as was
proposed in Section 6.2.

e.g. "Ana mio."   vs. "Ana mi o."
      I   go.habitual   I   go voc.marker

8.2.3 Conjunctions

    When items are together in a series, a suffix is added to each item
and affects the pitch pattern of the word to which it is attached, the same
as mentioned in Section 8.2.2 immediately above. Nouns or clauses may be
joined. The space will again be used to indicate the phonological change in
pitch pattern. An example follows.

 /'nɑpɑ ki'ɑwʌpʌ wɛpɛ so'sɑiɑpɑ wɛpɛ 'ɑliɑu wɛpe
  we.pl Kiawʌpʌ and Sosaiapa and Aliau and

    'nɑpɑ 'ɔte 'uwe se 'yɛimɛ/
     we.pl river bank at go.upstream.direction.past

  'We (Kiawʌpʌ, Sosaiapa, Aliau and I) went upstream along
   the river's bank.'

8.3 Verbs

    All Hewa verb roots end in a vowel. When tense and aspect markers
beginning with a high vowel (or semi-vowel) are added as suffixes to verb
roots ending in /ɑ/, they cause the /ɑ/ to glide. The examples shown below
are represented phonetically to illustrate this point.

Root	Present	Far Past Realis	Near Past Realis	Future Irrealis	Past Completed
	/-Ø/	/-m-ɛ/	/-i-ɛ/	/-u-ɔ/	/-po-m-ɛ/
-'ɑ- eat	'mɑ	'mɑmɛ	'mɑⁱyɛ	'mɑᵘwɔ	'mɑpomɛ
-le'ɑ- return	mɛle'ɑ	mɛle'ɑmɛ	mɛle'ɑⁱyɛ	mɛle'ɑᵘwɔ	mɛle'ɑpomɛ
-'nɑ- hit, beat	mʌ'nɑ	mʌ'nɑmɛ	mʌ'nɑⁱyɛ	mʌ'nɑᵘwɔ	mʌ'nɑpomɛ
-'ɑninɑ- lift	'mɑninɑ	'mɑninɑmɛ	'mɑninɑⁱyɛ	'mɑninɑᵘwɔ	'mɑninɑpomɛ

All other vowels at the end of a verb root do not change because the meaning is tied to the vowels.

-'uwaⁱ-   'muwaⁱ   'muwaⁱmɛ   'muwaⁱyɛ   'muwaⁱwɔ   'muwaⁱpomɛ
  fill

-'aneaᵘ-   'maneaᵘ   'maneaᵘmɛ   'maneaᵘyɛ   'maneaᵘwɔ   'maneaᵘpomɛ
  hand over

-'ɔ-   'mɔ   'mɔmɛ   'mɔyɛ   'mɔwɔ   'mɔpomɛ
  chop, carve

-'ɔu-   'mɔu   'mɔumɛ   'mɔuyɛ   'mɔuwɔ   'mɔupomɛ
  descend

-lu'ano-   'mulu'ano mulu'anome mulu'anoyɛ mulu'anowɔ mulu'anopomɛ

Because no other vowels glide when morphemes are suffixed to the verb roots, but the roots retain their shape, these morphophonemic glides on /a/ will not be written, but the basic root form will be kept. This is subject to later testing when there are Hewa literates. (Cochran 1977: 91-92).

Three verbs have been found to follow another pattern when only the future tense vowel suffix /u/ is added to the root. The last vowel is dropped and replaced by the /u/. These verbs return to the pattern when additional suffixes are added. The expected form is given last in the following examples.

    /'mɛku/   'will sleep'   < {mɛki -u}   (*/'mɛkiu/)
                                      sleep fut

    /'mɛkiwɔ/ 'intend to sleep' < {mɛki -u -ɔ}
                                      sleep fut irrealis

    /'mɛtu/   'will build'   < {mɛti -u} (*/'mɛtiu/)
                                      build fut

    /'mɛtiwɔ/ 'intend to build' < {mɛti -u -ɔ}
                                      build fut irrealis

    /mo'ɓu/   'will put'   < {mo'ɓo-u} (*/mo'ɓou/)
                                      put   fut

    /mo'ɓowɔ/ 'intend to put'   < {mo'ɓo-u -ɔ}
                                      put   fut irrealis

The phonemic shapes do not have the same form as any other known verb root, so there does not seem to be any confusion with other verbs. Also, later transfer of the phonemic shapes to an orthography will probably cause fewer errors for new readers than might spellings of the morphemic shapes on the right. Therefore, I prefer to use the phonemic shapes as the exceptions to the rule, rather than the morphemic shapes. This, too, is subject to later testing.

9. Orthography

9.1 Proposed orthography

The following is a listing of Hewa phonemes and allophones with a suggested orthographic symbol following.

Phoneme	Allophones	Orthographic Symbol
/p/	[p pʰ pˈ b]	p
/t/	[t tʰ tˈ]	t
/k/	[k kʰ kˈ g ḳ ǥ]	k
/ƀ/	[ƀ b]	f
/s/	[s z]	s
/x/	[x ɠ x̣]	x
/m/	[m]	m
/n/	[n]	n
/l/	[l ɭ r]	l
/w/	[w]	w
/y/	[y]	y
/i/	[i ɩ]	i
/e/	[e]	ĕ
/ɛ/	[ɛ]	e
/ʌ/	[ʌ]	ä
/ɑ/	[ɑ]	a
/u/	[u ʊ]	u
/o/	[o]	ŏ
/ɔ/	[ɔ]	o
/ˈ/	[ˈ]	ˈ

Regarding the symbolisation of /x/, my preference is to have "x" in the orthography since it causes no conflict with Duna (Cochrane, 1966) or Tok Pisin. Conflict with English is minimal in that there is no school with English instruction within the entire Hewa language area. Five or less children from Hewa-speaking homes have received any English instruction and that is found at a minimum of one full-day's walking outside the Hewa language area. The phoneme has a very low occurrence and a restricted co-occurrence pattern as well, therefore to use "x" should not cause much difficulty.

Healey and Taylor (1977:315) indicate frequent use of "h" as the representation in PNG orthographies. My objection to the use of "h" here is that the languages of contact, Duna and Tok Pisin, as well as the other languages of the Sepik Hill Stock with orthographies (Saniyo-Hiowe, Bahinemo, Alamblak) all use "h" to represent the back velar fricative /h/. The letter shows up in the language name "Hewa" /ˈhewɑ/, now the name used by the government and missions in both the Southern Highlands Province and in the Enga Province. I would rather avoid the confusion in pronunciation by not using "h" for /x/.

Both Healey and Taylor, and Cochran (1977:44) mention successful use of "q", although Cochran sees transfer problems to English. This would not apply in Hewa for five years or more. I feel that the Hewa /x/ is a combination historically of the glottal stop and the /h/ found in the three Sepik Hill Stock languages with phonologies recorded. Dye and Dye (1965)

use "q" for the glottal stop in Bahinemo. I would put it as my second
choice for the Hewa velar fricative. Initial literacy efforts with some
people literate in Tok Pisin has shown ready acceptance and use of "x" to
this point.

   Cochran (1977:44) sees "a preferable alternative...in the digraph gg,
or the symbol ,g, with a diacritic." I would strongly prefer to stick with
a symbol not used by the nearby languages for something else, as "x" or
"q". I see it as having the fewest problems.

   Regarding the distinction between symbolising /e/ and /ɛ/, /o/ and
/ɔ/, and /ɑ/ and /ʌ/, Cochran only suggests that /ɔ/ be an adaptation of
"o", such as "ö". However, Smalley (1959:49), Healey (1975:60-61) and Lynch
(1979:101-102) recommend that the less common vowel be the marked
variation. In thirty pages of text material, the frequency of /ɛ/ to /e/
was approximately five to one, /ɔ/ to /o/ approximately five to four, and
/ɑ/ to /ʌ/ approximately five to one. Therefore /e/, /o/ and /ʌ/ will be
the marked forms as "ĕ", "ŏ", and "ă", respectively.

   Regarding stress, being phonemic it will be indicated in the
orthography when it falls on a syllable other than the first syllable. It
will be indicated by placing the acute accent over the stressed vowel.
Should subsequent testing of the orthography show that the minimal stress
pairs cause very few ambiguities, as has frequently happened in P.N.G.
(Healey and Taylor, 1977), it will be eliminated for practicality's sake
(Cochran, p. 80).

9.2 Hewa pronunciation of English and Tok Pisin vocabulary

   Non-Hewa words which follow Hewa word patterns described above
(Section 7.1) cause no change of pronunciation, as for example,
   "kina"   ['kinɑ]   'monetary unit'
   "pusi"   ['pusi]   'cat'
   "tisa"   ['tisɑ]   'teacher'
   "töiya" ['toⁱyɑ] 'toea, monetary unit'.

   If the non-Hewa words have a final consonant of /m n l s/ or have it
as the first member of a cluster across syllable boundaries, the Hewa
speaker has no problem with it, as for example,

   "misine"   ['mɪsɪn]   'mission'
   "pise"   ['pɪs]   'tinned fish'
   "metásine"   [mɛ'tɑsɪn]   'medicine'
   "kömpaune"   ['kompɑᵘn]   'plantation compound for labourers'
   "sulsule"   ['sulsul]   'tultul, government-appointed representative'
   "paluse"   ['bɑlus]   'aeroplane'
   "faile"   ['ɓɑⁱl]   'file'.

   Consonant clusters are normally split, or one member is lost, as in
the following examples.

   "sukule"   ['sukulɛ]   'skul, school'
   "sitŏa"   [sɪ'toɑ]   'store'
   "tokesa"   ['tɔkɛsɑ]   'doctor, medical worker'
   "linke"   ['lɪŋ]   'ring, to call on the radio/telephone'

```
    "Kitisene"    ['kɪtisɛn]    'Christian, baptised church member'
    "kamane"      ['kamɑn]      'gavman, all levels of government'
```

Some words normally using /t/ in Tok Pisin are pronounced with /s/ in Hewa because they were introduced by Duna speakers. This was explained in Section 4.1.2 above.

```
    "sulsule"     ['sulsul]     'tultul, government-appointed representative'
    "lösu"        ['losu]       'lotu, church worship service'
    "piskise"     ['pɪskɪs]     'bisket, biscuit, cracker, cookie'
    "köse"        ['kos]        'kot, bring to trial'.
```

Voiced stops when found word initial in non-Hewa words are regularly changed to the voiceless equivalent or to another voiced consonant, as in the following examples,

```
    "pise"        ['pɪs]        'beads' (English)
    "kumi"        ['kumi]       'gumi, plastic bag'
    "pise"        ['pɪs]        'fish' (English)
    "pole"        ['pɔl]        'ball' (English)
    "kuspöi"      ['kusboⁱ]     'bosboi, work foreman'
    "tokesa"      ['tɔkɛsɑ]     'doctor, medical worker'
    "Kote"        ['kɔtɛ]       (from the Duna ['ŋgɔte])  'God'
```


Appendix 1

Contrasts

Contrasts Between Consonantal Phonemes

Those similar phonemes to be compared and contrasted are /p/ and /ɓ/, /t/ and /s/, /l/ and /y/, and /k/ and /x/.

/p/ and /ɓ/

```
    /'polɛ/       ['polɛ]       'scab of wound'
    /'ɓolɛ/       ['ɓolɛ]       'garden fence'

    /'mipu/       ['mipu]       'the Duna people'
    /'tiɓu/       ['tiɓu]       'large diameter bamboo'

    /'pɛne/       ['pɛne]       'cucumber'
    /'ɓɛne/       ['ɓɛne]       'you (dual)'
```

/t/ and /s/

```
    /'tɑu/        ['tɑᵘ]        'taro'
    /'sɑu/        ['sɑᵘ]        'broad-bladed bamboo arrow tip'

    /'mitɔ/       ['mitɔ]       'haven't gone yet'
    /'isɔ/        ['isɔ]        'doorway, window'
```

/l/ and /y/

    /'silɛ/   ['sɩlɛ]   'pandanus leaf mat'
    /'miyɛ/   ['miyɛ]   'went (recent past)'

    /'lu/   ['lu]   'husband'
    /'yu/   ['yu]   'firewood'

    /'laimɛ/   ['laⁱmɛ]   'cross-cousin'
    /'yaimɛ/   ['yaⁱmɛ]   'alive'

/k/ and /x/

    /'talikai/   ['talikaⁱ]   'clan name'
    /ta'loxai/   [tʌ'loxaⁱ]   'Squat!'

    /'tolukai/   ['tolukaⁱ]   'Swallow it!'
    /'laxai/   ['laxaⁱ]   'male name'

    /'koiya/   ['ko̜ⁱya]   'false'
    /'xoipa/   ['xoⁱpa]   'gourd container'

    /'yɔkɔlɛ/   ['yɔkɔlɛ]   'testicles'
    /'mɔxɔlɛ/   ['mɔxɔlɛ]   'jungle'

    /'tako/   ['tako]   'blood vessel, tree root'
    /'taxo/   ['taxo]   'broad leaf used in roofing'

    /'kolo/   ['kolo]   'forbid'
    /'xoxo/   ['xoxo]   'anger'

Contrasts Between Vowel Phonemes

    Those phonemes to be compared are /i/ and /e/, /e/ and /ɛ/, /u/ and /ɯ/, /u/ and /o/, /o/ and /ɔ/, /ɛ/ and /ʌ/, and /a/ and /ʌ/. Other comparisons between the vowel clusters /ei/, /ɛi/ and /ai/ will be included.

/i/ and /e/

    /'ni/   ['ni]   'corpse'
    /'ne/   ['ne]   'you (singular)'

    /'tiuma/   ['tiuma]   'place name'
    /'teuma/   ['teuma]   'male name'

    /'inapa/   ['ɩnapa]   'cigar holder'
    /'enapa/   ['enapa]   'heart'

/e/ and /ɛ/

    /'ʙɛne/   ['ʙɛne]   'you (dual)'
    /'ʙɛnɛ/   ['ʙɛnɛ] ~ ['ʙɛn] 'you (plural)'

```
        /'te/           ['te]           'we (dual)'
        /'tɛ/           ['tɛ]           'Have it! Receive it!'

        /'mane/         ['mane]         'get, hold'
        /'manɛ/         ['manɛ]         'able to eat'
```

/i/ and /y/

```
        /'aiai/         ['aⁱaⁱ]          'angry argument' (noun)
        /'ayai/         ['ayaⁱ] ~ [aⁱyaⁱ] 'recently was eating'
        /'yayai/        ['yayaⁱ] ~ ['yaⁱyaⁱ] 'recently was arriving'
```

/u/ and /w/

The phoneme /u/ fills a peak slot in the syllable whereas /w/ always
fills a peripheral slot adjacent to the peak slot.

```
        /'puɛ/          ['buɛ]          'bad'
        /'uwɛ/          ['u.wɛ]         'old, long ago, first'

        /'tuɛ/          ['tuɛ]          'now, today'
        /'tuwai/        ['tu.waⁱ]        'Fill it!'

        /'mane-u/       ['mane.u]       'will get'        (get-future)
        /'mane-wɔ/      ['mane.wɔ]      'intend to get'  (get-intend.to)

        /'ma-u/         ['mau]          'will eat'        (eat-future)
        /'ma-wɔ/        ['mawɔ]         'intend to eat'  (eat-intend.to)

        /'lɔpuana/      ['lɔ.pu.an.a]   'male name'
        /'uwane/        ['u.wa.ne]       'male name'

        /u'asi/         [u'asi]         'owner'
        /'wasi/         ['wasI]         'Let's go!'

        /u'a/           [u'a]           'log headrest, pillow'
        /'wa/           ['wa]           'hand-held drum'
```

/u/ and /o/

```
        /'yau/          ['yaᵘ]           'dog'
        /'yao/          ['yao]          'Raggiana Bird-of-Paradise'

        /'kuɛ/          ['kuɛ]          'word'
        /'koɛ/          ['koɛ]          'vomit'

        /'su/           ['su]           'Burn it!'
        /'so/           ['so]           'the fig beetle'
```

/o/ and /ɔ/

```
        /to'po/         [to'po]         'Put it! Set it!'
        /'tɔpo/         ['tɔpo]         'Tie it! Bind it!'
```

| /'toi/ | ['toⁱ] | 'a variety of sweet potato' |
| /'tɔi/ | ['tɔⁱ] | 'Close it!' |

/ɛ/ and /ʌ/

| /'kukuɛpɛ/ | ['kukʷɛpɛ] | 'have chatted, conversed' |
| /'nukuʌpe/ | ['nukʷʌpe] | 'morning' |

| /'kɛli/ | ['kɛli] | 'only, alone' |
| /'kʌle/ | ['kʌle] | 'widow' |

| /mɛ'nɛmɛ/ | [mɛ'nɛmɛ] | 'counted' |
| /'nʌmʌla/ | ['nʌmʌla] | 'accompany, together' |

| /'nɛmɛ/ | ['nɛmɛ] | 'thumb' |
| /'nʌma/ | ['nʌma] | 'sulphur-crested cockatoo' |

/a/ and /ʌ/

| /'ana/ | ['anɑ] | 'I' |
| /'ʌna/ | ['ʌna] | 'do like that' |

| /'tape/ | ['tabe] | 'male name' |
| /'tʌpɛ/ | ['tʌpɛ] | 'wasp' |

| /'maxali/ | ['maxali] | 'chase, run-off' |
| /'mʌxʌli/ | ['mʌxʌli] | 'bore a hole, hollow out' |

| /'topaxa/ | ['topaxa] | 'buttocks' |
| /'pʌxʌ/ | ['pʌxʌ] | 'pandanus tree variety' |

As may have been seen in the above comparisons, a vowel may be the verb root. In actual fact, nearly every vowel phoneme is a verb root and contrasts can be made in all verbal forms, though only a sample is given here.

Verb Root	Indef Fut	Far Past	Imperative
/i/ 'go, walk'	/'miwɔ/	/'mimɛ/	/'si/
/e/ 'do'	/'mewɔ/	/'memɛ/	/'se/
/ɛ/ 'have, exist'	/'mɛwɔ/	/'mɛmɛ/	/'tɛ/
/a/ 'eat, drink'	/'mawɔ/	/'mamɛ/	/'ta/
/u/ 'roast, burn'	/'muwɔ/	/'mumɛ/	/'su/
/ɔ/ 'chop, carve'	/'mɔwɔ/	/'mɔmɛ/	/'tɔ/

/ei/, /ɛi/ and /ai/

/'matei/	['mateⁱ]	'blood'
/'matɛi/	['matɛⁱ]	'must watch'
/ma'taipɛ/	[mʌ'taⁱpɛ]	'male name'

| /'tɛi/ | ['tɛⁱ] | 'Look!' |
| /'tai/ | ['taⁱ] | 'father's sister' |

/'yɛimɛ/   ['yɛⁱmɛ]   'went upstream'
/'yɑimɛ/   ['yɑⁱmɛ]   'alive'

Sequences with semi-vowels

    Words of the patterns VSV and VGSV contrast, where S is the semivowel
/y/ or /w/ and G is the offglide of the same point of articulation as the
semivowel.

/'muwɔ/   ['muwɔ]   'intend to cook'   (root -u-)
/'mɔwɔ/   ['mɔwɔ]   'intend to carve'   (root -ɔ-)
/'mɔuwɔ/   ['mɔ^uwɔ]   'intend to descend' (root -ɔu-)

/mʌ'nɑniɑwɔ/   [mʌ'nɑniɑwɔ]   'intend to find'   (root -nɑniɑ-)
/'mɔpiɑuwɔ/   ['mɔpiɑ^uwɔ]   'intend to sacrifice' (root -ɔpiɑu-)

/'mɔyɛ/   ['mɔyɛ]   'recently carved'   (root -ɔ-)
/'miyɛ/   ['miyɛ]   'recently went'   (root -i-)
/'mɔiyɛ/   ['mɔⁱyɛ]   'recently closed (door)' (root -ɔi-)

/'ɔyo/   ['ɔyo]   'habitually carved' (root -ɔ-)
/'ɔiyo/   ['ɔiyo]   'Come!'   (single morpheme)

/'ɔwe/   ['ɔwe]   'garden'   (single morpheme)
/'ɔuwɛpɛ/   ['ɔ^uwɛpɛ]   'after descending' (-ɔu- + conj. -wɛpɛ)

    Words of the patterns VV and VSV contrast, where S is a semi-vowel of
the same point of articulaion as the preceding vowel.

/'mue/   ['m^we]   'ribs'
/'uwe/   ['uwe]   'shore'
/'uɛ/   ['uɛ]   'old, long ago, first'

/'muwɛmɛ/   ['muwɛmɛ]   'cooked and...' (root -u-)
/'muɛmɛ/   ['muɛmɛ]   'wove'   (root -uɛ-)

/u'ɑ/   [u'ɑ]   'headrest, pillow'
/'uwɑ/   ['uwɑ]   'cause to burn, cook'
/'uwɑi/   ['uwɑⁱ]   'to fill (liquid)'

/'tuɑ/   ['t^wɑ]   'big, far'
/'tuwɑi/   ['tuwɑⁱ]   'Fill it!'

/'miyɛ/   ['miyɛ]   'recently went'
/'siɛ/   ['siɛ]   '(I) don't know'
/mi'ɛ/   [mi'ɛ]   'shoots'

/'liɛ/   ['liɛ]   'to win'
/mʌ'nɑliyɛ/   [mʌ'nɑliyɛ]   'recently spoke'

Appendix 2

Previously Analysis

Cochran (1968:144, footnote) presented a tentative list of phonemes for Yoliapi, an area at the edge of the western end of the Hewa language area, and 30-35 kilometres from where the data in this paper was gathered. She proposed the following phonemes.

14 Consonants

voiceless unaspirated stops	p	t	k
voiceless fricatives	ɸ	s	x
voiced fricatives	ƀ		ɡ
nasals	m	n	
continuants		r	
		l	
	w	y	

5 Vowels

i   u
e   ɔ
ɑ

Stress was phonemic and represented by "'" preceding the stressed syllable. Vowel clusters had not been completely analysed at the time of publication. Non-syllabic vowels were written as "w" or "y". No orthography was proposed or taught, but the analysis is applicable here.

It will be readily seen that she gave phonemic status to three items (ƀ, ɡ, r) which I regard as allophones of other phonemes. She also appears to have regarded /ɛ/ and /o/ as allophones, though I am firmly convinced they are full phonemes in this dialect.

A look at the phonemes of Saniyo-Hiowe (Hepburn, 1980), the most closely related language to have been analysed (Bruce, 1979:517), may help to put things into perspective as the Yoliapi dialect lies between Saniyo-Hiowe and the Hewa dialect analysed in this paper. Saniyo-Hiowe does not have voiced stops or fricatives, but chooses "r" over "l" as the predominant allophone of the one phoneme. I have chosen "l" for the same reason. It is well possible that Yoliapi uses both on an equal basis, but the pattern pressure, then, is towards one phoneme only, thus reducing Cochran's 14 consonants to the same eleven proposed here.

Saniyo-Hiowe vowels, however, parallel the five of Yoliapi rather than the eight proposed here, although previous analyses in Saniyo (Lewis and Lewis, 1970) had proposed six, regarding the [e] and [ɛ] as separate phonemes and not allophones of one phoneme. Yoliapi may well only have five vowel phonemes, however the [e]-[ɛ] split was the last phoneme to be recognised in the 1981 analysis of this central dialect. That distinction may be in the Yoliapi dialect as well.

Because the period of data collection at Yoliapi was short, was done under a heavily monolingual approach and was analysed outside the language

area without opportunity to check data with a native speaker, I don't
believe it can be given any more recognition than that given here. This is
not to slight, in any sense, Cochran's current deep understanding of P.N.G.
phonological patterns (Cochran, 1977), but by her own admission, her
interest in 1968 was grammatical analysis (personal communication). The
Yoliapi article indicates this, too, by having the phonemes in a footnote.

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