

2. Outline of Phonemes

2.1 Chart of phonemes

2.1.1 Work chart of contoids¹

^p [p p ^h p' b]	^t [t t ^h t']	^k [k k ^h k' k g ɸ]
^β [β b]	^s [s z]	^x [x x ɣ]
^m	ⁿ	
	^l [l l' l'']	
^w	^y	

2.1.2 Work chart of vocoids

ⁱ [i i']	^u [u u']
^e	^o
^ɛ	^ʌ ^ɔ
	^a

¹ Notice that there is no /h/ phoneme, even though the people and their language are called ['hewə]. 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 Kapiago 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 /a/ were being dropped word-finally following /m n l s/. Since /i/ and /a/ 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 [i u] already cannot occur word-finally in Hewa. The vowel /a/ 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 [mɔn] 'boy', [emɔn] 'girl', [wɔm] 'wild animal', [tʰɔlɔm] 'cassowary', [wɪp] 'pig', [ɔl] 'he', [ɪnɪk] 'sickness', [mɪs] 'long, tall', [yɪs] '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 /a/ very rarely being lost at the end of the past tense verbal suffixes /-mɔ/ [-mɔ] 'far past, realis' and /-yɔ/ [-yɔ] '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. /'ana 'pau/ ['an 'pau] 'I have none.'
I neg.
2. /'ɛlc ʌ'pu/ ['ɛl ʌ'pu] 'Where is he?'
he where
3. /'napa 'atapa 'wasi/ ['nap' 'atapa 'was] 'Let's all go!'
we.pl all hort.go
4. /'napa 'no 'ɔlo 'motoyai 'ncle/
we.pl place there stay.cont.past that

 ['napa 'nɔlo 'moto'yai 'ncle] 'That is where we were staying.'
5. /'mopi 'pɪlc 'wi ʌ'pɛ/ ['mob 'pɪlc 'wi ʌ'pɛ]
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.

/'masi/	['masI] ~ ['mas]	'must go'
/wɪpɛ/	['wɪpɛ] ~ ['wɪpɛ] ~ [wɪp]	'domestic pig'
/'wase/	['waseE] ~ ['wase]	'Let's do it!'
/'tiumʌ/	['tiumʌ] ~ ['tium]	'place name'
/'mapa/	['mapU] ~ ['mapa]	'forehead'
/'mawɔ/	['mawɔ] ~ ['mawɔ]	'intend to eat'
/'topo/	['topO] ~ ['topo]	'Put it (there)!'
/'tapu/	['tapU] ~ ['tapu]	'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.

/'wolapi/	['wolap ^h] ~ ['wolapI] ~ ['wolapi]	'all right'
/'lati/	['lat ^h] ~ ['latI] ~ ['lati]	'arm'

/'tɪtɕ/	['tɪtʰ] ~ ['tɪtɕ]	~ ['tɪtɕ]	'this'
/'wɪsɕtɕ/	['wɪsɕtʰ] ~ ['wɪsɕtɕ]		'cold'
/'nokɕ/	['nokʰ] ~ ['nokɕ]		'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

	-ɪ	-u	-o	-ɑ	-e	-ɕ	-ɔ
P	ɪ-	--	ɪu	ɪo	ɪɑ	ɪe	ɪɕ
r	u-	uɪ	--	uo	uɑ	ue	uɕ
e	o-	oɪ	ou	--	oɑ	oe	oɕ
	ɑ-	ɑɪ	ɑu	ɑo	--		
V	e-	eɪ	eu	eo	eɑ	--	eɕ
o	ɕ-	ɕɪ	ɕu	ɕo	ɕɑ	--	ɕɔ
c	ɔ-	ɔɪ	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.

[oo]	/'loloopa/	[ʰlolo²apɔ]	'male name'
[oe]	/o'e/	[o'e]	'affirmative response'
[oc]	/'koc/	['koc]	'vomit' (noun)
[oo]	/'yoo/	['yoo]	'the Raggiana Bird-of-Paradise'
[eo]	/'maseo/	['maseo]	'must regularly do'
[eɑ]	/'kcleamc/	['kcle²amɕ]	'therefore'
[eɕ]	/'lecma/	['lecma]	'female name'
[eɔ]	/'peɔ/	['peɔ]	'have not done'
[co]	/'tawɕlco/	['tawɕlco]	'Wake (him)!'
[cɑ]	/'sc'o/	['sc'o]	'Come!'
[cɔ]	/'mɔncɔlopi/	['mɔnc²ɔlopi]	'already assembled'
[ɔo]	/'moo/	['moo]	'knows how to carve'
[ɔɑ]	/'pɔopa/	['pɔopɔ]	'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.

[iʌ]	/ˈtiʌmʌ/	[ˈtiʌmʌ]	'place name'
[io]	/ˈmckio/	[ˈmckio]	'customarily sl
[io]	/tiˈomcne/	[tiˈomcne]	'slowly'
[ie]	/ˈlieopa/	[ˈlie ² opa]	'male name'
[ie]	/ˈsie/	[ˈsie]	'(I) don't know'
[io]	/ˈtio/	[ˈtio]	'ours (dual)'
[ui]	/ˈsuiɔ/	[ˈsuiɔ]	'female name'
[uo]	/mʌˈnɔluo/	[mʌˈnɔluo]	'customarily speaks'
[uo]	/ˈluo/	[ˈluo]	'wife'
[ue]	/ˈɔpuenɔm/	[ˈɔp ² e ² nɔmɛ]	'dragonfly'
[uc]	/ˈmɔlucnio/	[ˈmɔlu ² cnio]	'six (adj.)'
[iʌ]	/ˈɔpitiʌpʌ/	[ˈɔpitiʌpʌ]	'male name'
[uʌ]	/ˈnukuʌpe/	[ˈnuk ² ʌpe]	'morning'

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

/kopiˈumo/	[kopiˈumo]	'male name'
/tɪliˈcpi/	[tɪliˈcpi]	'afternoon'
/uˈosi/	[uˈosi]	'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 [Vʋ] generally take the timing of only one syllable, but those written [VV] generally take the timing of two syllables. (The key difference between [ˈmɔʋ] 'descend' and [mɔˈu] 'swim', or [ˈyoʋ] 'dog' vs. [yoˈu] 'sun', is not contrasting timing, but contrasting stress.)

[oʌ]	/ˈɔxol/	[ˈɔgoʌ]	'sweet potato'
[oʋ]	/ˈmɔpou/	[ˈmɔpou]	'will wrap/bind'
[aʌ]	/ˈpaikoa/	[ˈpaˈkɔa]	'tapioca'
[aʋ]	/ˈtonumɔne/	[ˈtonu ² mɔne]	'Pull!'
[eʌ]	/ˈleɪ/	[ˈleˈ]	'jungle vines'
[eu]	/ˈmoneu/	[ˈmoneu]	'will get'
[eʌ]	/ˈmciwɔ/	[ˈmciwɔ]	'intend to see'
[cu]	/ˈmɔu/	[ˈmɔu]	'will have'
[ɔʌ]	/ˈtɔɪm/	[ˈtɔɪm]	'strong'
[ɔʋ]	/ˈɔuna/	[ˈɔuna]	'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. [a¹] vs. [a.1]), 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.o]. (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. /'kueo¹o/ ['k^we²o¹o] 'male name' (3.2.3). When the high vowel follows another vowel, it is pronounced as the off-glide, e.g. /'tili¹ou/ ['t¹ili²o¹u] 'bat' and /'mou¹onu/ ['m¹ou²o¹nu] '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.

- /'mia/ 'is going' ['mia] < {mi-a}
go continuous
- /'miu/ 'will go' ['miu] < {mi-u}
go future
- /'miyou/ 'will be going' ['miyo^u] < {mi-a -u}
go cont fut
- /'miyc/ 'recently went' ['miyc] < {mi-i -c}
go nr.pst realis
- /'miwo/ 'intend to go' ['miwo] < {mi-u -o}
go fut irrealis
- /'miyow^u/ 'intend to be going' ['miyo^uw^u] < {mi-a -u -o}
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 /j/ 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 [ɹ], 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.")

/ˈpile/	['pɹile] ~ ['pile] ~ ['pele]	'mouth'
(The Sepik Hill Stock root for mouth/teeth is [pi-bi].)		
/pile'ko/	[ple'ko]	'teeth' (mouth's appendages)
/pili'paiaɹa/	[pli'paiaɹp]	'male name'
/ti'li/	['tʃi]	'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 [C^wV] will become /CuV/.

/ˈɔpɹenɔmɛ/	['ɔp ^w enɔmɛ]	'dragonfly'
/ˈnukuɹɔpɛ/	['nuk ^w ɹɔpɛ]	'morning'
/ˈtutuɹɔpɔ/	['tut ^w ɹɔpɔ]	'from that far (place)'
/ˈkui/	['k ^w i]	'the Huli people'
/ˈpɹɛ/	['p ^w ɹɛ]	'outer wrapping'
/ˈmɹɛmɛ/	['m ^w ɹɛmɛ]	'wove'

4. Description of Phonemes

4.1.1 Description of consonantal phonemes

/p t k β 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.

² Some secondary evidence for [β] 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/.

['misɹkɹis]	<u>bis</u> kit	'biscuit, cracker'
['mɹnɹtɹŋ]	<u>bi</u> natang	'insect'
['kɹsbo']	<u>bo</u> sboi	'government representative'
['pɹɔ']	<u>bo</u> i	'boy, male'
['pɹis]	<u>bi</u> s	'beads'
	and/or <u>pi</u> s	'tinned fish'

/pukɔ/	['pukɔ] ~ ['bukɔ]	'male name'
/napa/	['napa] ~ ['naba]	'we (plural)'
/pulu/	['pulu] ~ ['pʰulu]	'hunting bow'
/tapu/	['tapu]	'clouds'
/atete/	['atete]	'work' (n.)
/tito/	['tʰitɔ] ~ ['tʰitʰo] ~ ['tito]	'here'
/kamu/	['kʰamu] ~ ['kamu]	'frog'
/nikai/	['nikaʰ] ~ ['nigaʰ]	'eye'
/kəkopa/	['kəkopɔ] ~ ['kəgopʰ]	'nose'
/pene/	['pene]	'you (dual)'
/mopi/	['mopi] ~ ['mobi]	'married male'
/ʌpu/	[ʌ'pu] ~ [ʌ'bu]	'where?'
/masio/	['masio] ~ ['mazio]	'must go'
/sunc/	['sunc]	'Snap it!'
/sisale/	['sisale]	'ferns'
/xoipa/	['xoʰpa]	'gourd'
/axa/	['axa]	'mountain range'
/sɔxɔ/	['sɔxɔ]	'bone spoon'

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

/nokɔ/	['nokʰ] ~ ['noŋɔ]	'bird'
/kɔnɔ/	['kɔnɔ] ~ ['kɔŋɔ]	'banana'
/pəkama/	['bəkama] ~ ['bəkama]	'heel of foot'
/axoʰ/	['axoʰ] ~ ['aŋoʰ]	'sweet potato'
/ɔxɔlɔnɔ/	['ɔxɔlɔnɔ] ~ ['ɔxɔlɔnɔ]	'new'

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

/wolapi/	['wolapɪ] ~ ['wolapʰ]	'It's all right'
/wipc/	['wipɔ] ~ ['wipʰ]	'domesticated pig'
/iwitɔ/	['iwitɔ] ~ ['iwitʰ]	'down lower on mountain'
/tɪɪtɔ/	['tɪɪtɔ] ~ ['tɪɪtʰ]	'immediate vicinity'
/papakuku/	['papə²kukʉ] ~ ['papə²kukʰ]	'area name'

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 kʰ ɡ k̚ ɡ̚ x ɡ̚ x̚] as allophones of one phoneme is to overload the single phoneme /k/.
2. To group [k kʰ ɡ k̚ ɡ̚] as /k/ and [x ɡ̚ x̚] as /x/ follows the clear pattern of the allophones of /p/ vs. /pʰ/ 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.

/'mɔnc/	['mɔnɛ]	'unmarried male'
/'pɪsɔmɔ/	['pɪsɔmɔ]	'sugar cane'
/'ɔnc/	['ɔnɛ]	'me'
/'nokɛ/	['nokɛ]	'bird'

/l/ [ʃ] (infrequently) and [ɹ] vary freely with [l] in intervocalic position.

/'aɪe/	['aɪe] ~ [aʃe]	'shoulder'
/'a'ɪapɛni/	[a'ɪapɛni] ~ [a'ʃapɛni]	'upper arm'
/'tɪ'li/	['tɪ'li] ~ ['tʃi]	'Blue Wren Warbler'
/'tɔ'nɔlu/	['tɔ'nɔlu] ~ [tɔ'nɔɹu]	'Speak!'
/'nɪlɪmɔ/	['nɪlɪmɔ] ~ ['nɹlɪmɔ]	'two days away from today'
/'luɔ/	['luɔ]	'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).

/'wɔɪɔpi/	['wɔɪɔpi]	'all right, O.K.'
/'wɪwɔ/	['wɪwɔ]	'bark rope'
/'tɔwɔɪ/	['tɔwɔɪ]	'Hang (it) up!'
/'yɪlɪwɔ/	['yɪlɪwɔ]	'male name'
/'ɔmɛ'yɔ/	['ɔmɛ'yɔ]	'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/ ~ /β/

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

/t/ ~ /s/

/'takupa/	~ /'sakupa/	'white haired possum'
/'yakasonc/	~ /'yakatonc/	'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.

/'yoti/	~ /'loti/	'male rope belt'
/'nopili/	~ /'nopiyi/	'dark-furred possum (phalanger)'

/k/ ~ /x/

/'kaipa/	~ /'xaipa/	'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/.

/'iwcli/	[/'iwcli]	'sleeping mat'
/'niapa/	[/'niapa]	'age mate of the same sex'
/'ilipa/	[/'ilipa]	'bone'
/'sinu/	[/'sinu]	'Go up (into the house)!'
/'incpe/	[/'incpe]	'weapon'

/enapa/	['enapa]	'heart'
/'mewɔ/	['mewɔ]	'intend to do'
/'maneʉ/	['maneʉ]	'will get, hold'
/'ɛpime/	['ɛbime]	'already announced'
/pe'tenc/	['pe'tenɕ]	'young'
/me'ancɔlopi/	['me'ancɔlopi]	'already assembled'
/'ʌna/	['ʌna]	'do like that, is like that'
/'tʌmɛɔ/	['tʌmɛɔ]	'roof'
/'maxali/	['maxali]	'to hollow out, bore a hole'
/'aluʉ/	['aluʉ]	'fruit dove'
/'atapa/	['atapa]	'all'
/'yao/	['yao]	'Raggiana Bird-of-Paradise'
/'ule/	['ule]	'head covering'
/'kusiʉ/	['kusiʉ]	'Ecclectus Parrot'
/'pupɛtɕ/	['pupɛtɕ] - ['pupɛtɕ]	'pain'
/'wupɕ/	['wupɕ]	'yesterday, tomorrow'
/'opa/	['opa]	'hole/den in a tree'
/mato'to/	[mato'to]	'must gather'
/'ɔxɔɔnɕ/	[ɔxɔɔnɕ]	'new'
/'yɔkɔle/	['yɔkɔle]	'testicle'
/'ɔpɔ/	['ɔpɔ]	'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.

'SS	/wi.pɛ/	'pig'
	/'ya.ɔ/	'Raggiana Bird-of-Paradise'
	/'a.lɛ/	'shoulder'
'SSS	/'mo.lu.ɔ/	'married woman'
	/'i.li.pa/	'bone'
'SSSS	/'ku.ku.tɛ.tɕ/	'spider'
	/'pi.pa.la.lɛ/	'a hawk species'

S'SS	u.'tu.mə/	'elbow, knee'
S'SSS	/si.'lə.ku.mə/	'black'
SS'SS	/yɑ.pə.'si.nə/	'lizards'
SS'SSSS	/nu.pi.'sə.u.nə.mə/	'the Honeyeater bird'
SSS'S	/mə.to.po.'lə/	'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

m- -i
n- -c
l- -ʌ
s- -ə

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.

/'mɔtano/	['mə.tə.nə]	'bean'
/mə'tano/	[mə.'tə.nə]	'must listen'
/'tɛlc/	['tɛ.lɛ]	'that distant (thing)'
/tɛ'lc/	[tɛ.'lɛ]	'Scrape it!'
/'əpɔlc/	['ə.pɔ.lɛ]	'grave'
/ə'pɔlc/	[ə.'pɔ.lɛ]	'Where?'

/ 'yau/	['yaū]	'dog'
/ ya'u/	[yā.'u]	'sun'
/ 'sɪc/	['sɪ.c̄]	'(I) don't know'
/ si'c/	[sī.'c̄]	'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.

/ 'pɪpɔ̄lɔ̄le/	[¹pɪpɔ̄²lɔ̄le]	'a hawk species'
/ ke'ɔ̄luɔ̄ɔ̄ɔ̄/	[ke'ɔ̄lu²ɔ̄ɔ̄]	'a male name'
/ 'pɪpɪc̄m̄c̄/	[¹pɪpɪ²c̄m̄c̄]	'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.

/ 'tɪpɔ̄/	['tɪ̄.pɔ̄]	'a male name'
/ 'kɔ̄pɪ/	['kɔ̄.pɪ̄]	'a male name'

5. Non-contrastive Features

5.1 Onomatopoea

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

/ 'pɔ̄pɔ̄lo/	'bubbles, boiling action, gurgling stream'
/ 'nɔ̄pɔ̄ɔ̄ɔ̄/	'a strong wind (associated with rain)'
/ 'u/	'high-pitched howl of a dog' (Hewa dogs don't bark.)
/ 'eyɔ̄/	'a bush fowl which makes this cry'.
/ 'wɔ̄ɔ̄ɔ̄/	'cicadas, the time when they screech (approx. 6:30 pm)'
/ 'wɔ̄ɔ̄wɔ̄ɔ̄/	'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.

// <i>ʔuʔu</i> /	'a fruit dove'
// <i>mʌmʌ</i> /	'pleasant'
// <i>loʔloʔ</i> /	'a draft or gentle air movement'
// <i>mʌmʌ</i> /	'dance leader' (/mʌ/ 'beat drum')
// <i>ʔpiʔpi</i> /	'small portions or pieces' (/ʔpi/ 'part')
// <i>ʔliʔli</i> /	'on top' (/ʔli/ 'on')
// <i>kukuem</i> /	'chatted' (/kuc/ 'words')
// <i>ʔituʔuʔu</i> /	'from very far down the mountain' (/tuʔ/ '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'
	['ambila]	'female name'
[nd]	['tɛndiawa]	'male name'
	['anduku]	'female name'
[ŋg]	['pawɛŋgo]	'male name'
	['laŋgi]	'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 Ipi language areas, ['ɛŋgo] 'pandanus nuts'.

Another plant name is [kampe] 'reed'.

One word of unknown origin is a beetle name, ['kɛmba] 'rhinoceros beetle'.

The last words are related to seeing:

['ŋga']	~	['niko']	'eye'
[ŋ'kika]			'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).

/'wamc	till'	'omc/	['wam till'om]	'the wild cassowary'
wild.animal	cassowary			
/'wamc	'sua/		['wam 'sua]	'the wild bandicoot'
wild.animal	bandicoot			
/'emanc	pc'tenc/		['emanc pc'ten]	'young girl'
girl	young			
/'anc	tc'nc/		['anc tc'nc]	'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]				
/'kempa/		[kamba]		'male name'
/'ampilai/		['ambila']		'female name'
/'kompatio/		[kombatio]		'rhinoceros beetle'
/'kampe/		['kambe]		'reed'
/nt/ from [nd]				
/'tintilawa/		['tindiawa]		'male name'
/'antuku/		['anduku]		'female name'
/nk/ from [ŋg]				
/'pawianko/		['pawianggo]		'male name'
/'lapanki/		['lapangi]		'female name'
/'anka/		['angga]		'pandanus nuts'
/'in'kikai/		[ŋ'kika']		'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
am-	-su
upstream	towards
am-	-tut ^w ap ⁰
downstream	far-from
wɔn-	-pɪɔlɛ
across	there nearby
ɔ-	-puɪap ⁰
higher	from
i-	-witɪ
lower	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.

/ (?) / ['amsu] 'in the direction of upstream'
 / (?) / ['wɔntut^wap⁰] '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 ['amsu] 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 */amcsu/. However, when later written, this may be pronounced *['a.me.su] after the manner of /ame'ya/ ['a.me.'yo] 'fruitbat', as a three-syllable word. This would have to be watched when a practical orthography is taught.

Some examples are set out here:

/'amcsu/	['amsu]	'in the direction of upstream'
/'ɪmpɪɔlɛ/	['ɪmpɪɔlɛ]	'nearby on the downstream side'
/'wɔnɪpuɪapɔ/	['wɔnɪpuɪap ⁰]	'from across on the mountain'
/'ɔtutɪwɔpɔ/	['ɔtutɪwɔp ⁰]	'from far up the mountain'
/'iɪwɪtɪ/	['iɪwɪtɪ]	'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:

//'amc su/	['amsu]
//'imc piɔlc/	['ɪmpɪɔlc]
//'wɔnc pulapa/	['wɔncpulaɔp]
//'ɔ tutuapa/	['ɔtutʷap]
//'i witi/	['iwiti]

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.	//'wɔ/	'handheld drum'

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

V.V	//'ɔɔ/	'string bag'
V.CV	//'aki/	'chin'
CV.V	//niɔ/	'eye area'
CV.CV	//'tɔlc/	'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	//'alɔlo/	'hunger (n.)'
CV.V.V	//'koai/	'the Friar Bird'
CV.V.CV	//'niɔpa/	'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 /'iniɛɛ/ 'sickness'

V.CV.CV.CV /ɑ'lɑpɛnɛ/ 'upper arm'

CV.V.V.CV /'liɛɑpɑ/ 'male name'

CV.V.CV.CV /'miɛsiɛ/ 'dead'

CV.CV.V.V /'tɔnɛu/ 'Hand it (to me)!'

CV.CV.CV.CV /yɑpɑ'siɛ/ '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'ɑnɛɔlɔpɛɔmɛ/ '(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/, */xc/, */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 a	e i a	a i o	o a i
i a i	e i u	u e i	ɔ u i
i a u	e i o	u e a	ɔ u a
e a i	a i a	u a i	ɔ u o
e a u	a i u	u a 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:

a i a i
 a u a u
 i a i a

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

/mopo'laya/ 'is disposing of' [mopo'la'ya] < {mopo'la -a)
dispose.of cont

/mulu'anoyo/ 'repeatedly asks' [mulu'anoyo] < {mulu'ano-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 /'ana/ '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,

/'ana 'mau/ ['ana 'mau] 'I will eat' (Full form pattern)
I eat.future

/a'mau/ [a'mau] (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 /'amau/ ['amau] '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.

/'ycnc/ 'son' //ycnco/ 'Son, ...'

/'inaɪ/ 'daughter' //inaio/ 'Daughter, ...'

/'opia/ 'male name' //opiao/ '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.

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

'ano '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.

'nopa ki'awapa wepe so'saiapa wepe 'aliau wepe
we.pl Kiawapa and Sosaiapa and Aliau and

'nopa 'ote 'uwe se 'ycimc/
we.pl river bank at go.upstream.direction.past

'We (Kiawapa, 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 /a/, they cause the /a/ 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/	/-a-ɛ/	/-i-ɛ/	/-u-ɛ/	/-po-a-ɛ/
-'a- eat	'a	'aamɛ	'a'iyɛ	'a'uɛ	'a'apomɛ
-le'a- return	le'a	le'aamɛ	le'a'iyɛ	le'a'uɛ	le'a'apomɛ
-'na- hit, beat	'na	'naamɛ	'na'iyɛ	'na'uɛ	'na'apomɛ
-'onina- lift	'onina	'oninaamɛ	'onina'iyɛ	'onina'uɛ	'onina'apomɛ

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

'uwa ⁱ -	'muwa ⁱ	'muwa ⁱ me	'muwa ⁱ yc	'muwa ⁱ wa	'muwa ⁱ pomc
fill					
'onea ^u -	'monea ^u	'monea ^u me	'monea ^u yc	'monea ^u wa	'monea ^u pomc
hand over					
'o-	'mo	'mome	'moyc	'mowa	'mopomc
chop, carve					
'ou-	'mou	'moume	'mouyc	'mouwa	'moupomc
descend					
'lu'ono-	'mulu'ono	'mulu'onome	'mulu'onoyc	'mulu'onowa	'mulu'onopomc

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.

/'mcku/	'will sleep'	< {mcki -u} (*/'mckiu/)
		sleep fut
/'mckiwa/	'intend to sleep'	< {mcki -u -o}
		sleep fut irrealis
/'mctu/	'will build'	< {mcti -u} (*/'mctiu/)
		build fut
/'mctiwa/	'intend to build'	< {mcti -u -o}
		build fut irrealis
/'mo'pu/	'will put'	< {mo'po-u} (*/'mo'pou/)
		put fut
/'mo'powa/	'intend to put'	< {mo'po-u -o}
		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.

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