

2. Outline of Phonemes

2.1. Chart of consonant phonemes

	Bilabial	Alveolar	Velar	Glottal
Stops	p [p b]	t [t d]	k [k g]	
Prestopped Nasals	p ^m [p ^m p ^m]	t ⁿ [t ⁿ t ⁿ]	k ^ŋ [k ^ŋ k ^ŋ]	
Nasals	m	n [n ŋ]	ŋ	
Fricatives		s [s f i s]		h
Lateral		l		
Vibrant		r		
Semi-vowels	w	y		

2.2. Chart of vowel phonemes

				Palatalized		
	Front	Central	Back	Front	Central	Back
High	i		u	ɨ		ʉ
Mid	e		o	eɨ		oʉ
Low		a a:			ɔ	

3. Interpretation

3.1. Syllable patterns

The following non-suspect syllable patterns occur:

V	/a/	[a]	'genitive'
VC	/eɨ/	[eɨ]	'to give (irrealis)'
VCC	/aɨw/	[aɨw]	'to shoot'
CV	/pa/	[pa]	'that'
CCV	/kia.len/	[kiaɨlen]	'light'
CVC	/kop/	[kop]	'river'
CVCC	/palk/	[palk]	'skin'
CCVC	/trum/	[trum]	'kapok tree'
CCVCC	/plɔŋ/	[plɔŋ]	'finished; altogether'

3.2. Items which may be either consonant or vowel

3.2.1. [i] and [u] are interpreted as vowels when they are syllabic and parallel the occurrence of non-suspect vowels within the syllable.

/iɨw/	[iɨw]	'to shoot (irrealis)'
/ka.ki/	[koki]	'to peel'

/ku.no.kul/ [kunokul] 'young girl'

[i] and [u] are interpreted as vowels when they occur as the second vowel of a sequence of two vowels, because there are no non-suspect sequences of three consonants syllable finally.

/kqj/ [kai] 'to go'
 /rejm/ [reim] 'cage (for smoking game)'
 /no.urk/ [naurk] 'mango'

In other positions [i] and [u] are interpreted as consonants, because there are no non-suspect sequences of three vowels in a syllable and because there are non-suspect sequences of three consonants over syllable boundaries.

/taŋ.kwej/ [taŋguei] 'cheek'
 /wu.roŋ.kya/ [wuroŋgia] 'a name'
 (< /wuroŋ/ 'crowd' /ya/ 'road')

[w] and [y] are interpreted as consonants, since they are nonsyllabic and occur in consonant position of a syllable.

/wej/ [wej] 'bird'
 /wa.yu/ [wayu] 'taro'
 /yul/ [yul] 'fish'

In words like /kwa/ [kwa] 'up, above' and /kwej/ [kwei] 'mami' [w] is interpreted as consonant, because

- they are one-syllable words,
- there are no non-suspect sequences of three vowels within a syllable and
- there are non-suspect consonant sequences syllable initially.

[w] and [y] occur in the syllable onset only, both word initially and medially. They never occur syllable finally.

3.2.2. [h] is interpreted as consonant, since it occurs only in consonant position in a syllable. It occurs only syllable initially, never in consonant clusters, and drops off often, especially in unstressed position and after a consonant.

/hi/ [hi:] 'sore'
 /mo.ho/ [moho] 'pig's trail'
 /ma.hig/ [mahig] ~ [maig] 'not done'
 /hipm/ [hipm] 'leaf'
 but
 /nomuŋ hipm/ [nomuŋkipm] 'banana leaf'

3.3. Non-suspect consonant sequences

There are the following non-suspect consonant sequences.

WORD INITIALLY - stop + /l/ or /r/, except [t] does not occur:

[pl]	/pleŋ/	[pleŋ]	'to turn around'
[tr]	/trum/	[trum]	'kapok'
[kl]	/klak/	[klɔ:k]	'to wash'

WORD FINALLY - /l/ or /r/ + bilabial or velar stop or nasal:

[rk]	/work/	[work]	'wild pitpit'
[rm]	/arm/	[arm]	'to plant'
[lp]	/welp/	[welp]	'wasp'
[ŋ]	/paŋ/	[paŋ]	'to arrive, appear, come up'

WORD MEDIALY -

On the basis of

- non-suspect syllable patterns,
- non-suspect consonant sequences word initially and word finally and
- word compounds, morphemes and reduplication

the non-suspect consonant sequences word medially divide into two groups as follows:

Within syllable:

[ŋ]	/mŋ.ə.ni/ ¹	[mŋəni]	'cucumber'
[rŋ]	/kəŋ.e.pɪ/	[kəŋepɪ]	'crust'

Across syllable boundaries:

stop + /l/, /r/, nasal, stop

[p.l]	/kap.lim/	[kaplim]	'to blow'
[k.r]	/mak.rep/	[makrep]	'a tree'
[k.m]	/ok.mi.lip/	[o:kmalip]	'tongue'
[k.t]	/ok.telp/	[o:ktelp]	'tooth'

/l/, /r/, nasal + nasal, stop, /s/

[l.m]	/mal.mal/	[malma]	'thunder'
[r.n]	/nar.no/	[narno:]	'lengthwise'
[l.t]	/kol.ti/	[kolti]	'only'
[r.p]	/kar.pen/	[karpen]	'to blow (fire)'
[n.m]	/mon.mon/	[monmon]	'baby'
[ŋ.t]	/toŋ.toŋ/	[toŋtoŋ]	'strong, tight'
[n.s]	/kan.sim/	[kansim]	'to sweep'

¹ ED: The /ə/ appears in some phonemic forms although it is not listed as a phoneme because the author did not always know what the basic form of the [ə] was. For more discussion, see sections 4.3.1 and 7.2.3.

3.4. Items which may be either sequence or unit

3.4.1. Stops plus homorganic nasals ([pM tN kŋ] (word final); [pm tn kŋ] (word medial)) are interpreted as unit prestopped nasals although there are sequences of reverse order [mp nt ŋk], because

- there are no non-suspect sequences of three consonants syllable finally, while the clusters [rpM lpM rkŋ lkŋ] are found word finally,
- over syllable boundaries they can be followed by more consonants than can [mp nt ŋk] and also by consonant sequences,
- while on the basis of non-suspect consonant sequences syllable finally and initially the syllable break in words like ['ərpɔ] 'to be' could be after [p] or [m] (['ərp.ɔ] / ['ərp.m.ɔ]), in a word like [wɔlkŋet] 'hairy' (< [wɔlkŋ] 'hair') the syllable break must be after the [ŋ] since there are no [ŋ]-initial syllables, and
- the literate villagers identify them as units and as nasals rather than stops (see section 7.2.1).²

/norPm/	[norpM]	'a frog'
/tɔkŋ.ni/	[tokŋni]	'sun'

3.4.2. The alveolar or velar stops plus [w] within a syllable are interpreted as sequences of two consonants because

- there are non-suspect sequences of two consonants within syllables,
- there are no non-suspect sequences of three vowels within syllables, and
- with the following vowel they comprise only one syllable.

/kwei.kwei/	[kweikwei]	'something'
/ko.twɔŋ/	[kotwɔŋ]	'axe'

The other sequences of consonant plus semivowel ([l.w r.w p.w s.w k.w l.y r.y n.y k.y]) are interpreted as sequences of two consonants because of the morpheme boundary between them.

/wɔp.war/	[wɔpwar]	'cross cousins'
(< /wɔp/ 'ton tree', /war/ 'child, puppy, picklett')		
/wis.wis/	[wiswis]	'to jump on one foot'
/wan.yun/	[wanyun]	'door'
(< /wan/ 'house', /yun/ 'house end with hole')		
/wɔl.yɔ.ru/	[wɔlyɔ:ru]	'great-grandchild'

² ED: According to the author there are no contrasts between prestopped nasals and sequences of stop-schwa-nasal. Schwas are usually found in the first syllable (section 4.3.1) while prestopped nasals are found only syllable finally (section 5.1). Thus, another analysis would be to posit sequences of stop-schwa-nasal underlying prestopped nasals.

3.4.3. Nasals plus stops ([m.p n.t ŋ.k]) are interpreted as sequences since they only occur word medially.

/wam.peŋ/	[wambɛŋ]	'bamboo'
/wan.teŋ/	[wambɛŋ]	'to cut'
/uŋ.kwan/	[uŋkwɔn] ~ [uŋkwɔn]	'to chase away'
/kain.ten/	[kainɛn]	'strong'

3.4.4. [ts] is interpreted as a unit since it alternates freely with [s]. [ts] is rarer; generally only old people use it.

/a.ser/	[asɛr] ~ [atsɛr]	'to clean (grass)'
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3.4.5. The palatal nasals [ɲ tɲ tɲ] are interpreted as units, and they get the palatalization feature from the preceding vowel. In some instances it is clear that there is a preceding palatalized vowel:

/kai.no/	[kaiɲo]	'to go up'
(< [kai]	'go'	[no] 'to come up'

There is also a feminine-masculine difference in some words:

[mamikN]	'granddaughter'	[mamɲ]	'grandson'
[muikŋmɔyɛn]	'sister'	[muɲuro:r]	'brother'

In these forms the feminine could be /-ikŋ/ and the masculine /-in/. Positing a set of palatalized vowels, even when one does not hear them would account for all these forms.

/kuɲn/	[ku:ɲ]	'middle (adv.)'
/kɔj.no/	[kɔjɲo]	'to go up'
/kroɲtɲn/	[krotN] ~ [kroitN]	'very small'
/wiɲtɲim/	[witɲim]	'aibiga greens'

3.4.6. The vowel sequences [ai ei oi ui] which occur within syllables are interpreted as units because there are no non-suspect vowel sequences and because the first vowel is clearly predominant. [ai] and [ei] occur word initially, medially and finally. [oi] and [ui] are rare.

/ɔj.mol/	[oimol]	'dry (banana) leaf'
/am.peɲ/	[ampɛɲ]	'vine'
/muɲkŋ.muɲn/	[muikŋmuɲ]	'sister and brother'

The vowel sequences [ai au eu io ie] which occur across syllable breaks are interpreted as sequences of two vowels because

- there is a syllable break between the vowels,
- both vowels are relatively long and sound like a peak of a separate syllable each, and
- either vowel can be stressed.

/la.ɪk/	[loɪk]	'to shake; to wind'
/ma.ur/	[maur]	'spirit'

3.4.7. Long vowels are interpreted as units because there are no non-suspect sequences of two vowels.

/mɑn/	[mɑ:n]	'mother'
/ok.et/	[o:ket]	'fruit bearing'

4. Description of Phonemes

4.1. Segmental phonemes

STOPS

Voiceless stops occur word initially, medially and finally, and in consonant sequences. Each voiceless stop tends to get voiced word medially following a homorganic nasal, and also word initially if the previous word ends with a homorganic nasal.

/pa/	[pa]	'that'
/ta.por/	[tapor]	'to break'
/prek/	[prek]	'a plant'
/telp/	[telp]	'knife'
/kar.pen/	[karpən]	'to blow (fire)'
/nəm.pa/	[nəm̩pa]	'dog'
/a.ta/	[ata]	'only (with numerals)'
/wun.ta/	[wunda]	'ant'
/kia.len/	[kɪlən]	'holy; light'
/koŋ.ket/	[koŋket]	'black'

NASALS

The prestopped nasals occur voiceless word finally and voiced word medially. Both variants can combine with other consonants in both positions. They do not occur word initially. The bilabial and alveolar nasals occur word initially, medially and finally, and in consonant sequences word medially and finally. The velar nasal occurs word medially and finally, also in consonant sequences in both positions. The alveolar prestopped nasal and nasal become palatalized following a palatalized vowel. The vowel usually loses its palatalization.

/nePm.el/	[nepmɛl]	'by foot'
/kalPm.un/	[kalpmun]	'(f.i. breadfruit) flower'
/marPm/	[marpm]	'money'
/ɑ.kitn.en/	[okitnɛn]	'your, sg. 2. gen.'
/kitn/	[kitN]	'you, sg. 2'
/wɪʃt̪n.in/	[wɪʃt̪ɪn]	'dog's fleas'
/kru.ruʃt̪n/	[krurut̪N]	'a caterpillar'
/wɑkŋ.et/	[wɑ:kŋɛt]	'hot'
/tɑkŋ.ni/	[tɑkŋni]	'sun'
/wɑlkŋ/	[wɑlkŋ]	'hair'

/mɔn.to/	[mɔndo]	'pig'
/liɲ/	[liɲ]	'nose'
/nɔ.mug/	[nɔmug]	'banana'
/wɔn/	[wɔn]	'house'
/mɔɲ ur.or/	[mɔɲ urɔr]	'brother'
/nɔŋ.il/	[nɔŋil]	'mosquito'
/ɔŋ.ko/	[ɔŋko:]	'to fall (realis)'

FRICATIVES

/s/ occurs word initially, medially, and finally, also in consonant sequences word medially. It varies freely with allophones [ʃ] and (with older people) [ʃ̥].

/ɔ.ser/	[ɔsɛr] - [ɔʃɛr]	'to clean (grass)'
/kɔn.sɪm/	[kɔnsɪm] - [kɔnʃɪm]	'to sweep'
/kɪ.ni.pɪs/	[kinipɪs] - [kinipiʃ]	'stingy'

/h/ occurs word initially and medially, but can be left out especially in unstressed position. In speech flow it is left out after a consonant; also word initially and medially between vowels it sometimes drops off. (See 3.2.2.)

/huɪ/	[huɪ] - [uɪ]	'snake'
/mɔ.hɪŋ/	[mɔhɪŋ] - [mɔɪŋ]	'undone (food)'

LATERAL

/l/ occurs word initially, medially and finally, and in consonant sequences.

/ɔ.lɪɪŋ/	[ɔlɪɪŋ]	'to smoke'
/lɔs/	[lɔs]	'hawk'
/kuɪ/	[kuɪ]	'to come'

TRILL

/ʀ/ occurs word initially, medially and finally, and in consonant sequences.

/ʀɛs/	[ʀɛs]	'an edible plant'
/kʀɔkɔŋ/	[kʀɔkɔŋ]	'mark, letter, carving'
/wɛʀk/	[wɛʀk]	'feathers'

SEMI-VOWELS

/w/ and /y/ occur word initially and medially.

/nɔ.wɛ/	[nɔwɛ]	'to wear, to dress up'
/wɔn.yun/	[wɔnyun]	'door'
/yug/	[yug]	'bird of paradise'

VOWELS

All vowels occur word initially, medially, and finally.

/iɫ/	[iɫ]	'to shoot (irrealis)'
/kiˀn/	[kitN]	'you sg. 2'
/ko.ki/	[kaki]	'to peel'
/eɪ/	[eɪ]	'to give (irrealis)'
/weɪ/	[weɪ]	'bird'
/a.me/	[ame]	'to die (fire)'
/a.me/	[ame]	'to die (fire)'
/ko.ki/	[kaki]	'to peel'
/ko.ti.la/	[katilla:]	'to follow'
/ok/	[o:k]	'mouth'
/nol/	[nol]	'heart'
/a.lo/	[olo:]	'to wipe'
/ur.is/	[uris]	'one'
/num/	[num]	'skin'
/hu/	[hu]	'water'

All the vowels have a palatalized counterpart. /ɥ/ is recognizable only before alveolar nasals and prestopped nasals, because the nasals become palatalized. /ej/ is very infrequently realized as [æi]; /qj/ is infrequently realized as [zi]. /qj/ and /ɥj/ are rare.

/kɥn/	[ki:ñ]	'woman'
/wutn.ejk/	[wutneik]	'sago leaf sheaf'
/a.rejn/	[areñ]	'to be sorry'
/kej.po/	[kaipo]	'spider'
/kqj/	[koi]	'to go'
/paj̄n/	[pañ]	'stools'
/mo.rqj̄ŋ.kil/	[məraŋkil] - [məz̄iŋkil]	'chin'
/kroq̄t̄n/	[kroit̄N] - [krot̄N]	'very small'
/mɥk̄ŋ.mo.yen/	[muik̄ŋmayen]	'sister'
/kuj̄n/	[ku:ñ]	'middle'

4.3. Supra-segmental items

4.3.1. Stress

It has been somewhat difficult to determine what stress is in Urim. Perceived stress seems to be inconsistent, varying with different repetitions of the lexical item. There is a central vowel which never occurs in one-syllable words or in word final syllables. Because of its restricted distribution, it seemed inappropriate to interpret it as an independent phoneme. As examples, consider the following two-syllable words, in which there are the possibilities of :stressed and :full vowel

combinations. These would suggest that both stress and the central vowel were phonemic.

/'mɑ.le/	[mɑle]	'cave'
/mɑ.'lɑ/	[mɑlɑ:]	'who'
/tɑ.'pɔn/	[tɑpɔ:n]	'to squeeze'
/'tɑkŋ.ɑ/	[tɑkŋɑ:]	'a fruit'

About 230 two-syllable and three-syllable words in frame were studied with the help of the supra-segmental analyzer in order to better determine the acoustic correlates of stress. The analyzer records pitch, length and loudness. Most of the two-syllable words seemed to divide into two groups:

1. Those with the first syllable vowel more prominent (louder, longer and less ballistic (= has a slower rate of amplitude decay)/ louder and longer/ same length but louder/ same length but louder and less ballistic/ same loudness but longer/ same loudness and length but less ballistic). There were no central vowels in these words.
2. Those with the second syllable vowel more prominent (louder, longer and less ballistic/ same loudness but longer). All of these had a centralized vowel in the first syllable (exception: u could sometimes occur in this less prominent position).

From the rest of the two-syllable words studied, which did not fit to these two groups, it was difficult to decide whether the vowel in the first syllable or in the second syllable was more prominent. Some of the words with no central vowels in them had a longer vowel in the first syllable and a louder vowel in the second. Most of the words had a louder vowel in the first syllable and a longer vowel in the second syllable and nearly all the louder vowels of the first syllables were centralized.

/tɑ.pis/	[tɑpis]	'to peel'	[ɑ] longer, [i] louder
/'tɑkŋ.ɑ/	[tɑkŋɑ:]	'a fruit'	[ɑ] louder, [ɑ] longer
/hɑ.rok/	[hɑrɔk]	'sculp'	[ɑ] louder, [ɔ] longer

Could it be that the length of the vowel is more important feature than the loudness and so the longer, full vowel syllable would be stressed? On the other hand, open syllables word finally, as in [tɑkŋɑ:] tend to be generally longer anyway.

The sound analyzer did not give any more light to the stress, but studying the vowel combinations of the two-syllable words leads one to postulate the following "vowel harmony" rule:

In successive syllables vowels normally go from open to more closed. Any sequence of vowels in which the transition is from an open vowel to a more closed one or in which the vowels are phonemically identical, will result in the first vowel being reduced to [a].

This "vowel harmony" rule coupled with the following stress rule systematizes the distribution of both the stress and the central vowel.

Stress is on the first full vowel syllable of the root. It is manifested by \pm louder, \pm longer, \pm less ballistic (than the preceding vowel(s)) and \pm centralized vowel features. It has to have at least two of these features.

Thus, neither are phonemic. These rules work within the root.³

Examples of vowels going from open to more closed:

/kə.r.pɪk ^ŋ /	['kəpɪk ^ŋ]	'widow'
/kə.rek/	['kəkək]	'hen, rooster'
/wən.tɪŋ/	['wɛndɪŋ]	'junction'
/kə.mʊŋ/	['kəmuŋ]	'a bird'
/a.tok/	['ətək]	'white ant'
/kə.nu ^{kŋ} /	['kənuk ^ŋ]	'later'

Examples of words with [ə]:

In some words the [ə] does not always sound exactly central but towards a full vowel, especially if pronounced slowly. That full vowel is posited as the underlying form of the [ə].

/tən.tər/	[tən'tər] - [tən'tər]	'miserable'
/ne.nol/	[ne'nol] - [nə'nol]	'mushroom'
/nəm.pə/	[nəm'bə] - [nəm'bə]	'dog'
/tə.kər/	[tə'kər] - [tə'kər]	'not red'
/ku.lu/	[ku'lu] - [kə'lu]	'bottom'

Nearly all of the two-syllable irrealis verbs have [ə] in the first syllable. I suspect that /i/ is the underlying form for the [ə], since in one-syllable verbs the realis/irrealis is manifested by α /i change (/α/i/ [α:i] 'to eat' (realis), /i/ [i:i] 'to eat' (irrealis)).

/tɪ.kɛrŋ/	[tə'kɛrŋ]	'to peel off' [təkɛrŋ] (realis)
/kɪr.kuk/	[kə'r.kuk]	'to have a bath' [kər'kuk] (realis)
/ɪ.lɪŋn/	[ə'lɪŋ]	'to plant' [α'lɪŋ] (realis)

In many cases it is not obvious what the underlying form of [ə] would be because it is very reduced, especially if it occurs word initially.

/ərpəm.ə/	[ərpəm'ə]	'to be'
/əŋ.kərək/	[əŋ'kərək]	'to be afraid'
/ə.nu/	[ə'nu]	'female'

The "vowel harmony" rule does not apply over morpheme or word boundaries. If the first syllable of a three-syllable word is stressed, the third syllable usually gets a secondary stress.

/wɛt-en/	[wɛtən]	'younger sister/brother (same sex)'
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³ ED: Another possible analysis would be that stress is assigned to the second vowel when more closed than the first, otherwise to the first. An unstressed vowel in the first syllable would then be reduced to [ə].

/irpɪ.ɪŋ-kɪs/	[ərpɪ'ɪŋkɪs]	'hairless'
/wɑ.rɪm-pɛn/	['wɔrɪm ² pɛn]	'young person'

In reduplicated words, too, the vowels usually are not centralized because of the word boundary in between. All parts are stressed; the first one gets the primary stress.

/nɔŋ-nɔŋ/	['nɔŋ ² nɔŋ]	'sing-sing'
/kɪ-kɪ/	['kɪ ² kɪ]	'day after day after tomorrow'

4.3.2. Length

Length is contrastive only in fully closed one-syllable words (C)CVC(C). Thus far only /a/ and /ɑ:/ have been found contrasting in identical environment.

/nɔŋ/	[nɔŋ]	'name'
/nɑ:ŋ/	[nɑ:ŋ]	'ridge'
/kɪkɔk/	[kɪkɔk]	'crab'
/kɪɑ:k/	[kɪɑ:k]	'to wash'

If not purposely contrasting the length, it seems that the nature of the contrast is one between short and potentially long. Short and potentially long means that some words seem to be always short and in some the length of the vowel varies (often long, but can be short).

/nɛp/	[nɛp]	'coconut'
/nɛ:pM/	[nɛ:pM] - [nɛpM]	'foot, leg'
/kɑn/	[kɑn]	'a grub'
/yɑ:n/	[yɑ:n] - [yɑn]	'father'
/hɪpM/	[hɪpM]	'leaf'
/hɑ:pM/	[hɑ:pM] - [hɑpM]	'cloth'

No length contrast is possible in non-fully bounded syllables. In VCC syllables and words like the functor /ɛŋ/ and a few small words which never occur in isolation, vowels are short; in all others vowels are long.

/ɑɪ/	[ɑɪ]	'to shoot'
/ɛɪŋ/	[ɛɪŋ]	'to put'
/ɛŋ/	[ɛŋ]	'for, in order to...'
/ɑm/	[ɑm]	'now'
/ɑ/	[ɑ:]	'and'
/mɪ/	[mɪ:]	'grass'
/kwɑ/	[kwɑ:]	'up'
/ok/	[o:k]	'mouth'

When the one-syllable words are part of multi-syllable words, they usually keep their length.

/ik.et/ [i:ket] 'thorny'
 (< [i:k] 'thorn' [et] 'adj.')

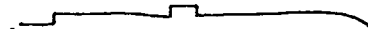
In multi-syllable words the length is often coupled with the stress.

4.3.4. Intonation

FINAL PAUSE

Falling Intonation

Statement:

 [paipatni kaki kwel rompu:k] 'Pelpatni peeled mami for drying.'

 [kupM kai sepik] 'I am from Sepik.'

Command:

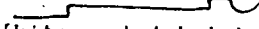
 [kitn la pen] 'Say it again!'

 [tukulel:k] ya:] 'Go out of the way!'

Rising Intonation

Interrogative:


 [kuŋo:kil] 'What is it?'

 [kitn numbət koləl:] 'How are you sick?'


TENTATIVE PAUSE

Level or Rising Intonation

List:

 [hu: kop wətət- wənukŋis- tənkorən- puŋk[is-...] 'Red, green, white and yellow swamps...'

Continuity:

 [wəndək] nɑ:rno:rno:rno:r-...] 'We two came down and down...'

Quotation Formula:

[kupm asen tetN-...] 'I ask you, ...'

Complex:

[kupm lala: paipM pəpa:-,....] 'If I say it wrong, ...'

5. Distribution

5.1. Syllable

Syllable structure is as follows:

$(C_1(C_2))V((C_3)C_4)$

C_1 - if $C_2 = \emptyset$, all except prestopped consonants or /ŋ/; otherwise only voiceless stops can occur

C_2 - only /l r w/ can occur, except for */t/

C_3 - only /l r/ can occur

C_4 - if $C_3 = \emptyset$, all consonants except /h w y/; otherwise only nasals, or bilabial and velar voiceless stops and prestopped nasals (The one occurrence of /n/ is in /kəln.tən/ [kəln.tən] 'strong'.)

V - all vowels can occur

For examples of syllables see section 3.1.

All syllable types occur in both positions of two-syllable words.

5.2. Consonants

The following sequences of two consonants have been found:

	p	t	k	p _m	t _n	k _ŋ	m	n	ŋ	l	r	s	w	y
p										12	12		5	
t											2		4	
k	1	1	5				5	1		12	12		124	5
p _m			5	5				1						
t _n														
k _ŋ				5			5	1					5	5
m	1		5								1			
n		1	5				5					1	5	5
ŋ	5	5	1					5						
l	13	5	13	34		34	134	5	34		5		5	5
r	1	5	134	34		34	134	5	34			1	1	5
s											5		5	

1 = word medial over syllable boundaries

2 = word initial

3 = word final

4 = word medial within syllables

5 = only over word boundaries of compound words

The following sequences of three consonants occur:

CC.C: /lŋ/ or /rŋ/ + /t/ or /k/
 /rŋ/ or /lŋ/ + /p/
 /ln/ + /t/
 across word boundaries: /lŋ.p rk.ŋ/

C.CC: /ŋ.p/ or /ŋ.k/ + /l/ or /r/
 /ŋ/ or /l/ or /r/ + /kw/
 across word boundaries: /pŋ.pl kŋ.kr ŋ.pw n.tw ŋ.ky ŋ.py s.pr/

6. Morphophonological Rules

The following tentative rules are ordered as indicated. In some cases the ordering is not essential but in several cases it is crucial that one rule be applied before the others. The closer knit the structure is, the more obligatorily most of these rules apply.

6.1. Insertion rules

6.1.1. A homorganic stop is inserted after a word final nasal if the following morpheme (except some suffixes) starts with a vowel, semivowel, /h/, or /r/. The /h/ then deletes, while the semivowel becomes a vowel (w > u; y > i).

/wŋŋ orPŋe/	[wŋŋorpŋe]	'to hold (with hands)'
/yan hŋŋ/	[yondŋŋ]	'name (father, hidden)'
/puŋ-is/	[puŋkis]	'yellow'
/won rakole/	[wontrakole]	'to remember'

6.1.2. A homorganic nasal is generally inserted at morpheme boundaries before a stop if the preceding morpheme ends with a vowel or /l/.

/əpŋa pejPŋ/	[əpŋaŋpejPŋ]	'navel cord'
/kŋj kŋj/	[kŋŋkŋj]	'to go (cont.)'
/ol-tu/	[olntu]	'their, pl.3.gen.'

6.1.3. A /w/ is generally inserted between vowels at morpheme breaks if the second morpheme is a one-syllable suffix. Before a one-syllable enclitic, the inserted consonant is /y/ after /l/ and either /h/ or /w/ in other cases.

/ari-e/	[ariwe]	'to know' (suffix)
/akle-oPŋ/	[aklewopŋ]	'scold me' (enclitic)
/ari-e-o/	[ariweho]	'learn!' (suffix and enclitic)
/awi-el/	[awiyel]	'take it' (enclitic)

6.1.4. A transitional vowel is usually inserted between consonants at word boundaries if these consonants do not combine with each other within a word. The vowel is typically [ə], alternating with [o] or [e].

/kŋŋn lŋŋ/ [kiŋəliŋ] - [kiŋəliŋ] 'name (woman, cassowary)'

/i:kŋ la/ [i:kŋəla:] ~ [i:kŋəla:] - [i:kŋla:] 'to spy'

6.2 Deletion rules

6.2.1 If two vowels occur at word boundaries the second one is usually deleted.

/yo ok/ [yo:k] 'tree fruit'
/ake antiwe/ [akentiwe] 'not able'

6.2.2. The palatalization of vowels is usually deleted at word boundaries.

/kaj oŋko/ [kaŋko:] 'go and fall'
/kaj kaj/ [kaŋkai] - [kaŋkai] 'to go (cont.)'

6.3. Assimilation rules

6.3.1. /n/ and /tŋ/ become palatalized following a palatalized vowel, with the vowel usually losing its palatalization. For examples see section 3.4.5.

6.3.2. The central vowel [ə] tends to assimilate to the preceding full vowel.

/ok əpma/ [o:kopma] 'food (mouth, stomach)'

A vowel between two vowels, one of which is closed and the other open, tends to change into a mid vowel in the transition.

/mɪnɪl lom/ [miŋelom] ~ [miŋelom] 'name (a worm, hidden)'

6.4. Dissimilation Rules

6.4.1. Word initial /t/ often becomes [s] or [iʃ] following a word final palatalized nasal, the nasal losing its palatalization.

/pajŋ taŋkɪl/ [pa:ŋtaŋkɪl]
> [pa:ntsɪŋkɪl] ~ [pa:nsɪŋkɪl] 'toilet'

/ki^tn ti/ [kitn] ~ [kitŋ]
> [kitntsɪ] 'you here'

/y/ becomes [s] or [iʃ] when following a word final [nt]. (This rule applies after 6.1.1. has applied.)

/mon yan/ [mɔ:nsɔ:n] ~ [mɔ:nɪʃɔ:n] ~ [mɔ:nyɔ:n]
'parents (mother, father)'

6.4.2. The suffix /n/ becomes /ŋ/ following /r/ or /l/, (/rn/ and /ln/ are not allowed consonant sequences syllable finally).

/kapor-n/ [kaporŋ] 'to break'
/plei-n/ [pleiŋ] 'to turn around'
/per-n-en/ [perŋten] 'quickly' (rule 6.1.1. applies first)

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