PHONEMIC SYLLABLE REPERTORY IN VIETNAMESE

NGUYỄN ĐĂNG LIÊM

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0.   INTRODUCTORY

Vietnamese[1] is, on the phonological level, a monosyllabic
language, in that phonemic syllables are phonemic words[2],
and no phonemic word contains more than one phonemic syl-
lable.   On the morphological level, although there are poly-
syllabic words which are formed by two or more monosyllabic
words or by reduplication[3], a large number of morphemic

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[1] See Nguyễn Đình Hòa, "Reading List on Vietnamese Language and
Writing", *Văn-Hóa Nguyệt-San (Culture)* 11.695-97 (1962), Saigon:
Directorate of Cultural Affairs, Department of Education.

[2] Trager and Smith define the phonemic word in English as 'A phonemic
phrase having no plus juncture' (*An Outline of English Structure*,
Studies in Linguistics: Occasional Paper 3, p.50, Washington D.C.:
American Council of Learned Societies, 1957).   For the discussions on
the word in Vietnamese, see David D. Thomas, "On Defining the 'Word' in
Vietnamese", *Văn-Hóa Nguyệt-San (Culture)* 11.519-23, and Laurence C.
Thompson, "The Problem of Word in Vietnamese", *Word* 19.39-52 (1963).

[3] For reduplications in Vietnamese, see Murray B. Emeneau, *Studies in
Vietnamese (Annamese) Grammar*, Berkeley, and Los Angeles: University of
California Press (1951), or Lê Văn Lý, *Le Parler Vietnamien* Saigon:
Institute of Historical Researches, Department of National Education
(1960).

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words[4] are monosyllabic. Thus, the language must have a fairly large number of phonemic syllables in order not to have too many homophonous morphemes.

It is the aim of this paper to examine the occurrence, non-occurrence, or the possibility of occurrence of phonemic sequences within syllable boundaries in Saigon Vietnamese[5], and to find rules as to the patterning of existing combinations.

1. THE SYLLABLE

Thompson defines the syllable in Saigon Vietnamese thus:

> "In Saigonese a fraction of utterance which begins with an onset of stress and ends immediately before the next onset of stress or before a pause is a SYLLABLE. No phone is obstrued to extend over a syllable boundary: an intersyllabic long consonant or vowel is taken to be two separate phones, the second beginning with the new onset of stress."[6]

The distribution of phonemes in Saigon Vietnamese is stated with reference to the boundaries of the phonemic syllable, the smallest phonological unit occurring in isolation. Each syllable is composed of the following elements (which are optional if they occur only in some syllables and are obligatory if they occur in all syllables):

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[4] See Trager and Smith, op.cit., p.58 ff.

[5] Saigon Vietnamese is one of the standard dialects of Vietnamese. Henri Maspéro, in his historical classification of dialects of Vietnamese, has divided them into two main groups: Tonkinese-Cochinchinese and Haut Annam dialects. This means that the northern speech and that of the southern region are more closely related than either is to the speech of the central region. ("Etudes sur la phonétique historique de la langue annamite: Les initiales", *Bulletin de l'Ecole Française d'Extreme-Orient*, 12.1-3 (1912). For a phonological comparison of dialects of Vietnamese, see Laurence C. Thompson, *A Vietnamese Grammar*, Seattle, Washington: University of Washington Press, 1965.

[6] Laurence C. Thompson, "Saigon Phonemics", *Language* 35.454-76 (1959), p. 455.

(a) an optional onset[7] - a consonant or consonant cluster;
(b) an obligatory nucleus - a vowel or diphthong;
(c) an optional coda - a consonant; and
(d) an obligatory tone.

As a minimum unit in phonological phrase groups or pause groups[8], the syllable carries a unit of stress, pitch, and length[9], which are not discussed in this paper, because they can be better described on higher phonological levels than that of the syllable itself[10].

2. ONSET AND CODA

There are twenty-two single consonants in Saigon Vietnamese[11].

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[7] The terms 'onset', 'nucleus', and 'coda' used in the description of syllable structure are taken from Charles F. Hockett, *A Manual of Phonology*, Memoir 11 of the International Journal of American Linguistics, p. 51ff. (1955).

[8] The idea of language as hierarchically ordered is taken from Kenneth L. Pike, *Language in Relation to a Unified Theory of the Structure of Human Behaviour*, Parts I, II, and III, Glendale, California: Summer Institute of Linguistics (1954, 1955 and 1960). For a comparison of grammatical hierarchies in English and Vietnamese, see, Nguyễn Đăng Liêm, *A Contrastive Analysis of English and Vietnamese*, vol. 1 *English Grammar*, Canberra: Linguistic Circle of Canberra Publications, The Australian National University (1966), vol. 2 *Vietnamese Grammar*, and other volumes forthcoming.

[9] For an instrumental analysis of Vietnamese intonation, see Aurélie H. M. Trần, *The Vietnamese Intonation*, The Australian National University, forthcoming Ph. D. dissertation.

[10] For an analysis of stress and pitch on higher phonological levels than that of the syllable itself, see John Chapman Crawford, *Totontepec Mixe Phonotagmemics*, Norman, Oklahoma: Summer Institute of Linguistics (1963).

[11] There can be multiple analyses of the Saigon Vietnamese phonology, and there seem to be some points of indeterminacy in the analyses done so far.

		Labial	Dental	Retroflex	Palatal	Velar	Glottal
Stops	plain	p[12]	t	$ṭ$	c	k	
	aspirated		t^h				
	voiced		d				
Fricatives	voiceless	f	s	$ṣ$		x	h
	voiced	v[13]				$ɣ$	
Lateral					l		
Nasal		m	n		$ɲ$	$ŋ$	
Trill				r[14]			
Semi-Consonants		w			j		

TABLE 1. CONSONANTS

The twenty-two consonants, as well as the fourteen clusters /tw, dw, $ṭw$, cw, kw, $ṣw$, sw, xw, t^hw, lw, $ɣw$, $ɲw$, $ŋw$, jw/, fill the optional onset slot[15]. It is noted that all the clusters have /w/ as their second phoneme.

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[12] The phoneme /p/ has initial voiced implosive or plain allophones and final voiceless and unreleased allophones. Jones and Thông among others set two phonemes /b/ and /p/ (*Introduction to Spoken Vietnamese,* Washington D. C. second edition [1960]).

[13] The phoneme /v/ has three phones [v, b^i, v^i].

[14] The phoneme /r/ has three phones [$ɽ$ $\tilde{ɽ}$ $ž$].

[15] For an analysis of phonotagmemes as slots plus filler classes, see John Chapman Crawford, op. cit.

Only eight consonants /p, t, k, m, n, ŋ, w, j/ can fill the optional coda slot.

3. NUCLEUS

Eleven vowels[16], and four diphthongs fill the obligatory nucleus slot.

VOWELS

		FRONT	CENTRAL	BACK Unrounded	BACK Rounded
HIGH		*i*		*ʉ*[17]	*u*
MID	Close	*e*		*σ*[17]	*o*
	Open	*ɛ*	*â*[17]		
LOW	Close		*ă*[17]		*ɔ*
	Open		*a*		

DIPHTHONGS

/iə, ʉə, uə, ău/

TABLE 2. VOWELS AND DIPHTHONGS

While the other nuclei can occur in free position, i.e. without being followed by a final consonant, /â, ă, ău/ can occur only in bound position, i.e. they must be followed by a final consonant.

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[16] /i, e, ʉ, σ, u, o/ have homophonously diphthongized allophones in free position, viz. [iⁱ, eᵉ, ʉʉ, uᵘ, oᵁ].

[17] The symbols ʉ, σ, â, and ă are taken from traditional spelling, and they represent roughly the sounds [ɯ ɣ ʌ ɑ] in the International Phonetic Association system.

4. TONES

There are five phonemic tones in Saigon Vietnamese whose allotones are conditioned by the relative stress of the syllables which bear them, as well as by the relative pitch and intonation contour. In the following table, each tone is represented only by its stressed allotone[18].
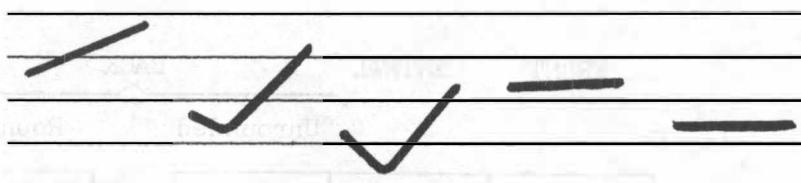
| | HR | MR | LR | HL | LL |

HR = High-Rising /↑/   *Example:*   *má* 'mother'
MR = Mid-Rising /∞/   "   *mả* 'tomb'
LR = Low-Rising /ʃ/   "   *mạ* 'young rice plants'
HL = High-Level /o/   "   *ma* 'ghost'
LL = Low-Level /↓/   "   *mà* 'but'

TABLE 3. TONES

5. COMBINATIONS OF NUCLEI AND CODAS

Besides twelve free nuclei, there are sixty-six combinations of nuclei and codas as shown in Table 4.

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[18] For more detail on allotones, see Aurélie H.M. Trần, op.cit.

NUCLEI	Free	-p	-t	-k	-m	-n	-ŋ	-j	-w
i	*i*	*ip*	*it*		*im*	*in*			*iw*
e	*e*	*ep*	*et*		*em*	*en*			*ew*
ε	*ε*	*εp*		*εk*	*εm*		*εŋ*		*εw*
â		*âp*		*âk*	*âm*		*âŋ*	*âj*	*âw*
ă			*ăt*	*ăk*		*ăn*	*ăŋ*		
a	*a*	*ap*		*ak*	*am*		*aŋ*	*aj*	*aw*
ɯ	*ɯ*	*ɯp*		*ɯk*	*ɯm*		*ɯŋ*	*ɯj*	*ɯw*
σ	*σ*	*σp*[19]		*σk*	*σm*[19]		*σŋ*	*σj*	*σw*
u	*u*	*up*		*uk*	*um*		*uŋ*	*uj*	
o	*o*	*op*[19]		*ok*	*om*[19]		*oŋ*	*j*	
ɔ	*ɔ*	*ɔp*[19]		*ɔk*	*ɔm*[19]		*ɔŋ*	*ɔj*	
iə	*iə*			*iək*			*iəŋ*		
ɯə	*ɯə*			*ɯək*			*ɯəŋ*		
uə	*uə*			*uək*			*uəŋ*		
ău				*ăwk*			*ăwŋ*		

TABLE 4. COMBINATIONS OF NUCLEI AND CODAS

6. PHONEMIC SEQUENCES AND NUMBER OF SYLLABLES

The statement of the phonemic composition of the syllable in Saigon Vietnamese in Section **1** can be formulated in terms of "canonical"[20] forms, or patterns of segmental and tonal phonemes (again stress, pitch contours, and length being disregarded because they are irrelevant in this paper). Phonemic syllables in the language can be of the following patterns of segmental and tonal phonemes:

VT, VCT, CVT, CVCT, CwVT, and CwVCT

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[19] The nuclei of /*σp, op, ɔp*/ and also of /*σm, om, ɔm*/ lose their phonemic contrast in less careful speech.

[20] The term "canonical" is taken from Eugene A. Nida, *Morphology: The Descriptive Analysis of Words*, Ann Arbor: The University of Michigan Press, second edition, 1957, p.66.

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where C represents a consonant, V a vowel or diphthong, w the semi-consonant /w/, and T a tone (which is conventionally placed at the end of the formulae).

In total, there are 4,467 phonemic syllables in Saigon Vietnamese. The method used to find all syllables was to look through standard dictionary entries[21] and to check the entries with the author's own idiolect. Reduplicating syllables, which are by themselves meaningless, were not counted.

Although there are fourteen consonant clusters in the language, there is only a relatively small number (337) of syllables beginning with an initial cluster.

While initial consonants have practically no influence on the permissibility of tone occurrences, there are phonological laws forbidding the combination of the mid-rising, low-level, and high-level tones with final stops. Other non-occurrences of particular tones and final consonants are not accounted for by any generalisation. The only possible explanation to the fact that phonemic syllables do or do not occur is that such is the phonological system of the language.

Tables 5-9 [22] show the number of syllables for each of the five tones in Saigon Vietnamese as found in the material used for this article. It is noted that the high-rising tone and the low-rising tone, both occurring with any syllable ending, have the largest numbers of syllables, 1198 and 938 respectively. The other three tones do not occur with final stops, and consequently have smaller number of syllables. There are 917 syllables with the high-level tone, 758 with the low-level tone, and 656 with the mid-rising tone.

Tables 10-24 show the number of syllables for each of the fifteen syllable nuclei.

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[21] Dictionaries used: Eugène Gouin, *Dictionnaire Vietnamien Chinois Français,* Saigon: Imprimerie d'Extrême-Orient (1957), and Thanh-Nghi, *Tự-Điển Việt-Nam,* Saigon: Thời-Thế (1958).

[22] Tridimensional tables in which the third dimension would classify syllables according to their first segmental phoneme are not necessary, seeing that such a classification would not give much more information on the combination of tonal and segmental phonemes in the language.

Nucleus			Free	Coda								TOTAL	PERCENT-AGE
				Stops			Nasals			Semi-Consonants			
				-p	-t	-k	-m	-n	-ŋ	-y	-w		
	Vowels	i	23	14	27		14	16			17	111	9.3
		e	20	7	19		3	10			7	66	5.5
		ε	26	14		25	10		13		16	104	8.7
		â		17		21	15		13	17	12	95	7.9
		ă			21	26		17	21			85	7.1
		a	29	17		27	14		30	30	21	168	14.0
		ɯ̛	15	4		24	8		13	6	4	74	6.2
		ơ̛	19	13		11	8		11	11	2	75	6.2
		u	18	11		21	12		17	14		93	7.8
		o	14	8		15	6		13	19		75	6.3
		ɔ	15	13		17	12		10	20		87	7.3
	Diphthongs	iə	9			22			22			53	4.4
		ɯ̛ə	15			19			13			47	3.9
		uə	5			13			6			24	2.0
		ău				22			19			41	3.4
TOTAL			208	118	67	263	102	43	201	117	79	1198	
PERCENT-AGE			17.4	9.8	5.6	21.9	8.5	3.6	16.8	9.8	6.6		

Table 5. SYLLABLES HAVING THE HIGH-RISING TONE

Nucleus				Coda								TOTAL	PER-CENT-AGE
			Free	Stops			Nasals			Semi-Con-sonants			
				-p	-t	-k	-m	-n	-ŋ	-y	-w		
Nucleus	Vowels	i	26	10	19		8	12			12	87	9.3
		e	22	5	13		2	8			4	54	5.8
		ɛ	11	12		16	3		9		17	68	7.3
		â		17		15	16		13	10	11	82	8.7
		ă			17	17		12	13			59	6.3
		a	21	13		28	14		23	18	19	136	14.5
		ɯ	12	3		23	8		9	5	5	65	6.9
		ɤ	16	6		10	5		8	7		52	5.5
		u	17	12		21	12		13	13		88	9.4
		o	11	11		11	4		10	10		57	6.1
		ɔ	15	9		14	6		9	9		62	6.6
	Diphthongs	iə	3			18			20			41	4.4
		ɯə	9			13			13			35	3.7
		uə	2			9			4			15	1.6
		ău				20			17			37	3.9
TOTAL			165	98	49	215	78	32	161	72	68	938	
PERCENT-AGE			17.6	10.4	5.2	22.9	8.3	3.4	17.2	7.7	7.3		

Table 6. SYLLABLES HAVING THE LOW-RISING TONE

| Nucleus | | | | Coda | | | | | | | | TOTAL | PER-CENT-AGE |
| | | | | Stops | | | Nasals | | | Semi-Con-sonants | | | |
			Free	-p	-t	-k	-m	-n	-ŋ	-y	-w		
Nucleus	Vowels	i	31				20	21			18	90	9.8
		e	25				6	18			11	60	6.6
		ɛ	27				11	23			19	80	8.7
		â					22	21		24	17	84	9.2
		ă						25	24			49	5.3
		a	30				15		32	27	20	124	13.5
		ɯ	15				10			6	13	44	4.8
		ɗ	21				10		15	19		65	7.1
		u	21				10		20	14		65	7.1
		o	20				12		16	17		65	7.1
		ɔ	21				12		19	16		68	7.4
	Diphthongs	iə	10						30			40	4.4
		ɯə	14						21			35	3.8
		uə	13						14			27	2.9
		ău							21			21	2.3
TOTAL			248				128	108	212	123	98	917	
PERCENT-AGE			27.9				14	11.8	23.1	13.4	10.7		

Table 7. SYLLABLES HAVING THE HIGH-LEVEL TONE

Nucleus			Free	Stops			Nasals			Semi-Consonants		TOTAL	PERCENTAGE
				-p	-t	-k	-m	-n	-ŋ	-y	-w		
Nucleus	Vowels	i	26				10	20			12	68	9.0
		e	20				4	13			10	47	6.2
		ɛ	23				11		12		17	63	8.3
		â					20		17	14	11	62	8.2
		ǎ						24	19			43	5.7
		a	27				14		26	25	19	111	14.6
		ɯˀ	14				8		18	8	3	51	6.7
		ɔˀ	20				11		10	12		53	7.0
		u	17				12		20	13		62	8.2
		o	12				10		14	15		51	6.7
		ɔ	18				10		12	11		51	6.7
	Diphthongs	iə	7						24			31	4.1
		ɯˀə	6						18			24	3.2
		uə	9						12			21	2.8
		ǎu							20			20	2.6
TOTAL			199				110	57	222	98	72	758	
PERCENTAGE			26.3				14.5	7.5	29.3	12.9	9.5		

Table 8.   SYLLABLES HAVING THE LOW-LEVEL TONE

Nucleus			Free	Coda								TOTAL	PER-CENTAGE
				Stops			Nasals			Semi-Consonants			
				-p	-t	-k	-m	-n	-ŋ	-y	-w		
Nucleus	Vowels	i	23				10	12			10	55	8.4
		e	19				1	12			4	36	5.5
		ɛ	18				3		11		17	49	7.5
		â					14		14	13	9	50	7.6
		ă						17	16			33	5.0
		a	28				11		25	25	16	105	16.0
		ɯ̛	14				3		18	9	9	53	8.1
		ɤ̛	22				5		7	6	1	41	6.2
		u	15				5		17	14		51	7.8
		o	21				4		9	12		46	7.0
		ɔ	16				11		8	9		44	6.7
	Diphthongs	iə	15						23			38	5.8
		uʼə	11						11			22	3.4
		uə	8						4			12	1.8
		ău							21			21	3.2
TOTAL			210				67	41	184	88	66	656	
PERCENTAGE			32.0				10.2	6.3	28.0	13.4	10.1		

Table 9. SYLLABLES HAVING THE MID-RISING TONE

		-i	-p	-t	-m	-n	-w	TOTAL	%
1	i-	o↑↓∞ʃ		↑ ʃ	o↑↓∞	o ↓	o↑	15	4.0
2	b-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓	o↑↓∞ʃ	↓∞	19	5.1
3	t-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	23	6.1
4	tʰ-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	o↑↓ ʃ	22	5.9
5	ṭ-	o↑↓∞ʃ	↑	↑ ʃ	o	o↑↓∞ʃ	↓∞ʃ	17	4.5
6	d-	o ↓∞	ʃ	↑ ʃ	↓↓∞	o↑↓∞ʃ	o↑↓∞ʃ	19	5.1
7	c-	o↑↓∞ʃ	↑	↑ ʃ	o↑↓	o↑↓∞	o↑↓ ʃ	19	5.1
8	k-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑ ∞ʃ	o↑↓	o↑↓∞ʃ	21	5.6
9	f-	o↑↓∞ʃ		↑	o↑	↓∞	o↑	12	3.2
10	v-	o↑↓∞ʃ		↑ ʃ	o	o ∞ʃ	↑	12	3.2
11	s-	o↑↓∞ʃ		↑	o	o↑↓∞	o↑↓∞ʃ	16	4.3
12	ṣ-	o ↓∞	↑	↑	o ∞	o↑↓ ʃ	o	12	3.2
13	x-	o↑↓∞	↑	↑	o↑	o↑	o↑	12	3.2
14	g-	o ↓ ʃ		↑ ʃ	o			6	1.6
15	h-	o↑↓∞	↑ ʃ	↑ ʃ	↓↓∞	o ↓	o↑ ∞ʃ	17	4.5
16	w-	o↑↓∞ʃ		↑ ʃ		o↑↓		10	2.7
17	r-	o↑↓∞ʃ	ʃ	↑ ʃ	o	o ↓ ʃ	o↑↓	15	4.0
18	l-	o↑↓ ʃ	↑	↑ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	22	5.9
19	m-	o↑↓∞ʃ	↑	↑ ʃ	↑ ∞	o ↓ ʃ	o↑↓	16	4.3
20	n-	o ↓∞ʃ	↑	↑ ʃ	o ↓ ʃ	o↑ ∞ʃ	o↑ ʃ	17	4.5
21	ɲ-	o↑↓∞ʃ	↑ ʃ	↑	o↑ ∞ʃ	↑↓ ʃ	o↑↓∞	19	5.1
22	ŋ-	o↑↓∞ʃ	ʃ	↑ ʃ	o ∞ʃ	o ↓∞	o	15	4.0
23	y-	o↑↓ ʃ	↑ ʃ	↑ ʃ	o↑↓∞ʃ	o↑↓	o ↓ ʃ	19	5.1
TOTAL		104	24	41	61	78	67	375	
PERCENTAGE		27.7	6.4	10.9	16.3	20.8	17.9		

Entropy: $\dfrac{375}{690}$ = 54.3.

Table 10. SYLLABLES HAVING /i/ AS NUCLEUS

		-i	-p	-t	-m	-n	-w	TOTAL	%
1	tw-	o ʃ						2	5.7
2	dw-								
3	ţw-	o ʃ						2	5.7
4	cw-	↓						1	2.9
5	kw-	o↑↓∞ʃ		↑ ʃ		↑↓		9	25.7
6	sw-	o↑		↑				3	8.6
7	şw-	o↑		↑				3	8.6
8	xw-	o				o	∞ʃ	4	11.4
9	tʰw-	↑↓∞ʃ						4	11.4
10	lw-	∞ʃ						2	5.7
11	gw-								
12	ɲw-	ʃ						1	2.9
13	nw-	o ʃ		↑				3	8.6
14	yw-	o						1	2.9
TOTAL		25		5		3	2	35	
PERCENTAGE		71.5		14.3		8.6	5.7		

Entropy: $\frac{35}{420}$ = 8.3.

Table 10a. SYLLABLES HAVING /i/ AS NUCLEUS AND INITIAL CLUSTERS

		-e	-p	-t	-m	-n	-w	TOTAL	%
1	e-	o↑	o	o ʃ	o↑	∞		8	3.4
2	b-	o↑↓∞ʃ	↑	↑ ʃ		o↑↓∞ʃ	o ↓ ʃ	16	6.8
3	t-	o↑↓∞ʃ		↑	o	o		8	3.4
4	tʰ-	o↑↓∞ʃ	↑	↑	o↑	o	o ↓	12	5.1
5	ṭ-	o ↓∞ʃ		ʃ			o↑ ʃ	8	3.4
6	d-	o↑↓∞ʃ	ʃ	↑	o↑ ʃ	↑↓∞	↓	14	6.0
7	c-	o↑↓ ʃ	↑	↑ ʃ	o ∞	o↑ ∞		12	5.1
8	k-	o↑↓∞ʃ	↑	↑ ʃ	↓	o ↓ ʃ	o ↓	14	6.0
9	f-	o↑ ʃ		↑		o ∞	↑↓∞	9	3.8
10	v-	o↑↓ ʃ		↑		o↑↓∞ʃ	o↑↓	13	5.6
11	s-	o↑↓∞ʃ	↑ ʃ	↑ ʃ		o↑		11	4.7
12	ṣ-	↓ ʃ	↑	↑ ʃ		o↑↓∞	o↑	11	4.7
13	x-	o↑↓ ʃ				o ∞ʃ	o ↓	9	3.8
14	g-	o↑↓				↓		4	1.7
15	h-	o ↓∞ʃ		↑	↓	o↑ ∞	∞	10	4.3
16	w-	o↑↓∞ʃ		↑				6	2.6
17	r-	o↑↓∞	ʃ	↑		o ↓	o ↓ ʃ	11	4.7
18	l-	o ↓∞ʃ	ʃ	↑ ʃ		o ↓ ʃ	o↑↓∞	14	6.0
19	m-	o↑↓∞ʃ		ʃ	↓	o↑↓∞ʃ	↑	13	5.6
20	n-	o ↓∞ʃ	↑ ʃ		o↑ ʃ	o↑↓ ʃ	o↑	15	6.4
21	ɲ-	∞						1	0.4
22	ɳ-	o ↓ ʃ		↑ ʃ		o ∞	o ∞ʃ	10	4.3
23	y-	o↑ ∞		ʃ		ʃ		5	2.1
TOTAL		89	13	27	16	54	35	234	
PERCENTAGE		38.0	5.6	11.5	6.8	23.0	15.0		

Entropy: $\dfrac{234}{690}$ = 33.9.

Table 11. SYLLABLES HAVING /e/ AS NUCLEUS

		-e	-p	-t	-m	-n	-w	TOTAL	%
1	tw-	↑ ʃ		↑		o		4	13.3
2	dw-					↓∞		2	6.6
3	ṭw-								
4	cw-	↑						1	3.3
5	kw-	o↑ ʃ		↑ ʃ		o↑↓	↓	9	30.0
6	sw-	o ↓∞		ʃ		↓		5	16.6
7	ṣw-								
8	xw-	o		↑				2	6.6
9	tʰw-	o↑ ∞						3	10.0
10	lw-								
11	gw-								
12	ŋw-	ʃ						1	3.3
13	nw-			↑				1	3.3
14	yw-	ʃ				↓		2	6.6
TOTAL		15		6		8	1	30	
PERCENTAGE		50.0		20.0		26.6	3.3		

Entropy: $\frac{30}{420}$ = 7.1.

Table 11a. SYLLABLES HAVING /e/ AS NUCLEUS AND INITIAL CLUSTERS

		-ε	-p	-k	-m	-ŋ	-w	TOTAL	%
1	ε-	o↑↓ ʃ	↑ ʃ	↑	o↑	o↑	o↑↓∞ʃ	16	5.0
2	b-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	↓∞	o↑↓∞ʃ	o↑↓∞ʃ	21	6.5
3	t-	o↑↓∞	↑ ʃ	↑ ʃ	o↑↓	o ∞	o ↓∞ʃ	17	5.3
4	th-	o↑↓∞	↑	↑	↓	o ↓ ʃ	o ∞ʃ	13	4.0
5	ţ-	o ∞		↑ ʃ	↓	∞	o↑↓ ʃ	10	3.1
6	d-	o ↓∞	ʃ	↑ ʃ	o	o ↓ ʃ	o↑↓∞	14	4.4
7	c-	o↑↓∞	↑ ʃ	↑ ʃ	o↑	o↑↓∞ʃ	o↑↓∞	19	5.9
8	k-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓∞	↑↓∞ʃ	o↑↓∞ʃ	22	6.9
9	f-	o↑↓	↑	↑ ʃ		o ↓	↓	9	2.8
10	v-	o↑↓∞		↑ ʃ	ʃ	o↑ ∞ʃ	o↑↓∞ʃ	16	5.0
11	s-	o↑ ∞	↑ ʃ	↑ ʃ	o↑	o↑ ∞	o↑↓∞ʃ	17	5.3
12	ş-	o ↓∞		↑	↑	o↑	ʃ	8	2.5
13	x-	o↑↓ ʃ	↑	↑	o	o	↑	9	2.8
14	g-	o↑↓∞ʃ	↑	↑	↑	o ↓	ʃ	11	3.4
15	h-	o↑↓ ʃ	ʃ	↑	↓∞	o ↓ ʃ	o↑↓∞	15	4.7
16	w-	o↑ ʃ						3	0.9
17	r-	o↑ ↓∞		↑ ʃ	↓	o↑↓	o↑ ∞	13	4.0
18	l-	o↑↓∞ʃ			o↑↓ ʃ	o↑↓∞	o↑↓∞ʃ	18	5.6
19	m-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o ↓	o↑↓	o↑↓∞ʃ	19	5.9
20	n-	o↑↓∞	↑ ʃ	↑ ʃ	o↑	↑	o ↓∞	14	4.4
21	ɲ-	o↑↓ ʃ	↑ ʃ	↑	o↑↓ ʃ	o	o↑↓ ʃ	16	5.0
22	ŋ-	o↑↓		↑ ʃ		↑ ∞ʃ	↓∞ʃ	11	3.4
23	y-	↑↓∞	↑ ʃ		↓	o	o ∞ʃ	10	3.1
TOTAL		88	26	33	38	58	78	321	
PERCENTAGE		27.4	8.1	10.3	11.8	18.1	24.3		

Entropy: $\frac{321}{690}$ = 46.5.

Table 12. SYLLABLES HAVING /ε/ AS NUCLEUS

		-ε	-p	-k	-m	-ŋ	-w	TOTAL	%
1	tw-	↑		↑ ʃ		o		4	9.1
2	dw-								
3	ʦ́w-								
4	cw-	o↑						2	4.5
5	kw-	o↑↓∞		↑ ʃ		o↑↓ ʃ	o↑↓ ʃ	14	31.8
6	sw-	↓ ʃ		↑ ʃ		o		5	11.4
7	ṣw-								
8	xw-	o↑ ∞		↑			↓	5	11.4
9	tʰw-								
10	lw-	o↑↓		↑				4	9.1
11	ǧw-								
12	ɲw-	↓				o ∞		3	6.8
13	nw-	o↑				o ∞	o↑ ∞ʃ	8	18.2
14	yw-								
TOTAL		17		8		10	9	45	
PERCENTAGE		38.6		18.2		22.7	20.5		

Entropy: $\dfrac{44}{280}$ = 15.7.

Table 12a. SYLLABLES HAVING /ε/ AS NUCLEUS AND INITIAL CLUSTERS

		-p	-k	-m	-ŋ	-w	-y	TOTAL	%
1	â-	↑	↑	o↑↓∞	o↑ ∞	o↑ ∞	o↑ ʃ	15	4.2
2	b-	↑ ʃ	↑ ʃ	o↑↓∞ʃ	o ↓∞ʃ	o↑↓ ʃ	o↑↓∞ʃ	22	6.1
3	t-	↑ ʃ	↑ ʃ	o↑↓∞	o↑↓∞ʃ	o↑ ∞ʃ	o ↓∞	20	5.6
4	th-	↑ ʃ	↑ ʃ	o↑↓∞ʃ	o ↓∞ʃ	o↑	o↑↓∞	19	5.3
5	ṭ-	↑	ʃ	o ↓∞		o↑↓	o ↓	10	2.8
6	d-	↑ ʃ	↑	o↑↓∞ʃ	o↑↓ ʃ			12	3.3
7	c-	ʃ	↑ ʃ	o ↓ ʃ	o↑↓∞ʃ	o↑↓ ʃ	o↑↓	18	5.0
8	k-	↑ ʃ	↑ ʃ	o↑↓∞	o↑↓∞ʃ	o↑ ↓∞ʃ	o↑↓ ʃ	22	6.1
9	f-	↑ ʃ	↑ ʃ	∞	o↑↓∞ʃ	o ∞	o↑ ∞	15	4.2
10	v-	↑	↑ ʃ	o ↓ ʃ	o↑↓∞		o ↓∞ʃ	14	3.9
11	s-	↑ ʃ	↑	o↑↓∞ʃ	o ↓	o↑	o↑↓∞	16	4.5
12	ṣ-	↑ ʃ		o↑↓ ʃ	o↑↓	o↑↓	o ʃ	14	3.9
13	x-	↑	↑	o ∞	o ∞	o↑ ∞ʃ	o ∞	12	3.3
14	g-	↑ ʃ	↑ ʃ	o↑↓ ʃ	o ↓	↑	o ↓∞ʃ	15	4.2
15	h-	↑ ʃ	↑	o ↓∞ʃ	o ʃ	o ↓ ʃ	o↑ ∞	15	4.2
16	w-		↑ ʃ	o				3	2.4
17	r-	ʃ	↑	o ↓ ʃ	↑↓ ʃ	o ↓ ʃ	o↑↓	14	3.9
18	l-	↑ ʃ	ʃ	o↑ ↓∞ʃ	o↑↓∞ʃ	o ↓∞ʃ	o↑↓∞ʃ	22	6.1
19	m-	ʃ	↑ ʃ	o↑↓	o ↓∞ʃ	o ↓∞ʃ	o↑↓∞ʃ	19	5.3
20	n-	ʃ	↑	o↑↓∞	o	o↑	o ∞	11	3.1
21	ɲ-	↑ ʃ	↑ ʃ	o↑↓ ʃ	o ∞ʃ	ʃ	o↑↓	15	4.2
22	ŋ-	ʃ	↑	o↑↓∞ʃ	o↑↓∞	↓∞	o↑	15	4.2
23	y-	↑	↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	o ↓∞ʃ	o↑↓∞ʃ	21	5.8
TOTAL		34	34	85	75	60	71	359	
PERCENTAGE		9.5	9.5	23.7	20.9	16.7	19.8		

Entropy: $\frac{359}{690}$ = 52.0.

Table 13. SYLLABLES HAVING /â/ AS NUCLEUS

		-p	-k	-m	-n	-w	-y	TOTAL	%
1	tw-								
2	dw-								
3	ṭw-								
4	cw-								
5	kw-		ɬ ʃ	ʃ	ɬɬ		oɬ ∞ʃ	9	64.2
6	sw-						oɬ	2	14.2
7	ṣw-								
8	xw-						oɬ	2	14.2
9	t^hw-								
10	lw-								
11	gw-								
12	ɲw-								
13	ŋw			ʃ				1	7.1
14	yw-								
TOTAL			2	2	2		8	14	
PERCENTAGE			14.2	14.2	14.2		57.1		

Entropy: $\frac{14}{420}$ = 3.3.

Table 13a. SYLLABLES HAVING /â/ AS NUCLEUS AND INITIAL CLUSTERS

		-t	-k	-n	-ŋ	TOTAL	%
1	ă-	↑ ∫	↑	o↑↓∞	↑	8	3.2
2	b-	↑ ∫	↑ ∫	o↑↓∞∫	o↑↓	12	4.8
3	t-	↑ ∫	↑ ∫	o↑↓ ∫	o ↓ ∫	11	4.4
4	tʰ-	↑	↑	o↑↓∞∫	o↑↓∞∫	12	4.8
5	ṭ-	↑ ∫	↑ ∫	o↑↓∞	o↑↓∞∫	13	5.2
6	d-	↑	↑ ∫	o↑↓∞	o↑↓∞∫	12	4.8
7	c-	↑ ∫	↑ ∫	o↑↓ ∫	o↑↓∞∫	13	5.2
8	k-	↑ ∫	↑ ∫	o↑↓∞∫	o↑↓∞∫	14	5.6
9	f-	↑ ∫	↑	o ↓	o ∞	7	2.8
10	v-	↑ ∫	↑ ∫	o ↓∞∫	o↑↓∞	12	4.8
11	s-	↑ ∫	↑	o	o↑↓∞	8	3.2
12	ṣ-	↑	↑ ∫	o↑↓∞	o↑ ∞	10	4.0
13	x-	↑	↑	o↑ ∞	o↑ ∞	8	3.2
14	g-	∫	↑ ∫	o↑↓ ∫	o↑↓ ∫	11	4.4
15	h-	↑ ∫	↑	o ↓∞∫	o↑↓∞	11	4.4
16	w-	∫	↑ ∫	o↑↓∞	o ∞	9	3.6
17	r-	↑ ∫	↑ ∫	o ↓∞	o↑↓ ∫	11	4.4
18	l-	↑ ∫	↑ ∫	o↑↓∞∫	o↑↓∞∫	14	5.6
19	m-	↑	↑ ∫	o↑↓ ∫	o↑↓ ∫	11	4.4
20	n-	↑	↑ ∫	o↑↓ ∫	o↑↓ ∫	11	4.4
21	ɲ-	↑	↑ ∫	o↑↓∞	o↑↓∞∫	12	4.8
22	ŋ-	↑ ∫	↑ ∫	o↑↓∞∫	o↑ ∞	12	4.8
23	y-		↑ ∫	o↑ ∫	o ↓ ∫	8	3.2
TOTAL		35	40	89	86	250	
PERCENTAGE		14.0	16.0	35.6	34.4		

Entropy: $\dfrac{250}{860}$ = 29.1

Table 14. SYLLABLES HAVING /ă/ AS NUCLEUS

		-t	-k	-n	-ŋ	TOTAL	%
1	tw-						
2	dw-			↓		1	5.2
3	ʈw-						
4	cw-		↑			1	5.2
5	kw-	o↑ ʃ			↓	4	21.0
6	sw-		↑		o↑ ∞	4	21.0
7	ʂw-						
8	xw-						
9	tʰw-		↑		o↑	3	15.8
10	lw-			o	↓	2	10.5
11	gw-						
12	ɲw-						
13	ŋw-	ʃ		∞		2	10.5
14	yw-			o ↓		2	10.5
TOTAL		5	3	5	6	19	
PERCENTAGE		26.3	15.8	26.3	31.6		

Entropy: $\frac{56}{280}$ = 20.0.

Table 14a. SYLLABLES HAVING /ă/ AS NUCLEUS AND INITIAL CLUSTERS

		-a	-p	-k	-m	-n	-w	-y	TOTAL	%
1	a-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑ ∞	o↑	o↑↓∞ʃ	o↑ ∞	22	4.1
2	b-	o↑↓∞ʃ		↑ ʃ	↑	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	23	4.3
3	t-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	28	5.2
4	th-	o↑↓∞	↑ ʃ	↑ ʃ	o↑↓∞	o↑ ∞	o↑↓∞ʃ	o↑ ∞	23	4.3
5	ṭ-	o↑↓∞	↑	↑ ʃ	↑↓∞ʃ	o↑↓ ʃ	o↑↓∞	o↑ ∞ʃ	23	4.3
6	d-	o↑↓∞	↑ ʃ	↑ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	28	5.2
7	c-	o↑↓∞ʃ	ʃ	↑ ʃ	↓ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	25	4.6
8	k-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	29	5.4
9	f-	o↑↓	↑ ʃ	↑ ʃ	↓ ʃ	o↑↓∞ʃ	o↑↓	o↑ ∞	20	3.7
10	v-	o↑↓∞ʃ		↑ ʃ	↓ ʃ	o↑↓∞ʃ	↓	o↑↓∞ʃ	20	3.7
11	s-	o↑↓∞ʃ	↑	↑ ʃ	o↑↓∞.	o↑	o↑↓∞ʃ	↑↓∞	22	4.1
12	ṣ-	o↑↓∞	↑ ʃ	↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	ρ↑↓∞	26	4.8
13	x-	o↑↓∞	↑ ʃ	↑ ʃ	o↑ ∞ʃ	o↑↓∞ʃ	o ∞	o↑ ∞	22	4.1
14	g-	o↑↓∞ʃ		↑ ʃ	o	o↑↓ ʃ	↑↓ ʃ	o↑↓∞	19	3.5
15	h-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o ↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	28	5.2
16	w-	o↑↓∞ʃ		↑ ʃ		↑↓∞ʃ		↓ ʃ	13	2.4
17	r-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑ ʃ	o↑↓ ʃ	o↑↓∞ʃ	↑↓	23	4.3
18	l-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o ↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	28	5.2
19	m-	o↑↓∞ʃ		↑ ʃ		o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	22	4.1
20	n-	o↑↓∞ʃ	ʃ	↑ ʃ	o↑ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓∞ʃ	26	4.8
21	ñ-	o↑↓∞ʃ	↑	↑ ʃ	o↑↓∞	o ↓∞ʃ	o↑↓ ʃ	o↑↓∞	24	4.4
22	ŋ-	o ↓∞	↑	↑ ʃ		o↑↓ ʃ	o↑↓ ʃ	o↑↓∞ʃ	19	3.5
23	y-	o↑↓∞ʃ	↑	↑ ʃ	o↑↓∞ʃ	o↑↓∞ʃ	o↑↓ ʃ	o↑↓∞ʃ	27	5.0
TOTAL		106	29	46	68	101	95	95	540	
PERCENTAGE		19.7	5.4	8.5	12.6	18.7	17.6	17.6		

Entropy: $\frac{540}{805}$ = 67.1.

Table 15. SYLLABLES HAVING /a/ AS NUCLEUS

		-a	-p	-k	-m	-ŋ	-w	-y	TOTAL	%
1	tw-	o ↑∞ʃ		↑ ʃ		o↑↓∞		↑ ʃ	12	11.1
2	dw-	ʃ		ʃ		o↑↓∞ʃ		↑↓	9	8.3
3	ṭw-									
4	cw-					o↑↓∞		o ↓∞	7	6.5
5	kw-	o↑↓∞ʃ		↑		o↑↓∞	↓ ʃ	o ↓∞	15	13.9
6	sw-	o↑↓∞		ʃ		o ↓		↑↓	9	8.3
7	ṣw-							↑	1	0.9
8	xw-	o↑ ∞		↑		o↑ ∞		o↑	9	8.3
9	tʰw-	o↑ ∞		↑ ʃ		o↑ ∞		o↑ ∞ʃ	12	11.1
10	lw-	o↑↓∞		ʃ		o↑↓∞ʃ		o ↓ ʃ	13	12.0
11	gw-	↑							1	0.9
12	ɲw-	↓				↑		o↑↓	5	4.6
13	nw-	o ʃ	↑			o ʃ	↑	o↑↓∞ʃ	11	10.2
14	yw-	↑ ʃ				o ∞			4	3.7
TOTAL		30	1	9		35	3	30	108	
PERCENTAGE		27.8	0.9	8.3		32.4	2.8	27.8		

Entropy: $\frac{108}{490}$ = 22.0.

Table 15a. SYLLABLES HAVING /a/ AS NUCLEUS AND INITIAL CLUSTERS

		-uʼ	-p	-k	-m	-n	-y	-w	TOTAL	%
1	uʼ-	o↑↓ ∫	↑	↑ ∫	o↑	o↑ ∞	o	o	14	4.9
2	b-	o↑↓ ∫	↑	↑ ∫	o↑↓ ∫	o↑↓∞	o ∞	o↑ ∞	20	7.0
3	t-	o↑↓∞∫		↑	o	o ↓∞	o↑	∞∫	14	4.9
4	tʰ-	o↑↓∞∫		↑ ∫		o ↓	↓	∞	11	3.9
5	ṭ-	↑↓∫		∫		o↑↓	∫	o ↓	11	3.9
6	d-	↓↓	∫	↑ ∫	o↑↓∞∫	↑↓ ∫	∫	o	15	5.3
7	c-	o↑↓∞		↑ ∫	o↑↓	o↑↓∞	∞	o↑↓∞	18	6.3
8	k-	o↑↓∞∫	↑	↑ ∫	o↑ ∫	o↑	↑↓∞	o↑↓∞∫	21	7.4
9	f-			↑ ∫		o	o	∫	5	1.8
10	v-			↑ ∫		↓∞∫		o	6	2.1
11	s-	o↑↓∞		↑ ∫		o↑ ∞	↓		10	3.5
12	ṣ-	o↑↓∞∫		↑ ∫		o ↓∞	∞	o ∞	13	4.6
13	x-	o↑ ∞				o↑ ∫		o↑	8	2.8
14	g-	↓		∫	o ↓ ∫	↓	∞		7	2.5
15	h-	o↑↓∞∫		↑	↓ ∫	o↑↓∞	∞	o ∞	15	5.3
16	w-			↑ ∫		o↑			4	1.4
17	r-			↑ ∫	o↑↓∞	o ↓	↑↓∞∫	∫	13	4.6
18	l-	o↑↓∞∫		↑ ∫	↓∞∫	o ∞	↑↓∞	o ∫	17	6.0
19	m-		↑	↑ ∫		↓∞	o ↓	o ∞	9	3.2
20	n-	o ∞∫	∫	↑ ∫	o↑ ∫	o↑ ∫		∞	13	4.6
21	ɲ-	o↑↓∞		↑ ∫	o↑↓	o ∞	↑↓ ∫		14	4.9
22	ŋ-	o ∞∫		∫	o ∫	o ↓∞	o ↓∞	o	13	4.6
23	y-	o↑ ∞∫	∫	↑ ∫		o ↓∞∫	↑ ∫		13	4.6
TOTAL		70	7	39	38	62	34	34	284	
PERCENTAGE		24.6	2.5	13.7	13.4	21.8	12.0	12.0		

Entropy: $\frac{284}{805} = 35.3$.

Table 16. SYLLABLES HAVING /uʼ/ AS NUCLEUS

		-uʼ	-p	-k	-m	-n	-y	-w	TOTAL	%
1	tw–			ꜗ		o ꜗ ꜖ ∞			5	17.2
2	dw–									
3	ṭw–			ꜗ ʃ		o			3	10.3
4	cw–					∞			1	3.4
5	kw–					o ꜖ ∞ ʃ			4	13.8
6	sw–			ꜗ		o ∞			3	10.3
7	ṣw–			ꜗ					1	3.4
8	xw–			ꜗ		o			2	6.9
9	tʰw–			ʃ		ꜗ ꜖ ∞ ʃ			5	17.2
10	lw–			ʃ		o ʃ			3	10.3
11	gw–									
12	ɲw–					꜖ ʃ			2	6.9
13	nw–									
14	yw–									
TOTAL				8		21			29	
PERCENTAGE				27.6		72.4				

Entropy: $\frac{29}{490}$ = 5.1.

Table 16a. SYLLABLES HAVING /ʊ̆/ AS NUCLEUS AND INITIAL CLUSTERS

		−ɗ	−p	−k	−m	−n	−y	−w	TOTAL	%
1	ɗ−	o ɬ ɬ ∞ ʃ		ɬ	∞	o ɬ	o ɬ		11	3.9
2	b−	o ɬ ɬ ∞ ʃ	ɬ	ɬ ʃ	o ɬ ʃ	o ɬ ∞ ʃ	o ɬ ɬ ∞		19	6.7
3	t−	o ɬ ɬ ∞ ʃ	ɬ ʃ		∞	∞ ʃ	o ɬ		12	4.2
4	tʰ−	o ɬ ɬ ∞ ʃ		ɬ	o	o ɬ	ɬ		10	3.5
5	ʈ−	o ɬ ɬ ∞ ʃ		ɬ ʃ	ɬ	o ɬ ʃ	o ɬ		13	4.6
6	d−	o ɬ ɬ ∞ ʃ	ɬ	ʃ	o ɬ ∞	o ɬ ɬ	ɬ ɬ ʃ		16	5.7
7	c−	ɬ ɬ ∞ ʃ	ɬ ʃ	ɬ ʃ	o ɬ ɬ	o ɬ ɬ	o ɬ		16	5.7
8	k−	o ɬ ɬ ∞		ʃ	o ɬ ʃ	o ∞ ʃ	o ɬ ɬ ∞		15	5.3
9	f−	o ɬ ∞	ɬ			o	o		6	2.1
10	v−	o ɬ ɬ ∞ ʃ		ɬ ʃ		ɬ	o ɬ ɬ ʃ		12	4.2
11	s−	o ɬ ɬ ʃ		ɬ ʃ	o ɬ	o ɬ	o ɬ		12	4.2
12	ʂ−	o ɬ ɬ ∞ ʃ	ɬ	ɬ	ɬ ɬ	o ɬ ɬ ∞	o ʃ		15	5.3
13	x−	ɬ	ɬ		ɬ		o ∞		5	1.8
14	ɠ−	o ∞		ʃ	o ɬ ɬ	ʃ	∞ ʃ		9	3.2
15	h−	o ɬ ɬ ∞	ɬ ʃ	ɬ ʃ	ɬ ʃ	o ɬ ɬ	o ɬ ∞ ʃ		17	6.0
16	w−									
17	r−	o ɬ ɬ ∞ ʃ	ʃ	ɬ	o ɬ ɬ ∞	ɬ ∞ ʃ	o ɬ ʃ	ɬ	18	6.4
18	l−	o ɬ ɬ ∞ ʃ	ɬ ʃ	ʃ	ɬ ∞ ʃ	o ɬ ɬ ʃ	o ɬ ɬ		18	6.4
19	m−	o ɬ ɬ ∞ ʃ	ɬ		ɬ	o ɬ	o ɬ ɬ	∞	13	4.6
20	n−	o ∞ ʃ	ɬ	o ʃ			o ɬ	ɬ	9	3.2
21	ɲ−	o ɬ ɬ ∞ ʃ			o ɬ ɬ	o ɬ ∞	o ∞		13	4.6
22	ŋ−	o ɬ ɬ ∞ ʃ	ɬ ʃ	ɬ	o ʃ	o	o ɬ ʃ		14	4.9
23	y−	o ɬ ∞	ɬ			ɬ ɬ ∞ ʃ	o ɬ		10	3.5
TOTAL		93	19	23	39	51	55	3	283	
PERCENTAGE		32.8	6.7	8.1	13.8	18.0	19.4	1.1		

Entropy: $\dfrac{283}{805}$ = 35.2.

Table 17. SYLLABLES HAVING /ɗ/ AS NUCLEUS

		-ɔʼ	-p	-k	-m	-n	-y	-w	TOTAL	%
1	tw-									
2	dw-									
3	ṭw-									
4	cw-									
5	kw-	o † ↓ ∞							4	80
6	sw-									
7	ṣw-									
8	xw-									
9	tʰw-	∞							1	20
10	lw-									
11	ǥw-									
12	ɲw-									
13	ŋw-									
14	yw-									
TOTAL		5							5	
PERCENTAGE		100								

Entropy: $\frac{5}{490}$ = 1.0.

Table 17a. SYLLABLES HAVING /ɔʼ/ AS NUCLEUS AND INITIAL CLUSTERS

		-u	-p	-k	-m	-ŋ	-y	TOTAL	%
1	u-	o ↑ ↓ ∞ ʃ	↑	↑ ʃ	o ↑			10	2.8
2	b-	o ↑ ↓ ʃ	↑ ʃ	↑ ʃ	↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	↑ ↓ ∞ ʃ	20	5.6
3	t-	o ↑ ↓ ∞ ʃ	↑	↑ ʃ	o ↑ ↓ ʃ	o ↑ ↓ ∞ ʃ	o ↑ ∞ ʃ	21	5.9
4	tʰ-	o ↑ ↓ ∞ ʃ	ʃ	↑ ʃ	o ∞	o ↑ ↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	20	5.6
5	ṭ-	o ↑ ↓ ʃ		↑ ʃ	↑ ↓ ʃ	o ↑ ↓ ∞ ʃ	o ∞ ʃ	17	4.7
6	d-	o ↑ ↓ ∞ ʃ	↑	↑ ʃ	↓	o ↑ ↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	19	5.3
7	c-	o ↑ ∞	ʃ	↑ ʃ	o ↑ ↓ ∞ ʃ	o ↑ ↓ ∞	o ↑ ↓ ∞	19	5.3
8	k-	o ↑ ↓ ∞ ʃ	↑ ʃ	↑ ʃ	↑ ↓ ʃ	o ↑ ↓ ∞ ʃ	↑ ↓ ∞ ʃ	21	5.9
9	f-	o ↑ ↓ ∞ ʃ	ʃ	↑ ʃ		o ↑ ↓ ʃ	∞	13	3.6
10	v-	o ↑ ↓ ∞ ʃ		↑ ʃ	∞	o ↓ ∞ ʃ	o ↑ ↓	15	4.2
11	s-	o ↓ ʃ	ʃ	↑ ʃ	↑	o ↑ ↓	o ↑ ↓	13	3.6
12	ṣ-	o ↑ ↓ ∞ ʃ	ʃ	↑ ʃ	o ↓ ʃ	o ↑ ↓ ∞ ʃ	o ↑	18	5.0
13	x-	o ↑		↑	o ↑ ʃ	o ↓ ∞	o	10	2.8
14	ɡ-	↓ ʃ		↑ ʃ	ʃ	↓	↓	7	2.0
15	h-	o ↑ ↓ ∞	↑ ʃ	↑ ʃ	o ↓	o ↑ ↓	↑ ∞ ʃ	16	4.5
16	w-								
17	r-	o ↑ ↓ ∞	ʃ	↑ ʃ	o ↑ ↓ ʃ	o ↑ ↓ ∞ ʃ	↓ ∞ ʃ	19	5.3
18	l-	o ↑ ↓ ∞ ʃ	↑ ʃ	↑ ʃ	o ↑ ↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	24	6.7
19	m-	o ↓ ∞ ʃ	↑	↑ ʃ		o ↓ ∞ ʃ	o ↑ ↓ ∞ ʃ	16	4.5
20	n-	o ʃ	↑	↑ ʃ	↑	o ↑ ↓ ∞	o ↑ ↓ ʃ	14	3.9
21	ɲ-	o ↑ ∞		↑ ʃ	o ↑	o ↑ ↓ ∞	o ∞	13	3.6
22	ŋ-	o ↑ ∞ ʃ	↑ ʃ	↑ ʃ	↑ ʃ	o ↑ ∞	o ʃ	15	4.2
23	y-	o ↑ ↓ ʃ	↑	ʃ	↑ ↓ ʃ	o ↑ ↓ ∞ ʃ	↑ ↓ ∞ ʃ	18	5.0
TOTAL		88	22	42	51	87	68	358	
PERCENTAGE		24.6	6.1	11.8	14.2	24.3	20.0		

Entropy: $\frac{358}{690}$ = 51.9.

Table 18. SYLLABLES HAVING /u/ AS NUCLEUS

		-o	-p	-k	-m	-n	-y	TOTAL	%
1	o-	o↑↓∞	ʃ	↑ ʃ	o↑	o ↓∞	o↑ ∞	15	5.1
2	b-	o↑↓∞ʃ	↑ ʃ	↑	↑	o↑↓∞ʃ	o↑↓ ʃ	18	6.1
3	t-	o↑↓∞ʃ	↑	↑ ʃ	o	o↑↓∞	o↑↓ ʃ	17	5.8
4	th-	o↑ ∞	ʃ	↑		o↑↓∞ʃ	o↑ ∞	13	4.4
5	ṭ-	o↑ ∞ʃ			o ʃ	o↑ ʃ	o↑↓∞ʃ	14	4.8
6	d-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑	o↑↓ ʃ	o↑↓∞ʃ	20	6.8
7	c-	∞		↑ ʃ	o ↓∞	o↑↓ ʃ	↑↓∞	13	4.4
8	k-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑ ʃ	o↑↓∞ʃ	o↑ ∞ʃ	21	7.1
9	f-	o↑ ∞	↑	↑	↑	↑	o↑ ∞	10	3.4
10	v-	o↑↓∞				o↑↓	o↑ ʃ	10	3.4
11	s-	o ∞	↑	↑	o↑↓	o↑ ʃ	o ∞	12	4.1
12	ṣ-	o↑↓∞	↑ ʃ	↑ ʃ	↓	↓	o↑↓	13	4.4
13	x-	o↑ ∞				o↑ ∞	o↑	8	2.7
14	ǧ-	o ↓∞	ʃ	ʃ	o↑↓	o	↑↓	11	3.7
15	l-	o↑↓∞ʃ	ʃ	↑ ʃ	o ∞	o ↓∞	o↑↓ ʃ	17	5.8
16	w-								
17	r-	o ↓∞ʃ			o ʃ	↑ ∞ʃ	↑↓∞	12	4.1
18	l-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	↑↓∞	↑↓∞ʃ	o↑↓∞ʃ	21	7.1
19	m-	o ↓∞ʃ			↓	o ↓	o↑↓∞ʃ	12	4.1
20	n-	o↑ ∞ʃ	ʃ	↑	o ↓ ʃ		o↑↓∞ʃ	14	4.8
21	ñ-	o ∞		↑ ʃ	o ∞	o ʃ	↓	9	3.1
22	ŋ-	o ∞ʃ	ʃ	↑ ʃ	↓	o↑	o ↓	11	3.7
23	y-					↓	↑↓	3	1.0
TOTAL		78	19	26	36	62	73	294	
PERCENTAGE		26.5	6.5	8.8	12.2	21.1	24.8		

Entropy: $\dfrac{294}{690}$ = 42.6.

Table 19. SYLLABLES HAVING /o/ AS NUCLEUS

		-ɔ	-p	-k	-m	-ŋ	-y	TOTAL	%
1	ɔ-	o↑↓ ʃ	↑ ʃ	↑	o ∞	o ↓∞	o↑↓	15	4.8
2	b-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o ↓∞	o↑↓∞ʃ	↑	18	5.8
3	t-	o ↓∞	↑ ʃ	↑ ʃ	o↑ ∞	o↑↓∞ʃ	↑	16	5.1
4	tʰ-	o↑↓∞ʃ	↑	↑ ʃ	o	o	o↑↓∞	14	4.5
5	ʈ-	o ↓∞ʃ		↑	↑↓∞	o↑↓ ʃ	o↑ ʃ	15	4.8
6	d-	o↑↓∞ʃ		↑ ʃ	o↑ ∞	o↑↓	↑↓ ʃ	16	5.1
7	c-	o↑↓∞	↑	↑ ʃ	↓∞	o ʃ	o↑↓ ʃ	15	4.8
8	k-	o↑↓∞ʃ	↑ ʃ	↑ ʃ	o↑↓ ʃ	o ↓∞	o↑↓∞	20	6.4
9	f-	o↑↓	ʃ					4	1.3
10	v-				↑	o	o↑	4	1.3
11	s-	o↑ ∞	↑ ʃ	↑ ʃ	↑	o	o↑	11	3.5
12	ʂ-	o ↓∞ʃ		↑ ʃ	↑ ʃ	o↑	o↑↓∞	14	4.5
13	x-	o↑↓		ʃ	o↑↓ ʃ		↑ ∞	10	3.2
14	g-	o ↓ ʃ	↑	↑ ʃ	o	o ↓∞ʃ	↑ ∞ʃ	14	4.5
15	h-	o ↓ ʃ	↑ ʃ	↑	o↑↓∞	o ↓	o↑ ∞	15	4.8
16	w-								
17	r-	o↑ ∞ʃ		↑	↓ʃ		o ʃ	9	2.9
18	l-	o↑↓∞ʃ	↑	↑ ʃ	o↑↓∞ʃ	o ↓∞ʃ	o↑↓∞ʃ	22	7.1
19	m-	o↑↓∞	↑ ʃ	↑ ʃ	↑ ∞	o↑↓ ʃ	o ↓∞ʃ	18	5.8
20	n-	o↑↓∞ʃ	↑			o↑ ∞	o↑↓ ʃ	13	4.2
21	ɲ-	o ∞ʃ			o↑ ∞	o↑ ʃ	o↑	11	3.5
22	ŋ-	o↑↓∞ʃ	↑	↑ ʃ	↓∞	o↑↓∞ʃ	o↑↓	18	5.8
23	y-	o↑↓∞ʃ	ʃ	↑ ʃ	o↑ ʃ	o↑↓	o↑↓∞ʃ	19	6.1
TOTAL		85	22	31	51	58	64	311	
PERCENTAGE		27.3	7.1	10.0	16.4	18.6	20.6		

Entropy: $\frac{311}{690}$ = 45.1.

Table 20. SYLLABLES HAVING /ɔ/ AS NUCLEUS

		-iə	-iək	-iən	TOTAL	%
1	iə-	∞		o↑	3	1.9
2	b-	o↑↓ ʃ	↑ ʃ	o↑↓∞ʃ	11	6.9
3	t-	o↑ ∞	↑ ʃ	o↑↓∞ʃ	10	6.3
4	tʰ-	o ↓	↑ ʃ	o↑↓∞ʃ.	9	5.6
5	ṭ-		↑		1	0.6
6	d-	↑↓∞ʃ	↑	o↑↓∞ʃ	10	6.2
7	c-	o↑↓∞	↑	o↑↓∞ʃ	10	6.2
8	k-	o ↓∞	↑ ʃ	o↑↓∞ʃ	10	6.2
9	f-	↑	ʃ	o↑↓ ʃ	6	3.8
10	v-	↑ ∞	↑ ʃ	o↑↓∞ʃ	9	5.6
11	s-	↑ ∞	↑ ʃ	o ↓∞	7	4.4
12	ṣ-	∞	↑	o ∞	4	2.5
13	x-	↑ ∞	↑	o ∞	5	3.1
14	ɡ-			↓	1	0.6
15	h-	o		o↑↓∞ʃ	6	3.8
16	w-		↑ ʃ	o↑↓∞ʃ	7	4.4
17	r-	o ↓∞	↑	o ↓	6	3.8
18	l-	o ↓ ʃ	↑ ʃ	o↑↓∞ʃ	10	6.2
19	m-	↑ ∞	↑ ʃ	o↑↓∞ʃ	9	5.6
20	n-	o ∞	↑ ʃ	o ↓∞	7	4.4
21	ɲ-	∞	↑ ʃ	o	4	2.5
22	ŋ-	∞	ʃ	o↑↓ ʃ	6	3.8
23	y-	↑ ∞	↑ ʃ	o↑↓∞ʃ	9	5.6
TOTAL		44	32	84	160	
PERCENTAGE		27.5	16.1	52.5		

Entropy: $\dfrac{160}{345}$ = 46.4

Table 21. SYLLABLES HAVING /iə/ AS NUCLEUS

		-iə	-iək	-iəŋ	TOTAL	%
1	tw-		↑ ʃ	o↑↓∞	6	13.6
2	dw-					
3	ʈw-			↓ ʃ	2	4.5
4	cw-			o↑↓∞ʃ	5	11.4
5	kw-		↑ ʃ	o↑↓∞ʃ	7	15.9
6	sw-		↑	o↑	3	6.8
7	ṣw-			∞	1	9.1
8	xw-	o	↑	o↑ ∞	5	11.4
9	tʰw-		↑	o ↓	3	6.8
10	lw-			↑ ʃ	2	4.5
11	gw-					
12	ɲw-			∞	1	2.3
13	ŋw-		ʃ	o ↓∞ʃ	5	11.4
14	yw-		ʃ	o↑ ʃ	4	9.1
TOTAL		1	9	34	44	
PERCENTAGE		2.3	20.5	77.3		

Entropy: $\dfrac{44}{210}$ = 20.9.

Table 21a. SYLLABLES HAVING /iə/ AS NUCLEUS
AND INITIAL CLUSTERS

		-uʼə	-uʼək	-uʼən	TOTAL	%
1	uʼə-	o↑ ∫	↑	o ↓∞	7	4.3
2	b-	o↑↓∞∫	↑	o↑↓	9	5.5
3	t-	o ∫	↑ ∫	o↑↓∞∫	9	5.5
4	tʰ-	o↑↓∞	↑ ∫	o ↓∞∫	10	6.1
5	ṭ-	o	↑ ∫	o↑↓∞∫	8	4.9
6	d-	∩↑	↑ ∫	o ↓	6	3.7
7	c-	o↑ ∞	↑	o↑ ∞	7	4.3
8	k-	o↑ ∫	↑	o ↓∞	7	4.3
9	f-		↑	o↑↓ ∫	5	3.0
10	v-	↓∞∫	∫	o↑↓ ∫	8	4.9
11	s-	o	↑ ∫	o↑↓∞	7	4.3
12	ṣ-	o↑ ∞	↑ ∫	o↑↓ ∫	9	5.5
13	x-	↑	↑	o	3	1.8
14	ɡ̇-			o ∫	2	1.2
15	h-	↑	↑	o↑↓∞	6	3.7
16	w-					
17	r-	↑ ∞∫	↑ ∫	o↑↓ ∫	9	5.5
18	l-	o↑↓∞∫	↑ ∫	o ↓∞∫	11	6.7
19	m-	o↑ ∞	↑ ∫	o↑↓ ∫	9	5.5
20	n-	o↑ ∞	↑	o↑↓	7	4.3
21	ɲ-		↑ ∫	o↑↓ ∫	6	3.7
22	ŋ-	↑↓∞∫	↑ ∫	∞∫	8	4.9
23	y-	o↑ ↓∞∫	∫	o ↓∞∫	10	6.1
TOTAL		55	32	76	163	
PERCENTAGE		33.7	19.6	46.6		

Entropy: $\frac{163}{345}$ = 47.2

Table 22. SYLLABLES HAVING /uʼə/ AS NUCLEUS

		-uə	-uək	-uən	TOTAL	%
1	uə-	↑ ∞∫		↑ ∞	5	5
2	b-	↑↓∞	↑ ∫	o ↓	7	7
3	t-	o ∞	↑ ∫	o ↓	6	6
4	tʰ-	o ↓∞	↑ ∫	o ∞	7	7
5	ṭ-			o↑↓	3	3
6	d-	o ↓∞	↑	o	5	5
7	c-	o↑↓	↑ ∫	o ↓ ∫	8	8
8	k-	o ∫	↑ ∫	o↑↓ ∫	8	8
9	f-					
10	v-	o ↓	↑ ∫	o	5	5
11	s-	o		↑↓∞	4	4
12	ṣ-	∞	↑	o ↓	4	4
13	x-	o		o	2	2
14	g-		↑		1	1
15	h-			o↑	2	2
16	w-					
17	r-	o ↓∞	↑ ∫	↓ ∫	7	7
18	l-	o↑↓ ∫	↑ ∫	o↑↓	9	9
19	m-	o↑↓		o↑↓∞∫	8	8
20	n-	o	↑ ∫	o	4	4
21	ɲ-		↑		1	1
22	ŋ-			↓	1	1
23	y-	o ↓		↓	3	3
TOTAL		37	22	41	100	
PERCENTAGE		37	22	41		

Entropy: $\frac{100}{345}$ = 29.0

Table 23. SYLLABLES HAVING /uə/ AS NUCLEUS

		-ăwk	-ăwŋ	TOTAL	%
1	ăw-	↑ ʃ	o↑↓∞ʃ	7	5.0
2	b-	↑ ʃ	o↑↓∞ʃ	7	5.0
3	t-	↑ ʃ	o↑↓∞ʃ	7	5.0
4	tʰ-	↑ ʃ	o↑↓∞	6	4.3
5	ṭ-	↑ ʃ	o↑↓∞ʃ	7	5.0
6	d-	↑ ʃ	o↑↓∞ʃ	7	5.0
7	c-	↑ ʃ	o↑↓∞	6	4.3
8	k-	↑ ʃ	o↑↓∞ʃ	7	5.0
9	f-	↑	o↑↓∞ʃ	6	4.3
10	v-	↑ ʃ	o ↓∞ʃ	6	4.3
11	s-	↑ ʃ	o ∞	4	2.8
12	ṣ-	↑ ʃ	o↑↓∞	6	4.3
13	x-	↑	o↑ ∞	4	2.8
14	g-	↑ ʃ	↓ ʃ	4	2.8
15	h-	↑ ʃ	o↑↓∞ʃ	7	5.0
16	w-		↓	1	0.7
17	r-	↑ ʃ	o↑↓∞ʃ	7	5.0
18	l-	↑ ʃ	o↑↓∞ʃ	7	5.0
19	m-	↑ ʃ	o↑↓∞ʃ	7	5.0
20	n-	↑ ʃ	o↑↓∞ʃ	7	5.0
21	ɲ-	↑ ʃ	o↑↓∞ʃ	7	5.0
22	ŋ-	↑ ʃ	o↑↓∞ʃ	7	5.0
23	y-	↑ ʃ	o↑↓∞ʃ	7	5.0
TOTAL		42	99	141	
PERCENTAGE		29.8	70.2		

Entropy: $\dfrac{141}{230}$ = 61.3

Table 24. SYLLABLES HAVING /ăw/ AS NUCLEUS