A PHONOLOGY OF BUWAL

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Abbreviations

1pSBJ(excl)	First person plural exclusive subject marker
1sOBJ	First person singular direct or indirect object marker
1sPOSS	First person singular possessive pronoun
1sSBJ	First person singular subject marker
1pOBJ(dual)	First person dual direct or indirent object marker
1pSBJ(excl)	First person plural exclusive subject marker
1pSBJ(incl)	First person plural inclusive subjet marker
2sSBJ	Second person singular subject marker
3pSBJ	Third person plural subject marker
3pOBJ(ind)	Third person plural indirect object marker
3sOBJ(dir)	Third person singular direct object marker
3sOBJ(ind)	Third person singular indirect object marker
3sSBJ	Third person singular subject marker
BEN	Self-benefactive marker
C	Consonant
CENT	Centric marker
DEF	Definite article
DEM	Demonstrative
INF	Infinitive marker
EXO	Exocentric marker
K^w	Labialised velar plosive
LOC	Locative
N	Nasal
NEG	Negation
NOM	Nominalisation
OPT	Optative marker
PERF	Perfective aspect marker
PL	Plural marker
PRED	Predicator
IMP	Imperfective aspect marker
REL	Relative pronoun
TOP	Topic marker
TRANS	Transitive marker
V	Vowel

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1 Introduction

1.1 Language Background

Buwal is a Chadic language spoken in the Far North region of Cameroon. It is mainly spoken in and around the village of Gadala in the canton of Matakam Sud, Mokolo subdivision, division of Mayo-Tsanaga. Brye (2000: 2) estimates the population as around 7000. In the *Ethnologue* (Gordon 2005: 59), Buwal is classified as Afro-Asiatic, Chadic, Biu-Mandara A, A.7. Dieu and Renaud (1983: 357) in their *Altas Linguistique de l'Afrique Centrale-Le Cameroun* give the following: Tchadique, Centre-Ouest, Daba, Nord. The most closely related languages to Buwal are Gavar, Mbedam, Mina and Daba. In fact there has been some discussion over whether Buwal and Gavar (with a slighty larger population) are distinct languages. Dieu and Barreteau (2000: 65) state that Buwal and Gavar are 82% lexicostatistically 'similar'. Rapid Appraisal surveys were done of both languages by L. Seguin of SIL Cameroon (Seguin 1992). Out of this came a recomendation that intelligibility testing be carried out between the two languages. Such a study was carried out in 2000 (Brye 2000). It was discovered that there was 90% lexicostatistical similarity of a wordlist of 126 words. It was also found that each group could understand about 80-82% of the others' speech (Brye 2000: 8). However much of this intercomprehension could be due to a high frequency of contact between the two groups, and although speakers may understand one another they cannot neccessarily speak the other language. It should also be noted that intelligibility testing was only carried out in one locality in each language area rather than three at different distances from the language border as originally recommended by Seguin (1992: 6). The people themselves consider the two languages as distinct and a study of Gavar phonology (Noukeu 2004) indicates some significant differences in the phonological system of Gavar compared with Buwal. More study will need to be done before a conclusion can be reached as to the status of these two languages.

1.2 Sources of Information

The data for this study was collected between June 2004 to Oct 2005 and Oct 2006 to Jan 2009 by Michael and Melanie Viljoen of SIL Cameroon. The author wishes to express her thanks to DELI, Benjamin and KOYANG, Ernest of Gadala Centre, KONAI Pascal of Hodango, and MBOUVAI, François originally of Magawai for their help in the collection of this data.

2 Segmental Phonology

2.1 Basic Underlying Consonants

Table 1: Buwal Consonant Phonemes

	Labial	Alveolar	Laminal	Palatal	Velar	Labialised Velar	Labial-Velar
Plosive-voiceless	p	t	ts		k	k^w	kp
Plosive-voiced	b	d	dz		g	g^w	gb
Plosive – voiced, prenasalised	^{m}b	^{n}d	^{n}dz		^{ŋ}g	^{ŋ}g^w	^{ŋm}gb
Implosive	ɓ	ɗ					
Fricative – voiceless	f	ɬ	s		x	x^w	
Fricative – voiced	v	ɮ	z		ɣ	$ɣ^w$	
Nasal	m	n			ŋ	$ŋ^w$	
Lateral		l					
Trill		r					
Glides				j		w	

As can be seen from the above table Buwal has 38 consonant phonemes. This inventory is very similar to those found for other central Chadic languages (Roberts 2001: 95). There are five main ‘points’ of articulation, labial, alveolar, laminal, palatal and velar. I have followed Roberts (2001: 95) in grouping the alveolar affricates and fricatives together under ‘laminal’. Each of these consonants has a sibilant element, which causes them to behave in a similar way under the influence of palatalisation. Of note is the series of labialised velar consonants. Although these can sometimes be analysed as allophones of the velars (Roberts 2001: 96) this is not the case for Buwal (see section 2.1.7 Labialised Velar Consonants). Other unusual consonants, which are quite common in central Chadic languages, are the implosives, the lateral and velar fricatives, and the labial-velar plosives.

2.1.1 Plosives

Buwal has a symmetrical set of voiced and voiceless plosives at the labial, alveolar, laminal and velar points of articulation. Laminal plosives will be discussed with the other laminal consonants in section 2.1.4 Laminals.

The glottal plosive [ʔ] whilst at times heard phonetically should not be analysed as a phoneme. It is occasionally heard word finally after an [ɛ]. Smith (1999: 12) noticed a similar phenomenon in Muyang. He states that one possible explanation is that a glottal segment has vanished. This may also be the case in Buwal as in the example below where both pronunciations are acceptable.

0802. [kʷùʃɛ̄ʔ] ~ [kʷùʃɛ̄tˀ] ‘fishing net’

Note that implosives are pronounced as unreleased plosives word finally so that underlyingly the above word ends in the phoneme /ɗ/.

Another example which may indicate the disappearance of an implosive is:

1346. [méʃfɛ́] ~ [méʃfɛ́ʔ] ‘cold weather’

The same word in Mofu-Gudur ends with /ɗ/. (Barreteau 1988, Vol II: 184)

Roberts (2001: 96) states that the glottal plosive if analysed as a phoneme has been found to be marginal in most Central Chadic languages.

Voiced and voiceless plosives /b/, /p/, /d/, /t/, /g/ and /k/ occur in word-initial, syllable-initial and intervocalic positions. See section 4 Phonotactics and Appendix A: Phonotactics Tables for the phonotactics of the different consonants.

Examples of contrast of voiced and voiceless plosives:

0507.	[bàtˀ]	‘deceive’	0648.	[pātˀ]	‘wrap up’
0031.	[mābás]	‘shoulder’	1378.	[māpát]	‘morning’
1407.	[dàm]	‘enter’	0632.	[tàm]	‘pour’
1500.	[dàdàn]	‘singe’	1718.	[xətàn]	‘fog’
0781.	[gàdātˀ]	‘arrow’	1696.	[kádāk]	‘well (adv)’
1768.	[hágām]	‘yawn (n)’	2001.	[pákàm]	‘mouth (inside)’

An interesting characteristic of plosives is that only voiceless plosives occur word-finally which is standard for Central Chadic languages. There is a contrast between voiceless plosives and implosives word finally in that the voiceless plosives are audibly released, even slightly aspirated in slow speech as Smith (1999: 8) found for Muyang.

Examples of word final plosives:

0733.	[ɗāwāp]	‘rag’	0479.	[ɬàp]	‘tell, recount’
1378.	[māpát]	‘morning’	0757.	[pɛ̀t]	‘harvest’
0974.	[gāmták]	‘chicken’	0099.	[ɗɛ̄lɛ̄k]	‘bile, gall’

The above plosives also occur phonetically in word-initial and word-medial consonant clusters but never word-final. In word-initial position, all the plosives occur in clusters followed by the liquid /r/. The labial plosives /b/ and /p/ also occur in clusters followed by /l/. A [ə] may be optionally inserted between the two consonants to aid pronunciation. In this section only *phonetic consonant clusters* will be addressed.

Examples of plosives in consonant clusters with liquids:

1980.	[prētˀ]	‘split’	0964.	[bré]	‘herd’
1423.	[pʾɾàɬ]	‘snatch’	0207.	[bʾɾàz]	‘hurt oneself’
2335.	[ŋ̀trām]	‘spur’	0879.	[dràf]	‘song’
1318.	[ŋ̀tʾɾā]	‘moon’	1277.	[drèʃ]	‘clay’
1855.	[ŋ̀kràŋ]	‘delay’	0131.	[grē] ~ [gʾɾē]	‘see’
1344.	[ŋ̀kʾɾàm]	‘dry season’			
1817.	[plēm]	‘twist out’	1823.	[blèk]	‘spread over’

In word-initial position, plosives can also be found in consonant clusters preceded by a nasal. These nasals are phonetically longer than those in prenasalised plosives and will be analysed as syllabic (see section 2.1.5 Nasals).

Examples of plosives in consonant clusters with nasals:

0640.	[m̀pāk]	‘close (v)’
0183.	[ŋ̀təɓàl]	‘(be) tired’
1344.	[ŋ̀kʾɾàm]	‘dry season’

The voiceless velar and labial plosives /k/ and /p/ can also occur in a word-initial consonant cluster preceded by the laminal fricative /s/. As for clusters containing liquids, a [ə] may be optionally inserted between the consonants.

Examples of plosives in consonant clusters with /s/:

1457.	[ʃkēn]	‘crush, grind’	1165.	[ʃʾkɛ́] ~ [ʃkɛ́]	‘fig tree’
0820.	[skām]	‘buy’	1357.	[ʃʾpɛ́k] ~ [ʃpɛ́k]	‘late’

Note that for two words containing /sk/, /s/ may be elided as in the examples 1385 and 1647 below. As /s/ can be elided this would indicate that a bisegmental analysis is appropriate in this case. It is possible that /sk/ represents the older form cf. Hdi [skwi] ‘thing’ (Langermann 1994: 63).

Examples of free variation of /k/ and /sk/:

1385. [skàn] ~ [kàn] ‘thing’

1647. [àkʷō] ~ [àskʷō] ‘nothing’[1]

In word-medial position, plosives may occur in a wider variety of consonant clusters than described above.

Examples of word medial consonant clusters containing plosives:

2595.	[hʷōptsá]	‘broken in piles’	1315.	[máhʷāwbókʷ]	‘cloud’
0089.	[mɛ̄ftɛ́ʃ]	‘muscle’	0551.	[gàvdā]	‘bracelet’
2004.	[médʒìknɛ́]	‘butterfly’	1331.	[bārgādāŋ]	‘harmattan’

2.1.2 Implosives

Buwal has two implosives at the labial and the alveolar points of articulation. These have been found to occur in all other Central Chadic languages (Roberts 2001: 96).

Both the **labial and alveolar implosives, /ɓ/ and /ɗ/**, occur in word and syllable-initial, word and syllable-final and intervocalic position. In word-final position these implosives are realised phonetically as unreleased voiceless plosives.

Examples of implosives in different positions:

0269.	[ɓās]	‘laugh’	0621.	[dɛ̄ŋ]	‘bowel’
0737.	[jāp˥]	‘wash’	0507.	[bàt˥]	‘deceive’
0197.	[ɓáɓā]	‘deaf/mute’	0260.	[gádāŋ]	‘(be) stupid’
0909.	[zàɓlā]	‘ghost’	1109.	[mèvɛ̄ɗvɛ̄dɛ́ŋ]	‘turtle’

The implosives also occur in mostly word-medial phonetic consonant clusters. They may be preceded by sonorants such as nasals or liquids and there is also an example of the labial implosive /ɓ/ being followed by /l/.

Examples of implosives in consonant clusters:

1167.	[m̀ɓā]	‘tamarind tree’			
1912.	[kárɓā]	‘while’	0075.	[sārɗá]	‘bone marrow’
2075.	[wɛ̄lɓɛ̄]	‘nature spirit’	0909.	[zàɓlā]	‘ghost’
1561.	[ɣàzɓàŋ]	‘(be) yellow’			

[1] It may be that example 1647 is a contraction of [akaskʷo] lit. ‘there is not’ which may also at times be heard. The Buwal have contracted this to [akʷo] or [askʷo] whilst the Gavar use [akas].

The alveolar implosive also occurs in clusters with other obstruents but in these cases either the word contains inherent reduplication or it could be analysed as a compound word.

0894. [māk^{w}œɗk^{w}œɗɛ́] ‘rattle (n)’ 1323. [dàɗg^{w}àts] ‘Pleiades’

Note the following example containing a lengthened alveolar implosive:

1969. [zàɗːá] ‘a bit further’

This is actually a complex word consisting of [zát¬] ‘a bit far’ (2334) plus the directional suffix /-ɑ/. The same phenomenom can be observed when the directional suffix is attached to the verb [$k^{ə}$ɾāt¬] ‘approach’ (1401). The result is the adverb [kràɗːá] ‘a bit closer’ (2376).

Adverbs often have lengthened final consonants followed by a vowel in other languages. However, for Buwal this seems to be a phonetic phenomenon which only occurs with words ending in the alveolar implosive /ɗ/.

2.1.3 Fricatives

Buwal has a neat symmetrical set of voiceless and voiced fricatives at the labial, alveolar, laminal and velar points of articulation. The laminal fricatives will be treated in section 2.1.4 Laminals.

Both the **voiceless and voiced labial fricatives /f/ and /v/** occur in word and syllable initial, word and syllable-final and intervocalic position.

Examples of labial fricatives in different positions:

0797.	[fāt]	‘slaughter’	0809.	[vàl]	‘give’
0111.	[ǹtɛ̀f]	‘spit’	1409.	[tɛ̀v]	‘climb, go up’
1188.	[fàfàn]	‘flower’	0979.	[zāvān]	‘guineafowl’
0089.	[mɛ̄ftɛ́ʃ]	‘muscle’	0551.	[gàvdā]	‘bracelet’

The labial fricatives /f/ and /v/ can be found in phonetic consonant clusters preceded by a nasal, preceded or followed by liquids, followed by plosives and in the case of the voiceless labial fricative /f/ it may be preceded by the voiceless laminal fricative /s/. A [ə] may be optionally inserted between /s/ and /f/.

Examples of labial fricatives in consonant clusters:

0577.	[ŋfá]	‘flour’	0102.	[ŋvá]	‘excrement’
1128.	[màflāflā]	‘tarantula’	0763.	[bālvār]	‘winnow’
1884.	[fràt˥]	‘dislocate’	1639.	[vrām]	‘many’
0089.	[mɛ̄ftɛ́ʃ]	‘muscle’	0551.	[gàvdā]	‘bracelet’
0092.	[sfân] ~ [sʰfân]	‘breath’	1346.	[méʃfɛ́]	‘cold weather’

The fricatives listed in the alveolar column of Table 1: Buwal Consonant Phonemes are actually the **voiceless and voiced lateral fricatives /ɬ/ and /ɮ/**. The alveolar fricatives /s/ and /z/ will be covered under laminal consonants in section 2.1.4 Laminals. Each of the lateral fricatives occurs in word and syllable-initial, word-final and intervocalic position.

Examples of lateral fricatives in different positions:

0494.	[ɬā]	‘prepare’	0719.	[ɮà]	‘saw, cut’
1994.	[ɬɛ̄ŋ]	‘dance while jumping’	0062.	[ɮɛ́ɾɛ̄k]	‘fingernail’
0734.	[m̀ɬàt˥]	‘broom’	0656.	[xàrɮàk]	‘tie knot’
1914.	[ɓàɬ]	‘forge’	1783.	[ɗámɓāɮ]	‘pumpkin’
0069.	[tʃəhèɬ]	‘ankle’	2038.	[prèɮ]	‘cut in pieces’
1115.	[ɬāɬəɾāj]	‘slip’	1293.	[ɮàɮár]	‘river’
2247.	[ɬɛ́ɬɛ̄dɑ́kʷ]	‘skin of millet stalk’	1819.	[ɣèɮɛ̄ɥ]	‘(be) underdeveloped’

Lateral fricatives are found in phonetic consonant clusters preceded by other continuants such as the nasal /m/ and the alveolar trill /r/, and there is one example with the voiceless velar fricative /x/. A [ə] may be optionally inserted between the /r/ and the following consonant.

Examples of lateral fricatives in consonant clusters:

0734.	[m̀ɬàt˥]	‘broom’	0399.	[m̀ɮā]	‘blacksmith’
1097.	[ŋ̀kʷórɬá]	‘puff adder’	1279.	[ɓàrɮām]	‘iron’
1525.	[táxɬádə̄j]	‘(be) flat’			

The **voiceless and voiced velar fricatives /x/ and /ɣ/**, are similar in their phonological behaviour to the labial fricatives. An interesting feature of /x/ however, is that it has an allophone, the **glottal fricative [h]**. They appear to occur in free variation in word-initial position (see examples 0272 and 0266). Intervocalic and following a consonant the allophone [h] is more frequent (examples 1711 and 1636). However, only [x] occurs in word-final position and before a consonant (examples 0130 and 1592).

Examples of the position of allophones [x] and [h]:

0272.	[xā̃n] ~ [hā̃n]	‘cry, weep’	0266.	[hèʃèŋ] ~ [xèʃèŋ]	‘forget’
1711.	[zə̀hā̃j]	‘good fortune’	1636.	[párhám]	‘(be) lacking’
0130.	[fə̀dā̃x]	‘wake up’	1592.	[màxkáɗ]	‘three’

Assuming therefore that [x] and [h] are allophones it can be seen that both /x/ and /ɣ/ occur word and syllable-initial, intervocalic and word-final (although there is only one example in the data of /ɣ/ word-final). /x/ occurs syllable-final in the word-medial position, whilst /ɣ/ does not. It is possible that the distinction is neutralised in this position or as /ɣ/ is infrequent, the data is insufficient.

Examples of /x/ and /ɣ/ in different positions:

0272.	[xā̃n]	‘cry, weep’	0866.	[ɣə̀m]	‘war’
1472.	[ɓàx]	‘hide’	2022.	[kʷàɣ]	‘have diarrhea’
0115.	[wɛ́rtʃə̄hèɥ]	‘sneeze’	1020.	[ⁿdʒɛ́ⁿdʒèɣéɥ]	‘fruit bat’
1592.	[màxkáɗ]	‘three’			

The voiceless velar fricative /x/ occurs in phonetic consonant clusters preceded by a nasal and followed by both continuants and obstruents. The only examples of the voiced velar fricative /ɣ/ in a consonant cluster in the data are those where it is followed by the alveolar trill /r/. This may be due to the fact that the phoneme /ɣ/ does not occur frequently in the data. Again a [ə] may be optionally inserted between the consonant and the alveolar trill /r/.

Examples of velar fricatives in consonant clusters:

0388.	[ŋ̀xɛ̄l]	thief	1525.	[táxɬáɗā̃j]	‘(be) flat’
1592.	[màxkáɗ]	‘three’	0180.	[xᵊ̃rātᵑ]	‘(be) sated’
1450.	[ɣᵊrə̀ɗ]	‘scrape(v)’			

2.1.4 Laminals

The **voiceless and voiced laminal fricatives /s/ and /z/** both occur in word and syllable-initial, word and syllable-final and intervocalic position and in consonant clusters. They have as allophones the **postalveolar fricatives [ʃ] and [ʒ]** which occur in palatalised morphemes. The palatalisation prosody will be discussed further in section 2.2.1 Vowel Harmony and the Palatalisation Prosody.

Examples of alveolar fricatives in different positions:

0255.	[sàn]	‘know’	0140.	[zàm]	‘eat’
1350.	[ʃēŋʃēŋ]	‘shadow’	1098.	[ʒèŋʒèŋ]	‘python’
0896.	[mbàz]	‘blow (instrument)’	0954.	[m̀pàs]	‘bury’
0138.	[gēʃ]	‘touch’	1283.	[gēʒ]	‘rust (n)’
0001.	[kʷùsàm]	‘body’	1105.	[hʷùzām]	‘crocodile’
0436.	[ʃēʃœ̄kʷ]	‘whisper’	1095.	[ʒéʒœ̄kʷ]	‘snake’

The **voiceless and voiced laminal fricatives /s/ and /z/** occur in phonetic consonant clusters preceded by a nasal and either preceded or followed by the alveolar trill /r/, in which case a [ə] may be optionally inserted. As mentioned in section 2.1.1 Plosives, the voiceless laminal fricative /s/ may be followed by a plosive such as the labial or velar voiceless plosives /p/ and /k/. It may also be followed by the voiceless labial fricative /f/ as mentioned in section 2.1.3 Fricatives. There are also examples of /s/ and /z/ preceded by /p/ and /b/ respectively where the schwa is so brief that they could possibly be considered consonant clusters (examples 2191 and 1674). The voiced laminal fricative /z/ may also be preceded or followed by other consonants word medially.

Examples of laminal fricatives in consonant clusters:

0604.	[m̀sàw]	‘roast’	0571.	[m̀zā]	‘fat’
0340.	[m̀sᵊrā]	‘old person’	0151.	[gʷɔ̀rᵊzām]	‘get up’
1357.	[ʃəpɛ́k] ~ [ʃpɛ́k]	‘late’	0820.	[skām]	‘buy’
0092.	[sfân] ~ [sᵊfân]	‘breath’	1346.	[méʃfɛ́]	‘cold weather’
2191.	[pᵊsàr]	‘lift off’	1674.	[ábᵊzā]	‘outside’
1854.	[dûxʷzòkʷ]	‘bark for brides’	1561.	[ɣàzɓàŋ]	‘(be) yellow’

Buwal has both **voiceless and voiceless laminal affricates /ts/ and /dz/**. These undergo palatalisation under the palatalisation prosody to become the postalveolar affricates [tʃ] and [dʒ] respectively. In this way they behave phonologically similarly to the laminal fricatives. They both occur in word and syllable-initial and intervocalic position, and in consonant clusters.

Examples of laminal affricates in various positions:

1469.	[tsā]	‘put, place, set’	1446.	[dzà]	‘hit, strike’
0344.	[tʃèn]	‘father’	1511.	[dʒèm]	‘(be) high’
0132.	[tsàtsàn]	‘notice’	2269.	[dzàdzàr]	‘filter drop by drop’
0259.	[kʷótʃér]	‘(be) intelligent’	1177.	[védʒēɗ]	‘leaf’

The laminal affricates behave in a similar way to plosives in that only the voiceless laminal affricate occurs syllable finally. For this reason they have been labelled as ‘plosives’ in Table 1: Buwal Consonant Phonemes.

0249.	[màts]	‘die’	0417.	[ɓɛ̀tʃ]	‘assemble’
2079.	[mátsk^{w}ōx^{w}]	‘evening’			

The voiceless laminal affricate /ts/ occurs in phonetic consonant clusters preceded by a nasal and in one case (example 2079) followed by a plosive. Whilst there are some examples of the voiced laminal plosive /dz/ preceded by a nasal, these are (always) interpreted as a prenasalised plosive (see section 2.1.6). Both voiced and voiceless laminal affricates also occur followed by the alveolar trill /r/. A [ə] may be optionally inserted in these cases.

Examples of laminal plosives in consonant clusters:

0011.	[m̀tsā̀r]	‘nose’	0143.	[ŋ̀tsə̀kà̀p$^{\neg}$]	‘chew’
2079.	[mátsk^{w}ōx^{w}]	‘evening’			
2105.	[ts^{ə}ɾā̀t$^{\neg}$]	‘twist off’	1747.	[dzrà̀v]	‘jump up and down’

The laminal affricates /ts/ and /dz/ should be analysed as single segments. A [ə] is never inserted between the two sounds, neither do /s/ and /t/ or /d/ and /z/ occur together in consonant clusters in the reverse order. These affricates behave as a unit, as is evidenced by the fact that they behave phonologically like both plosives and other laminals. Furthermore, the voiceless laminal affricate also occurs word-final whilst there are no other instances of a complex word-final coda found in the language.

2.1.5 Nasals

Buwal has a symmetrical set of nasal phonemes at the **labial /m/, alveolar /n/ and velar /ŋ/** points of articulation. There is also a **labialised velar nasal /ŋ^{w}/**, which will be discussed under section 2.1.7 Labialised Velar Consonants with the the other labialised velar consonants.

The labial and alveolar nasals occur in word and syllable-initial position before a vowel whereas the velar nasal normally does not. However, all three nasals contrast in word-final position following a vowel and before certain word-medial consonants. Therefore the velar nasal needs to be recognised as a phoneme, albeit a marginal one.

Examples of nasal consonants in different positions:

0015.	[mā]	‘mouth’			0609.	[nā]		‘ferment’	
0572.	[mèl]	‘oil’			1066.	[nɛ̄ɬɛ̄]		‘egg’	
0005.	[tāmā]	‘face’			0233.	[vənā]		‘vomit (v)’	
1024.	[mɛ̄mɛ̄ŋ]	‘leopard’			0716.	[dʒènɛ̀]		‘axe’	
0013.	[ɮàm]	‘ear’	0703.	[ɮàn]	‘work’	0850.	[ɮāŋ]	‘cross (v)’	
0808.	[lèm]	‘get, obtain’	0810.	[ʒèn]	‘return’	1443.	[ʒɛ̄ŋ]	‘hang up’	

The above distribution rules for nasals apply to the morpheme only, as when suffixes are added to verb roots ending in nasals, no variation occurs.

0561.	[bān]	‘wash’	[sà bɛ̄nɛ̄nɛ́]	‘I wash for him.’
			[sà bānā́]	‘I wash there.’
0764.	[mbɛ̄ŋ]	‘winnow’	[sā mbɛ̄ŋɛ̄nɛ́]	‘I winnow for him.’
			[sā mbɛ̄ŋá]	‘I winnow there.’

These examples show that /ŋ/ is not restricted to the syllable-final position.

All three nasals occur in word-initial and word-medial consonant clusters. However, not all three nasals need to be regarded as contrastive in the word-initial position. This will be discussed further below. Restrictions on the types of consonants that they may occur with are discussed below. A [ə] is never inserted between a nasal and a following consonant.

Examples of nasals in consonant clusters:

0734.	[m̀ɬàtˀ]	‘broom’	1965.	[ᵐbílmètˀ]	‘flying termite’
0111.	[ǹtèf]	‘spit’	1556.	[dàkᵊnàk]	‘(be) black’
0354.	[ŋ̀ʃɛ̄ŋ]	‘descendant’	1778.	[káŋkās]	‘beans’

There are certain restrictions on the type of consonants with which nasals can occur in the word initial position. The labial nasal is found to occur before labial, alveolar and laminal consonants but never velar (examples 0954 to 0571). The velar nasal occurs before labial, alveolar, laminal and velar consonants (examples 0102 to 0388). Interestingly it is never found before the laminal fricatives /s/ and /z/. Only /m/ is found in this position (examples 0604 and 0571). The alveolar nasal occurs rarely in word-initial position and only before alveolar consonants (examples 0303 and 0116). In these cases it usually is in free variation with the velar nasal (examples 0725 and 0141). This leads to the conclusion that the contrast between /n/ and /ŋ/ is neutralised in the word-initial position. The labial nasal, on the other hand, is seen to contrast with /n/ before the voiceless laminal affricate. It also contrasts with /ŋ/ before the voiceless laminal affricate and fricative (examples 0953 to 0354).

Examples:

0954.	[m̀pàs]	‘bury’	0399.	[m̀ɮā]	‘blacksmith’
0604.	[m̀sàw]	‘roast’	0571.	[m̀zā]	‘fat’
0102.	[ŋ̀vá]	‘excrement’	1428.	[ŋ̀tèŋ]	‘lower’
1436.	[ŋ̀tsòkʷ]	‘push’	0388.	[ŋ̀xɛ̄l]	‘thief’
0373.	[ǹtòxʷ]	‘orphan’	0116.	[ǹtʃēx]	‘groan’
0725.	[ŋ̀tàv] ~ [ǹtàv]	‘sew’	0141.	[ŋ̀tsà] ~ [ǹtsà]	‘bite’
0953.	[m̀tʃè]	‘corpse’	0116.	[ǹtʃēx]	‘groan’
0048.	[m̀tsā]	‘vagina’	1114.	[ŋ̀tsā]	‘bite’
2194.	[m̄ʃétˀ]	‘nastiness’	0354.	[ŋ̀ʃēŋ]	‘descendent’

As was seen above there is a tendency for /n/ to become [ŋ] in word-initial position when pronounced in isolation. Therefore the contrast between these two phonemes in neutralised in this position. Evidence for this is shown in the following example in which [ŋ] → [n] in a non-pausal situation.

0183. [ŋ̀tə̀ɓàl]	‘(be) tired’
[mbé ntə̀ɓàl]	‘He is tired’
3s (be) tired	

In word-medial position, the restrictions on consonants following nasals differ in some respects from those applying to word-initial position. As for the word-initial position, word-medial /m/ may be followed by labial, alveolar, laminal but never velar consonants (examples 1783 to 0975). The alveolar nasal occurs before a greater range of consonant types in the word-medial position than the word-initial position. It may be followed by alveolar and laminal consonants (examples 1160 to 2112) and the palatal glide (example 2268). The velar nasal, on the other hand is more restricted in terms of consonants which may follow it in word-medial position. It only occurs before velar consonants or the laminal fricative (example 1160 and 1310). When the velar nasal is followed by a labialised velar consonant it becomes rounded (examples 1137 and 1225).

Examples:

1783.	[ɗámɓàɮ]	‘pumpkin’	1043.	[kām̀pāx]	‘dove’
1322.	[gàmɮā]	‘star’	0975.	[gām̀zókʷ]	‘rooster’
1160.	[wāntā]	‘mahogany tree’	1263.	[tʃēntʃēl]	‘summit’
2112.	[kʷónzáŋ]	‘coil of metal’	2268.	[wánjā]	‘trad. song’

1778.	[káŋkās]	‘beans’	1310.	[tʃɛ̄ŋtʃélém]	‘firewood’
1137.	[gʷòŋʷkʷāt˥]	‘caterpillar’	1225.	[gʷōŋʷkʷójāx]	‘eggplant’

In the word-medial position, the labial and alveolar nasal contrast before the voiceless alveolar plosive (examples 0308 and 2127) and the voiced laminal fricative (0975 and 2112). All three nasals can be seen to contrast before the voiceless laminal affricate (examples 2274, 2497 and 1118). However, as this contrast is very limited in nature it may be due to historic compounding or reduplication.

Examples:

0308.	[mɛ̄ʃémtɛ̄]	‘(be) shy’	2127.	[màxántávāj]	‘type of plant’
0975.	[gāmzókʷ]	‘rooster’	2112.	[kʷónzáŋ]	‘coil of metal’
2274.	[ɣʷòmtsōkʷ]	‘type of grass’	2497.	[dàntsá]	‘sleep (white deposit)
1118.	[tsáŋtsāt˥]	‘flea’			

There remains the question of whether word-initial nasals are syllabic, or form part of a complex onset. Nasals preceding a consonant in word-initial position appear to be syllabic in that they carry tone and are distinctly pronounced. This tone is mostly predictable, in the vast majority of cases being low. It could also be that these nasals are the coda of an ‘empty’ syllable (Clements 2000: 145) meaning that their origin is a VN syllable where the V is in the process of being lost. Giving weight to the syllabic nasal analysis is the fact that in alternative pronunciations of the same word often a vowel can be heard preceding the nasal (see examples below). In the same way such clusters in word-medial position could be analysed as coda + onset.

Examples of alternate pronunciations of words beginning with nasals:

0011.	[m̀tsār] ~ [àmtsār]	‘nose’	0065.	[ŋ̀tāwāl] ~ [àŋtāwāl]	‘thigh’
0111.	[ǹtɛ̀f] ~ [àntɛ̀f]	‘spit (v)’	0160.	[ŋ̀tàt˥] ~ [àŋtàt˥]	‘swim’

In Buwal a schwa is never inserted between a nasal and a following consonant in either the word-initial or word-medial position, although in other Central Chadic languages it may be optional depending on the speed of the speech (Barreteau 1988: 324, Bow 1997: 8). Instead a vowel may be inserted *before* the nasal to aid pronunciation. Sometimes this vowel is pronounced [ə] and often as [ɑ] because a schwa does not usually occur word-initially in Buwal. The fact that this vowel is often pronounced [ɑ] rather than [ɛ] in palatalised words breaks palatalisation rules as for example 0111 below (see section 2.2.1 Vowel Harmony and the Palatalisation Prosody for a discussion of the palatalisation prosody). This is evidence that this vowel is not part of the underlying structure but inserted later in the derivation. It is true that in some Central Chadic languages word-initial vowels may not undergo palatalisation (Bow 1997: 33) but this is not the case for Buwal (example 1874).

0111. [ǹtɛ̀f] ~ [ànt ɛ̀f] ‘spit (v)’
1874. [ɛ́ŋgɛ̄] ‘over there’

The derivation of the alternate pronunciation would then be as follows:

	0011. /m̀tsār/	‘nose’
Rule 1: Insertion of ə before a word-initial nasal	əmtsār	
Rule 2: Vowel lowering of schwa in word-initial position	[àmtsār]	

2.1.6 Prenasalised Consonants

Buwal has a set of **prenasalised plosives at the labial /^{m}b/, alveolar /^{n}d/, laminal /^{n}dz/, velar /^{ŋ}g/ and labialised velar /^{ŋ}g^{w}/** points of articulation. They occur in word-initial and intervocalic positions and contrast with their unnasalised counterparts in these positions. As with the other laminal consonants (see section 2.1.4 Laminals) the laminal prenasalised plosive /^{n}dz/ has the allophone [^{n}dʒ] which occurs in an environment of palatalisation.

Examples of prenasalised plosives contrasting with plosives:

0767.	[^{m}bāt$^{¬}$]	‘domesticate’	0507.	[bàt$^{¬}$]	‘deceive’
0098.	[^{m}bá^{m}bāz]	‘blood’	2074.	[bàbàr]	‘roar’
0154.	[^{n}dā]	‘walk’	0591.	[dà]	‘prepare’
1798.	[^{n}dɛ̀^{n}dɛ̀lɛ̀k^{w}]	‘short and circular’	1420.	[dɛ́dɛ̄x^{w}]	‘(be) slow’
1727.	[^{n}dʒɛ̀n]	‘follow’	1511.	[dʒɛ̀m]	‘(be) high’
1223.	[vɛ̄^{n}dʒɛ̄x]	‘red pepper’	1177.	[vɛ́dʒɛ̄t$^{¬}$]	‘leaf’
0749.	[^{ŋ}gàp$^{¬}$]	‘transplant’	0601.	[gāp$^{¬}$]	‘knead’
1887.	[kā^{ŋ}gāŋ]	‘drum (med)’	1768.	[hágām]	‘yawn (n)’
0321.	[^{ŋ}g^{w}òv]	‘suffer’	1040.	[g^{w}òp$^{¬}$]	‘ruminate’
1489.	[tàtə^{ŋ}g^{w}òl]	‘float’	0227.	[fóg^{w}ólók^{w}]	‘leprosy’

The labial, laminal, alveolar, and velar prenasalised plosives all occur in phonetic consonant clusters followed by liquids. A schwa may be optionally inserted between the plosive and the following liquid. However, there are no examples in the data of the labial prenasalised plosive /^{m}b/ being followed by the alveolar trill /r/ or of the laminal prenasalised plosive /^{n}dz/ followed by the lateral /l/. Also no examples were found of the labialised prenasalised velar plosive /^{ŋ}g^{w}/ followed by liquids. Certain prenasalised plosives can also be preceded by the alveolar trill in which case once again a schwa may be optionally inserted.

Examples of prenasalised plosives in consonant clusters:

0220.	[ᵐbᵊlāx]	‘wound, sore’	0384.	[ᵐbᵊlōkʷ]	‘guest, visitor’
1233.	[ⁿdrèj]	‘millet’			
1135.	[gāᵑgᵊláŋ]	‘praying mantis’	0890.	[gɛ̄ᵑgréŋ]	‘harp’
1012.	[ⁿdzᵊɾám]	‘palm rat’			
1551.	[ɮàrᵐbàt˥]	‘(be) sticky’	1182.	[dùɾᵊᵑgʷōɮ]	‘stump’

Prenasalised plosives can be distinguished from other nasal + consonant clusters in that the nasal is shorter.

Examples contrasting prenasalised plosives with nasal + consonant clusters:

0759.	[ᵐbāl]	‘pick fruit’	1167.	[m̀ɓā]	‘tamarind tree’
0154.	[ⁿdā]	‘walk’	0111.	[ǹtɛ̀f]	‘spit’
0035.	[ᵑgálá]	‘side (of body)’	0655.	[ŋ̀kàn]	‘fasten, bind’
0321.	[ᵑgʷòv]	‘suffer’	0182.	[ŋ̀hʷāz]	‘(be) drunk’
0150.	[ⁿdzā]	‘sit, stay’	0116.	[ǹtʃɛ̄x]	‘groan’

Adding weight to this argument is that you don’t get [ɑ]-zero alternations before prenasalised plosives word-initially as it may be in the case of NC clusters as described in section 2.1.5 Nasals.

1456.	[ⁿdɛ̄ⁿdɛ̄t˥]	‘squeeze’	0111.	[ǹtɛ̀f] ~ [àntɛ̀f]	‘spit (v)’

The length of the nasal, however, is not the best criterion as it may depend on the environment. For example the nasal is more distinctly heard if it is preceded by a vowel within a phrase.

Another argument that prenasalised plosives are indeed distinct from other nasal clusters is that the nasal always assimilates to the place of articulation of the following plosive. For example at no time is the velar nasal heard before alveolar, laminal or labial voiced plosives word-initially as it is for NC clusters containing voiceless plosives (see section 2.1.5 Nasals). On the other hand, this could be evidence of conditioning.

Examples contrasting prenasalised plosives with nasal + voiceless plosive clusters:

0154.	[ⁿdā]	‘walk’	1422.	[ŋ̀tā]	‘take’
0819.	[ᵐbāt˥]	‘exchange’	0102.	[ŋ̀vá] ~ [àŋvá] ~ [àmvá]	‘excrement’
0150.	[ⁿdzā]	‘sit, stay’	1114.	[ŋ̀tsā]	‘bite’

Prenasalised sequences are part of the standard inventory of Central Chadic A languages but nasal+plosive clusters are not so common, although they are found in the closely related language Mina (Frajzyngier and Johnston, 2005: 15).

Further evidence for these prenasalised plosives behaving as a unit is given by the fact that prenasalised plosives occur in inherently reduplicated forms.

Examples showing prenasalised plosives in inherently reduplicated forms:

0098.	[ᵐbáᵐbāz]	‘blood’	1020.	[ⁿdʒéⁿdʒèɣéɥ]	‘fruit bat’
1175.	[ᵑgéᵑgɛ̄]	‘reed’	0881.	[ᵑgʷòᵑgʷɔ̀r]	‘hum’

2.1.7 Labialised Velar Consonants

An interesting aspect of Buwal phonology is the existence of **labialised velar consonants.** These include the labialised velar plosives and fricatives **/kʷ/**, **/gʷ/, /xʷ/, /ɣʷ/**, the prenasalised labialised voiced velar plosive /**ŋgʷ/** and the **labialised velar nasal /ŋʷ/**. These consonants, apart from the labialised velar nasal /ŋʷ/, can be found to occur in word and syllable-initial and intervocalic position (see examples 2022 to 1486 below). The voiceless labialised velar plosive /kʷ/ occurs in syllable final position (word-medial) and in word-final position (see examples 1130 and 0175) but its voiced counterpart is not found in word-final position as for the ordinary plosives (see section 2.2.1 Vowel Harmony and the Palatalisation Prosody). As for the voiceless velar fricative /x/, the labialised voiceless velar fricative /xʷ/ has as an allophone the labialised glottal fricative /hʷ/ which occurs in the same positions as its non-labialised counterpart (see section 2.1.3 Fricatives). The labialised voiced velar fricative /ɣʷ/ does not occur in syllable-final, or word-final position. Again, this may be because it is infrequent in the data. The labialised velar nasal /ŋʷ/, like its unnasalised counterpart /ŋ/, is only contrastive word-final. It occurs elsewhere only when followed by a labialised velar consonant (see examples 1252. to 1756. below and section 2.1.5 Nasals for a discussion of nasals). Even word initially [ŋʷ] may be in free variation with [ŋ] (example 1252.). The prenasalised labialised velar plosive /ᵑgʷ/ was described in section 2.1.6.

Examples of labialised velar consonants in different positions:

2022.	[kʷàɣ]	‘have diarrhoea’	0625.	[gʷāɬōkʷ]	‘box’
1649.	[hʷā]	‘you (sg)’	0264.	[ɣʷòl]	‘show’
1449.	[tùkʷāt¬]	‘rub’	1029.	[dʊ̀gʷàr]	‘hump of cow’
0578.	[bùhʷòm]	‘salt’	1486.	[tsùɣʷōp¬]	‘soak’
1130.	[mélœ̄kʷdɛ́]	‘dung beetle’	0175.	[tʃəfœ̄kʷ]	‘squat’
1252.	[ŋ̀ʷxʷṑl] ~ [ŋ̀xʷṑl]	‘whither’	1137.	[gʷòŋʷkʷāɗ]	‘caterpillar’
1756.	[ⁿdòŋʷ]	‘bottom’			

Labialised velar plosives can also be found in CC sequences. The labialised velar plosives /kʷ/ and /gʷ/ mostly occur in phonetic consonant clusters where sonorants are the first consonant (examples 2102 to 1595). There are examples when they are preceded by the alveolar implosive /ɗ/ but these words are likely to be compounds or contain reduplicated elements (examples 0894 and 1323). There are also examples of the voiceless labialised velar plosive /kʷ/ occurring in a consonant cluster followed by the alveolar implosive /ɗ/ and a nasal (examples 1130 and 0349).

Examples of labialised velar plosives in clusters:

2102.	[gʷɔ̄rkʷókʷókʷ]	‘(be) large’	0889.	[tálgʷōj]	‘flute (for men)’
1547.	[mɛ̄ʃkʷɛ̄ɗ]	‘soften’	1595.	[ŋ̀kʷáx]	‘six’
0894.	[mā̀kʷɛ̄ɗkʷɛ̄ɗɛ́]	‘rattle’	1323.	[dàɗgʷàts]	‘Pleiades’
1130.	[mélɛ̄kʷdɛ̄]	‘dung beetle’	0349.	[kʷùzòkʷᵊnā̀]	‘uncle’

There are far fewer examples of the labialised velar fricatives /xʷ/ and /ɣʷ/ in phonetic consonant clusters. The voiceless fricative /xʷ/ is found in several examples preceded by a nasal whilst there is one example of the voiced fricative /ɣʷ/ preceded by the alveolar trill /r/.

0182.	[ŋ̀hʷā̀z]	‘(be) drunk’	1084.	[ⁿdàrʲɣʷòz]	‘catfish’

The labialised velar nasal /ŋʷ/ occurs in phonetic consonant clusters only followed by another labialised velar consonant. It could be regarded as an allophone of /ŋ/ in this position, simply taking it’s labialisation from the following consonant. Therefore it is not contrastive in this position.

1137.	[gʷōŋʷkʷát˥]	‘caterpillar’	1252.	[ŋ̀ʷxʷōl] ~ [ŋ̀xʷōl]	‘whither’

It can be seen that in most cases labialised velar consonants occur adjacent to rounded vowels. However, this is not a case of rounded vowels causing the labialisation of the consonants. Rather, the labialisation spreads from the consonant onto an adjacent vowel causing it to become rounded. Rules governing this labialisation spread are outlined in section 2.2.2 Local Labialisation Effects.

In some Central Chadic languages, the presence of labialised velar consonants and rounded vowels has been analysed as being the result of a prosody of labialisation (Roberts 2001: 103-108). In Buwal, however, a labialisation prosody is not needed because labialisation is generally not seen to act on the entire word. Instead, in the majority of cases, only vowels adjacent to the labialised velar consonant are affected.

Further evidence that labialised velar consonants should be recognised as phonemes is that there are examples where they are found in environment where there is not adjacent rounded vowel. In these cases they cannot be said to be a result of a prosody nor caused by the presence of a rounded vowel.

2022. [kʷàɣ] ‘have diarrhea’ 1961. [dùgʷàɮ] ‘small water pot’

That the labialised velar consonants should be analysed monosegmentally is supported by them displaying ‘anti-edge’ effects. The labialisation at times spreads both onto following and preceding vowels.

0317. [fógʷój] ‘(be) stubborn’ 0714. [mōkʷóhʷō] ‘log’

Further evidence that labialised velar consonants are segments is that they can occur word-finally as in the examples below. No phonetic consonant clusters occur in word-final position in Buwal.

0175. [tʃəfœ̄kʷ] ‘squat’ 2179. [jōxʷ] ‘thread(v)’
0338. [dàrlōŋʷ] ‘young man’

2.1.8 Labial-velar Plosives

The **voiced labial-velar plosives /gb/** and its prenasalised counterpart **/ᵑᵐgb/** are rare in Buwal with only three examples of /gb/ and two examples of /ᵑᵐgb/ found in the data. However they should be recognised as phonemes because they are contrastive. Also their presence is not surprising as they do exist in other related languages such as Daba: [gbām] ‘stubborn’ and [mgbà] ‘no’ (Leinhard and Giger 1982: 36, 86). Only one example of the **voiceless labial-velar plosive /kp/** was found and this was in an ideophone which often have unusual phonological features.

Examples of the labio-velar plosives:

2680. [kpáŋ] ‘manner of getting something’
1591. [gbāk] ‘two’
1530. [gbár] ‘(be) straight’ cf. 2347. [bār] ‘along’
2348. [gbáŋ] ‘opposite’
1662. [ᵑᵐgbá] ‘up’
0189. [ᵑᵐgbòkʷ] ‘hump’ cf. 2166. [mbōkʷ] ‘evaporate’

2.1.9 Liquids

Buwal has two liquids, the **alveolar lateral /l/** and the **alveolar trill /r/** which has the alveolar flap [ɾ] as its allophone occurring in the intervocalic position. Each of these liquids occurs in word and syllable-initial, word-final and intervocalic position and in consonant clusters.

Examples of lateral consonants in different positions:

0702.	[lā]	‘act, do’	0740.	[rà]	‘dig’
0808.	[lèm]	‘get, obtain.	0208.	[rɛ̄x]	‘heal’
1431.	[ɓàl]	‘shoot’	2074.	[bàbàr]	‘roar’
0388.	[ŋ̀xɛ̄l]	‘thief’	0446.	[bɛ̄r]	‘announce’
2069.	[ɗáláz]	‘trap’	1028.	[fárám]	‘horn’
0086.	[ɣɛ̄lɛ́]	‘intestines’	1134.	[dʒɛ̄rɛ́]	‘locust’

The liquids, especially the alveolar trill /r/ occur in a wide variety of phonetic consonant clusters. Word-initial they may be preceded by obstruents although the alveolar lateral /l/ only occurs with labial plosives (examples 0505 and 1622). The alveolar trill /r/ may also be preceded by fricatives (examples 2172 and 0854). Word medially they may occur in clusters followed and preceded by obstruents (examples 0584 to 0909). They may also be followed by sonorants (examples 1220 and 0763). However, only the lateral fricative /l/ has been found preceded by other sonorants (example 1128).

Examples of liquids in consonant clusters:

0505.	[ⁿdràm]	‘please, satisfy’	1622.	[blòkʷ]	‘thousand’
2172.	[vrèʁ]	‘separate out’	0854.	[xᵊɾāts]	‘bale out’
0584.	[hèrgɛ̄dɛ́ŋ]	‘mold’	0889.	[tálgʷōj]	‘flute (for men)’
0890.	[gɛ̄ᵑgrɛ́ŋ]	‘harp’	0909.	[zàɓlā]	‘ghost’
1220.	[ɣʷɔ̀rnòkʷ]	‘onion’	0763.	[bālvār]	‘winnow’
1262.	[bārlā]	‘mountain’	1128.	[màflāflā]	‘tarantula’

A [ə] is often optionally inserted for consonant clusters containing an alveolar trill /r/.

0338.	[dàrlōŋʷ] ~ [dàɾᵊlōŋʷ]	‘young man’
1112.	[kārkájāx] ~ [kārᵊkájāx]	‘shell’

Mohrlang (1972: 34) found a similar case for Higi where a trilled vibrant varies with a flapped vibrant followed by a transition break. The [ə] is usually inserted in word-initial consonant clusters containing /l/ (example 0220) and may optionally be inserted in word-medial clusters (example 1135).

0220.	[ᵐbᵊlàx]	‘wound, sore’	1135.	[gāᵑgᵊláŋ]	‘praying mantis’

2.1.10 Glides

Buwal has the **labialised-velar and palatal glides /w/ and /j/**. They occur in word and syllable-initial, word and syllable-final and intervocalic position and in consonant clusters.

Examples of the glides in different positions:

1284.	[jàm]	‘water’	1599.	[wám]	‘ten’
0530.	[hājāk]	‘country’	0042.	[dàwán]	‘back’
0392.	[bāj]	‘chief’	1459.	[bàw]	‘alter, change’

There are very few clear examples of the glides /w/ and /j/ occurring in phonetic consonant clusters. The majority of them concern words containing inherent reduplication.

Examples of glides in phonetic consonant clusters:

0698.	[wòlwàl]	‘lamp’	1241.	[wɛ̄lwɛ́lɛ̄]	‘sugar cane’
2029.	[dārᵊjókʷ]	‘stubborn’	1003.	[kʷójkʷójá]	‘hyena’

The labio-velar glide /w/ is also found in phonetic consonant clusters in alternative pronunciations of words which otherwise phonetically begin with [ʊ]. This [ʊ] is slightly lengthened in comparison with [ʊ] the allophone of [ə] (discussed in section 2.2.4 The Schwa and its Allophones) and so is transcribed as [ʊˑ].

0082.	[ùˑnāf] ~ [àwnāf]	‘heart’	0084.	[ùˑlɛ̄ʃ] ~ [àwlɛ̄ʃ]	‘kidney’
0196.	[ùˑlàf] ~ [àwlàf]	‘blind person’	0569.	[ùˑdā] ~ [àwdā]	‘food’

For the examples above it could be argued that each word underlyingly begins simply with the labialised velar glide /w/ followed by a consonant. In order to make this pronounceable a vowel is inserted. Where the /w/ is pronounced /ɑw/ the following process may be taking place.

		/wnɑf/	‘heart’	0082.
Rule 1.	ə insertion before the consonant	əwnɑf		
Rule 2.	vowel lowering in word initial position	[àwnāf]		

The above is a similar process to that which occurs with word-initial nasals as discussed in section 2.1.5 Nasals where a full vowel may sometimes be pronounced before the nasal. The first step in the derivation is that a schwa is inserted before the word-initial consonant.

Rule 1

$$\begin{array}{ccc} C & \rightarrow & \text{ə}C/\#\_\_ \\ \lceil +\text{cont} \rceil & & \lceil +\text{cont} \rceil \\ \lfloor +\text{dist} \rfloor & & \lfloor +\text{dist} \rfloor \end{array}$$

As [ə] is disallowed in word-initial position it becomes a full vowel.

Rule 2

$$\text{ə} \rightarrow V/\#\_\_\_$$

More common is the first pronunciation of the above words where the labialised velar glide /w/ is pronounced [ʊˑ] word initially. In this case it could be said that the vowel lowering rule 2 is optional.

		/wnɑf/	‘heart’	0082.
Rule 1.	ə insertion before the consonant	əwnɑf		
Rule 3(a).	Regressive rounding of ə	ʊwnɑf		
Rule 4(a).	Fusion of vowel with following /w/	[ùˑnāf]		

In the above example two more rules come into play. Firstly, a [ə] is rounded when preceding a labialised velar glide.

Rule 3(a)

$$[\text{ə}] \rightarrow [\text{ʊ}]/\_\_w$$

Secondly a ʊw combination fuses to become [ʊˑ].

Rule 4(a)

$$\text{ʊw} \rightarrow [\text{ʊˑ}]$$

A similar situation was found by Barreteau for the language Mofu-Gudur (1988 Vol I: 162) where he found three acceptable pronunciations for words whose underlying form began with /wə/.

Example from Mofu-Gudur:

/wədéz/ ‘arbre’ [wùdéz] ~ [ʷùdéz] ~ [ùdéz]

Barreteau (1988 Vol I: 163) also found that the sequence /ə + w/ is pronounced [u.] before a consonant in word-medial position in Mofu-Gudur. This also appears to be the case for the Buwal language. As for the word-initial case, rules 3(a) and 4(a) apply as illustrated by the following example.

Example:

		/məwsɑ/	‘twin’	0333.
Rule 3(a).	Regressive rounding of ə	mʊwsɑ		
Rule 4(a).	Fusion of vowel with following /w/	[mʊ̄ˑsɑ́]		

In a similar process to above /ə/ + /w/ occurring before a consonant in word-medial position in palatalised words undergoes rounding and fusion to be pronounced [ʏˑ]. (the prosody of palatalisation will be discussed in section 2.2.1 Vowel Harmony and the Palatalisation Prosody). In this case the following rules are applied.

Rule 3(b)

ɪ → [ʏ]/__w

Rule 4(b)

ɪw → [ʏˑ]

This is illustrated by the following example.

		/mɑtəwlɑ^{Y}/	‘lie’	0452.
Rule 7.	Palatalisation of vowels	mɛtɪwlɛ		
Rule 3(b).	Regressive rounding of ɪ	mɛtʏwlɛ		
Rule 4(b).	Fusion of vowel with following /w/	[mɛ̄tɤ̄ˑlɛ́]		

Note that this process only occurs before a consonant in the word-medial position. In the word-initial position a [ə] + /w/ continues to be pronounced [ʊˑ]. This can be explained by rule ordering. The insertion of a schwa before a nasal or glide in the word initial position occurs after palatalisation spread as in the following derivation.

Example:

		[wlɑ̄ɗ^{Y}]	‘pus’	0221.
Rule 7.	Palatalisation spread onto vowels	wlɛɗ		
Rule 1.	Insertion of schwa before cons	əwlɛɗ		
Rule 3(a).	Regressive rounding of ə	ʊwlɛɗ		
Rule 4(a).	Fusion of vowel with /w/	[ʊ̀ˑlɛ̄tˉˡ]		

The labialised velar glide /w/ is also pronounced differently when occurring next to [e]. For example /w/ is fronted when preceded by [e] to become the approximant [ɥ] word finally as in the following examples.

Rule 5

/w/ → [ɥ]/e__#

Examples:

1424. /ɬew/ → [ɬēɥ] ‘catch’

1194. /gɛⁿdew/ → [gɛ̄ⁿdēɥ] ‘palm’

Another characteristic of the labialised velar glide /w/ is that word finally /ɑw/ is often pronounced [o:] as in the following examples:

1459. [bɑ̀w] ~ [bò:] ‘alter, change’

0284. [ɗɑ̀w] ~ [ɗò:] ‘love’

This leads to the following phonological rule:

Rule 6

/ɑw/ → [o:]/__#

The above discussion shows that an underlying labialised velar glide /w/ may manifest itself phonetically in a number of different ways. The palatal glide /j/, on the other hand is more limited. It does parallel the labialised velar glide, however, in that the combination [ə] + /j/ is pronounced as a slightly lengthened [i] (which will therefore be written [iˑ]) before a consonant. Barreteau (1988 Vol II: 136) also found this to be the case for Mofu-Gudur. In order for this to happen two further phonological rules must apply. Firstly a [ə] is heightened and fronted before /j/ to become [i].

Rule 3(c)

[ə] → [i]/__j

This rule is illustrated by the following example:

1343. /vəjā/ → [vìjā] ‘wet season’

Secondly ij is fused to become [iˑ] before a consonant.

Rule 4(c)

ij → [iˑ] /__C

Example:

		/kəjzɑŋ/	‘firstborn girl’ 2379.
Rule 3(c).	ə becomes [i] before /j/	kijzɑŋ	
Rule 4(c).	ij pronounced [iˑ]	[kìˑzɑ̄ŋ]	

Whilst there are not many examples illustrating the above process one significant one is the third person plural subject agreement marker which is pronounced [íˈ].

eg. [í.kāxɑ̄n] ‘They are crying.’

In this case the underlying form of this marker would be /j/ and the phonetic form is derived by the addition of an initial schwa along with the processes described above.

Buwal does not have complex vowel nuclei, or diphthongs. Rather these should be considered as CV or VC syllables with glides in the onset or coda position. Roberts states that glides are found in all Central Chadic languages and their status is always consonantal rather than part of a diphthong (Roberts 2001:98). His main argument for this is that they occupy consonantal slots in the phonological structure. This seems to be also the case for Buwal, the glides occurring like other consonants in word and syllable-initial, word and syllable-final and intervocalic position and in consonant clusters. Also Buwal does not tolerate two vowels adjacent to one another. When this occurs either at a word or a phrase level one vowel is deleted (see sections 5.2.1 Vowel Elision and 6.2.3 Vowel Elision).

2.2 Basic Underlying Vowels

Some Central Chadic languages have been analysed as having just two or even one underlying vowel phoneme (Roberts 2001: 99-103). The many surface realisations can be explained as being the results of word level prosodies, the effect of neighbouring consonants and the syllable type. For example, Gravina (2001: 120) found for Mbuko, a central Chadic language of the A5 subgroup, that it had two underlying vowel phonemes, the central vowels /ə/ and /ɑ/. He states that if /ə/ could be considered an epenthetic vowel breaking up consonant clusters as has been argued for other Central Chadic languages (Roberts 2001: 102), then the language may have only one vowel phoneme.

The situation described above can also be used to explain the vowel system of Buwal. For Buwal the schwa will be treated as an underlying vowel with respect to derivation of surface vowels. However, there are arguments which also support the epenthetic vowel analysis. These will be discussed in section 2.2.5 The Epenthetic Nature of Schwa.

The surface vowels in Buwal can be found in Table 2 below.

Table 2: Surface Vowels in Buwal

	Front		Back	
	Unrounded	**Rounded**	**Unrounded**	**Rounded**
'Epenthetic'	i/ɪ	ʏ	ə	u/ʊ
Full	e/ɛ	œ	ɑ	o/ɔ

How these many surface vowels can arise from one underlying vowel phoneme is summarised in Table 3 and explained more fully in the sections which follow.

Table 3: Summary of How Surface Vowels Arise

	No Prosody				Palatalisation Prosody				
		__K^w or K^w__	__/j/	__/w/ or /w/__		__K^w or K^w__	__/j/	__/w/	/w/__
/ə/	[ə]	[ʊ]	[i]	[ʊ]	[ɪ] ~ [ə]	[ʊ] or [u]	[i]	[ʏ]	[ʊ]
/ɑ/	[ɑ]	[ɑ], [o] or [ɔ] (_ /r/)	[ɑ]	[ɑ] or [o]	[ɛ]	[œ], [o] or [ɛ]	[e]	[e]	[ɛ]

K^w represents labialised velar consonant except for the glide. A full vowel adjacent to such a consonant or the labialised velar glide /w/ may or may not be rounded depending on circumstances which will be described more fully in section 2.2.2 Local Labialisation Effects. The back rounded vowels [u/ʊ] and [o/ɔ] have been grouped together with central unrounded vowels [ə] and [ɑ] under 'back' because they behave as a group in terms of apparent vowel harmony.

2.2.1 Vowel Harmony and the Palatalisation Prosody

Before examining the schwa and its realisations, the full vowel /ɑ/ and its different phonetic representations will be discussed. At first glance Buwal appears to exhibit vowel harmony in the point of articulation with all full vowels in a morpheme being either central [ɑ] or front [ɛ] or [e] (back rounded vowels will be discussed in section 2.2.2 Local Labialisation Effects).

Examples of vowel harmony:

0765.	[pāpāɬ]	'shell peanuts'	0038.	[ʒèmbēl]	'umbilical cord'
0033.	[mādàdā]	'chest'	0062.	[ɮéɾēk]	'finger nail'
0132.	[tsàtsàn]	'notice (v)'	0148.	[ʃéʃép˥]	'suck'

The vowel systems of a number of central Chadic languages have been explained by morpheme-level prosodic features, here abbreviated to 'prosodies' (Gravina 1999: 53; Smith 1999: 13-20; Bow 1997b; 6). The two prosodies usually invoked are palatalisation (PAL) which produces the fronting of vowels and palatalisation of certain consonants, and labialisation (LAB) which produces the rounding of vowels and the labialisation of certain consonants (Roberts 2001:103). Buwal does not have the LAB prosody but the PAL prosody is useful for explaining both the vowel harmony described above and the palatalisation of laminal consonants (see section 2.1.4 Laminals). The notation used for the PAL prosody is a superscript Y at the end of the morpheme to which it is applied.

Examples exhibiting the palatalisation prosody:

0089.	/mɑftɑs^{Y}/	→	[mɛ̄ftɛ́ʃ]	'muscle'
0136.	/ndzɑf^{Y}/	→	[ndʒɛ̀f]	'smell(v)'
1800.	/mɑtsɑfɑk^{Y}/	→	[mɛ̄tʃɛ́fɛ́k]	'lid for granery'

The basic scope of the palatalisation prosody is the morpheme which can be a root, affix or clitic. Palatalisation normally spreads from right to left. Palatalisation may also spread onto one or more syllables preceding the palatalised morpheme. How far it spreads may depend on the speed of the speech. Rules governing the spread of palatalisation beyond a morpheme will be discussed in section 5.1.1 Palatalisation Prosody Spread.

The following rules indicate how the full vowel and laminal consonants are affected by the PAL prosody.

Rule 7(a)

/ɑ/ → [ɛ]/_^{Y}

Rule 8

$$C \rightarrow C/\_^{Y}$$

$$\begin{bmatrix} +\text{strid} \\ +\text{cor} \\ +\text{ant} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{strid} \\ +\text{cor} \\ -\text{ant} \end{bmatrix}$$

Glides may also at times have a raising effect on full vowels. For example glides cause [ɛ] to be pronounced [e] as in the following palatalised words.

Rule 9(a)

[ɛ] → [e]/__ j

		/vápɑ̄j^{Y}/	'when?'	1687.
Rule 7(a).	Raising of full vowels	vépɛ̄j		
Rule 9(a).	Raising of [ɛ] by /j/	[vépēj]		

Rule 9(b)

[ɛ] → [e]/__ w

		/gə̄ndə̄wˠ/	‘palm branch’ 1194.
Rule 7(a).	Raising of full vowels	gɛ̄ndɛ̄w	
Rule 9(b).	Raising of [ɛ] by /w/	gɛ̄ndēw	
Rule 5.	/w/ fronted and raised to become [ɥ]	[gɛ̄ndēɥ]	

This raising effect of glides may also explain the one exceptional example which does not show vowel harmony. The palatal glide may have heightened /ɑ/ to become [e].

0095. [ɗə̄ɗə̄ɾéj] ‘phlegm’

Adding weight to this explanation are the alternate pronunciations that are sometimes heard of certain verb roots beginning with the palatal glide.

0420. [jə̀k] ~ [jɛ̀k] ‘abandon’ 1082. [jə̄ɬ] ~ [jɛ̄ɬ] ‘hatch’

This is not a pervasive process in the Buwal language, however, as there are many examples of /ɑ/ adjacent to /j/ where the vowel is not heightened.

1284. [jə̀m] ‘water’ 0392. [bə̄j] ‘chief’

2.2.2 Local Labialisation Effects

Whilst some central Chadic languages such as Mbuko (Gravina 2001: 121-122) and Muyang (Smith 1999: 15-19) can be said to have a labialisation prosody acting on a whole morpheme or word, the same cannot be said for the Buwal language. In Buwal, rounded vowels are usually only found adjacent to a labialised velar consonant. As described in section 2.1.7 Labialised Velar Consonants, in most cases the labialisation spreads from the labialised consonant onto an adjacent vowel. Rules that condition this labialisation spread are outlined below and are similar to those found by Barreteau (1988 Vol I: 326-331) for Mofu-Gudur. If the vowel is [ɑ] it is rounded to become [o] (or [ɔ] before /r/). If there is palatalisation present, [ɛ] may be rounded to become [œ].

Two major rules condition labialisation spread within a root.

1) Labialisation spreads to the vowel to the right of a labialised velar consonant except word finally.

Rule 10(a)

[ɑ] → [o]/K^w_(C).

Examples:

1011.	[hʷósáśāp˥]	‘cane rat’	0491.	[lākʷótāj]	‘whip(n)’
0066.	[mātōkʷtōkʷā]	‘knee’	0965.	[ŋ̀ʷxʷā]	‘goat’

The full vowel following a labialised velar consonant in palatalised words is usually pronounced [œ] (examples 0894 to 0306). However, in word-initial syllables there are certain words where [œ] appears to be in free variation with [o] (examples 2559 and 2487). Also for word-initial syllables ending in /r/ the rounded vowel is always pronounced [ɔ] (examples 1978 and 1226).

Examples:

0894.	[mākʷœ̄dkʷœ̄ɗɛ́]	‘rattle’	0166.	[kʷœ̄tɛ̄k]	‘point’
2571.	[kʷœ́ʃkʷœ́ʃɛ́]	‘kindling’	2062.	[ɣʷœ́tʃɛ́tʃɛ́]	‘acidic, sour’
2596.	[hʷœ́lɛ́lɛ́]	‘broken and scattered’	0306.	[ŋgʷœ́ʃɛ́m]	‘(be) fierce’

2559.	[kʷœ́ɬɛ́x] ~ [kʷóɬɛ́x]	‘line scratched in skin’
2487.	[kʷōlɛ̄lɛ́] ~ [kʷœ̄lɛ̄lɛ̄]	‘fine’

1978.	[kʷɔ̄rɮéj]	‘disorder, noise’	1226.	[ɣʷɔ̄rgɛ́]	‘mushroom’

It can be observed from the above examples that in the cases where the rounded vowel is not pronounced [œ] it is followed by an alveolar continuant consonant (examples 2559 and 2487). (However, this variation is not always heard (see examples 2596 and 0306)). To account for this variation the following rule for palatalisation spread could be applied in these cases.

Rule 7(b)

$$[o] \rightarrow [œ]/K^{w}\_\_\_C^{Y}$$
$$\ulcorner\text{-alveo}\ \urcorner$$
$$\llcorner\text{-cont}\ \lrcorner$$

This type of variation is not unheard of in Central Chadic languages. Barreteau (1988 Vol I: 331) states that for Mofu-Gudur sometimes [o] was heard where [œ] was expected.

As mentioned above an exception to the rightward spread of labialisation is that vowels will usually not be rounded in a word final syllable before a pause if the onset is a labialised velar plosive, unless the word ends with a non-alveolar consonant.

0682.	[kʷōɬākʷār]	‘garbage’	1103.	[mātə́tə́lgʷā]	‘gecko’
0889.	[tálgʷōj]	‘flute’	0019.	[tátákʷōm]	‘molar tooth’

Rule 10(b)

/ɑ/ → [o]/K^w_C##
[-alveolar]

Where ## indicates a pause.

When such a word occurs in a phrase, the labialisation spreads.

Examples:

0066. [mātōk^{w}tōk^{w}ā] ‘knee’
[mātōk^{w}tōk^{w}ō nágè] ‘my knees’

0929. [k^{w}ók^{w}ās] ‘sacrifice’
[hèdʒí. kālā k^{w}ók^{w}ōs mālā dāmārā]
‘People are offering sacrifices for misfortune.’

Exceptional examples found in the data include the following but in both cases the alternate pronunciation is acceptable:

1182. [dùrᵊŋg^{w}ōɮ] ~ [dùrᵊŋg^{w}āɮ] ‘stump’
1230. [k^{w}ódāk^{w}ó] ~ [k^{w}ódāk^{w}á] ‘sweet potato’

Spreading often occurs from a labialised velar fricative before a pause but may at times be in free variation with no spreading.

Rule 10(c) (optional)

/ɑ/ → [o]/K^w_(C)##
[+cont]

Examples:

0264. [ɣ^{w}òl] ‘show’ 1488. [ŋ̀x^{w}ōl]~ [ŋ̀x^{w}āl] ‘dry out’

2) Labialisation will spread leftward:

(a) if rightward spread is blocked by a syllable boundary in which case it spreads leftward onto the preceding vowel.

Rule 11

/ɑ/ → [o]/_K^w.

Again rule 7(b) is applied in palatalised words so that the rounded vowel is pronounced [œ].

Examples:

1019. [tèbɑ́k^{w}] ‘bat’ 1037. [bɑ̄bōx^{w}] ‘bark (v)’

1130. [mɛ́lɑ̄k^{w}ɗɛ́] ‘dung beetle’ 0066. [mɑ̄tōk^{w}tōk^{w}ɑ̄]‘knee’

(b) if the onset of the preceding syllable is a labial consonant.

Rule 12

/ɑ/ → [o]/ C _ K^{w}
[+lab]

0317. [fóg^{w}ój] ‘(be) stubborn’

1374. [vōg^{w}úmtáɗ] ~ [vɑ̄g^{w}úmtáɗ] ‘day after tomorrow’

0714. [mōk^{w}óh^{w}ō] ‘log’

2303. [mbòg^{w}òf] ‘mouse (house)’

There are no examples in the data of the above process occurring in palatalised words.

The following examples show leftward spreading even though the previous consonant is alveolar. However in both cases the pronunciation without the spread is acceptable also.

1901. [sò^{ŋ}g^{w}òf] ~ [sà^{ŋ}g^{w}òf] ‘pour out all together (ideo)’

0194. [dòk^{w}òf] ~ [dàk^{w}òf] ‘(be) impotent’

The labialised velar glide /w/ does not in Buwal have as strong a rounding effect on the full vowel /ɑ/ as it does in many other Central Chadic languages. In most cases an adjacent full vowel is not rounded when in contact with /w/ as in the following examples.

0042. [dàwán] ‘back’ 0900. [lɑ̄wɑ̄ɗ] ‘play’

There is one example in the data of /ɑ/ being rounded to become [o] following a labio-velar glide /w/ word medially.

0698. /wàlwàl/ → [wòlwàl] ‘lamp’

In this example /ɑ/ is both preceded and followed (in spite of an intervening consonant) by /w/ which may have a greater rounding effect than a single /w/.

It was mentioned in the section 2.1.10 on glides that word final /ɑw/ may often be pronounced [oː].

Rule 6

/ɑw/ → [oː]/__#

This process could be divided into two steps. Firstly, the rounding of /ɑ/ preceding a word final /w/.

Rule 6(a)

/ɑ/ → [o]/__w#

Secondly the fusing of [o] and [w] into a long vowel [oː].

Rule 6(b)

ow → [oː]/__#

Example:

		/ɗɑw/ ‘love’ 0284.
Rule 6 (a)	Regressive rounding of /ɑ/	ɗow
Rule 6 (b)	Fusion of [o] and [w]	[ɗôː]

2.2.3 Word-Level Labialistion

There are some examples in the data which seem to show labialisation spreading through an entire word. For the majority of these examples it could be argued that the spreading occurs due to the presence of a labial consonant at the opposite end of the word from the labialised velar (see examples 1729 to 2094).

Examples showing labialisation spread throughout a whole word:

1729. [bū̀rdzōdzōxʷ] ‘slope’
1050. [bū̀ɗōkʷ bū̀ɗōkʷ] ‘hornbill’
1303. [hʷū̀bóf] ‘foam’
0001. [kʷù̀sà̀m] ~ [kʷù̀sò̀m] ‘body’
0784. [gʷù̀lā̀m] ~ [gʷù̀lṑm] ‘quiver(n)’
2094. [xʷɔ̀rò̀m] ‘bend down’

However, for the following examples labialisation has not spread throughout the entire word in spite of the presence of a labial consonant in the word.

2079. [mátskʷōxʷ] ‘evening’
1862. [pā̀rɮò̀kʷ] ‘escape’
1533 [hʷò̀rlà̀v] ‘bend (n)’

In all these cases it can be observed that there is an intervening consonant cluster between the labialised velar consonant and the labial consonant. However this is also the case for example 1729 above and for this word the labialisation still spread. It is possible that the first vowel being a schwa may make it more susceptible to being rounded, whereas the above three examples contain only full vowels.

Two examples of completely labialised words were found where the above explanation does not apply.

1867. [fóᵑgʷɔ̄rlɔ́r] ‘hollow’

0026. [kʷōndōndōl] ‘larynx’

Labialisation varies significantly among Central Chadic languages. For some languages, labialisation is a local effect. For others, a labialisation prosody is recognised but it is more limited in scope that the palatalisation prosody (Roberts 2001:105-106). Other languages have a labialisation prosody which is equal in function to palatalisation (Gravina 2001: 121). As Buwal examples showing labialisation at the word level are relatively few in number, it cannot be said that the prosody of labialisation is an important feature of the phonology of the language. However, the above examples may indicate that a labialisation prosody is in the process of being created.

2.2.4 The Schwa and its Allophones

The schwa /ə/ has a number of allophones caused by the influences of palatalisation and labialisation or glides. These allophones are [ɪ], [i], [ʊ], [u] and [ʏ].

The high front unrounded vowel [ɪ] occurs when a schwa occurs in a palatalised word.

Rule 7(b)

/ə/ → [ɪ]/__^{Y}

Examples:

0095. /səɓāŋ^{Y}/ → [ʃìɓēŋ] ‘nasal mucus’

0697. /gədágdá^{Y}/ → [gìdégdē] ‘mat (trad.)’

2215. /mādzəvā^{Y}/ → [mēdʒīvē] ‘ancestor pot’

2298. /bəzàm^{Y}/ → [bìʒèm] ‘species of mouse’

At times [ɪ] may be in free variation with [ə] in this environment.

0069. [tʃəhèɬ] ~ [tʃìhèɬ] ‘ankle’ 2427. [pəɬēt˥] ~ [pìɬēt˥] ‘peel off layers’

Already mentioned in the section on glides (2.1.10) is the rule that states that a schwa is heightened and fronted to become [i] when followed by the palatal glide /j/.

Rule 3(c)

/ə/ → [i]/__j

Examples:

1343. /vəjā/ → [vìjā] ‘rainy season’
2107. /kʷákʷəjáŋ/ → [kʷókʷíjáŋ] ‘mystery’
2475. /fəjām/ → [fìjām] ‘weevel’

The high back rounded vowel [ʊ] is produced when the schwa comes in contact with a labialising environment; for example preceeding or following a labialised velar consonant /Kʷ/. This yields the following rules.

Rule 13(a)

/ə/ → [ʊ]/Kʷ__

Examples:

0001. /kʷəsàm/ → [kʷùsàm] ‘body’
0465. /gʷəlāk/ → [gʷùlāk] ‘argue’
1105. /hʷəzām/ → [hʷùzām] ‘crocodile’
2284. /tātákʷədɗòf/ → [tātákʷʊ̄dɗòf] ‘(be) thick (liquid)’

Rule 13(b)

/ə/ → [ʊ]/__Kʷ

Examples:

1449. /təkʷāt¬/ → [tùkʷāt¬] ‘rub’
1029. /dəgʷàr/ → [dʊ̀gʷàr] ‘hump (cow)’
0578. /bəhʷòm/ → [bʊ̀hʷòm] ‘salt’
1486. /tsəɣʷōp¬/ → [tsʊ̀ɣʷōp¬] ‘soak’

Note that [ʊ] is raised to [u] in closed syllables.

Rule 14

[ʊ] → [u]/C__C

Examples:

0002. [bùkʷlā] ‘skin’ 2263. [ɣʷúrgʷūm] ‘type of bird’

Note also that in palatalised words the schwa is still pronounced [ʊ] when in contact with a labialised velar consonant (see examples below). This is in contrast to Muyang (Smith 1999: 11) where every schwa in a palatalised and labialised environment is pronounced [ʏ]. At the other extreme Bow (1997: 15) states that in Moloko, the schwa cannot bear both palatalisation and labialisation and in this situation is pronounced [ʊ] or [u]. Buwal falls somewhere between these extremes. The schwa may be pronounced [ʏ] when occuring next to the labialised velar glide /w/. This difference can be explained by rule ordering. Rounding provoked by labialised velar consonants occurs earlier in the derivation than rounding caused by the labialised velar glide (see examples below).

Example:

		/kʷəlàʏ/	‘amulet, charm’ 0924.
Rule 13(a).	Progressive rounding of ə	kʷʊlɑʏ	
Rule 7.	Pal spread onto vowels	[kʷʊ̀lɛ̀]	

In this case the vowel [ʊ] is not susceptible to palatalisation.

It was mentioned in the section on glides (2.1.10) that the labio-velar glide /w/ also causes rounding of a preceding schwa.

Rule 3(a)

/ə/ → [ʊ]/__w

Examples:

1893.	/təwāl/	→ [tʊ̄wāl]	‘wrap around’
0691.	/zəwāj/	→ [zʊ̀wāj]	‘paint (n)’

It is the interaction of this rounding effect of the labio-velar glide /w/ and the palatalising effect of the palatalisation prosody which produces the final allophone of the schwa, [ʏ]. This rule was also mentioned in the section on glides (2.1.10). In this case the rounding of the schwa occurs *after* palatalisation has taken place.

Rule 3(b)

[ɪ] → [ʏ]/__w

Example:

		/ŋtsəwàʏ/	‘travel’ 0843.
Rules 7&8.	Pal spread onto vowels and cons	ŋtʃɪwɛr	
Rule 3(b).	Regressive rounding of [ɪ]	[ŋ̀tʃ̀ʏwɛ̀r]	

2.2.5 The Epenthetic Nature of Schwa

In previous sections it was stated that in Buwal the schwa /ə/ (and its allophones [ɪ], [i], [ʊ], [u] and [ʏ]) could be interpreted as not being underlying but as epenthetic used to break up consonant clusters. This type of analysis has been proposed for a number of Central Chadic languages such as Mofu-Gudur (Barreteau 1988: 409), Muyang (Smith 1999: 11) and Moloko (Bow 1997: 11). Various arguments have been put forward to support this interpretation. For Mofu-Gudur, Barreteau (1988: 405-409) studied the tone on the schwa and found it to be predictable, and so concluded that schwa was epenthetic. For Muyang, Smith (1999: 11) states the fact that the schwa does not occur in the word-initial or final position as a support for epenthentic schwa. In Moloko (Bow 1997: 10) in fast speech the schwa may be elided with no change in the resulting meaning.

For some Central Chadic languages, however, the schwa should be considered as a full vowel phoneme. For example Mohrlang (1972) in his phonology of the Higi interprets cases of clustering, consonant closure and syllabic consonants as manifestations of a basic CV syllable pattern (Mohrlang 1972: 17). In this case /ə/ (or [ɨ] in the case of Higi) is interpreted as being a full vowel although it is shorter than the other full vowels and depending on the consonants it may reduce to little more than a transition break and sometimes completely disappear (Morhlang 1972: 46). For Gemzek, Gravina (2003:7) treats the schwa as an underlying vowel as there is very little vowel-zero alternation and very few permitted CC sequences.

For certain Central Chadic languages such as Higi (Mohrlang 1972: 13) interpreting [ə] as a full vowel phoneme helps keep the syllable structure simple, having only V or CV syllables. However, Roberts (2001: 115) concludes, the syllable is not a particularly useful notion in some Central Chadic languages as it belongs to the surface structure and is predictable. Therefore, whether there are more complex syllable types is not very significant. He concludes that what is more important is the consonant skeleton that makes up lexical roots.

For Buwal the status of schwa is not easy to determine, but we have chosen to analyse it as a phoneme rather than an epenthetic vowel. This is based on the following tests:

1. Is is restricted to interconsonantal environments?
2. Does it carry contrastive tone?
3. Does its behaviour with prosodies require it to be present at the start of the derivation?
4. Does it constrast with zero, or are schwa and zero in complementary distribution?
5. Are there morphological processes where schwa alternates with zero?

1. Is is restricted to interconsonantal environments?
This first test seems to support and epenthetic analysis. As for Muyang, the schwa is not found in the word-initial or word-final position but only word-medial.

2. Does it carry contrastive tone?
As in Mofu-Gudur, the tone on the schwa for Buwal can be predicted which also supports an epenthetic analysis. In a word-initial syllable this tone is low before a mid tone and mid before a high tone. If one of the adjacent consonants is a glide or a liquid the schwa may be very brief and so carry a mid tone before another mid tone.

0162.	[ɬəkār]	‘kick’	0078.	[dzəvā]	‘breastbone’
0708.	[gəmáz]	‘bellows’	1153.	[dībɛ́]	‘termite hill’
1222.	[tsəlāk]	‘failure’	0761.	[kəlāŋ]	‘threshing floor’

When /ə/ occurs in the word-medial position a number of patterns emerge. If the tones on either side are the same the schwa takes on the same tone.

0618.	[dàmtəkʷàl]	‘pestle’	0908.	[mālū.lā]	‘demon’

These tone patterns contrast with the tone melodies found on the following examples with full vowels.

0426.	[mèɗɛ́lɛ̀]	‘ressemblance’	2218.	[mɛ̄ɬɛ́pɛ̄tʃ]	‘foam on beer’

If the tone on the left is lower than the tone on the right, the schwa takes on the tone from the left.

2257.	[mākəɓá]	‘type of sacrifice’	2213.	[gàrkəsāŋ]	‘tic’

Again this contrasts with the tone melodies found on the following examples with full vowels.

1009.	[māɬáhájˌ]	‘mouse’	1128.	[màflāflā]	‘tarantula’

If the tone on the left is high and the tone on the right is mid, the tone on the schwa will be high.

1244.	[gágəmāj]	‘cotton’	1842.	[tʃɛ́tʃʏ́wɛ̄r]	‘filter’

Constrasting tone melody on example with full vowels:

0630.	[dábdābā]	‘stopper’

If the tone on the left is high and that on the right is low, or vice versa, the schwa will carry a mid tone.

1314.	[tátəd̀ùm]	‘air’	2395.	[másùxʷvərzáj]	‘sore throat’

Contrasting tone melodies on examples with full vowels:

0720.	[pápálù̀m]	‘plank’	0544.	[gèdʒɛ́rɛ́]	‘loincloth’

3. Does its behaviour with prosodies require it to be present at the start of the derivation?

The epenthetic schwa analysis helps explain why alternate pronunciations of the schwa are at times heard in palatalised words. In the majority of cases the schwa in palatalised words is pronounced [ɪ] (examples 0018 and 0176). However, in some cases /ə/ may be pronounced [ə] in palatalised words (examples 0069 and 2427). Also between /r/ and an adjacent consonant [ə] is always heard (examples 0074 and 1557). This may be because in this case the schwa is so brief there is no chance for it to be raised. Alternatively, consonant sequences containing /r/ may be allowed in the language with [ə] being optionally inserted later in the derivation after palatalisation has already spread.

Examples:

0018.	[ʒ̀ìd̀é̞ŋ]	‘tooth’	0176.	[gīlɛ̄pˀ]	‘kneel’
0069.	[tʃəhè̞ɬ] ~ [tʃ̀ìhè̞ɬ]	‘ankle’	2427.	[pə̀ɬɛ̄tˀ] ~ [pì̞ɬɛ̄tˀ]	‘peel off layers’
0074.	[kɛ̀rə̀ŋgè̞ɬ]	‘bone’	1557.	[vˀrɛ̀] ~ [vrɛ̀]	‘red’

If the schwa was underlying, then in palatalised words it should always be raised and fronted to become [ɪ]. Where the epenthetic vowel is realised [ə] in palatalised words it could be argued that it is inserted *after* palatalisation has applied to the underlying form of the word. It is a question of rule ordering as in the following example.

		/tsxɑɬˠ/	‘ankle’	0069.
Rule 7.	Palatalisation spreads leftward	tʃxɛɬ		
Rule 1.	Insertion of schwa	[tʃəhè̞ɬ]		

Where the epenthetic vowel is realised [ɪ], the order of the rules is reversed.

		/tsxɑɬˠ/	‘ankle’	0069.
Rule 1.	Insertion of schwa	tʃəxɑɬ		
Rule 7.	Palatalisation spreads leftwards	[tʃ̀ìhè̞ɬ]		

In the second example rules 1 and are 7 in a ‘feeding’ relationship; rule 1 providing input to rule 7 (Kenstowicz 1994: 94). In the first example rule 1 is applied after rule 7 and so cannot provide input to it. However, as the realisation of the schwa as [ə] in palatalised words is exceptional, this does *not* provide a very strong argument for the epenthetic

vowel analysis. Apart from the above situation, the insertion of schwa is always the first step in any derivation which supports its status as a phoneme.

4. Does it constrast with zero, or are schwa and zero in complementary distribution? Another argument for the epenthetic analysis is that the schwa does not contrast but is in complementary or free distribution with zero. This means that the distribution of schwa is predictable as Smith (1999: 26) found for Muyang. For Buwal the schwa is distributed as follows.

1) A schwa optionally occurs

(a) Between a consonant and an alveolar trill /r/ word initially and word medially.

Examples:

1557.	[vᵊɾɛ̀] ~ [vrɛ̀]	'(be) red'	0131.	[grɛ̄] ~ [gᵊɾɛ̄]	'see'
1540.	[dāᵈɾās]	'(be) blunt'	1140.	[zāzᵊɾátˀ]	'earthworm'

(b) Between a labial consonant and the lateral /l/.

Examples:

0220.	[mbᵊlàx]	'wound, sore'	1817.	[plɛ̄m]	'sprain (foot)'

(c) Between /s/ and /f/

Example:

0106.	[səfān] ~ [sfān]	'breathe'

(d) Between /s/ and a following voiceless labial or velar plosive.

Examples:

1457.	[ʃkɛ̀n] ~ [ʃəkɛ̀n]	'crush'	1357.	[ʃəpɛ́k] ~ [ʃpɛ́k]	'late'

2) Schwa does *not* occur

(a) Between a word-initial nasal and a following consonant.

Examples:

0712.	[m̀pɛ̀]	'wood'	0605.	[m̀sār]	'fry'
0577.	[ŋ̀fá]	'flour'	1498.	[ŋ̀kə̀də̀w]	'burn'

(b) Between word-medial consonants if the sonority of the two consonants are the same or the sonority of the first consonant is greater than the second.

Examples:

1137.	[gʷòŋʷkʷātˀ]	‘caterpillar’	0021.	[kālkākāk]	‘jaw’
0089.	[mɛ̄ftɛ́ʃ]	‘muscle’	1636.	[párhám]	‘(be) lacking’
1146.	[pədāktáwáj]	‘butterfly’	2268.	[wánjā]	‘trad. song’

The sonority heirachy which applies in this case is as follows:
plosives > implosives >fricatives > liquids
affricates nasals
glides

The main exception to the sonority rule is for words containing inherent reduplication of either a syllable or the whole phonological word.

Examples:

1751.	[fɛ̄ɗfɛ̄dɛ̄]	‘roof matting’	2064.	[jáf jáf]	‘very delicious’

Other examples which appear to break the sonority rule above are as follows. There is one example of a schwa being inserted between two plosives in the word medial postion. In this case it is the alveolar followed by a labial plosive.

0158.	[gādəbāŋ]	‘crawl’

In the following example a plosive is followed by an implosive with no schwa occuring between the consonants.

1130.	[mélɔ̄kʷdɛ̄]	‘dung beetle’	
cf.	2284. [tātákʷūdɔ̀f]		‘thick (liquid)’

When a liquid is followed by a prenasalised plosive a schwa may be inserted to aid pronunciation. This schwa is not underlying but is inserted postlexically according to the following rule.

Rule 15

$$\emptyset \rightarrow [\text{ə}]/\text{C}\ \_\_\ \text{C}$$
$$\ulcorner +\text{cons} \urcorner \ulcorner -\text{cont} \urcorner$$
$$\vert +\text{son} \quad \vert \llcorner +\text{nas} \lrcorner$$
$$\llcorner -\text{nas} \quad \lrcorner$$

Example:

0074.	/kàrŋgàɬʸ/	→	kèrŋgèɬ	→	[kèɾəŋgèɬ]	‘bone’
2346.	/ɣʷàlŋgʷàtˀ/	→	ɣʷòlŋgʷòtˀ	→	[ɣʷòləŋgʷòtˀ]	‘uproot’

Smith (1999: 26) states for Muyang that two adjacent consonants do not need intervening vocalisation if they can be construed as being a coda plus an onset. This is generally also the case for Buwal, apart from the exceptions outlined above, and explains why there are a greater variety of consonant clusters found in the word-medial position than word-initial.

5. Are there morphological processes where schwa alternates with zero?

There is very little ∅ ~ [ə] alternation which can be seen in the morphology. When suffixes are added to verb stems containing /ə/, the schwa remains even when according to the distribution rules outlined above it should dissappear. This is an indication that the schwa is part of the underlying structure of the morpheme (see example below) and therefore should be analsyed as a phoneme. However, the tone on the schwa is not underlying and may change according to the environment.

Example:

0758. [fətār] 'dig up'

[í: kāf**ə̄**tār ù.lèj māɬáhájˈ] 'They are digging up the mouse hole.'

Conclusion

The above tests have shown that the presence of the schwa in the underlying form is predictable which implies that historically schwa was not a contrastive element. However, since the presence of the schwa is required in the underlying form for the derivational process it should be considered a phoneme in Buwal.

2.2.6 Conditions Under Which V → ə

A full vowel may be reduced to a schwa or its allophones in a destressed syllable. A syllable may become destressed due to:

1. Fast speech.

Stress in Buwal normally occurs on the final syllable of a word spoken in isolation. In fast speech a vowel in a non-final syllable may be reduced as in the following examples.

0620. [tēkɛ́t˥] ~ [tīkɛ́t˥] 'plate'

1807. [ʃɛ̄ɓɛ̄lɛ́ŋ] ~ [ʃɪ̄ɓɛ̄lɛ́ŋ] 'married, middle-aged woman'

In the middle of a phrase, vowels in word-final syllables may be reduced to a schwa in fast speech especially if they are followed by a continuant consonant. Compare the following examples each one spoken more quickly that the last.

[ɓamam kɛlɛm kan ta zam a wata g^wombok^w k^{w}o]

[ɓamam kɛlɛm kan ta z**ə**m a wata g^wombok^w k^{w}o]

[ɓam**ə**m kɛlɛm kan t**ə** z**ə**m a wata g^wombok^w k^{w}o]

'The bee did not get something to eat at the toad's house.'

2. Stress Shift.
If`stress bearing suffix or enclitic is attached to a root, the stress shifts from the root and the root vowel is reduced. This does not appear to be a pausal phenomenon as the full vowel version may also occur in the middle of a phrase. Also, it only occurs for morphemes ending with certain continuant consonants such as the labial fricative /v/, the liquids /l/ and /r/ and the glides /j/ and /w/. This will be discussed further later in this section and in section

5.2.2 Vowel Reduction.

Examples:
2185. /dz**à**v/ ‘assemble, bring together’

[hʷʊnɛ dz**ɑ**v mɑ ŋʷkʊnɛ]	‘You agree. (lit. you bring together your speech)’
[ijkɑdz**ə**vɑ tɑr]	‘They participate in chores.’

1426. [ᵐb**ɑ̄**l] ‘hold, stop, grab’

[sɑkɑmb**ɑ**l ɔrej]	‘I am preparing vegetables.’
[ɑnɑmb**ə**lɑ kılomɛtrə vɑnɑj]	‘How many kilometres is it? (lit. It will stop at how many kilometres?’)

3. Syllable type.
Gravina (2001:123) found that in Mbuko, in a closed syllable underlying /ɑ/ becomes underlying /ə/, except before a pause. This is not the case for Buwal, except that in closed syllables ending with continuent consonants which are followed by another consonant the full vowel /ɑ/ has a tendency to be reduced to /ə/. This is illustrated by certain examples where /ɑ/ and /ə/ (or its allophones) are in free variation.

Examples of /ɑ/ → /ə/ in closed syllables:

2289.	[dējdéj] ~ [dījdéj]	‘(be) abundant, too much’ (ful)			
0736.	[tàrgàɬ] ~ [tə̀rgàɬ]	‘polish’			
2075.	[wɛ̄lɓɛ̄] ~ [wīlɓɛ̄]	‘nature spirit’			
2286.	[kɛ́rkɛ̀m] ~ [kírkɛ̀m]	‘dried left-over fufu’			
0581.	[gʷūjgʷōjā]	‘festival’	cf.	0933. [gʷōjgʷōjɑ]	‘feast (n)’

The following vowel reduction rules are applied in these cases.

Rule 16(a)

/ɑ/ ~ [ə]/__C.C
[+cont]

Rule 16(b)

$$[\varepsilon] \sim [\text{ɪ}] / \underline{\quad} \text{C.C}$$
$$[+\text{cont}]$$

Rule 16(c)

$$[\text{o}] \sim [\upsilon] / \underline{\quad} \text{C.C}$$
$$[+\text{cont}]$$

The words below may also be an illustration of this process, as the tone occurring on the schwa (or its allophones) does not fit with the pattern outlined in section 2.2.5 The Epenthetic Nature of Schwa above.

Examples:

1123.	[māk^{w}**ʊ́**lə́^{m}báŋ]	‘ant’	1101.	[k^{w}**ʊ́**rə́^{n}dzàlāx]	‘agama lizard’
1164.	[k^{w}**ʊ́**rə́^{m}bàlá]	‘shea-butter tree’	2395.	[más**ù**x^{w}vərzáj]	‘sore throat’

A possible derivation for example 1123. above could be as follows:

		/māk^{w}álmbáŋ/	‘ant’	1123.
Rule 10.	Lab spread rightward	māk^{w}ólmbáŋ		
Rule 16(c).	Vowel reduction	māk^{w}úlmbáŋ		
Rule 15.	Schwa insertion	[māk^{w}úlə́mbáŋ]		

It is difficult to say whether the above process belongs in the lexicon or is postlexical (Kenstowicz 1995: 213). The fact that there is variation between speakers of the language, some applying this rule and others not seems to indicate that it is unconscious and therefore a postlexical process. However, some speakers do seem to be aware of the difference and will insist for example that [dàrlōŋ^{w}] (0338 ‘young man’) is really [dərlōŋ^{w}] while others insist that the first rendition is correct. This could be an example of a postlexical rule in the process of being incorporated into the lexicon.

There are a few examples of [ɪ] in word final closed syllables in Buwal but in each case there is free variation with [ɛ].

0516.	[dèp$^{\neg}$] ~ [dìp$^{\neg}$]	‘appease’	0129.	[ʃìŋʃìŋ] ~ [ʃèŋʃèŋ]	‘dream’
0600.	[ʃkèn] ~ [ʃkìn] ‘grind’				

As schwa never occurs in word final syllables, the above could be explained by the fact that some speakers tend to pronounce [ɛ] more like [ɪ].

2.2.7 Nasal Vowels

Nasal vowels are not underlying in Buwal however they do occasionally occur phonetically as in the examples below.

1700. [ɛ́ɣɛ̀] ‘no’

1679. [ŋ̀ɣā] ~ [ã̀ɣ̃ā] ‘this’

Example 1679 above gives a clue to this nasalisation. It seems that when there is an underlying nasal preceeding the velar fricative /ɣ/ the nasalisation spreads onto the surrounding vowels and the nasal itself is no longer pronounced distinctly.

Rule 17

$$\underset{[+nas]}{V}\eta\gamma\underset{[+nas]}{V} \rightarrow [V\gamma V]$$

Example derivation:

		/ŋɣā/	‘this’	1679.
Rule 1.	Schwa insertion before word initial nasal	ə̀ŋɣā		
Rule 2.	Schwa lowered word initially	àŋɣā		
Rule 17:	Vowel nasalisation	[ã̀ɣ̃ā]		

2.2.8 Long Vowels

Only two examples were found in the data of words containing long vowels. In both these cases versions have been heard which do not contain the long vowel but an extra syllable.

Examples of long vowels:

2262. [kɛ̄ːvɛ́k] ‘type of bird (small)’ (alternate: [kɛ̄vɛ̄vɛ́k])

2504. [gʷáːɮā̄m] ‘hole in tree trunk’ (alternate: [gʷóɮáɮā̄m])

A similar phenomenom occurs for certain words in Mofu-Gudur (Barreteau 1988 Vol I: 333-334). Gravina (2008: 5-6) explains this by stating that historically phonological material has been lost which is then compensated for by either reduplication or vowel lengthening.

2.3 Phonology of Loan Words

Loan words in Buwal generally come from either Fulfulde or French. There has been longer contact with fulfulde so its influence has been greater. In terms of phonology, loan

words fall into two categories; those which have been unchanged and those which have been deformed in some way in order to better fit the phonological system of Buwal.

Looking first at those words which have retained their original form, some already fit within Buwal phonology.

Examples:

[kɑj]	'interjection, no'	(Fulfulde 'kay!')

Other words contravene the rules of Buwal phonology such as:

(a) palatalisation as a prosody covering a whole root.

[sej]	'except'	(/s/ not palatalised to become [ʃ])	(Fulfulde 'sey')
[ʃɑj]	'tea'	([ʃ] occuring before an unpalatalised vowel)	
		(Fulfulde 'sha'i')	
[nɛbɑm]	'oil'	(Fulfulde 'nebbam')	
[lɛkʷol]	'school'	(French 'l'école')	

(b) round vowels occuring only next to labialised velar consonants or the labio-velar glide /w/.

[ɓundo]	'well'	(Fulfulde 'ɓunndu')
[fu]	'all'	(Fulfulde 'fuu')
[tol]	'roofing iron'	(French 'tole')

(c) No words ending in [ə].

[kɪlomɛtrə]	'kilometre'	(French)
[pɑstəː]	'pastor'	(French 'pasteur')

(d) No nasal vowels.

[mɑgɑzĩ]	'store'	(French 'magasin')

(e) No long vowels.

[dɑlɑːʒ]	'concrete slab'	(French 'dalage')

(f) Insertion of schwa between two consonants word medially.

[hɑɓdɑ]	'make an effort'	(Fulfulde)

Some of the above words, especially those from French could be regarded as a case of code switching rather than borrowing. Most Buwal speakers can speak Fulfulde to some degree, and those who have been to school can speak some French.

There are other words which have been borrowed that have been deformed. The types of processes which take place in the deformation of borrowed words include:

(a) correction of palatalisation.

[ʃaj]	→ [saj]	'tea'	(Fulfulde 'sha'i')

Note this is an alternate pronunciation to the one listed above where the palatalisation is not corrected.

[dʒanːga]	→ [dʒɪŋgɛ]	'read, study'	(Fulfulde 'jannga')
[paɾɛːdʒɛ]	→ [pɛɾɛdʒɛ]	'doors'	(Fulfulde 'pareeje')
[ɗɛɾɛwol]	→ [ɗɛɾɛwɛl]	'paper'	(Fulfulde 'ɗerewol')
[koːsaj]	→ [kʷoʃɛ]	'doughnut'	(Fulfulde 'koosay')

(b) correction of labialised vowels.

[tum tum]	→ [tam tam]	'daily, all the time'	(Fulfulde 'tum')
[luːmo]	→ [lumɑ]	'market'	(Fulfulde 'luumo')
[ɗɛɾɛwol]	→ [ɗɛɾɛwɛl]	'paper'	(Fulfulde 'ɗerewol')
[koɾowal]	→ [kaɾawal]	'chair'	(Fulfulde 'korowal'

(c) Word final [ə] becomes a full vowel.

[sʏkɾə]	→ [sukɑ]	'sugar'	(French 'sucre')
[mɛːtɾə]	→ [mɛntɛr]	'teacher'	(French 'maître')
[ɓunːdu]	→ [ɓundo]	'well'	(Fulfulde 'ɓunndu')

(d) Long vowels eliminated. Either simply shortened or the syllable is closed with a nasal.

[bɑːbɑ]	→ [bɑbɑ]	'father'	(Fulfulde 'baaba')
[fuː]	→ [fu]	'all'	(Fulfulde 'fuu')

(e) Long consonants eliminated.

[nɛbːam]	→ [nɛbam]	'oil'	(Fulfulde 'nebbam')
[ɓunːdu]	→ [ɓundo]	'well'	(Fulfulde 'ɓunndu')
[dʒanːga]	→ [dʒɪŋgɛ]	'read, study'	(Fulfulde 'jannga')
[sɛmːbɛ]	→ [ʃembɛ]	'strength'	(Fulfulde 'semmbe')

(f) The high, front vowel [i] is lowered to [ɛ] in word-final syllables.

[maʃin]	→ [maʃɛn]	'machine'	(French 'machine')
[lir]	→ [lɛr]	'read'	

(f) Nasal vowels are eliminated by closing the syllable with a nasal.

[bɑlõ] → [bɑloŋ]	'ball'	(French 'balon')
[gɑlõ] → [gɑloŋ]	'bottle'	(French 'gallon')

2.4 Phonology of Interjections, Onomatopoeia and Ideophones

Interjections and onomatopoeia in Buwal, as in other languages show some unusual phonological features such as:

(a) Wild changes in pitch.

2317. [jāàà̰ː] 'noise of rain'

(b) Long vowels and consonants.

2406. [héēèj] 'hey!'

2317. [jāàà̰ː] 'noise of rain'

1706. [ᵐbɛ̀ɮːɛ́] 'fixedly'

(c) Aspiration.

2412. [pʰőhʷ] 'noise of suddenly entering or exiting'

(d) Presence of the glottal stop.

2411. [m̄ʔm̄ː] hesitation

(e) Repetition for repeated events or noises.

2415.	[ᵑgām ᵑgàm ᵑgām ᵑgàm]	'noise of grinding with a stone'
2409.	[kʷőɗɛ̋ kʷóɗɛ́ kʷūɗɛ̄ kʷùɗɛ̀ ....]	'a bird cry'
2316.	[dīm dīm dīm]	'noise of thunder'
2319.	[tāp tāp tāp]	'noise of running quickly'

(f) Vowel glides

2407.	[ɛ̏ɛ̀]	'hey?'
2418.	[wóő]	'whoa!'

(g) Nasal vowels

2407. [ɛ̏ɛ̀] 'hey?'

(h) Breaking of palatalisation rules.

2410. [kő̌tʃő́ kə́tʃá kātʃā̌ kə̀tʃà....] 'cry of the guinea fowl'

(i) Short vowels (i˙e. /ə/ and its allophones) in word final syllables

2408. [bǐm] ‘noise of suddening digging’

(j) Rounded vowels not next to labialised velar consonants or labio-velar glide /w/.

2322. [bőf] ‘suddenly come out’

2321. [bőj] ‘suddenly’

Buwal, like other Central Chadic languages has a class of manner adverbs which are often described as ‘ideophones’(Schuh 1998: 308-309; Frajzyngier 2001: 164). In many languages these have unusual phonological features. An extensive study has not yet been made of ideophones in Buwal but of those noted so far many conform to the normal phonological system of the language. Some, however, do not and show the following unusual features:

(a) Long vowels

2318. [fáː] ‘manner of putting hand in bag’

Example sentence:

[ɗɑf ɑ ɗɑf rɑ, **fɑː**, ɑ ndʒew rɑ hɛdʒɛ fogʷolokʷ]

‘He reached into the bag and pulled out the hand of the leper.’

(b) Short vowels (ie. /ə/ and its allophones) in word final syllables

2414. [àtúl] ‘manner of smoke ascending’

Example sentence:

[**ɑtul**, ɑ dəbɑs] ‘Smoke rising, it catches fire.’

1923. [ɣrī̀k] ‘manner of arriving fat and solid’

Example sentence:

[iː tsoː, mɑlɑm ɛgɛ wɛʃɛ **ɣrɪk**] ‘They were over there, those hefty muslims.’

(c) Rounded vowels not next to labialised velar consonants or labio-velar glide /w/.

2414. [àtúl] ‘manner of smoke ascending’

1922. [ūrɓám] ‘the fall of one dead’

Example sentence:

[ɑ ɓɑlɑtɑ tsɑ, **ʊrɓɑm**, iː mɑc] ‘He shoots them, they die.’

(d) Breaking of palatalisation rules.

2619. [àŋgέ] ‘noise of flute’

Example sentence:

[biː kádzʊˈlɑ zɑ tɑ mʃɛ, ɑŋgɛ, ɑŋgɛ]

‘The chief cried out on the mountain Mshe, peep, peep.’

2.5 Ordering of Morpheme Level Phonological Rules

In Table 4 below is a proposed ordering of morpheme level phonological rules for Buwal outlined so far. Note that some of the rules above can change their order (these are shaded). For example the rule concerning the interaction of full vowel with following glides (rules 5-6 and 9) could occur any time after palatalisation has been applied. Also, the final two post lexical rules could just as easily be applied before rule 15 concerning schwa insertion. However, the order of the other rules is important. This is illustrated by the example derivations following the table. The vowel reduction rule (16) has been placed in parentheses as it is optionally applied.

Table 4: Order of Morpheme Level Phonological Rules

Summary of Rules	Rule Number
Lexical Rules	
(Vowel reduction in closed syllables)	Rule 16(a)
Labialisation from labialised velar consonants onto vowels	Rule 10(a)-Rule 13(a)
Palatalisation	Rule 7(a)-Rule 8
Insertion of schwa before a nasal or glide word initially	Rule 1
Rounding or heightening of schwa and its allophone by glides	Rule 3(a)
Fusion of allophones of schwa and following glide	Rule 4(a)
Vowel lowering of schwa word initially	Rule 2
Raising of [ɛ] to [e] before glides	Rule 9(a)
Fronting of /w/ to [ɥ] following [e]	Rule 5
Fusion of /ɑw/ to become [oː] word finally	Rule 6
Postlexical Rules	
Insertion of schwa between a liquid and following prenasalised plosive	Rule 15
Raising of [ʊ] to [u] in closed syllables	Rule 14
Vowel nasalisation	Rule 17

Labialisation from labialised velar consonants needs to occur *before* palatalisation as illustrated by the following derivations.

		/kʷátsárʏ/	‘(be) intelligent’	0259.
Rule 10(a).	Labialistion of full vowel	kʷotsɑrʏ		
Rules 7-8.	Palatalisation	[kʷœ́tʃɛ́r]		
		/gʷəzəláx/	‘(be) striped’	1997.
Rule 13(a).	Labialisation of schwa	gʷʊzəlɑxʏ		
Rules 7-8.	Palatalisation	[gʷʊ̀ʒìlɛ̀x]		

As was mentioned earlier, [ʊ] is not susceptible to palatalisation.

It can also be seen that palatalisation needs to be applied *before* the insertion of schwa before a nasal or glide word initially and any modifications that may be made to the schwa.

		/wnɑ̀kʏ/	‘make hot’	2018.
Rule 7.	Palatalisation	wnɛk		
Rule 1.	Insertion of schwa	əwnɛk		
Rule 3(a).	Rounding of schwa	ʊwnɛk		
Rule 4(a).	Fusion	[ʊ̀.nɛ̀k]		

In this example rules 1 and 3 are in a feeding relationship with rule 4 and therefore must be applied beforehand. Palatalisation occurs before the insertion of schwa as in this case the schwa is not palatalised to become [ɪ] as in the following example where schwa is part of the underlying structure of the word.

		/ləwɑ̀tsʏ/	‘fireplace’	1309.
Rules 7-8.	Palatalisation	lɪwɛtʃ		
Rule 3(c).	Rounding of [ɪ]	[lʏ̀wɛ̀tʃ]		

3 Basic Structural Units

3.1 Syllable Structure

Buwal has a large variety of syllable types which are listed in the following table with examples.

Table 5: Summary of Syllable Structures in Buwal

Syllable Type	Example
V	1699. [ā̀jāw] 'yes'
N	0605. [m̀sār] 'fry'
VC	2492. [án**t**á] 'his'
CV	0856. [d**ā**] 'bring'
CVC	0247. [g**àl**] 'grow up'
CCV	0768. [br**ɛ́**] 'herd'
CCVC	1817. [pl**ɛ̄m**] 'sprain (foot)'

The most common syllables types are CV and CVC.

3.2 Root Structure

Roberts (2001 : 114) states that the consonant skeleton is more important to the phonological structure of Central Chadic languages than syllables. This consonantal skeleton along with the full vowel phoneme /ɑ/ provide the basis onto which the schwa, tone and palatalisation and labialisation prosodies are added to form lexemes. In this section, therefore, the structure of lexical roots in Buwal, particularly of nouns and verbs, will be examined with relation to the consonantal skeleton and the position of the full vowel phoneme. The schwa will not be included as part of the underlying structure in this section.

3.2.1 Root Structure of Nouns

Table 6, below, summarizes the root structures discovered for nouns in Buwal. Next to each structure is the number of examples found in an inventory of 466 simple nouns. Many nouns have been excluded due to reduplication, the presence of a possible lexicalised affix or being compound nouns. These are discussed under the section on noun word structure (section 3.3.1 Nouns).

The most common noun structure in Buwal is CaCaC, followed by CCaC, CCa and then CaCCaC. Note that there were no nouns found beginning with a vowel.

Table 6: Root Structure of Nouns

	1 Vowel	2 Vowels	3 Vowels
1 Consonant	Ca (7)		
2 Consonants	CaC (54) CCa (33)	CaCa (36)	
3 Consonants	CCaC (88) CCCa (3)	CaCaC (120) CaCCa (15) CCaCa (2)	CaCaCa (13)
4 Consonants	CCCaC (21)	CCaCCa (2) CaCCCa (3) CaCCaC (29) CCaCaC (2)	CaCaCaC (22) CaCCaCa (1)
5 Consonants		CaCCCaC (1)	CaCaCCaC (3) CaCCaCaC (9)
6 Consonants			CCaCCaCaC (2)

Examples for each noun root structure:

1 Vowel

Ca	0015.	/mā/			‘mouth’
CaC	0013.	/ɣàm/			‘ear’
CCa	0078.	/dzvā/	→	[dzəvā]	‘breastbone’
CCaC	0022.	/bzám/	→	[bəzám]	‘chin’
CCCa	1318.	/ŋtrā/	→	[ŋtᵊɾā]	‘moon’
CCCaC	1344.	/ŋkràm/	→	[ŋkᵊɾàm]	‘dry season’

2 Vowels

CaCa	0197.	/ɓáɓā/			‘deaf/mute’
CaCaC	0099.	/dā̃lākʸ/	→	[dɛ̃lɛ̃k]	‘bile, gall’
CaCCa	0551.	/gàvdā/			‘bracelet’
CCaCa	0800.	/ŋtālāʸ/	→	[ŋtɛ̃lɛ̃]	‘fish dam’
CCaCCa	0349.	/kʷzàkʷnā/	→	[kʷùzòkʷəˀnā]	'uncle'
CaCCCa	0664.	/hālwlā/	→	[hālū.lā]	‘wall’
CaCCaC	0085.	/ɣāmpāf/			‘lungs’
CCaCaC	2219.	/ŋtáwán/			‘type of fruit’
CaCCCaC	0618.	/dàmtkʷàl/	→	[dàmtəkʷàl]	‘pestle’

3 Vowels

CaCaCa	0017.	/gānānā/			‘tongue’
CaCaCaC	0019.	/tátákʷām/	→	[tátákʷōm]	‘molar tooth’
CaCCaCa	1164.	/kʷrᵐbɑlɑ/	→	[kʷúrə́ᵐbàlá]	‘shea-butter tree’
CaCaCCaC	1046.	/tātākʷlásʸ/	→	[tētēkʷūlɛ́ʃ]	‘partridge’
CaCCaCaC	0020.	/gārɗáɗāŋ/			‘palate’
CCaCCaCaC	1136.	/kʷƮāktáɗāk/	→	[kʷùƮāktáɗāk]	‘leech’

3.2.2 Root Structure of Verbs

Verb roots in Buwal consist of a consonantal skeleton containing one to three of the basic vowel /ɑ/. The schwa was inserted historically, depending on the consonants and resulting syllable structure in order break up consonant clusters (see section 2.2.5 The Epenthetic Nature of Schwa). The table below summarizes the root structures discovered for verbs. It can be readily seen that there is a greater variety of root structures for nouns than for verbs. Next to each structure is the number of examples found in an inventory of 447 Buwal verbs.

Table 7: Root Structures of Verbs

	1 Vowel	2 Vowels	3 Vowels
1 Consonant	Ca (21)		
2 Consonants	CaC (224) CCa (10)	CaCa (2)	
3 Consonants	CCaC (110)	CaCaC (55)	
4 Consonants	CCCaC (11)	CaCCaC (12)	CaCaCaC (1)

It can be seen from the above table that a wide variety of root structures are available for verbs in Buwal. The most common structure is CaC, followed by CCaC and then CaCaC. No verb roots begin with a vowel and the majority of verbs end in a consonant. Also of note is that no consonant clusters appear in the word-final position. This is unusual for Central Chadic languages. For example for Moloko, Bow (1997: 30) found that many words contain an epenthetic schwa in the final syllable in a non-pausal situation but that this vowel is lowered before a pause to become a full vowel. It is possible that this process occurred in Buwal sometime in the past but now the full vowel has become part of the underlying structure of the word.

Examples for each verb root structure:

1 Vowel

Ca	0591.	/dà/		‘prepare food’
CaC	0128.	/wān/		‘sleep’
CCa	0476.	/bƷā/	→ [bəƷā]	‘bless’
CCaC	0130.	/fɗāx/	→ [fəɗāx]	‘wake up’
CCCaC	0183.	/ŋtɓàl/	→ [ŋ̀təɓàl]	‘(be) tired’

2 Vowels

CaCa	0122.	/nānā/		‘shiver’
CaCaC	0276.	/làlàk/		‘be frightened’
CaCCaC	0151.	/gʷàrzàm/	→ [gʷəɾˤzàm]	‘rise up’

3 Vowels

CaCaCaC	1414.	/tàtàᵑgàlʸ/	→ [tètèᵑgèl]	‘roll (on ground)’

3.2.3 Structure of Adjectives

As for nouns there is a large variety of root structures for adjectives in Buwal which are summarised in the following table. Next to each structure is the number of examples found in an inventory of 98 Buwal adjectives.

Table 8: Root Structure of Adjectives

	1 Vowel	2 Vowels	3 Vowels
1 Consonant	Ca (2)		
2 Consonants	CaC (12) CCa (3)	CaCa (8)	
3 Consonants	CCaC (11)	CaCaC (13) CaCCa (2) CCaCa (1)	CaCaCa (8)
4 Consonants	CCCaC (4)	CaCCaC (9) CCCaCa (1)	CaCaCaC (12) CaCCaCa (2)
5 Consonants		CaCCCaC (1) CCCaCaC (1)	CaCaCCaC (1) CaCCaCaC (7)

Examples for each adjective root structure:

1 Vowel

Ca	2020.	/ndzā^{Y}/	→	[ndʒɛ̄]	‘raw’
CaC	1515.	/dāf^{Y}/	→	[dɛ̄f]	‘short’
CCa	1557.	/vɾà^{Y}/	→	[vᵊɾè]	‘red’
CCaC	1639.	/vrām/			‘many’
CCCaC	1652.	/dfnàk^{Y}/	→	[dìfnèk]	‘dark (colour)’

2 Vowels

CaCa	1588.	/máwā/	→	[méwɛ̄]	‘new’
CaCaC	2006.	/fáʃāt¬^{Y}/	→	[fɛ́ʃɛ̄t¬]	‘tiny’
CaCCa	1640.	/tʃákʷdā^{Y}/	→	[tʃékʷúdɛ̄]	‘few’
CCaCa	1811.	/zkʷōná /	→	[zʊ̀kʷōná]	‘better’
CaCCaC	1561.	/ɣàzɓàŋ /			‘yellow’
CCCaCa	1907.	/wrɗàɗá^{Y}/	→	[wʊ̀rɗɛ̀ɗɛ́]	‘patchy’
CaCCCaC	2525.	/mátrʃáŋ^{wY}/	→	[métərʃœ́ŋʷ]	‘pestle’
CCCaCaC	2513.	/tkʷsásār/	→	[tūkʷsásār]	‘dry’

3 Vowels

CaCaCa	1634.	/dàkālá/			‘abundant’
CaCaCaC	1734.	/mátákān/			‘another’
CaCCaCa	1787.	/bàrlàlá/			‘patchy’
CaCaCCaC	2284.	/tātákʷdàf/	→	[tātákʷʊ̄dɗof]	‘thick (liquid)’
CaCCaCaC	2509.	/kʷàftàlàxʷ/	→	[kʷòftàlòxʷ]	‘dusty’

A significant number of adjectives are formed by inherent reduplication.

Examples of reduplicated adjectives:

2192. [ɬɛ̄p¬ɬɛ́p¬] ‘narrow’ 0193. [tʃɛ́rtʃɛ́r] ‘thin’

3.2.4 Structure of Simple Prepositions

Grammatical particles such as simple prepositions have simpler structure than lexical items in that they are mono or disyllabic. Open syllables are common. Consonant clusters are rare, but they do occur in certain morphemes. Interestingly, a preposition may consist of a single vowel or consonant. Possible structures of simple prepositions with examples are listed in Table 9 below.

Table 9: Structure of Prepositions

Structure	Examples	Gloss	Number
a	[á]	‘to, at’	2420.
C	[ŋ́]	‘in’	2421.
Ca	[tá]	‘by’	2479.
CaC	[gbáŋ]	‘opposite’	1677.
CCa	[kədā]	‘towards’	1709.
CaCa	[mālā]	‘for’	1812.
CaCaC	[tsáláx]	‘up to’	2671.

3.2.5 Structure of Affixes

The majority of affixes in Buwal attach to verbs. Prefixes have a simple structure, being either one or two syllables. The subject agreement markers below illustrate the possible prefix structures.

Table 10: Structure of Prefixes

Structure	Examples	Gloss
a-	/ā-/	3sSBJ
C-	/ɟ́-/	3pSBJ
Ca-	/sā-/	1sSBJ
CaCa-	/nɛ̀né-/	1p(excl)SBJ

There is a larger range of structures for suffixes than prefixes. Possible suffix structures are summarised in the table below.

Table 11: Structure of Suffixes

Structure	Examples	Gloss
-a	/-ā/	EXO
-aC	/-āw/	3sOBJ(dir)
-Ca	/-ɓā/	BEN
-CaC	/-màw/	1p(dual)OBJ
-aCa	/-ānà^{Y}/	3sOBJ(ind)
-aCaC	/-ākāy^{Y}/	1sOBJ
-aCaCa	/-ātānā^{Y}/	3pOBJ(ind)

3.3 Word Structure

This section describes the structure of word stems and the phonological processes involved in their formation.

3.3.1 Nouns

3.3.1.1 Plural Marking

Noun morphology is relatively simple compared with verb morphology in Buwal. Noun roots may take either the irregular plural suffix /-jɑ^{Y}/ which applies to a closed class of animate nouns which are listed in the table below, or the plural enclitic /=ɑgɑ^{Y}/. The plural enclitic is described in more detail and examples are given in section 5 Morphophonemic Processes on morphophonemics.

When the plural suffix /-jɑ^{Y}/ was attached historically to the noun root the final rhyme of the root was deleted. If the resulting root ended with a consonant a schwa was inserted which was then pronounced [i] due to the presence of the following palatal glide. The first two examples in the table below of nouns ending in /Vk/ which was then elided could be a case of an ancient suffix. Schuh (1981: 19) states that –k is a proto-Chadic determiner. He found that in the Bade/Ngizim group of Western Chadic nouns have the suffix (a)k. In Ngizim it is only found on the singular form of nouns as in the case for these few examples in Buwal. The other examples where the noun ends in a vowel could be an example of vowel reduction of the noun final vowel and then heightening due to the palatal glide /j/.

Table 12: List of Nouns Which Take the Plural Suffix /-jɑ^{Y}/

Singular		Plural	
gɑmtɑk	‘chicken’	gɛmtijɛ	‘chickens’
ŋtɪmɛk	‘sheep’	ŋtɪmijɛ	‘sheep(pl)’
ŋh^{w}ɑ	‘goat’	ŋh^{w}ijɛ	‘goats’
wɑlɑ	‘woman’	wɪlijɛ	‘women’
hɑldɑmɑ	‘girl’	hɛldɪmijɛ	‘girls’
hɛdʒɛ	‘person’	hɛdʒijɛ	‘people’
mɮɑ	‘blacksmith’	mɮijɛ	‘blacksmiths’
ɮɑ	‘cow’	ɮijɛ	‘cattle’

There is also an irregular plural which end with the plural suffix /-jɑ^{Y}/:

[^{m}boː] ‘child’ [ʊˈʒijɛ] ‘children’

The plural suffix /-jɑ^{Y}/ differs from the plural enclitic /=ɑgɑ^{ʏ}/ in that it only occurs with a closed group of animate nouns (apart from 'other'). Not all animate nouns form their plural in this way. For example whilst the plural of [wɑlɑ] 'woman' is [wɪlijɛ] 'women', the plural of [mɑwɑl] 'man' is [mɑwɑlɛgɛ] 'men'. Whilst it is difficult to come up with a simple rule which determines which animate nouns take /-jɑ^{Y}/, it can be observed that it is the domestic animals which are raised for food which form their plural in this way, whereas wild animals do not. Another difference between the two ways of forming the plural is that the suffix /-jɑ^{Y}/ is always attached to the noun root whereas the enclitic /=ɑgɑ^{ʏ}/ occurs at the end of the noun phrase.

3.3.1.2 Nouns Derived from Verbs

Certain nouns may be derived from verbs. There are two main types: agent nouns and action nouns. For both of these a prefix of the form CV- (/mɑ-/ for agent nouns and /lɑ-/ for action) is attached to the front of a verb root.

Examples of verb nominalisations:

0453.	[ràk]	'ask'	0405.	[māràk]	'begger' (lit. one who asks)
			0455.	[lāràk]	'request'

3.3.1.3 Compound Nouns

There are many compound nouns in Buwal. They are formed by the juxtaposition of the two noun roots. The types of morphophonemic processes which occur during compound noun formation are described and examples given in section 5 Morphophonemic Processes.

Examples of compound nouns:

0059.	[mbàrá]	'finger'	1232.	[ndərəŋg^{w}ójāŋ]	'corn'
	/mbàw + rá/			/ndràj^{Y} + ŋg^{w}ájāŋ/	
	child hand			millet 'Ngoyang' (name)	
	'Child of hand'			'millet of Ngoyang'	

3.3.1.4 Reduplication

Many nouns in Buwal contain inherent reduplication of syllables or the whole phonological word (see examples below). For nouns this reduplication carries no particular meaning.

Examples of reduplication:

1350.	[ʃɛ̄ŋʃɛ̄ŋ]	‘shadow’	2150.	[xɛ̄ɗɛ́xɛ̄ɗɛ́]	‘justice, sincerity’
1094.	[ɣʷɔ̀rɮáɣʷɔ̀rɮā]	‘snail’	1049.	[tʃɛ́ktʃɛ́kgɛ̀ɾɛ̄k]	‘kingfisher’

Nouns of the form in the examples below may have originally been reduplications of the structure CaCa with the second vowel being deleted.

0933.	[gʷōjgʷōjā]	‘feast (n)’	1241.	[wɛ̄lwɛ́lɛ̄]	‘sugar cane’

For example 1241. above, the pronunciation [wɛ́lɛ̄wɛ́lɛ̄] is also attested and in the neighbouring language, Gavar, the word for ‘feast’ is [gʷōjāgʷōjā].

3.3.1.5 Lexicalised Affixes

Most Central Chadic languages have nouns with a prefix /mɑ-/ which is probably very old and may not be the same as the nominalising prefix on verbs mentioned in section 3.3.1.2 Nouns Derived from Verbs (Smith 1999, 23). There are many nouns which begin with /mɑ/ which may have originally been a nominalisation but over time have been lexicalised so that the original meaning has been lost. This is probably the case for many nouns which refer to animals or insects which not only begin with /mɑ/ but are also polymorphemic.

For the example below the original morphemes can still be discerned:

1099. [mādzábākālāf] ‘green mamba’

mɑ = dzɑ-bɑkɑlɑf
REL=hit/kill-buffalo
‘One who kills the buffalo’

The morphemes in the following example can only be partially discerned:

1145. [mɛ́mbɛ̀rəvɛ́tɛ́kɛ̄m] ‘dragonfly’

mɑ = mbɛr -vɛtɛkɛm
REL = jump/fly-?
‘One who flies ?’

For this example it is difficult to discern the orginal morphemes:

1127. [māɮárbābó:] ‘spider’

3.3.2 Verbs

There are very few phonological processes for forming verb stems in Buwal. However, as Gravina (2001, 5) found for Mbuko, many verb roots in Buwal can be seen to have developed historically through reduplication. Many of the examples (though not all) in the table below contain the idea of a repeated action or an ongoing process. However, no semantically linked pairs of verbs where one is a reduplicated form of the other, have as yet been found. Therefore is must be concluded that this process is no longer productive.

Table 13: Reduplicated Verb Roots in Buwal

Number	Verb	Gloss	Number	Verb	Gloss
0747.	[bābāt˥]	'clear (land)'	0122.	[ɬāɬār]	'paint'
2507.	[ɓɛ̄ɓɛ̄ɬ]	'sprinkle'	1856.	[nānā]	'shiver/tremble'
1585.	[dàdàk]	'make dirty'	1826.	[ŋgàŋgàl]	'sway'
0845.	[dɛ̀dɛ̀r]	'wander'	2019.	[ŋgʷōŋgʷōp˥]	'develop (sore)'
2269.	[dzàdzàr]	'filter'	2428.	[pāpās]	'spread out bits'
0882.	[fɛ̄fœ̄kʷ]	'whistle'	1039.	[ràɾàm]	'growl'
2640.	[gàgàt]	'gulp down'	1990.	[sàsàk]	'sift'
2560.	[hʷòhʷàt]	'dig a little'	0132.	[tsàtsàn]	'notice'
1499.	[kàkàt˥]	'massage'	2435.	[tʃɛ̄tʃɛ̄r]	'pour a little'
2181.	[jājāx]	'melt'	0777.	[tātāk]	'chase'
1467.	[kʷœ̄kʷɛ̄t˥]	'scatter'	1632.	[tsàtsàl]	'solve, resolve'
0276.	[làlàk]	'be afraid'	1751.	[wɛ̄wɛ̄k]	'twirl'

4 Phonotactics

4.1 Distribution of Consonants in Words and Syllables

In this section, the phonotactics of consonants and their behaviour in phonetic consonant clusters is described. The phonotactics of consonants apart from consonant clusters is summarised in Table A1: Phonotactics of Consonants (apart from word-initial consonant clusters) in Appendix A: Phonotactics Tables. Several observations can be made about the restrictions of the occurrence of particular consonants in certain positions.

1) Voiced plosives are never found word-final.

2) The distribution of the velar nasals /ŋ/ and /ŋ^{w}/ is extremely limited. They are not contrastive in the word-initial position before a consonant where the contrast with /n/ is neutralised. In the word-medial position /ŋ/ and /n/ were found only to contrast before the laminal affricate (see section 2.1.5 Nasals).

3) Prenasalised plosives do not occur in word-final position.

4) Certain classes of consonants were not found in the syllable-final position in the middle of a word.

(a) Voiced plosives, except for the velar voiced plosive /g/.
(b) The lateral fricatives: /ɬ/ and /ɮ/
(c) The voiceless and voiced velar labialised fricatives: /x^{w}/ and /ɣ^{w}/
(d) The labio-velar plosives: /gb/ and /^{ŋm}gb/

4.2 Distribution of Consonants in Phonetic Clusters

The fact that roots in Buwal are based on a consonantal skeleton along with the full vowel phoneme /ɑ/ leads to the manifestation of many consonant clusters at the phonetic level. Historically, certain underlying consonant clusters were broken up at the phonetic level by schwa insertion, however others remained. The distribution of the schwa was outlined in section 2.2.5 The Epenthetic Nature of Schwa. This section describes the distribution of consonants within phonetic consonant clusters. There are a limited number of permitted combinations for word-initial consonant clusters. They generally involve:

(a) A nasal followed by a [-sonorant] consonant.
(b) A [-sonorant] consonant followed by a liquid (a schwa may be optionally inserted to aid pronunciation).
(c) The voiceless laminal fricative /s/ followed by either a labial or a velar voiceless plosive.

Possible phonetic word-initial consonant clusters are summarised in Table A2: Possible Word-Initial Phonetic CC Clusters in Appendix A: Phonotactics Tables.

Consonant clusters containing three consonants may sometimes be found word-intial when a nasal is followed by a [-sonorant] followed by a liquid as in the following examples:

0340. [m̀sʰɾā] ‘old person’ 1344. [ŋ̀kʰɾàm] ‘dry season’

A greater variety of word-medial phonetic consonant clusters is found. These include all the word-initial clusters outlined above, plus clusters which include:

(a) Two obstruents e.g. 0697. [gìdégdɛ̄] ‘mat’

These usually involve a velar and an alveolar obstruent in either order. Both obstruents are either voiced or voiceless, with the alveolar implosive [ɗ] being grouped with the voiceless consonants.

(b) A continuent + an obstruent e.g. 0551. [gávdā] ‘bracelet’

(c) Two continuents e.g. 1525. [tāxɬādɗ̄j] ‘(be) flat’

From the above it can be seen that for word-medial consonant clusters the sonority hierarchy is relevant. Most of the CC clusters have two consonants of either the same sonority or a higher sonority followed by a lower sonority. The exception is clusters containing liquids which have already been shown to form a complex syllable onset in the word-initial position. These clusters also form a complex syllable onset in the word-medial position whereas other clusters occur across a syllable boundary.

4.3 Co-occurence Restrictions of Consonants in Clusters

Now we come to a discussion of the types of consonants which may occur together in consonant clusters. Table A3: Consonant types of Following Consonants in C Clusters and Table A4: Consonant Types of Preceding Consonants in C Clusters in Appendix A: Phonotactics Tables summarise the consonant types which may occur for following and preceding consonants in phonetic consonant clusters. The data for word-initial and word-medial consonant clusters have been combined. Looking firstly at the consonant types for following consonants, some general observations can be made about place of articulation restrictions.

(a) Labial consonants apart from the nasal /m/ may only be followed by alveolar consonants.
(b) Velar consonants apart from the nasal /ŋ/ are generally only followed by alveolar consonants except for one exception where the velar voiceless fricative /x/ is followed by the velar voiceless plosive /k/.
(c) Alveolar consonants apart from the nasal /n/ and the implosive /ɗ/ are only followed by other alveolar consonants.

(d) Laminal consonants are not followed by other laminal or palatal consonants.
(e) The labialised velar nasal /ŋ^{w}/ is only followed by labialised velar consonants.
(f) The alveolar nasal /n/ is never followed by a labial or velar consonant.
(g) Glides are not followed by palatal consonants and the labio-velar glide /w/ is never followed by a velar consonant.

Concerning the manner of articulation of following consonants:
(a) Plosives are never followed by a glide.
(b) Implosives are not followed by another implosive, a nasal or a glide.
(c) Fricatives are not followed by implosives, nasals or glides.
(d) Nasals are not followed by liquids.
(e) The liquid /r/ may be followed by consonants of any manner of articulation but /l/ cannot be followed by another liquid, an implosive or a nasal.
(f) Glides cannot be followed by implosive or another glide.

In terms of voicing restrictions on following consonants, there seems to be no consistent pattern. Voiced consonants were found to follow all consonants except the voiceless laminal fricative /s/ and the alveolar nasal /n/. Voiceless consonants on the other hand showed a possible restriction in that they were not found to occur following voiced [-sonorant] consonants.

Turning now to consonant types of preceding consonants in consonant clusters, the following observations can be made about restrictions on the place of articulation:
(a) Labial consonants cannot be preceded by any other labial consonant except for the nasal /m/.
(b) Alveolar consonants apart from the liquid /r/ are not preceeded by laminal or palatal consonants.
(c) Velar consonants may not be preceeded by a labial consonant.
(d) Laminal consonants may not be preceeded by other laminal or palatal consonants.
(e) The palatal glide /j/ may only be preceeded by alveolar consonants.

Concerning the manner of articulation of preceeding consonants:
(a) Plosives are found to be preceeded by consonant with any manner of articulation except that only labialised plosives are preceeded by implosives.
(b) Implosives are not preceeded by other implosives or glides.
(c) Fricatives are not preceeded by plosives or glides.
(d) Nasals are not preceeded by plosives or implosives.
(e) Both liquids are not preceeded by nasals and the alveolar trill /r/ is never preceeded by as implosive or another liquid.
(f) Glides are never preceeded by plosives, implosives, fricatives or glides.

There is no consistent pattern of voicing restrictions of preceeding consonants in consonant clusters.

5 Morphophonemic Processes

In Buwal, verb morphology is more complex than noun morphology. Verbs roots may occur on their own in the imperative form or take up to three prefixes and five suffixes. Prefixes include subject and tense/aspect markers whilst suffixes include direct and indirect object markers, directionals, benefactive and transitive markers. For nouns only plural marking and the formation of compound nouns are relevant for this section. Irregular plurals were discussed in section 3.3.1.1 Plural Marking whilst the plural enclitic /-ɑgɑ^{Y}/ will be covered here.

This section describes the phonological processes which occur when morphemes come together to form phonological words.

5.1 Prosodic Processes

An interesting aspect of many Central Chadic languages is that prosodies such as palatalisation and labialisation (see sections 2.2.1 Vowel Harmony and the Palatalisation Prosody and 2.2.2 Local Labialisation Effects) may spread from one morpheme to another during word formation.

5.1.1 Palatalisation Prosody Spread

1) Palatalisation can spread leftwards from:

(a) a verb root to its prefixes

sɑ	+ kɑ	+ ɮɪmɛ	→ [s**ɛkɛ**ɮɪmɛ]	'I understand.'
1sSBJ	PRES.IMP	understand		

Note that in this case whether the palatalisation spreads left from a verb root onto its prefixes and how far it spreads may depend on the speed of speech. Therefore for the above example one could hear the following variations:

[sɑkɑɮɪmɛ] [sɑkɛɮɪmɛ] [sɛkɛɮɪmɛ] [ʃɛkɛɮɪmɛ]

(b) a verb suffix to the verb root (and beyond).

sɑ	+ skɑm	+ ɛnɛ	→ [**ʃɛʃkɛm**ɛnɛ]	'I buy for him…'
1sSBJ	buy	3sOBJ(ind)		

Palatalisation will *always* spread from the verb suffix to the verb root but whether it spreads beyond again depends on the speed of speech as described above.

The exception to the above is that a labialised syllable may block the spread of palatalisation as described in section 2.2.2 Local Labialisation Effects.

ɣ^{w}ol	+ zɑ	+ ɛkej	→ [ɣ^{w}olʒɛkej]	'Show that to me'
show	TRANS	1sOBJ		

2) Palatalisation may spread rightward from a verb root onto the 3rd person singular direct object suffix /-ɑw/.

sɑ	+ ká	+ mɛɗ	+ ɑw →	[sɑkémɛɗęɥ]	‘I swallowed it.’
1sSBJ	PERF	swallow	3sOBJ(dir)		

The following rules for word level palatalisation spread may be proposed:

Rule 18

(a) Palatalisation spreads from right to left zero, one or more syllables across morpheme boundaries depending on the speed of speech.

(b) Palatalisation may spread from left to right one syllable across a morpheme boundary.

5.1.2 Labialisation Spread

When affixes are attached to a root there may be some variation in the rules conditioning labialisation spread as described in section 2.2.2 Local Labialisation Effects. For example, when the 2nd person subject agreement prefix /xʷɑ̄-/ is attached to the front of a verb, labialisation does not always spread rightward as in Rule 10(a). Whether it does or not depends on the following consonant. In general if the following consonant is anything but alveolar /ɑ/ will always be rounded to become [o].

Rule 19(a)

$$/x^{w}ɑ\text{-}/ \rightarrow [h^{w}o]/\_\_C_{[-\text{alveolar}]}$$

Examples:

/xʷɑ-/ +	/fɑt/ +	/-ɑw/	→ [hʷ**o**fɑtɑw]	‘You slaughter it.’
2sSBJ	slice	3sOBJ(dir)		

/xʷɑ-/ +	/kɑ-/ +	/zɑm/	→ [hʷ**o**kɑzɑm]	‘You are eating.’
2sSBJ	IMP	eat		

However, before an alveolar consonant /ɑ/ and [o] are in free variation.

Rule 19(b)

$$/x^{w}ɑ\text{-}/ \sim [h^{w}o]/\_\_C_{[+\text{alveolar}]}$$

Example:

/xʷɑ-/ +	/ɗɑᵐbɑlʸ/ +	/ɑkɑjʸ/	→	[hʷɑɗɛmbɛlɛkej] ~ [hʷoɗɛmbɛlɛkej]
2sSBJ	pick	1sOBJ(ind)		‘You pick for me.’

Labialisation also spreads leftward from a root onto a prefix, or from a suffix onto the previous syllable.

Rule 20

$$\underset{[-\text{round}]}{V} \rightarrow \underset{[+\text{round}]}{V/\_\_]K^{w}}$$

Examples:

/sɑ-/ + /ká-/ + /gʷɑrzɑm/ → [sɑkʷ**ó**gʷɔrzɑm] ‘I got up.’

1sSBJ PERF get up

/sɑ-/ + /ɣʷɑl/ + /-zɑ/ + /-ɑhʷɑ/ → [sɑɣʷolz**o**hʷo] ‘I show that one to you’

1sSBJ show TRANS 2sOBJ(ind)

5.2 Vocalic Processes

5.2.1 Vowel Elision

When two vowels come together at a morpheme boundary (represented by a square bracket), the first vowel is elided. This is actually a phrase rule which manifests itself also at the word level (see section 6.2.3 Vowel Elision).

Rule 21

$$V_1] + [V_2 \rightarrow [V_2$$

Examples of vowel elision:

xəzɑ + =ɛgɛ → [xəzɛgɛ] ‘dogs’

dog =PL

dɑ + ɛkej → [dɛkej] ‘bring to me’

bring 1sOBJ(ind)

5.2.2 Vowel Reduction

The circumstances under which a full vowel may be reduced to a schwa and the reverse were discussed in section 2.2.6 Conditions Under Which V → ə. The following rules were proposed.

Rule 16(a)

$$/ɑ/ \sim [ə]/\_\_\underset{[+\text{cont}]}{C.C}$$

Rule 16(a)

[ɛ] ~ [ɪ]/___C.C
[+cont]

Rule 16(a)

[o] ~ [ʊ]/___C.C
[+cont]

This type of process also can occur across morpheme boundaries when a suffix beginning with a consonant is attached to a verb or a noun ending with a continuent consonant.

Rule 22

/ɑ/ ~ [ə]/___C]C
[+cont]

For example, when the transitive marker suffix /-zɑ̃/ is attached to a verb ending with a continuent consonant the above process may take place.

Examples:

/gɑj/	+	/-zɑ/	→	gəyzɑ	→	[giˈzɑ]	‘Spoil that!’
spoil		TRANS					
/ɗɑw/	+	/-zɑ/	→	ɗəwzɑ	→	[ɗùˈzɑ]	‘Ask about that.’
want		TRANS					
/sɑr/	+	/-zɑ/	→	[sərzɑ]			‘Visit him/her.’
see		TRANS					

As was the case within morphemes, it is difficult to decide whether the above process is postlexical or not. There are variations in pronunciation depending on the speaker which would indicate that it is unconcious. For example for the verb ‘spoil’ one could hear the following three versions:

[gɑjzɑ] [gɛzɑ] [giˈzɑ]

However, there are certain speakers, especially those who speak french and fulfulde well who can hear the change in the vowel. It could be that this process of vowel reduction is in the process of becoming lexicalised.

The vowel reduction process can also be seen in the production of compound words where a morpheme ending with a glide is followed by a morpheme beginning with a consonant.

Examples:

/mɑ-/ +	/tɑwᵞ/ +	/mtsɑᵞ/	→	[métɤ̀.mtʃé]	1732.
REL-	carry	corpse		corpse carrier	
/ɮɑyᵞ/ +	/kʷʊsɑm/		→	[ɮì.kʷʊ̀sɑ̀m]	2630.
meat	body			flesh	

5.3 Consonantal Processes

5.3.1 Final Plosive Voicing

Word final voiceless velar plosives become voiced when the plural enclitic /=ɑgɑᵞ/ is attached to a noun root. Note that this is the only affix which causes this change in voicing. Verb suffixes which contain voiced consonants do not provoke this change.

Rule 23

$$C \rightarrow C/\_\_\_/=\text{ɑgɑ}^{\gamma}/$$

$$\begin{bmatrix}-\text{voice}\\ +\text{dors}\\ +\text{obstr}\end{bmatrix} \quad \begin{bmatrix}+\text{voice}\\ +\text{dors}\\ +\text{obstr}\end{bmatrix}$$

/gɑmtɑk/ + /= ɑgɑᵞ/ →	[gɑmtɛ**g**ɛgɛ]	‘chickens’[2]	
chicken =PL			
/dokʷ/ + /= ɑgɑᵞ/ →	[do**g**ʷɛgɛ]	‘horses’	
horse =PL			

In the following example, the final vowel of the 1st person possessive pronoun /nɑkɑ/ is elided before the plosive is voiced.

/hɛdʒɛ/ + /nɑkɑ/ + /=ɛgɛ/ →	[hɛdʒɛ nɛ**g**ɛgɛ]	‘my people/family’
person 1sPOSS =PL		

Compare:

/sɑ-/ + /flɑkʷ/ + /-ɛnɛ/ →	[sɑflo**kʷ**ɛnɛ]	‘I snatch woman for him.’
1sSBJ snatch woman 3sOBJ(ind)		

[2] This is an alternate plural form to [gɛmtijɛ] mentionned in section 3.3.1.1 Plural Marking.

5.4 Ordering of Word and Morpheme Level Phonological Rules

In the table below is a proposed ordering of word and morpheme level phonological rules for Buwal.

Table 14: Order of Word Level and Morpheme Level Phonological Rules

Summary of Rules	Rule Number
Lexical Rules	
Vowel elision	Rule 21
Vowel reduction in closed syllables	Rule 16(a), Rule 22
Labialisation from labialised velar consonants onto vowels	Rule 10(a)-Rule 13(a), Rule 19(a) & Rule 20
Palatalisation	Rule 7(a)-Rule 8, Rule 18
Insertion of schwa before a nasal or glide word initially	Rule 1
Rounding or heightening of schwa and its allophones by glides	Rule 3(a)
Fusion of allophones of schwa and following glide	Rule 4(a)
Vowel lowering of schwa word initially	Rule 2
Raising of [ɛ] to [e] before glides	Rule 9(a)
Fronting of /w/ to [ɥ] following [e]	Rule 5
Fusion of /ɑw/ to become [oː] word finally	Rule 6
Postlexical Rules	
Insertion of schwa between a liquid and following prenasalised plosive	Rule 15
Raising of [ʊ] to [u] in closed syllables	Rule 14
Vowel nasalisation	Rule 17
Final plosive voicing	Rule 23

As previously, those rules which are shaded could vary in their order in relation to other rules (see the explanation following Table 4: Order of Morpheme Level Phonological Rules). Note that affixes and clitics are attached early in word derivations before other rules are applied.

		/ɡɑmtɑk/	+	/=ɑgɑ^{Y}/
		chicken		=PL
Rule 18.	Palatalisation spread	ɡɑmtɛkɛgɛ		
Rule 23.	Final plosive voicing	[ɡɑmtɛgɛgɛ]		‘chickens’

As for morphemes, local labialisation effects caused by labialised velar consonants occur before palatalisation spread from affixes as can be illustrated from the following derivation where is can be seen that labialisation blocks palatalisation.

		/sɑ-/ +	/flɑkʷ/ +	/-ɑnɑʏ/
		1sSBJ	snatch woman	3sOBJ(ind)
Rule 11.	Labialisation	sɑflokʷɑnɑʏ		
Rule 18.	Palatalisation	[sɑflokʷɛnɛ]	‘I snatch woman for him’	
	(Pal blocked by Lab)			

The following example illustrates how vowel reduction occurs earlier in the derivation that palatalisation.

		/mɑ-/ +	/tɑwʏ/ +	/mtsɑʏ/
		REL-	carry	corpse
Rule 22.	Vowel reduction	mɑtəwmtʃɑʏ		
Rule 18.	Palatalisation	mɛtɪwmtʃɛ		
Rule 3.	Rounding of ɪ	mɛtʏwmtʃɛ		
Rule 4.	Fusion with glide	[mɛtʏ.mtʃɛ]	‘corpse carrier’	

That vowel elision occurs early in the derivation is shown by the following example.

		/hʷɑ-/ +	/rɑ/ +	/ɑkɑjʏ/
		2sSBJ	dig	1sOBJ(ind)
Rule 21.	Vowel elision	hʷɑrɑkɑjʏ		
Rule 19.	Labialisation	hʷorɑkɑjʏ		
Rule 18.	Palatalisation	[hʷorɛkɛj]	‘You dig for me.’	

6 Phrase Level Phonology

The phonological phrase in Buwal can be defined in terms of stress, phonological processes occurring within a phrase and pause or boundary marking.

6.1 Stress

Gravina (2001, 129) found that stress in Mbuko operated within a metrical system. He found that rhythmic stress was right-headed and runs from right to left. Within a pause phrase, the final syllable is stressed and then every second or third syllable counting to the left is stressed. A similar situation appears to be the case for Buwal. The final syllable of a phonological phrase is stressed and then every second, third and occasionally forth syllable to the left is also stressed (example sentences (1) and (2)). Stressed syllables are slightly lenghtened and have a greater volume.

(1)

[**dzā** là-**hān** ā**ká**] ‘Stop crying there!’

cut NOM-cry LOC

(2)

[**kʷóp** màdàk**nàk** màdē **vé**gēɗ m̀**pé**] ‘A cup which is black like tree leaves’

cup REL-black like leaves tree

An exception is pause phrases ending with certain disyllabic question words. In this case the first syllable of the question word is stressed (example sentence (3)).

(3)

[**dʒèm** ān**tá** ndzā **vá**ᵑgáj] ‘How long/high is it?’

length DEF sit how

6.2 Phonological Processes within a Phonological Phrase

6.2.1 Palatalisation Spread

Palatalisation does not normally spread across word boundaries in ordinary speech. However, the word-final vowel in an open syllable of a previous word may be palatalised as in the example sentences (4) and (5) below.

(4)

[kʷop madaknak madɛ vɛdʒɛɗ mpɛ] ‘A cup which is black like tree leaves’

cup REL=black like leaf tree

(5)

[dokʷ a laxtar **ɛ** ndʒɛ ɛndɛ ɣɛ̃] ‘That horse has a very black face.’

horse DEM very black at eye like this DEM

6.2.2 Labialisation Spread

Labialisation may spread leftward to the final syllable of a previous word if the syllable is open. Labialisation is more likely to spread if the onset of the previous syllable is a labial or velar consonant (see section 2.2.2 Local Labialisation Effects).

Rule 24

$$\underset{[\text{-round}]}{V} \rightarrow \underset{[+\text{round}][\text{-alveo}]}{V} \; / C\_\#K^{w}$$

Example:

(6)

/ɑ-/ + /sɑ/ + /-ɓɑ/ + /kʷɑlɑ/ → [ɑsɑɓ**o** kʷolɑ] 'he smokes a pipe for himself'

3sSBJ drink BEN pipe

6.2.3 Vowel Elision

As when two morphemes come together to form a phonological word (see section 5.2.1 Vowel Elision), when two vowels come together within a phonological phrase the first is elided as in examples (7) and (8) below.

Rule 25

$$V_1\# + \#V_2 \rightarrow V_2$$

Examples:

(7)

/xʷɑ-/ + /dɑ/ + /-ɛnɛ/ /ɑ/ /vɑjɑj/ → [hʷɑdɛn **ɑ** vɑjɑj]

2sSBJ prepare 3sOBJ(ind) to who

'Who are you preparing (food) for?'

(8)

/mɑtəwlɑʸ/ + /ɑkʷɑw/ → [mɛtʏ.l **ɑ**kʷoː]

lie at-NEG

'There is no lie.'

6.3 Pause or Boundary Phenomena

This section lists the phenomena which apply to the phonological word in both non-pausal and pausal situations.

In a non-pausal situation:

(i) Word initial /ŋ/ assimilates to the place of articulation of a following consonant (see section 2.1.5 Nasals).

Rule 26

/ŋ/ → [n]/ V__C
[+alveo]

(ii) Word final /ɑj/ fuses to be pronounced [ɛ].

Rule 27

/ɑj/ → [ɛ]/__#

Examples:

0392. [bāj] ‘chief’
[bɛ̄ gāɮāvāj] ‘God (chief of heaven)’

0560. [ɮāᵐbāj] ‘walking stick’
[ɮāᵐbɛ́ mɛ́dʒɛ̄m] ‘a long walking stick (lit. a walking stick which is long)’

(iii) The plural suffix /-jɑʸ/ is dropped.

Rule 28

/-jɑʸ/ → ∅/__#

Example:

(9)

/sɑ- kɑ- mpɑm ŋxʷɑ-ə**jɑʸ** nɑkɑ=ɑgɑʸ/ → [sɑkɑmpɑm ŋʷxʷ**i** nɛgɛ]
1sSBJ- IMP-look for goat -PL 1sPOSS=PL
‘I am looking for my goats.’

(10)

/ɑrɑ ŋʷxʷɑ-ə**jɑʸ**/ → [ɑro ŋʷxʷi**jɛ**]
PRED goat-PL
‘They are goats.’

Note than example (9) above the final verson of ‘goats’ retains the [i] which was the result of schwa being raised by the following palatal glide (see section 3.3.1.1 Plural Marking). This shows that the dropping of the plural suffix occurs at a later stage in the derivation.

(iv) In section 2.2.2 Local Labialisation Effects it was seen that labialisation does not spread onto a following vowel from a labialised velar plosive in word final syllables (example (12)). However, in the middle of a phrase spreading does occur (example (11)).

Example:
(11)

[ɑ- kɛ- lɛm tsɑ, hɛdʒɛ **gʷɔr** -ɑkʷo -ɑw]

3sSBJ-IMP-find TOP 1pSBJ(incl) arrive-OPT-3sOBJ(dir)

'If it's possible, we all will arrive there.'

(12)

[ɑ- kɛ- lɛm tsɑ, mɑ-**gʷɑr**]

3sSBJ- IMP- find TOP 1pSBJ(duel)-arrive

'If it's possible we(two) will arrive.'

At pause boundaries:

(i) Vowel elision does not occur (see section 6.2.3 Vowel Elision).

Example:
(13)

[ɑ- kɑ -ɗo: tsɑ, **ɑ** -lɑ kɑdɑk]

3sSBJ- IMP- want TOP, 3sSBJ-do well

'It must go well.'

(ii) Labialisation does not spread (see section 6.2.2 Labialisation Spread).

Example:
(14)

/ᵐbɑxʷ kʷɑgʷɑ, xʷɑ -jɑ vɑᵑgɑj/ → [ᵐboxʷ kʷogʷɑ, hʷojɑ vɑᵑgɑ]

pardon firstly 2sSBJ-say how

'Excuse me, wait, what did you say?'

(iii) A word-final low tone on a noun will be become high tone whilst mid remains the same (see section 7.2.5 Tone Raising Before a Pause).

Rule 29

L → H/___##

6.4 Ordering of Phrase-level Phonological Rules

The majority of phrasal phonological rules are applied after the morpheme and word level rules and as they do not interact with one another, their order is not important. However Rule 25, vowel elision is applied before any of the other rules from any level (see Table 14: Order of Word Level and Morpheme Level Phonological Rules).

7 Tone

Buwal has three underlying tone levels, low (L), mid (M) and high (H). In many Chadic languages consonant type has a significant effect on tone. Some languages have depressor consonants which tend to lower the pitch of the syllable in which they occur (Roberts, 2001: 110). Other languages also have raiser consonants. However for Buwal no raising or lowering effects due to consonant type have been observed.

7.1 Minimal Tone Pairs

In common with most Central Chadic languages (Roberts 2001, 109), the lexical load for tone in Buwal is not high. However a number of tone minimal pairs were found in the data. The majority of these were verbs as in the examples below.

Examples of tone minimal pairs:

0591.	[dà]	‘prepare (food)	0856.	[dā]	‘bring’
0113.	[ɗàɮ]	‘belch’	0212.	[ɗāɮ]	‘form abscess’
2048.	[làm]	‘help’	0685.	[lām]	‘build’
2287.	[tàl]	‘sharpen’	1931.	[tāl]	‘boil’

Three minimal tone pairs were found for nouns.

0379.	[vàn]	‘family’	1335.	[vān]	‘rain’
0129.	[ʃèŋʃèŋ]	‘dream’	1350.	[ʃēŋʃēŋ]	‘shadow’
0311.	[wēr wēr]	‘curiosity’	0205.	[wér wér]	‘health’

Other minimal pairs concern words of different classes.

2310.	[pā]	‘put’	2330.	[pá]	‘more than’
1715.	[tàr]	‘do a chore’	2207.	[tár]	‘for good’

7.2 Noun Roots

7.2.1 Monosyllabic Noun Roots

Monosyllabic noun roots in Buwal have three underlying tone melodies: H, M and L.

Examples:

/H/:	0345.	[mán]	‘mother’	0034.	[wá]	‘breast’
/M/:	0392.	[bāj]	‘chief’	0070.	[ⁿgās]	‘foot’
/L/:	0955.	[dʒèpˀ]	‘tomb’	0703.	[ɮàn]	‘work’

Disyllabic noun roots containing a schwa, a syllabic nasal or both can be grouped with monosyllabic nouns in terms of their underlying tone melodies. This is due to the fact that neither the schwa nor the nasal carries underlying tone. Their surface tone can be predicted. The schwa will have a surface tone of low (or mid if brief), before a mid or low tone, or mid before a high tone. On the other hand, the nasal always carries a low tone.

Examples:

/H/:	1303.	[hʷūbóf]	‘foam’	0577.	[ŋ̀fá]	‘flour’
/M/:	0078.	[dzəvā]	‘breastbone’	1272.	[ŋ̀kədə̄ŋ]	‘stone’
/L/:	0039.	[dəmàs]	‘abdomen’	1083.	[ŋ̀kìlɛ̀f]	‘fish’

7.2.2 Disyllabic Noun Roots

Disyllabic noun roots in Buwal have nine underlying tone melodies. These are: H, M, L, HM, HL, MH, ML, LH and LM.

Examples:

/H/:	0035.	[ⁿgálá]	‘side (of body)’	0612.	[ɗáwár]	‘pot (for water)’
/M/:	0744.	[ɣālā]	‘boundary’	0979.	[zāvān]	‘guinea fowel’
/L/:	1188.	[fàfàn]	‘flower’	1293.	[ɮàɮàr]	‘river’
/HM/:	0202.	[gádə̄ŋ]	‘idiot’	1017.	[bɛ́ⁿdʒēr]	‘squirrel’
/HL/:	2307.	[málàj]	‘only child’	2121.	[mánjàm]	‘type of straw’
/MH/:	0031.	[mābás]	‘shoulder’	2056.	[dābá]	‘bedroom (woman’s)’
/ML/:	1276.	[hājāk]	‘dirt, soil’	1066.	[nēɬē]	‘egg’
/LH/:	2104.	[mbàwák]	‘small flute’	0651.	[mbàrlá]	‘strap’
/LM/:	0343.	[dʒèdʒē]	‘grandparent’			

Note that disyllabic nouns with an underlying tone melody of /ML/ are phonetically pronounced [MM]. These nouns can be separated from those which are underlyingly /M/ as they behave differently before a pause. This is described further in section 7.2.5 Tone Raising Before a Pause.

Trisyllabic noun roots containg a schwa or a syllabic nasal can be grouped according to the disyllabic underlying tone melodies listed above. Only the melody LH has not yet been attested. The tone on the schwa can be predicted as outlined in section 2.2.5 The Epenthetic Nature of Schwa and the tone on the nasal is always low.

Examples:

/H/:	2107.	[kʷókʷíjáŋ]	‘mystery, enigma’	1097.	[ŋ̀kʷɔ́rɬá]	‘puff adder’
/M/:	0800.	[ŋ̀tēlɛ̄]	‘fish dam’	0664.	[hālʊ̄.lā]	‘wall’
/L/:	1084.	[ⁿdàrəɣʷòz]	‘catfish’	0074.	[kɛ̀ɾəⁿgɛ̀ɬ]	‘bone’
/HM/:	1244.	[gágə́māj]	‘cotton’	1842.	[tʃétʃýwēr]	‘filter’
/HL/:	1314.	[tátədə̀m]	‘air’	2164.	[hávədàn]	‘soot’
/MH/:	2257.	[mākəbá]	‘type of sacrifice’	1016.	[māⁿdəván]	‘hare’
/ML/:	2215.	[mɛ̄dʒīvɛ̄]	‘ancestor pot’			
/LM/:	1141.	[dʒèdʒɣ̀wēt˥]	‘fly’	2213.	[gàrkəsāŋ]	‘tic’

7.2.3 Trisyllabic Noun Roots

Eighteen tone melodies were discovered in the data for trisyllabic noun roots. These are: H, M, HM, HL, MH, ML, LH, LM, HMH, HLH, HLM, MHM, MLM, MHL, LHL, LML, LHM and LMH. Interestingly no trysyllabic nouns were found with the tone melody of L. The only other possibilities so far unattested are HML and MLH. Note that for the two-tone melodies, for HM, HL and LH the first tone is distributed over the first two syllables of the word (examples 1011, 0720 and 0963). However for MH, ML and LM the second tone is distributed over the last two syllables of the word (examples 1009, 0004 and 1128).

Examples:

/H/:	0227.	[fógʷólókʷ]	‘leprosy’
/M/:	0017.	[gānānā]	‘tongue’
/HM/:	1011.	[hʷósásāp˥]	‘cane rat’
/HL/:	0720.	[pápálàm]	‘plank’
/MH/:	1009.	[māɬáháj]	‘mouse’
/ML/:	0004.	[mānānòkʷ]	‘forehead’
/LH/:	0963.	[vèlɛ̀ŋgét˥]	‘calf’
/LM/:	1128.	[màflāflā]	‘tarantula’
/HMH/:	1230.	[kʷódākʷá]	‘sweet potato’
/HLH/:	1131.	[mɛ́ʒɛ̀ŋkét˥]	‘jigger, sand flea’
/HLM/:	1891.	[tʃétʃɛ̀gʷɛ̄ʒ]	‘stalk of millet head’

/MHM/:	2218.	[mɛ̄ɬɛ́pɛ̄tʃ]	‘foam on millet beer’
/MLM/:	0033.	[mādə̀də̄]	‘chest’
/MHL/:	1304.	[ndākábə̀j]	‘slime’
/LHL/:	0426.	[mèɗélè]	‘someone who resembles’
/LML/:	2304.	[màndārsə̀k]	‘species of mouse’
/LHM/:	1112.	[kàrˤkájāx]	‘shell’
/LMH/:	0584.	[hèrgēdéŋ]	‘mold’

Again, four syllable nouns containing a schwa have tone melodies which correspond to some of the melodies found for three syllable nouns with full vowels.

/MH/:	1123.	[mākʷúlə́ᵐbáŋ]	‘ant’
/LH/:	1046.	[tètèkʷùléʃ]	‘partridge’
/HLH/:	1164.	[kʷúrə́ᵐbàlá]	‘shea-butter tree’
/HLM/:	1101.	[kʷúrə́ⁿdzàlāx]	‘agama lizard’
/MHM/:	1136.	[kʷùɮāktáɗāk]	‘leech’

Note that in each of the the examples 1101, 1164, and 1123 there appear to be two underlying schwas. However in each case one of these schwas is underlylingly a full vowel which has been reduced due to their occuring in closed syllables with continuent codas (see section 2.2.6 Conditions Under Which V → ə).

7.2.4 Four Syllable Noun Roots

Four syllable noun roots in Buwal are rare but do exist. Eight tone melodies were discovered in the data: M, MH, LH, LM, HLM, LMH, MHMH, LHLH.

Examples:

/M/:	2275.	[māhʷōjhʷōjā]	‘type of grass’
/MH/:	0894.	[mākʷœ̄ɗkʷœ̄ɗé]	‘rattle’
/LH/:	2436.	[bèrdèbèrdé]	‘dust’
/LM/:	1109.	[mèvēɗvēɗɛ̄ŋ]	‘turtle’
/HLM/:	2186.	[kʷɔ́rkʷɔ́rdèdɛ̄m]	‘cicada’
/LMH/:	1120.	[mèdèfɛ̄ʃéŋ]	‘bedbug’

/MHMH/: 1127. [māɮárbābó:] ‘spider’
/LHLH/: 1094. [ɣʷɔ̀rɮáɣʷɔ̀rɮá] ‘snail’

7.2.5 Tone Raising Before a Pause

For Buwal nouns, a syllable final low tone is changed to high before a pause, whilst high and mid tones stay the same. This was mentionned in section 6.3 Pause or Boundary Phenomena (Rule 29). This phenomenon does not apply for other word classes such as verbs, adjectives or adverbs.

Examples with monosyllabic nouns:

/L/: 0334. [mbò:] ‘child’
[mbà mán] ‘child of mother’
[mán mbó:] ‘mother of child’

/M/: 0392. [bāj] ‘chief’
[bāj mán] ‘chief of mother’
[mán bāj] ‘mother of chief’

/H/: 0768. [bré] ‘herd’
[bré mán] ‘herd of mother’
[mán bré] ‘mother of herd’

This is not just a phenomenon limited to associative constructions. In the first example sentence below, the low tone noun [ʤèp˥] is pronounced with a high tone at the end of the utterance. However when it occurs in mid-phrase it is pronounced with a low tone.

Example:

[íj kāmpās ɗālá ŋ ʤép˥] ‘They are burying someone in a tomb.’
[ʤèp˥ māvōŋgʷɔ́r vōŋgʷɔ́r ákāmpās] ‘The old tomb is colapsing in on itself.’

As mentioned in section 7.2.2 Disyllabic Noun Roots, the above tone raising rule can help us distinguish between disyllabic nouns which have underlying tone melodies of /M/ and /ML/. Both of these are manifested in the phrase-medial position as [M]. However, before a pause, for nouns which have an underlying tone melody of /ML/, the syllable final tone is raised to H as in the examples below. This indicates the the underlying tone on this syllable is L as if it was M, it would not be raised.

Examples:

/M/: 0744. /ɣālā/ ‘boundary’

[ɣālā mán] ‘boundary of mother’

[mán ɣālā] ‘mother of boundary’

/ML/: 1066. /nāɬàᵞ/ ‘egg’

[nɛ̄ɬɛ̄ mán] ‘egg of mother’

[mán nɛ̄ɬɛ́] ‘mother of egg’

Note also the following example. The word /hājàk/ (1276. ground, land) when spoken in isolation is pronounced [hāják]. Phrase-medially, however, the pronunciation becomes [hājāk] as in the sentence below.

[ù.ʒí: kádā **hājāk** á mó.tá ŋ́ ndá lám ù.dʒɛ̄k]

‘The children brought soil by car to go and build a house.

To distiguish dysyllabic nouns which have tone melodies of /ML/ and /MH/ we need to examine their behaviour phrase-medially as before a pause they are both pronouced with a high tone on the final syllable. In the examples below, the noun has an underlying tone melody of /ML/ (1276.), but in the middle of a phrase the syllable final tone becomes M. However, there is no variation in the tone melody for the noun which has an underlying melody of /MH/ (0031.).

Examples:

/ML/: 1276. /hājàk/ ‘ground, land’

[hāj**āk** mán] ‘land of mother’

[mán hāják] ‘mother of land (ie. the world)’

/MH/: 0031. /mābás/ ‘shoulder’

[māb**ás** mán] ‘shoulder of mother’

[mán mābás] ‘mother of shoulder’

7.3 Verb Roots

7.3.1 Monosyllabic Verb Roots

Monosyllabic verb roots can be divided into three groups according to tone: L, M and (L)M.

Examples:

/L/:	0247.	[gàl]	‘grow up’
/M/:	0951.	[xān]	‘cry’
/(L)M/:	0435.	[ɮāp]	‘speak’

(L) is a floating low tone which manifests itself by lowering a preceeding mid tone to low. It has no effect on a high tone.

Examples:

[sā xān]	‘I cry.’	[sà ɮāp]	‘I speak.’
[sá kāxān]	‘I am crying.’	[sá kàɮāp]	‘I am speaking.’
[sā náxān]	‘I will cry.’	[sā náɮāp]	‘I will speak.’

Only two verbs were found which carry high tone.

Examples:

0159.	[xéj]	‘run’
2387.	[táŋ]	‘place feet’

As these two verbs incorporate the concept of motion, it is possible that the high tone may be grammatical, indicating direction.

As for monosyllabic noun roots (see section 7.2.1 Monosyllabic Noun Roots), disyllabic verb roots beginning with a nasal or containing a schwa can be grouped with the monosyllabic verb roots in terms of underlying tone melodies.

Examples:

/L/:	0954.	[m̀pàs]	‘bury’	1465.	[gə̀ɗə̂m]	‘gather’
/M/:	0182.	[ŋ̀hʷāz]	‘(be) drunk’	1989.	[gʷə̀dāx]	‘dig up’
/(L)M/ :	2230.	[ŋgə̀tāw]	‘rip’	2239.	[kə̀ɗāŋ]	‘finish’

As for the monosyllabic verb roots those with the tone melody (L)M lower a preceding M whilst those with the tone melody M do not.

Examples:

[sā gʷə̀dāx]	‘I dig up’	[sà kə̀ɗāŋ]	‘I finish’

7.3.2 Disyllabic Verb Roots

Disyllabic verb roots have been found with the following tone melodies: L, M, (L)M, LM and ML, however these last two melodies are rare.

Examples:

/L/:	2074.	[bàbàr]	‘roar’
/M/:	0900.	[lāwāt˥]	‘play’
/(L)M/:	1892.	[ɬāɬāp]	‘cover lightly’
/LM/:	2266.	[lɛ̀ɓɛ̄t˥]	‘plead’
/ML/:	1862.	[pārɮòkʷ]	‘escape’

Trisyllabic verb roots beginning with a nasal or containing a schwa can be grouped with disyllabic verb roots in terms of tone melodies. As trisyllabic verb roots are rare none have yet been found with the tone melody (L)M.

Examples:

/L/:	1498.	[ŋ̀kəɗə̀w]	‘burn’	2346.	[ɣʷòləŋgʷòt˥]	‘uproot’
/M/:	2439.	[ŋ̀tūkʷāl]	‘fold’	0158.	[gādəbāŋ]	‘crawl’

7.4 Grammatical Tone

Grammatical tone is only relevant for verbs in Buwal. Both nouns and verbs carry lexical tone, the difference being that nouns have three levels of contrastive tone, whilst verbs only have two. Also, all tense/aspect forms in Buwal are indicated by affixes or separate words, although there is often also a tonal element present (see the sections which follow). All verb suffixes appear to have a fixed tone, although verb final suffixes with mid and low tones change to high before a pause as in the examples below. This contrasts with nouns where only a syllable final low tone is changed to high before a pause (see section 7.2.5 Tone Raising Before a Pause).

Examples:

/sā-/	+	/ŋtā/	+	/-ɓā/	→	[sāŋtā**ɓá**]	‘I take for myself.’
1sSBJ		take		BEN			
						cf. [sāŋtā**ɓā́** jám]	‘I take for myself also.’
/sā-/	+	/̀bā/	+	/-ānà^{Y}/	→	[sɛ̀b**ɛ̄nɛ́**]	‘I create for him.’
1sSBJ		create		3sOBJ(ind)			
						cf. [sɛ̀b**ɛ̄nɛ̀** jám]	‘I create for him also.’

7.4.1 Imperfective

The imperfective is marked by the prefix /kā-/ which attaches to the verb root and a high tone on the preceding syllable of the subject agreement marker.

[sā**-**nānā]	‘I shiver’
[sá**-kā-**nānā]	‘I am shivering’
[nè**-né-**nānā]	‘We(excl) shiver’
[nè**-né-kā-**nānā]	‘We(excl) are shivering’

7.4.2 Perfect

The only difference between the perfect and the imperfective is tone. The perfect is indicated by the prefix /ká-/. Another interesting tonal feature of this form of the verb is that disyllabic subject agreement markers with the tone melody of LH become LL before this aspect marker whilst the tone on the other subject agreement markers does not change.

[sā**-**zàzàk]	‘I rest’	[sā**-ká-**zàzàk]	‘I had rested’
[nè**-né-**zàzàk]	‘We(excl) rest’	[nè**-nè-ká-**zàzàk]	‘We(excl) had rested.’
[**íj-**zàzàk]	‘They rest’	[**íjkáz**àzàk]	‘They had rested.

That this is a feature of the perfect verb form and not of the subject agreement markers in question is shown by what happens when the future prefix /ná-/ is attached to the verb stem. It also carries a high tone but does not provoke the same tonal changes in the subject agreement markers.

[nè**-né-**wān]	‘We(excl) sleep.’	[nè**-né-ná-**wān]	‘We(excl) will sleep.’

7.4.3 Past Tense

The past tense is formed by a repetition of the verb root with the subject agreement marker in between the two. For M tone and (L)M verb roots there are no unusual tonal changes but for L tone verb roots, the tone on the first verb is raised to mid and the tone on the subject marker to high.

L:	/gàl/	‘grow’	[āgàl]	‘He grows’	[gāl ágàl]	‘He grew’
M:	/xān/	‘cry’	[āxān]	‘He cries’	[xān āxān]	‘He cried’
(L)M:	/ˆ ƛāp/	‘speak’	[àƛāp]	‘He speaks’	[ƛāp àƛāp]	‘He spoke’

7.4.4 Action Nominalisation

The action nominalisation prefix /lɑ-/ changes its tone depending on the tone on the verb root. If the tone on the verb root is low, the prefix tone is high. If the tone on the verb root is mid or floating low-mid, the tone on the prefix low.

0247.	/gàl/	‘grow up’	[lágàl]	‘growing up’
0128.	/wān/	‘sleep’	[làwān]	‘sleeping’
0435.	/ˀ ɮāp/	‘speak’	[làɮāp]	‘speaking’

0185.	/zàzàk/	‘rest’	[lázàzàk]	‘resting’
0122.	/nānā/	‘shiver’	[lànānā]	‘shivering’
2201.	/ˀ ɮāɮār/	‘join together’	[làɮāɮār]	‘joining’

8 Word List

/ɑ/

2420: [á] ‘to, at’
1674. [ábᵊzā] ‘outside’
1699. [ājāw] ‘yes’
1647. [àkʷō]~[àskʷō] ‘nothing’
2492. [ántá] ‘his’
2619. [àŋgɛ́] ‘noise of flute’
2414. [àtúl] ‘manner of smoke ascending’
1677. [āzá] ‘away from’

/b/

1548. [bā] ‘create’
2074. [bàbàr] ‘roar’
0747. [bābātˀ] ‘clear (land)’
1037. [bābōxʷ] ‘bark (v)’
2279. [bādāgʷār] ‘batchelor’
0392. [bāj] ‘chief’
0561. [bān] ‘wash’
0997. [bākālāf] ‘buffalo’
0624. [bākātār] ‘bag’
0713. [bàl] ‘cut down (tree)’
0949. [bāl] ‘funeral’
0763. [bālvār] ‘winnow’
2347. [bār] ‘along’
1964. [bāɾāj] ‘second weeding’
2271. [bārɗáɗāk] ‘(be) slightly sour’
1331. [bārgādāŋ] ‘harmattan’
1262. [bārlā] ‘mountain’
1787. [bàrlàlá] ‘(be) patchy’
1496. [bās] ‘light(fire)’
1490. [bāt] ‘sink’
0507. [bàtˀ] ‘deceive’
2061. [bàts] ‘operate bellows’
1898. [bāts] ‘crush’
2249. [bàv] ‘open(start)’
2524. [bāv] ‘make a hole’
1459. [bàw] ~ [bɔ̀ː] ‘alter, change’
0885. [bēɗbēɗēŋ] ‘biggest drum’
0770. [bɛ́ʒē] ‘animal enclosure’
0672. [bèn] ‘bedroom (man)’
1017. [bɛ́ⁿdʒēr] ‘squirrel’
1376. [bɛ́ŋ] ‘dawn’
0446. [bēr] ‘announce’
2436. [bèrdèbèrdɛ́] ‘dust’
0986. [bèrdʒɛ̄ŋ] ‘donkey’
1270. [bədām] ‘cave’
2326. [bədzār bədzār] ‘(be) branching’
0476. [bəʒā] ‘bless’
2028. [bəʒāk] ‘slander(v)’
0558. [bəràm] ‘plait, braid’
1906. [bərfɔ̀kʷ] ‘(be) grey (light)’
0022. [bəzám] ‘chin’
2408. [bǐm] ‘noise of suddening digging’
2298. [bìʒèm] ‘species of mouse’
1899. [bᵊlāx] ‘break off’
0996. [bᵊlēr] ‘hippopotamus’
1823. [blèk] ‘spread over’
1622. [blòkʷ] ‘thousand’
1968. [blòxʷ] ‘solid/fat’
2322. [bőf] ‘suddenly come out’
2321. [bőj] ‘suddenly’
2529. [bòkʷ] ‘itch(v)’
2142. [bòkʷ] ‘empty out’
2392. [bòlàŋgʷàtˀ] ‘uproot’
0064. [bᵊɾā] ‘hip’
2391. [bràf] ‘boil over’
0207. [bᵊɾàz] ‘hurt oneself’
0964. [brɛ́] ‘herd’
2231. [bùdōkʷ] ‘tear deeply’
1050. [būɗōkʷ būɗōkʷ] ‘hornbill’
0578. [bùhʷòm] ‘salt’
0002. [bùkʷlā] ‘skin’
1729. [būrdzōdzōxʷ] ‘slope’
0785. [brɤ̀wēŋ] ‘spear’

/ɓ/

0197. [ɓáɓā] ‘deaf/mute’
1750. [ɓàf] ‘boil, heat’
1431. [ɓàl] ‘shoot’

1914. [ɓàɬ] ‘forge’
0142. [ɓām] ‘crunch’
1143. [ɓāmām] ‘bee’
1934. [ɓāŋkāl] ‘ceremonial calabash’
2355. [ɓār] ‘crack(v)’
1572. [ɓārʰɓār] ‘strength’
1148. [ɓárám] ‘antenna’
1279. [ɓàrɮām] ‘iron’
0269. [ɓās] ‘laugh’
0510. [ɓàw] ‘pierce’
2445. [ɓāw] ‘peel away’
1472. [ɓàx] ‘hide’
2158. [ɓè] ‘fill(grain)’
2507. [ɓēɓēɬ] ‘sprinkle’
1843. [ɓéʃɛ̄] ‘liquid filtered through ashes’
0417. [ɓètʃ] ‘assemble’
2336. [ɓèɮ] ‘fence(v)’
1950. [ɓéɬ ɓéɬ] ‘(be) well developed’
2109. [ɓēr] ‘support’
2081. [ɓèʒ] ‘divide’
0127. [ɓàɾàɮ] ‘faint’
2197. [ɓōkʷ] ‘make lump’
2092. [ɓōxʷ ɓóxʷ] ‘(be) warm’
0014. [ɓùɣʷòm] ‘cheek’

/d/

0856. [dā] ‘bring’
0591. [dà] ‘prepare’
2056. [dābá] ‘bedroom (woman)’
0630. [dábdābā] ‘stopper, plug’
1585. [dàdàk] ‘dirty(v)’
1500. [dàdàn] ‘singe’
1753. [dàdàp] ‘convince’
1582. [dàdàpˀ] ‘(be) beautiful’
2086. [dadàpˀ] ‘stuttering’
0324. [dàdāwār] ‘danger’
2002. [dàdó:] ‘back (where child carried)’
0320. [dádōkʷ] ‘(be) difficult’
1540. [dādʰɾās] ‘(be) blunt’
2325. [dādrōkʷ] ‘begin to learn’
1323. [dàɗgʷàts] ‘Pleiades’
0411. [dāfátˀ] ‘sorcerer’
1438. [dāj] ‘overtake’
1936. [dāk] ‘trample’
2528. [dàkā] ‘dregs’
1507. [dākāl] ‘(be) big’
1634. [dākālá] ‘(be) abundant’
2041. [dàklájˀ] ‘gossip’
1556. [dàkʰnàk] ‘(be) black’
2025. [dālāj] ‘maiden’
2034. [dālātˀ] ‘batchelor’
2030. [dāɮ] ‘block(v)’
1407. [dàm] ‘enter’
2173. [dāmā] ‘glue’
1765. [dāmāɾā] ‘misfortune’
1260. [dámó:] ‘bush’
0618. [dàmtàkʷàl] ‘pestle’
2497. [dàntsá] ‘sleep (white deposit in eye)’
1138. [dāⁿdˢɾókʷ] ‘centipede’
1872. [dàᵑgàl] ‘sort’
0970. [dāᵑgāz] ‘ram’
0642. [dàp] ‘cover’
1939. [dàp dàp] ‘big pieces’
1873. [dār] ‘plant in ground’
2029. [dāɾʰjókʷ] ‘stubborn’
0338. [dàrlōŋʷ] ‘young man’
0246. [dàɾʰlōŋʷ] ‘(be) young’
1256. [dàrɮám] ‘desert’
1434. [dàtˀ] ‘pull’
1876. [dāts] ‘crowd around’
1245. [dàv] ‘grow(plant)’
1432. [dāvās] ‘knock down’
0042. [dàwán] ‘back’
0224. [dāwār] ‘sickness’
1719. [dàhʷóm] ‘hill’
1133. [dázòkʷ] ‘cricket’
1824. [dɛ̀bɛ́bɛ̄r] ‘clay bed’
1420. [dɛ́dœ̄xʷ] ‘(be) slow’
1515. [dɛ̄f] ‘short’
2359. [dɛ̀f dɛ̄f] ‘short (adv)’
1904. [dɛ̀kɛ̄rɛ̄] ‘fufu with milk’

1827. [délélɛ́] ‘directly’
0516. [dèp˥] ~ [dìp˥] ‘appease’
0552. [dɛ̄ʃ] ‘necklace’
2329. [dɛ̄ʃ] ‘divination tools’
1909. [dɛ̄t˥] ‘push along’
1280. [dəɓár] ‘gold’
0944. [dəmā] ‘bride’
0039. [dəmàs] ‘abdomen’
0752. [dəvàr] ‘hoe’
1153. [dībɛ́] ‘termite hill’
1562. [dìfnèk] ‘(be) dark’
2289. [dījdéj] ~ [dējdéj] ‘(be) too much’ (ful)
2316. [dīm dīm dīm] ‘noise of thunder’
0982. [dōkʷ] ‘horse’
2469. [dòkʷ] ‘dip’
0194. [dòkʷòf] ~ [dàkʷòf] ‘(be) impotent’
0879. [dràf] ‘song’
2333. [drāt˥] ‘eat fufu with meat’
1439. [drèɮ] ‘surround’
1277. [drèʃ] ‘clay’
1961. [dùgʷàɮ] ‘clay pot’
0961. [dù.ɮā] ‘heifer’
1182. [dùrᵊᵑgʷōɮ] ~ [dùrᵊᵑgʷāɮ] ‘stump’
0834. [dùwā] ‘debt’
1671. [dʏ̀.ʒɛ́] ‘behind’

/dz/

1446. [dzā] ‘hit, strike’
1594. [dzāɓán] ‘five’
2397. [dzàdzàk] ‘heap up soil’
2269. [dzàdzàr] ‘filter drop by drop’
1289. [dzādzáp˥] ‘marsh’
1598. [dzáfát˥] ‘nine’
2277. [dzáhàrɮàk] ‘type of grass’
1560. [dzàjá] ‘(be) brown’
0157. [dzāk] ‘limp’
2036. [dzām] ‘call a meeting’
1464. [dzāmāl] ‘accumulate’
1597. [dzāmāxkát˥] ‘eight’
1433. [dzàp˥] ‘turn over’
2185. [dzàv] ‘assemble’
2053. [dzāw] ‘fasten’
0343. [dʒèdʒɛ̄] ‘grandparent’
1927. [dʒèdʒɞ̄kʷ] ‘regret’
1141. [dʒèdʒʏ̀wēt˥] ‘fly’
0171. [dʒɛ̄k] ‘lean against’
1511. [dʒèm] ‘(be) high’
0716. [dʒènè] ‘axe’
0955. [dʒèp˥] ‘tomb’
1134. [dʒɛ̄rɛ́] ‘locust’
1642. [dʒɛ́x] ‘(be) whole’
2138. [dzənàk] ‘knead’
0078. [dzəvā] ‘breastbone’
1767. [dzəvàk] ‘resow’
2238. [dzəvāt˥] ‘tangle’
1193. [dʒìkèt˥] ‘thorn’
2168. [dzòkʷ] ‘stack’
1745. [dzōkʷɔ̄rōkʷ] ‘peanut stick’
0599. [dzōxʷ] ‘pound’
2447. [dzràt˥] ‘stir’
1747. [dzràv] ‘jump up and down’

/ɗ/

0095. [ɗādɑ̄ɾéj] ‘phlegm’
1822. [ɗāf] ‘reach for’
0444. [ɗāf má] ‘call out to’
1908. [ɗāk] ‘(be) gone’
0326. [ɗālā] ‘someone’
2069. [ɗáláz] ‘trap’
0212. [ɗāɮ] ‘form abscess’
0113. [ɗàɮ] ‘belch’
1896. [ɗàɮ] ‘around’
1783. [ɗámɓàɮ] ‘pumpkin’
2106. [ɗàr] ‘fresh grass’
0284. [ɗàw] ~ [ɗɔ̀ː] ‘love’
0733. [ɗāwāp] ‘rag’
0612. [ɗáwár] ‘pot (for water)’
0742. [ɗàs] ‘cultivate’
0634. [ɗàt˥] ‘take out’
2244. [ɗáx ɗáx] ‘(be) sour’
1567. [ɗédʏ̄wēk] ‘(be) bitter’
0099. [ɗɛ̄lɛ̄k] ‘bile, gall’

1846. [dɛ̄mɓɛ̄ʒ] ‘calabash for serving fufu’
0621. [dɛ̄ŋ] ‘bowel’
2210. [dɛ̄ʒ] ‘edible calabash’
2238. [dəbàs] ‘flame(v)’
0993. [dəlōŋʷ] ‘cat’
2605. [dɛ̄m] ‘fleeing as a crowd’
1029. [dʊ̀gʷàr] ‘hump of cow’
1854. [dʊ̀xʷzòkʷ] ‘bark for brides’

/e/

2542. [èbè] ‘this one’
2407. [ɛ̀ɛ̀] ‘hey?’
1955. [ɛ́ⁿdɛ̄] ‘like this’
1974. [ɛ́ᵑgɛ̄] ‘over there’
1654. [étɛ̄] ‘here’

/f/

2318. [fá:] ‘manner of putting hand in bag’
1188. [fàfàn] ‘flower’
1508. [fàl] ‘enlarge’
1028. [fárám] ‘horn’
0797. [fāt] ‘slaughter’
0565. [fàtˀ] ‘shave’
1754. [fɛ̄ɗfɛ̄dɛ̄] ‘roof matting’
1510. [fɛ̄fɛ̄tˀ] ‘diminish’
0882. [fɛ̄fœ̄kʷ] ‘whistle’
1920. [fɛ̄lɛ̄x] ‘take little by little’
0105. [fɛ̄ŋ] ‘blow nose’
2332. [féŋféŋ] ‘(be) scented’
2006. [féʃɛ̄tˀ] ‘(be) tiny’
0110. [fɛ̄t] ‘blow (with mouth)’
2051. [fété] ‘pepper’
0130. [fəɗā̃x] ‘wake up’
2337. [fətàn] ‘spark’
0758. [fətār] ‘dig up’
2475. [fɪjām] ‘weevel’
2481. [fɪkɛ̄tˀ] ‘use up’
1939. [fīték] ‘(be) lost’
2311. [flòkʷ] ‘snatch (woman)’
0317. [fógʷój] ‘(be) stubborn’
0227. [fógʷólókʷ] ‘leprosy’
1867. [fóᵑgʷɔ̄rlɔ́r] ‘hollow’
1884. [fràtˀ] ‘dislocate’

/g/

0781. [gàdātˀ] ‘arrow’
0158. [gādəbāŋ] ‘crawl’
0629. [gàdzāk] ‘gourd’
2073. [gādzāᵐbāl] ‘harpe’
0260. [gáɗāŋ] ‘(be) stupid’
2640. [gàgàt] ‘gulp down’
1244. [gágɘ́māj] ‘cotton’
0940. [gàj] ‘spoil’
0247. [gàl] ‘grow up’
1786. [gālābā] ‘(be) better’
1725. [gāláŋ] ‘enclosed area’
2059. [gàlāpˀ] ‘hanger’
0987. [gāldám] ‘pig’
1447. [gàɮ] ‘beat’
0541. [gāɮāŋgār] ‘hat’
0906. [gāɮāvāj] ‘God’
0422. [gām] ‘drive away’
1322. [gàmɮā] ‘star’
0974. [gāmták] ‘chicken’
0975. [gāmzókʷ] ‘rooster’
0017. [gānānā] ‘tongue’
2462. [gàᵑgàɮ] ‘shake head’
1135. [gāᵑgˀláŋ] ‘praying mantis’
1517. [gāp] ‘(be) fat’
0601. [gāpˀ] ‘knead’
2154. [gār] ‘stand’
0873. [gārák] ‘shield’
0020. [gārɗáɗāŋ] ‘palate’
2213. [gàrkəsāŋ] ‘tic’
2005. [gās] ‘times’
0339. [gāsáŋ] ‘virgin’
1788. [gàt] ‘eat with hands’
0551. [gàvdā] ‘bracelet’
1033. [gàzgàz] ‘mane’
0544. [gèdʒɛ́rɛ̄] ‘loincloth’
1735. [gɛ́f] ‘difficulty’

1194. [gɛ̄ⁿdēɥ] ‘palm’
2226. [gɛ̀ᵑgèr] ‘rub’
0890. [gɛ̄ᵍgréŋ] ‘harp’
2037. [gɛ̄p˥] ‘leave’
0138. [gɛ̄ʃ] ‘touch’
2129. [gɛ̀ʃgèl] ‘folere’
1283. [gɛ̄ʒ] ‘rust (n)’
1656. [gɔ̀dɔ̀k] ‘(be) far’
1465. [gɔ̀dɔ̀m] ‘gather’
0710. [gɔ̀dāŋ] ‘mold’
0708. [gɔ̄máz] ‘bellows’
0697. [gìdégdɛ̄] ‘mat (trad.)’
0176. [gīlɛ̄p˥] ‘kneel’
1001. [gìmɛ̀ɬ] ‘monkey’
0131. [grɛ̄] ~ [gˀrɛ̄] ‘see’

/gb/

1591. [gbāk] ‘two’
2348. [gbáŋ] ‘opposite’
1530. [gbár] ‘(be) straight’

/gʷ/

2504. [gʷá:ɮām] ‘hole in tree trunk’
0625. [gʷāɬōkʷ] ‘box’
2087. [gʷār] ‘arrive’
1808. [gʷōɓé] ‘(be) fresh’
1057. [gʷōdāɾāk] ‘vulture’
1795. [gʷōdʒɛ̄ŋgʷɛ̄r] ‘chicken cage’
0661. [gʷòfɑ̀t] ‘loosen’
1527. [gʷòfəlōŋʷ] ‘(be) hollow’
2502. [gʷōjā] ‘(be) tangy’
0933. [gʷōjgʷōjɑ] ‘feast (n)’
1987. [gʷòlàlá] ‘unground grain’
0995. [gʷòɮà] ‘elephant’
0647. [gʷōm] ‘heap up’
1106. [gʷōmbōkʷ] ‘frog, toad’
2132. [gʷòᵑgʷòxʷ] ‘rub, scrub’
1137. [gʷòŋʷkʷāt˥] ‘caterpillar’
1225. [gʷōŋʷkʷójāx] ‘eggplant’
1040. [gʷòp˥] ‘ruminate’
2102. [gʷɔ̄rkʷókʷókʷ] ‘(be) large’
0151. [gʷɔ̀ɾˀzàm] ‘get up’
2446. [gʷùbāts] ‘cook gently’
1988. [gʷùdāx] ‘dig up’
0674. [gʷùɗòkʷ] ‘entrance hut’
0581. [gʷūjgʷōjā] ‘festival’
0465. [gʷùlāk] ‘argue’
0784. [gʷùlām] ~ [gʷùlōm] ‘quiver(n)’
2300. [gʷūlér] ‘species of mouse’
2455. [gʷùlèt] ‘hoe (hard)’
1933. [gʷùɮām] ‘funeral canary’
1451. [gʷùnāt] ‘scratch(v)’
1546. [gʷūnép˥ gʷūnép˥] ‘(be) soft’
0796. [gʷùɾàt] ‘wound’
0751. [gʷùvàt˥] ‘hoe(v)’
2302. [gʷūʒét˥] ‘species of mouse’

/ɣ/

0108. [ɣàɣàndàr] ‘snore’
1941. [ɣàɮ] ‘eat raw’
0744. [ɣālā] ‘boundary’
2453. [ɣàɮàlàw] ‘bad (to eat)’
0866. [ɣàm] ‘war’
0085. [ɣāmpāf] ‘lungs’
1932. [ɣār] ‘stare’
0478. [ɣāv] ‘boast’
1561. [ɣàzɓàŋ] ‘(be) yellow’
0635. [ɣèf] ‘fill’
0086. [ɣēlé] ‘intestines’
1819. [ɣèɮēɥ] ‘(be) underdeveloped’
2148. [ɣēm] ‘judge’
2514. [ɣénénép˥] ‘wet’
1759. [ɣénɣén] ‘sweet’
2141. [ɣēɥ] ‘catch in trap’
2062. [ɣʷœ́tʃétʃé] ‘acidic’
1450. [ɣˀràt˥] ‘scrape(v)’
1923. [ɣrīk] ‘arriving solid’

/ɣʷ/

2454. [ɣʷòf] ‘murder sickness’
0264. [ɣʷòl] ‘show’

2346. [ɣʷòləŋgʷòtˀ] ‘uproot’
2274. [ɣʷòmtsōkʷ] ‘type of grass’
2480. [ɣʷòndàtˀ] ‘dig out’
1461. [ɣʷòràm] ~ [ɣʷòròm] ‘destroy’
1532. [ɣʷòrⁿdzàlòŋʷ] ‘(be) crooked’
1226. [ɣʷōrgé] ‘mushroom’
1094. [ɣʷòrɮáɣʷòrɮá] ‘snail’
1220. [ɣʷòrnòkʷ] ‘onion’
2211. [ɣʷòrəᵑgʷōm] ‘cactus’
2350. [ɣʷōtátàŋ] ‘slightly acidic’
2027. [ɣʷōtˀ] ‘anger, annoy’
1810. [ɣʷòv] ‘half rot’
1186. [ɣʷòzɣʷóz] ‘silk, hair(maize)’
1584. [ɣʷœ́ɮɛ́k ɣʷœ́ɮɛ́k] ‘(be) clean’
2062. [ɣʷœ́tʃɛ́tʃɛ́] ‘acidic, sour’
2263. [ɣʷúrgʷūm] ‘type of bird’

/j/

0418. [jà] ‘say, call, invite’
2317. [jāàà:] ‘noise of rain’
2064. [jáf jáf] ‘very delicious’
1499. [jājāx] ‘melt’
0291. [jàk] ‘abstain’
1082. [jāɬ] ‘hatch’
1284. [jàm] ‘water’
0529. [jāŋ] ‘move away’
1523. [jáp] ‘deep’
0737. [jāpˀ] ‘wash’
2434. [jār] ‘flee’
2013. [jàts] ‘flee in secret’
1760. [jáxjáx] ‘sweet(average)’
1516. [jòkʷ] ‘shorten’
2179. [jōxʷ] ‘thread(v)’

/k/

2496. [kā] ‘must’
1696. [kádāk] ‘well (adv)’
0021. [kālkākāk] ‘jaw’
1778. [káŋkās] ‘beans’
1887. [kāᵑgāŋ] ‘drum (med)’
2035. [kāpˀ] ‘mix (solids)’
1912. [kárɓā] ‘while’
1093. [kārkájāx] ‘clam’
1112. [kārʾkájāx] ‘shell’
2076. [kātˀ] ‘move, displace’
2066. [kāx] ‘dig’
1881. [kāzámzám] ‘fatty cricket’
2047. [kēɗé kéɗé] ‘tickling’
1271. [kéfē] ‘big rock’
1536. [kéf kéf] ‘(be) light’
2206. [kèlēk kèlēk] ‘on ahead’
1814. [kēlkēl] ‘summit’
0074. [kèrʾᵊᵑgèɬ] ‘bone’
1404. [kēʃ] ‘leave(place)’
2261. [kéʃ kéʃ] ‘type of bird (small)’
2262. [kɛ̄:vɛ́k] ‘type of bird (small)’
2239. [kəɗāŋ] ‘finish’
0761. [kəlāŋ] ‘threshing circle’
2493. [kəlāw] ‘hook onto’
1401. [kərātˀ] ‘approach’
2547. [kəró: kəró:] ‘(be) all white’
2356. [kātsáŋ kātsáŋ] ‘quickly’
0112. [kətsāx] ‘cough’
2410. [kőtʃő kátʃá kātʃā kətʃà....] ‘cry of the guinea fowel’
2155. [kəvā] ‘side (of place)’
0596. [kəvātˀ] ‘mix’
1692. [kīɗé] ‘if’
0257. [kìlèŋ] ‘wisdom’
2286. [kírkèm] ~ [kérkèm] ‘dried left-over fufu’
2016. [kìtʃəkèm] ‘start(jump)’
0156. [kītʃəkētˀ] ‘stumble’
2379. [kì.zāŋ] ‘first-born girl’
2376. [kràɗ:á] ‘a bit closer’
2220. [krāk] ‘tuck into’
2439. [krāp] ‘press down’
1401. [kᵊrātˀ] ‘approach’

/kp/

2680. [kpáŋ] ‘manner of getting something’

/kʷ/

2022. [kʷàɣ] ‘have diarrhea’
1552. [kʷák] ‘(be) hot’
1483. [kʷètʃ] ‘sprinkle’
1692. [kīdé] ‘if’
1230. [kʷódākʷó] ~ [kʷódākʷá] ‘sweet potato’
2509. [kʷòftàlòxʷ] ‘dusty’
1305. [kʷóhʷó] ‘feu’
1915. [kʷōj] ‘scatter’
1003. [kʷójkʷójá] ‘hyena’
0929. [kʷókʷās] ‘sacrifice’
1646. [kʷòkʷét] ‘nobody’
1874. [kʷōkʷōp˥] ‘dip in water’
2107. [kʷókʷíjáŋ] ‘mystery, enigma’
0902. [kʷōlā] ‘smoking pipe’
1316. [kʷōlāj] ‘rainbow’
2487. [kʷōlēlé] ~ [kʷœ̄lēlē] ‘fine’
2444. [kʷóló^{ŋ}gōj] ‘burden’
0682. [kʷōɬākʷār] ‘garbage’
2559. [kʷóɬɛ́x] ~ [kʷœ́ɬɛ́x] ‘line scratched in skin’
0864. [kʷōm] ‘load’
1063. [kʷō^{n}dāt˥] ‘crop (of bird)’
0026. [kʷō^{n}dō^{n}dōl] ‘larynx’
2112. [kʷónzáŋ] ‘metal coil’
1930. [kʷōp] ‘throw at’
2186. [kʷɔ́rkʷɔ́rdèdēm] ‘cicada’
1978. [kʷārɮéj] ‘disorder, noise’
1467. [kʷœ̄kʷēt˥] ‘scatter’
1962. [kʷœ́mpɛ́] ‘underpants’
2571. [kʷœ́ʃkʷœ́ʃɛ́] ‘kindling’
0166. [kʷœ̄tē̄k] ‘point
0259. [kʷœ́tʃɛ́r] ‘(be) intelligent’
2234. [kʷœ̄tʃē̄t˥] ‘spread out’
1437. [kʷūdāp] ‘lose’
2409. [kʷűdɛ̋ kʷúdɛ́ kʷūdɛ̄ kʷùdɛ̀ ....] ‘a bird cry’
1999. [kʷúdkʷét˥] ‘very fine’
1570. [kʷūlā] ‘(be) able to’
0187. [kʷūlāp] ‘wrinkle’
2060. [kʷùlāp˥] ‘paint’
0924. [kʷùlè] ‘amulet, charm’
1542. [kʷúlét˥ kʷúlét˥] ‘(be) smooth’
1136. [kʷùɮākták̀dāk] ‘leech’
1351. [kʷùɮè] ‘darkness’
1982. [kʷú.nó:] ‘millet drink’
1164. [kʷórɔ́^{m}bàlá] ‘shea-butter tree’
1101. [kʷórɔ́^{n}dzàlāx] ‘agama lizard’
0001. [kʷùsàm] ~ [kʷùsòm] ‘body’
0802. [kʷùʃɛ̄ʔ] ~ [kʷùʃēt˥]‘fishing net’
1031. [kʷūtél] ‘tail’
1801. [kʷūtʃék] ‘chicken basket’
1104. [kʷùvōxʷ] ‘monitor lizard’
0349. [kʷùzòkʷ^{ʔ}nā] ‘uncle’

/l/

0743. [lā] ‘field’
0702. [là] ‘act, do’
0685. [lām] ‘build’
2048. [làm] ‘help’
0491. [lākʷótāj] ‘whip(n)’
0858. [lāp˥] ‘send’
0455. [lāràk] ‘request’
0900. [lāwāt˥] ‘play’
1972. [láxláx] ‘(be) pleasant’
2440. [lébēr lébēr] ‘flexible’
2266. [lèɓēt˥] ‘plead’
1885. [lèlēŋ] ‘humidity’
0808. [lèm] ‘get, obtain’
2297. [léŋ] ‘plus’
2246. [lē^{n}gēt˥] ‘trad. ball game’
1025. [lēvērē] ‘lion’
1521. [lēʒ] ‘narrow’
2068. [làgé] ‘pasture’
1224. [làɮàw] ‘okra’
0457. [làvà] ‘baby sling’
2353. [lāváŋ lāváŋ] ‘dark’

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2188. [lōkʷ] ‘lose weight’
1309. [lɤ̀wètʃ] ‘fireplace’

/ɬ/

0494. [ɬā] ‘prepare’
1115. [ɬāɬərāj] ‘slip’
0479. [ɬàp] ‘tell, recount’
1919. [ɬápˀ] ‘almost’
2189. [ɬār] ‘smear’
1171. [ɬārāmā] ‘date palm’
2044. [ɬātˀ] ‘ask persistently’
1453. [ɬāx] ‘tear(v)’
2272. [ɬēɗœ̄kʷ] ‘type of grass’
2247. [ɬɛ́ɬēdɛ́kʷ] ‘skin of millet stalk’
2119. [ɬɛ̄ɬɛ̄tˀ] ‘remove skins’
1994. [ɬɛ̄ŋ] ‘dance while jumping’
1755. [ɬɛ̄r] ‘exterminate’
1424. [ɬēɥ] ‘catch’
2192. [ɬɛ̄pˀɬépˀ] ‘narrow’
0162. [ɬəkār] ‘kick’
2510. [ɬəkàtˀ] ‘change skin colour’
2345. [ɬəlāj] ‘place horizontally’
1897. [ɬəràpˀ] ‘cover lightly’

/ɮ/

0958. [ɮà] ‘ox’
0719. [ɮà] ‘saw, cut’
1293. [ɮàɮàr] ‘river’
0013. [ɮàm] ‘ear’
0560. [ɮāᵐbāj] ‘walking stick’
0703. [ɮàn] ‘work’
0850. [ɮāŋ] ‘cross (v)’
2523. [ɮāpˀ] ‘help each other’
0639. [ɮàr] ‘open’
2221. [ɮárdāj] ‘gap’
1425. [ɮàtˀ] ‘pick up’
0598. [ɮàv] ‘strain’
0855. [ɮāz] ‘capsize’
2171. [ɮɛ̄ɮɛ̄] ‘long ago’
1258. [ɮéɮívér] ‘forest’
0062. [ɮérɛ̄k] ‘fingernail’
0570. [ɮéj] ‘meat’
2438. [ɮɛ̄pˀ] ‘overlap’
2143. [ɮəɮāw] ‘lay something on’
2135. [ɮəràts] ‘pour grain into’
2125. [ɮāráv] ‘type of grass’
1551. [ɮərᵐbàtˀ] ‘(be) sticky’
0018. [ɮìɗéŋ] ‘tooth’
2068. [lìgé] ‘pasture’
2630. [ɮì.kʷùsàm] ‘flesh’
0134. [ɮìmɛ̄] ‘hear, understand’
1259. [ɮìvèr] ‘clearing’
1558. [ɮòxʷɗàj] ‘(be) blue’

/m/

0015. [mā] ‘mouth’
0031. [mābás] ‘shoulder’
2183. [màbókʷ] ‘type of grass’
2295. [màdā] ‘if’
0053. [mādàdòkʷrá] ‘elbow’
0033. [māɗàɗā] ‘chest’
0978. [māɗàɗàklá] ‘turkey’
1336. [màɗàn] ‘drizzle’
1099. [mādzábākālāf] ‘green mamba’
1128. [màflāflā] ‘tarantula’
1791. [māgʷúlváŋ] ‘bean pap’
1315. [máhʷāwbókʷ] ‘cloud’
2275. [māhʷōjhʷōjā] ‘type of grass’
1189. [máhʷərʃœ́kʷ] ‘bud’
0289. [mājˀ] ‘choose’
0093. [mājā] ‘saliva’
2328. [mākáɬáfāj] ‘misfortune’
2257. [mākāɓá] ‘type of sacrifice’
2096. [māskʷōlāj] ‘stubborness’
0894. [mākʷœ̄dkʷœ̄ɗɛ́] ‘rattle (n)’
1123. [mākʷúlə́mbáŋ] ‘ant’
1812. [mālā] ‘for’
2307. [málàj] ‘only child’
0908. [mālō.lā] ‘demon’
2063. [máɬàgá] ‘piece of cloth’
1009. [māɬáhájˀ] ‘mouse’
0782. [māɬālāw] ‘poison’
2212. [màɬāxɬā] ‘arthritis’

1418. [màɮāɮáj] ‘speed’
1056. [màɮārāw] ‘hawk’
1127. [māɮárbābó:] ‘spider’
2340. [māmbāzá] ‘so much’
1145. [mémbèrəvétékēm] ‘dragonfly’
0345. [mán] ‘mother’
2396. [mānānāx] ‘bitterness’
0004. [mānānòkʷ] ‘forehead’
2327. [mānāŋ] ‘individual’
1016. [māⁿdāván] ‘hare’
2167. [màⁿdzəráf] ‘end’
1010. [māⁿdúwán] ‘rat’
2341. [māᵑgālāj] ‘fruit with one seed.’
1861. [māᵑgáráj] ‘butting heads’
0025. [máᵑgʷərlàm] ‘throat’
2123. [māᵑgráw] ‘type of grass’
1378. [māpát] ‘morning’
1501. [mār] ‘begin’
0405. [māràk] ‘begger’
2399. [márātˀ] ‘plane’
0941. [mārpā] ‘fiance’
2126. [màs] ‘type of weed’
0313. [māságāl] ‘(be) lazy’
2395. [másùxʷvərzáj] ‘sore throat’
1162. [mátāpˀ] ‘baobab’
1103. [mātɔ́tɔ́lgʷā] ‘gecko’
0066. [mātōkʷtōkʷā] ‘knee’
0249. [màts] ‘die’
2461. [mātˀ] ‘finish’
1850. [mātsáɮāj] ‘head ornament’
2514. [mátsərɓàɬ] ‘adult tooth’
2079. [mátskʷōxʷ] ‘evening’
1592. [màxkáɗ] ‘three’
0395. [mává] ‘slave’
2090. [māvává] ‘old(former)’
0588. [mávō:] ‘beer (trad.)’
1701. [māwá] ‘type of tree’
0328. [màwàl] ‘man’
2198. [māwálāj] ‘youth meeting’
2127. [màxántávāj] ‘type of plant’
2120. [māxéjŋgō:] ‘type of grass’
1593. [màxkátˀ] ‘three’
1722. [màzālāk] ‘pile of millet’
0037. [mázōxʷ] ‘navel’
1167. [m̀ɓā] ‘tamarind tree’
1120. [mèdèfɛ̄ʃéŋ] ‘bedbug’
1799. [mèdʒɛ̄rɛ̄] ‘terrace’
2215. [mɛ̄dʒīvɛ̄] ‘ancestor pot’
0426. [mèɗélè] ‘resemblance’
0089. [mɛ̄ftéʃ] ‘muscle’
0049. [mègʷùdɛ̄ŋ] ‘clitoris’
0572. [mèl] ‘oil’
1130. [mélœ̄kʷɗé] ‘dung beetle’
2218. [mɛ̄ɬépɛ̄tʃ] ‘foam on beer’
1024. [mēmēŋ] ‘leopard’
2312. [mèn] ‘(be) left’
0871. [mɛ̄ⁿdé] ‘sword’
1142. [méⁿdʒéu] ‘mosquito’
0209. [mɛ̄ⁿdʒɛ̄vɛ̄k] ‘medecine’
0226. [mēnēkēt] ‘ringworm’
2448. [mènēnēʃ] ‘fried bean leaves’
1005. [méŋ] ‘antelope’
1853. [mépètʃék] ‘bark for young girls’
0959. [mērέ] ‘bull’
1945. [mēʃélēbé] ‘head scarf’
0308. [mēʃémtē] ‘(be) shy’
2357. [mēʃèʃœ́kʷ] ‘soot stain’
1346. [méʃfé] ~ [méʃfé?] ‘cold weather’
1547. [mɛ̄ʃkʷœ̄ɗ] ‘soften’
2358. [méʃœ́kʷ] ‘small ant’
2222. [mètēné] ‘malnutrition’
2209. [mētɛ̄rɛ̄f] ‘infection’
1707. [mètéʃ] ‘hunger, famine’
0814. [mētètœ̄kʷ] ‘poverty’
2525. [métərʃœ́ŋʷ] ‘(be) naked’
1800. [mētʃéfék] ‘lid for grainery’
2556. [métʃētˀ] ‘dagger’
0145. [mètˀ] ‘swallow’
0460. [mētˀ] ‘swear’
2105. [métɤ̄hʷé] ‘(be) true’
0452. [mētɤ̄.lé] ‘lie’
1732. [métɤ̀.mtʃé] ‘corpse carrier’

1109. [mèvēɗvēdɛ̄ŋ] ‘turtle’
1588. [méwɛ̄] ‘(be) new’
1131. [mézɛ̀ŋkétˀ] ‘jigger, sand flea’
1312. [mèʒērɛ̄f] ‘prositution’
2152. [məɾɛ̄tˀ] ‘stretch’
0734. [m̀ɬàtˀ] ‘broom’
0399. [m̀ɮā] ‘blacksmith’
0714. [mōkʷóhʷō] ‘log’
2116. [mōkʷúɗá] ‘next year’
0640. [m̀pāk] ‘close (v)’
1474. [m̀pàm] ‘look for’
0954. [m̀pàs] ‘bury’
2464. [m̀pàtˀ] ‘take little by little’
0712. [m̀pè] ‘wood’
0605. [m̀sār] ‘fry’
0604. [m̀sàw] ‘roast’
1119. [m̀ʃétˀ] ‘flea’
2194. [m̄ʃétˀ] ‘nastiness’
0340. [m̀sˢɾā] ‘old person’
0048. [m̀tsā] ‘vagina’
0011. [m̀tsār] ~ [àmtsār]‘nose’
2489. [m̀tsátˀ] ‘tweezers’
0953. [m̀tʃɛ̀] ‘corpse’
0333. [mō.sá] ‘twin’
1963. [mú.ʒɛ̄l] ‘removal of excess plants’
0571. [m̀zā] ‘fat’
0886. [m̀zār] ‘smallest drum;
2411. [m̄ʔm̄ː] ‘mm…’

/mb/

1794. [ᵐbádàpˀ] ‘type of leaf’
0217. [ᵐbádɔ̀kʷ] ‘goiter’
1227. [ᵐbāj] ‘casava’
2394. [ᵐbāk] ‘stop short’
0759. [ᵐbāl] ‘pick fruit’
1426. [ᵐbāl] ‘hold, stop, grab’
0231. [ᵐbāl má] ‘hurt’
2425. [ᵐbāɮá] ‘type of beer’
0098. [ᵐbáᵐbāz] ‘blood’
0073. [ᵐbàŋgás] ‘toe’
0059. [ᵐbàrá] ‘finger’
0651. [ᵐbàrlá] ‘strap, rope’
0767. [ᵐbātˀ] ‘domesticate’
0819. [ᵐbātˀ] ‘exchange’
2177. [ᵐbàtˀ ᵐbàtˀ] ‘chaff’
2104. [ᵐbàwák] ‘flute (small)’
0896. [ᵐbàz] ‘blow (instrument)’
1650. [ᵐbé] ‘him, her, it’
0968. [ᵐbèhɛ̄tʃɛ̄kɛ̄] ‘kid’
0104. [ᵐbɛ̄ɬ] ‘wink’
1706. [ᵐbèɮːé] ‘fixedly’
0764. [ᵐbɛ̄ŋ] ‘winnow’
1085. [ᵐbèŋtʃɛ̄rɛ̄ɥ] ‘mudfish’
0161. [ᵐbēr] ‘jump’
1657. [ᵐbér ᵐbér] ‘near’
2522. [ᵐbērvēdʒɛ̄ŋ] ‘pumpkin leaves’
0220. [ᵐbˀlàx] ‘wound, sore’
0384. [ᵐbˀlōkʷ] ‘guest, visitor’
1965. [ᵐbílmètˀ] ‘flying termite’
0334. [ᵐbòː] ‘child’
2166. [ᵐbōkʷ] ‘evaporate’
2303. [ᵐbògʷòf] ‘mouse (house)’
2099. [ᵐbóxʷ] ‘pardon’
2110. [ᵐbòxʷ] ‘wrap up corpse’

/n/

0609. [nà] ‘ferment’
0641. [nāk] ‘stop up’
2533. [nākā] ‘my’
0083. [nàm nàm] ‘liver’
0122. [nānā] ‘shiver’
0147. [nāt] ‘lick’
1429. [nāx] ‘drop’
2323. [nāx má] ‘leave’
2180. [nɛ̄f] ‘put on end of stick’
1338. [ném ném] ‘dew’
1066. [nɛ̄ɬɛ̄] ‘egg’
2290. [nènè] ‘we (excl)’
1771. [nɛ̄nɛ̄ɥ] ‘throw from far’
2255. [nètʃ] ‘light end of stick’
0111. [ǹtèf] ~ [àntèf] ‘spit (v)’
0116. [ǹtʃɛ̄x] ‘groan’

/nd/

0154. [ⁿdā] ‘walk’
2248. [ⁿdàblām] ‘young hen’
1723. [ⁿdālā] ‘pile of stalks’
1917. [ⁿdár] ‘so that’
1084. [ⁿdàrʲᵊɣʷòz] ‘catfish’
1900. [ⁿdàt˥] ‘align’
1411. [ⁿdàv] ‘fall’
1535. [ⁿdép˥ ⁿdép˥] ‘weight’
0332. [ⁿdēɗéʒ] ‘newborn’
0195. [ⁿdél] ‘(be) barren’
1534. [ⁿdéléx ⁿdéléx] ‘(be) heavy’
2351. [ⁿdélwéŋ] ‘peanut and beef bone’
2098. [ⁿdéⁿdēɓēk] ‘(be) fresh’
1798. [ⁿdèⁿdèlɶèkʷ] ‘short and circular’
1456. [ⁿdēⁿdēt˥] ‘squeeze’
1777. [ⁿdēr] ‘crush lightly’
2033. [ⁿdālóŋʷ] ‘same, similar’
1163. [ⁿdāklém] ‘silk-cotton tree’
2344. [ⁿdàlàj] ‘place horizontally’
2478. [ⁿdālám] ‘(be) in pieces’
1232. [ⁿdàrəⁿgʷójāŋ] ‘corn’
0706. [ⁿdàvàl] ‘hammer’
1475. [ⁿdō:] ‘find’
1756. [ⁿdòŋʷ] ‘bottom’
1179. [ⁿdòw] ‘tree trunk’
1565. [ⁿdɶkʷ ⁿdɶkʷ] ‘sweet’
0505. [ⁿdràm] ‘please, satisfy’
2343. [ⁿdrāmdámdáj] ‘ground pea (large)’
1960. [ⁿdrè māzāmbák]‘red millet’
1233. [ⁿdrèj] ‘millet’
2518. [ⁿdrò:] ‘crush’
1386. [ⁿdùkʷlōm] ‘piece’
2225. [ⁿdɤ̀ų ⁿdɤ̄ų] ‘stone game’

/ndz/

0150. [ⁿdzā] ‘sit, stay’
2147. [ⁿdzàt˥] ‘wrap with cloth’
0772. [ⁿdʒè] ‘feed’
0006. [ⁿdʒē] ‘eye’
2020. [ⁿdʒē] ‘raw’
0136. [ⁿdʒèf] ‘smell(v)’
2273. [ⁿdʒél] ‘type of grass’
2236. [ⁿdʒèɮ] ‘join’
1727. [ⁿdʒèn] ‘follow’
1020. [ⁿdʒéⁿdʒèɣéų] ‘fruit bat’
2531. [ⁿdʒēɾéŋ] ‘string game’
1435. [ⁿdʒèų] ‘drag’
2133. [ⁿdʒēx] ‘rub’
1012. [ⁿdzᵊɾám] ‘palm rat’
1772. [ⁿdʒəɾèɮ] ‘pull out’
2190. [ⁿdzòkʷ] ‘transport’
1579. [ⁿdʒɤ̀wèn] ‘truth’

/ŋ/

2421. [ŋ́] ‘in’
1966. [ŋɓòxʷ] ‘pull apart’
0577. [ŋfá] ‘flour’
1593. [ŋfát˥] ‘four’
1679. [ŋɣā] ~ [ǎɣā̄] ‘this’
1700. [ɛ̋ɣɛ̀] ‘no’
1548. [ŋhʷāl] ‘dry’
0182. [ŋhʷāz] ‘(be) drunk’
0655. [ŋkàn] ‘fasten’
2232. [ŋkāp] ‘wait’
1185. [ŋkēm] ‘stem’
1272. [ŋkəɗāŋ] ‘stone’
1498. [ŋkəɗâw] ‘burn’
1083. [ŋkìlɛ̀f] ‘fish’
1344. [ŋkᵊɾàm] ‘dry season’
1855. [ŋkràŋ] ‘delay’
1851. [ŋkrāp] ‘hide for women’
2212. [ŋkràt] ‘boil, simmer’
2422. [ŋ́ʷkʷūné] ‘your (pl)’
2534. [ŋkʷā] ‘your(sg)’
1595. [ŋkʷáx] ‘six’
0081. [ŋkʷōp˥] ‘brain’
0218. [ŋkʷōkʷ] ‘hernia’
1097. [ŋkʷórɬá] ‘puff adder’
1573. [ŋkʷùlāf] ‘(be) weak’
2422. [ŋ́ʷkʷūné] ‘your (pl)’

1173. [ŋkʷōsāf] ‘grass’
0354. [ŋʃēŋ] ‘descendant’
1596. [ŋʃìlétˀ] ‘seven’
1416. [ŋtā] ‘burst’
1422. [ŋtā] ‘take’
2443. [ŋtāpˀ] ‘twist’
0828. [ŋtàr] ‘pay’
1882. [ŋtātˀ] ‘cut while pulling apart’
0160. [ŋtàtˀ] ~ [àŋtàtˀ] ‘swim’
0725. [ŋtàv] ~ [ǹtàv] ‘sew’
2204. [ŋtàw] ‘whip’
0065. [ŋtāwāl] ‘thigh’
2219. [ŋtáwán] ‘type of fruit’
0548. [ŋté] ‘shoe’
0800. [ŋtēlē] ‘fish dam’
1428. [ŋtèŋ] ‘lower’
0173. [ŋtēpˀ] ‘bow’
0897. [ŋtèr] ‘write’
1466. [ŋtèʒ] ‘separate’
0183. [ŋtəɓàl] ‘(be) tired’
2082. [ŋtəɾàpˀ] ‘grab’
0969. [ŋtìmēk] ‘sheep’
1506. [ŋtōkʷ] ‘finish’
1318. [ŋtʰɾā] ‘moon’
2335. [ŋtrām] ‘spur’
2058. [ŋtrókʷ] ‘well’
1114. [ŋtsà] ‘bite’
1064. [ŋtsālā] ‘gizzard’
0815. [ŋtsàtˀ] ‘(be) rich’
0559. [ŋtʃèr] ‘scarify’
1229. [ŋtʃəfētˀ] ‘yam’
0143. [ŋtsàkàpˀ] ‘chew’
2280. [ŋtʃíné] ‘earlier’
1436. [ŋtsòkʷ] ‘push’
2240. [ŋtʃœkʷ] ‘tighten’
0843. [ŋtʃʏwèr] ‘travel’
2439. [ŋtōkʷāl] ‘fold’
2170. [ŋtʏwéʃ] ‘folere seed’
0102. [ŋvá] ~ [àŋvá] ~ [àmvá] ‘excrement’
0615. [ŋván] ~ [m̀ván] ‘grinding stone’
0388. [ŋxēl] ‘thief’
0517. [ŋxēl] ‘steal’
0965. [ŋʷxʷā] ‘goat’
1488. [ŋxʷōl] ~ [ŋxʷāl]‘dry out’
1252. [ŋʷxʷōl] ~ [ŋxʷōl]‘whither’

/ᵑg/

1460. [ᵑgā] ‘break’
0035. [ᵑgálá] ‘side (of body)’
2415. [ᵑgām ᵑgàm ᵑgām ᵑgàm] ‘noise of grinding with a stone’
0749. [ᵑgàpˀ] ‘transplant’
0070. [ᵑgās] ‘foot’
2052. [ᵑgātˀ] ‘mix sold with liquid’
0450. [ᵑgàz] ‘advise’
1058. [ᵑgēf] ‘feather’
0414. [ᵑgèl má] ‘meet’
0804. [ᵑgélé] ‘fishhook’
1273. [ᵑgēlēlēm] ‘gravel’
2242. [ᵑgél ᵑgél] ‘(be) spherical’
0786. [ᵑgéɮé] ‘knife’
0905. [ᵑgìɮēŋ] ‘awe, fear’
1175. [ᵑgéᵑgē] ‘reed’
2156. [ᵑgēr] ‘develop’
0101. [ᵑgéʃ] ‘urine’
0119. [ᵑgēʃ] ‘urinate’
2230. [ᵑgətāw] ‘rip’
0574. [ᵑgìjēj] ‘pap’
0705. [ᵑgìɮē] ‘forge’
1237. [ᵑgìɮèŋ] ‘peanuts’
1044. [ᵑgɾáɮ] ‘weaver-bird’
2185. [ᵑgrèŋ] ‘greed’

/ᵑgʷ/

1430. [ᵑgʷōf] ‘throw’
2019. [ᵑgʷōᵑgʷōpˀ] ‘develop (sore)’
0881. [ᵑgʷòᵑgʷòr] ‘hum’
0741. [ᵑgʷóᵑgʷōv] ‘rubbish’
2519. [ᵑgʷòrlàlá] ‘(be) course’

0321. [ⁿgʷòv] ‘suffer’
0306. [ⁿgʷœʃém] ‘(be) fierce’
1790. [ⁿgʷùdã] ‘millet and beans’
2145. [ⁿgʷùrēx] ‘scratch’

/ᵑᵐgb/

1662. [ᵑᵐgbá] ‘up’
0189. [ᵑᵐgbòkʷ] ‘hump’

/p/

2310. [pā] ‘put’
2330. [pá] ‘more than’
2482. [pádãj] ‘(be) flat and oval’
1928. [páj] ‘(be) arrived’
2554. [pāk] ‘put to one side’
2001. [pákàm] ‘mouth (inside)’
1949. [pāl] ‘(be) alone’
1849. [pālām] ‘type of grass’
0930. [pāɬ] ‘pour libation’
1059. [pápá] ‘wing’
0720. [pápálàm] ‘plank’
0765. [pāpāɬ] ‘shell peanuts’
2428. [pāpās] ‘spread out bits of’
2228. [pār] ‘come apart’
1927. [párák párák] ‘overflowing’
1636. [párhám] ‘(be) lacking’
1862. [pārɮòkʷ] ‘escape’
0425. [párpār párpār] ‘(be) different’
1877. [pàskàkàtˀ] ‘many (tiny things)’
1032. [pátákʷār] ‘hoof’
0648. [pātˀ] ‘wrap up’
2521. [pēk] ‘shake up and down’
2484. [pēlēm] ‘(be) vaste’
2491. [pēlēŋ] ‘come away from’
1769. [pēŋ] ‘cut at an angle’
1558. [pépēɗék] ‘(be) white’
1088. [pépèɮéŋ] ‘fish scale’
1878. [pēpīɗél] ‘scamper (ideo)’
2118. [pèprèk má] ‘race, compete’
0294. [pēr] ‘prevent’
2508. [pēr] ‘sprinkle water’
2383. [péré péré] ‘(be) full to overflowing’
1317. [pèʃ] ‘sun’
0757. [pèt] ‘harvest’
2430. [pētʃ] ‘gouge’
0594. [pədãk] ‘slice’
1146. [pədãktáwáj] ‘butterfly’
0556. [pədœ́kʷ] ‘razor’
2405. [pèlāx] ‘take apart’
2427. [pèɬētˀ] ~ [pìɬētˀ] ‘peel off layers’
2191. [pˀsàr] ‘lift off’
0120. [pèsàt] ‘break wind’
0047. [pèʃēl] ‘testicle’
0103. [pètsàm] ‘blink’
2085. [pèzòkʷ] ‘explode’
1522. [pìɗēm] ‘(be) deep’
1875. [pīʃēk] ‘spit out’
1818. [pītēɬ] ‘nibble’
2134. [pìtʃìkètˀ] ‘shake up and down’
1864. [plāv] ‘pierce’
1817. [plēm] ‘twist out’
1752. [pōxʷ] ‘betray’
2146. [pōxʷ póxʷ] ‘threshing stick’
2080. [pòhʷòkʷ] ‘pull away’
2412. [pʰœ́hʷ] ‘noise of suddenly entering.’
1423. [pˀràɬ] ‘snatch’
1895. [pràt] ‘detatch, divide’
2038. [prèɮ] ‘cut in pieces’
1980. [prētˀ] ‘split’
2229. [pūtōkʷ] ‘tear in passing’
2423. [pùtùkʷās] ‘turn over grain’

/r/

0050. [rá] ‘arm, hand’
0740. [rà] ‘dig’
1361. [ràdākál] ‘often’
0536. [ràgʷàts] ‘piece of clothing’
0453. [ràk] ‘ask’
1633. [rák rák] ‘(be) equal’
2506. [ràɬ] ‘scratch lightly’
0592. [rāɮ] ‘cut’

2385. [ráp] ‘all together’
1039. [rɑ̀ɾɑ̀m] ‘growl’
1903. [rɑtˀ] ‘press down flour’
2498. [rɑ̀v] ‘resound’
1129. [rɛ̀dʒɛ̀] ‘scorpion’
0208. [rɛ̄x] ‘heal’
2088. [rəd̪ā] ‘rot’

/s/

0149 [sà] ‘drink’
0327. [sā] ‘self’
2441. [sāfāj] ‘erase’
0024. [sāhá] ‘nape of neck’
1042. [sālák sālák] ‘crow’
0051. [sāᵐbòwá] ‘armpit’
0255. [sàn] ‘know’
1986. [sáŋkáɾá] ‘mastitis’
0133. [sār] ‘look at’
2450. [sār] ‘stiffen’
0075. [sārd̪á] ‘bone marrow’
0543. [sárlá] ‘trousers’
2433. [sàrlájˀ] ‘rabies’
1180. [sásábāj] ‘bark’
0063. [sāsālāj] ‘leg’
0267. [sàsàm] ‘(be) happy’
1990. [sàsàk] ‘sift’
2254. [sāsátˀ] ‘inside part of stalk’
0262. [sàsəɾàk] ‘learn’
2133. [sāsōkʷ] ‘shake empty’
0562. [sātˀ] ‘apply(ointment)’
2270. [sāx sáx] ‘(be) slightly sour’
2091. [ʃɛ̀f] ‘cool down’
2182. [ʃɛ̀ntɔ̀xʷ] ‘dregs of beer’
2267. [ʃéᵑgɛ̄] ‘funeral pots’
0652. [ʃéɾék] ‘string’
1350. [ʃɛ̄ŋʃɛ̄ŋ] ‘shadow’
0129. [ʃɛ̀ŋʃɛ̀ŋ] ‘dream’
2159. [ʃɛ̄ʃé] ‘measles’
1413. [ʃɛ̄ʃɛ̄d̪ɛ̄m] ‘slide’
0148. [ʃéʃépˀ] ‘suck’
0436. [ʃɛ̄ʃɔ̄kʷ] ‘whisper’
1481. [ʃɛ̄ʃɛ̄r] ‘drip’
1844. [ʃéwɛ̄tˀ] ‘mixing stick’
1821. [ʃɛ̄ɥ] ‘bear (with)’
0092. [sfɑ̀n] ~ [sˢfɑ̀n] ‘breath’
0106. [səfɑ̄n] ~ [sfɑ̄n]‘breathe’
0503. [sə̀bɑ̄r] ‘follow’
1979. [sə̀bōkʷ] ‘discussion’
1746. [ʃə̀ɓɛ̄] ‘pay bride-price’
2057. [ʃɪ̀fɛ̀] ‘mourning string’
0485. [sə̀lɑ̄m] ‘caress’
0724. [sə̀ᵐbɑ̀r] ‘nail’
1805. [sə̀ɾɑ̄x] ‘jealousy’
2224. [sərōxʷ] ‘slide’
1807. [ʃɪ̄ɓɛ̄lɛ̄ŋ] ~ [ʃɛ̄ɓɛ̄lɛ̄ŋ] ‘married, middle-aged woman’
0095. [ʃɪ̀ɓɛ̄ŋ] ‘nasal mucus’
0129. [ʃɪ̀ŋʃɪ̀ŋ] ~ [ʃɛ̀ŋʃɛ̀ŋ]‘dream
0820. [skɑ̄m] ‘buy’
1385. [skɑ̀n] ~ [kɑ̀n] ‘thing’
1165. [ʃʸké] ~ [ʃké] ‘fig tree’
0600. [ʃkɛ̀n] ~ [ʃkɪ̀n] ‘grind’
1457. [ʃkɛ̀n] ~ [ʃəkɛ̀n] ‘crush’
2499. [skʷɑ̀j] ‘inside part of calabash’
1901. [sòᵑgʷòf] ~ [sɑ̀ᵑgʷòf] ‘pour out all together (ideo)’
0540. [sòŋgʷòjòŋʷ] ‘(be) naked’
1357. [ʃʲpék] ~ [ʃpék] ‘late’
2520. [sùgʷōf] ‘remove skins by wetting’
0361. [sūkʷəlóxʷ] ‘in-law’

/t/

2386. [tá] ‘leave’
2479. [tá] ‘by’
0789. [tábā] ‘hunting net’
1392. [tàbā] ‘middle’
1410. [tàdòkʷ] ‘descend’
0847. [tɑ̀f] ‘path’
0692. [tāfsālā] ‘ladder’
2065. [tāj] ‘patch’

0293. [tāk] ‘forbid’
2071. [tākāt˥] ‘sharpen’
2476. [tākázù.dá] ‘calabash for fufu’
2550. [tàktárgʷā] ‘medium calabash’
2151. [tākʷār] ‘roll up’
1931. [tāl] ‘boil’
2287. [tàl] ‘sharpen’
0889. [tálgʷōj] ‘flute (for men)’
0632. [tàm] ‘pour’
0005. [tāmā] ‘face’
0788. [tāmtōkʷ] ‘club’
0303. [tāntān] ‘(be) honest’
2384. [táŋ] ‘place feet’
2319. [tāp tāp tāp] ‘noise of running quickly’
2207. [tár] ‘for good’
1715. [tàr] ‘do a chore’
1653. [tātā] ‘they’
2459. [tátàjá] ‘cucumber’
0777. [tātāk] ‘chase’
0019. [tátákʷōm] ‘molar tooth’
2284. [tātákʷūdɔ̀f] ‘thick (liquid)’
0619. [tàtám] ‘mortar’
2401. [tātār] ‘cackle’
1314. [tátɔ̄dɑ̀m] ‘air’
1789. [tāwār] ‘go for a walk’
1525. [táxɬádɑ̄j] ‘(be) flat’
1019. [tèbɑ́kʷ] ‘bat’
0620. [tɛ̄két˥] ~ [tīkét˥] ‘plate’
1894. [tɛ̄ɬ] ‘snap(v)’
0700. [téⁿdéŋ] ‘bell’
1590. [téᵑgʷùlèŋ] ‘one’
1126. [tépɛ̄] ‘termite’
2054. [tɛ̄ptépɛ̄] ‘calabash (large)’
1635. [tété] ‘(be) enough’
1046. [tètèkʷòléʃ] ‘partridge’
2349. [tètɛ̄né] ‘horn’
1414. [tètèᵑgèl] ‘roll (on ground)’
1409. [tèv] ‘climb, go up’
1638. [téɥ téɥ] ‘all’
0135. [tɛ̄x] ‘listen’
2400. [tɔ̄dɔ̄xʷ] ‘beat well’
1442. [tɔ̀kāt˥] ‘coil (rope)’
2084. [tɔ̀lāj] ‘after-birth pains’
2009. [tɔ̄lám] ‘(be) recent’
2432. [tɔ̀lām] ‘scoop out’
0736. [tɔ̀rgɑ̀ɬ] ~ [tɔ̀rgɑ̀ɬ]‘polish’
0878. [tɔ̀rgʷā] ~ [tɔ̀rgʷā] ‘granary’
2431. [tɔ̀rvɑ̀t˥] ‘twist’
1489. [tɔ̀tɔ̀ᵑgʷòl] ‘float’
2176. [tìbœ̀kʷ] ‘chaff’
0679. [tīkɛ́r] ‘well’
1449. [tùkʷāt˥] ‘rub’
2513. [tūkʷsásār] ‘(be) dry’
1893. [tūwāl] ‘wrap around’
0126. [tùwàr] ‘(be) dizzy’
1829. [tūwāt˥] ‘finish’
1576. [tūwáx] ‘(be) good’
2139. [tɤ̀.lèk] ‘make a circle’

/ts/

1469. [tsā] ‘put, place, set’
0415. [tsā má] ‘accompany’
0898. [tsāf] ‘decorate’
0253. [tsāk] ‘believe’
0492. [tsàk] ‘help’
0801. [tsākʷār] ‘fish trap’
2671. [tsáláx] ‘up to’
2196. [tsām] ‘pick up’
1308. [tsáŋtsāx] ‘smoke’
1118. [tsáŋtsāt˥] ‘flea’
0677. [tsāp] ‘fence in’
0776. [tsáp tsáp] ‘quickly’
1716. [tsāp˥] ‘smear’
2243. [tsáp˥ tsáp˥] ‘(be) a bit sour’
0132. [tsàtsàn] ‘notice’
1983. [tsàr] ‘bad behaviour’
1091. [tsārəgā ɬ] ‘crab’
2501. [tsātsāf] ‘type of spikey plant’
1632. [tsàtsàl] ‘arrange, solve’
0132. [tsàtsàn] ‘notice’
2174. [tsāwāl] ‘scoop out’

2354. [tʃédɗék tʃédɗék] ‘light (not dark)’
1049. [tʃéktʃékgèɾēk] ‘kingfisher’
1640. [tʃékʷúdɛ̄] ‘few’
2382. [tʃélélélé] ‘without one missing’
2285. [tʃélélēɥ] ‘(be) thin (liquid)’
1998. [tʃémpétˀ] ‘monkey (red)’
0344. [tʃèn] ‘father’
1263. [tʃēntʃēl] ‘summit’
1310. [tʃēŋtʃélém] ‘firewood’
1537. [tʃépˀ tʃépˀ] ‘(be) sharp’
0193. [tʃér tʃér] ‘thin’
1891. [tʃétʃègʷēʁ] ‘stalk of millet head’
2435. [tʃētʃēr] ‘pour (a little)’
1842. [tʃétʃʏ́wēr] ‘filter’
2402. [tʃēɥ] ‘prune’
1452. [tʃèv] ‘pierce (lightly)’
0175. [tʃəfœ̄kʷ] ‘squat’
0069. [tʃəhèɬ] ~ [tʃìhèɬ] ‘ankle’
2470. [tsəlāpˀ] ‘dip finger’
1222. [tsəlāk] ‘failure’
2105. [tsᵊɾātˀ] ‘twist off’
0539. [tsòkʷ] ‘undress’
1865. [tsràʁ] ‘pile’
1486. [tsùɣʷōpˀ] ‘soak’

/v/

1369. [vā] ‘year’
2539. [váj] ‘where?’
1683. [vájāj] ‘who?’
0809. [vàl] ‘give’
1335. [vān] ‘rain’
0379. [vàn] ‘family’
1690. [vánáj] ‘how many?’
1402. [vāŋ] ‘arrive’
1689. [váᵑgáj] ‘how?’
1238. [vár] ‘sesame seeds’
2021. [vār] ‘burn lightly’
2237. [vàrlàm] ‘submerge’
0675. [vārvāɾā] ‘courtyard’
2178. [vās] ‘hurry’
1365. [vāx] ‘spend time’
2157. [vēɗœ́kʷ] ‘small baby’
1177. [védʒēɗ] ‘leaf’
1223. [vɛ̄ⁿdʒēx] ‘red pepper’
1685. [vékē] ‘which (one)?’
0963. [vèlèŋgétˀ] ‘calf’
2245. [vēléʒ] ‘type of game’
1684. [vémé] ‘what?’
1687. [vépēj] ‘when?’
2095. [vēɾēx] ‘ridge’
2520. [vétʃē] ‘whose?’
2223. [vèvœ̄ɥ] ‘swinging’
0780. [vəlēx] ‘bow’
0233. [vànā] ‘vomit (v)’
0726. [vànām] ‘needle’
2163. [vəʒœ̄kʷ] ‘slime’
1682. [vīdíjé] ‘other’
0046. [vìdɛ̄] ‘penis’
1343. [vìjā] ‘wet season’
1041. [vìgèm] ‘bird’
1509. [vīʒœ́kʷ] ‘(be) small’
1374. [vōgʷúmtáɗ] ~ [vāgʷúmtáɗ] ‘day after tomorrow’
1274. [vòkʷ] ‘sand’
2548. [vōŋgʷɔ̄r] ‘spend a long time’
1639. [vrām] ‘many’
1557. [vᵊɾè] ~ [vrè] ‘(be) red’
2172. [vrèʁ] ‘separate out’
2381. [vrēŋ] ‘naughtiness’

/w/

0569. [ù.dā] ~ [àwdā] ‘food’
2424. [ù.dāf] ‘slightly off millet’
2003. [ù.dāl] ‘cut into sections’
1630. [ù.dāk] ‘decrease’
0626. [ù.dzām] ‘basket’
0663. [ù.dʒēk] ‘hut’
0023. [ù.lā] ‘neck’
0196. [ù.làf] ~ [àwlàf] ‘blind person’
0252. [ù.lāk] ‘think’
2162. [ù.làpˀ] ‘clod’
1984. [ú.lé] ‘not yet’

1268. [ù.lèj] ‘hole’
2018. [ù.nèk] ‘make hot’
0084. [ù.lɛ̄ʃ] ~ [ùwlɛ̄ʃ] ‘kidney’
0221. [ù.lɛ̄tˀ] ‘pus’
0082. [ù.nāf] ~ [ùwnāf] ‘heart’
2202. [ù.ɾàf] ‘(be) lukewarm’
1337. [ū.ɾáɬ] ‘hail’
1444. [ù.ɾātˀ] ‘spread out’
1781. [ù.ɾɛ̄j] ‘vegetable, sauce’
1992. [ù.sāx] ‘(be) in labour’
1663. [ú.zā] ‘down’
0377. [ù.zàm] ‘tribe, village’
1841. [ù.ʒījé] ‘children’
0034. [wá] ‘breast’
2389. [wā] ‘become’
2457. [wàjà wàjá] ‘everywhere’
1132. [wājāk] ‘grasshopper’
1959. [wāk] ‘(be) crazy, mad’
2308. [wāl] ‘leave early’
2527. [wāl] ‘isolate’
0329. [wàlā] ‘woman’
2403. [wālāŋ] ‘a long time’
1599. [wám] ‘ten’
0754. [wāᵐbāt] ‘sickle’
0128. [wān] ‘sleep’
2268. [wánjā] ‘traditional song’
1160. [wāntā] ‘mahogany tree’
1956. [wár] ‘still’
2100. [wásāj] ‘thanks’
0662. [wātá] ‘compound, home’
2199. [wàtsà wàtsá] ‘patchy’
2456. [wàwà] ‘everywhere’
2252. [wāwāj] ‘close (meeting)’
2075. [wɛ̄lɓɛ̄] ‘nature spirit’
2486. [wélélé] ‘in small pieces’
1241. [wɛ̄lwélɛ̄] ‘sugar cane’
2128. [wénɛ̄] ‘small fruit’
1981. [wénⁿdé] ‘a certain, another’
1311. [wénⁿdʒèk] ‘ashes’
0091. [wɛ̄ŋ] ‘vein’
0311. [wɛ̄ɾ wɛ̄r] ‘curiosity’
0204. [wéɾ wér] ‘good health’
1996. [wèrtʃètʃé] ‘(be) spotted’
0115. [wértʃɪ̄hèɥ] ‘sneeze (n)’
1680. [wɛ̄ʃé] ‘that’
1492. [wètˀ] ‘shine’
1751. [wɛ̄wɛ̄k] ‘twirl’
1054. [wéʒèm] ‘owl’
2418. [wóáˀ] ‘wo!’
0698. [wòlwàl] ‘lamp’

/x/

0003. [xā] ~ [hā] ‘head’
0114. [hádɑ̄k] ‘hiccup (n)’
1797. [hādzáŋ] ‘wine pot’
0213. [hāf] ‘swell’
2283. [hàgàk] ‘(be) shocked’
1768. [hágām] ‘yawn (n)’
1276. [hājāk] ‘dirt, soil’
0530. [hājāk] ‘country’
2374. [xāk] ‘prop up’
0336. [háldəmá] ‘girl’
0664. [hālū.lā] ‘wall’
0272. [xān] ~ [hān] ‘cry, weep’
1738. [hāᵑgá] ‘as if’
2007. [hàpˀ] ‘swallow’
1100. [hàɾˢɮāk] ‘lizard’
0656. [xàrɮàk] ‘tie knot’
2331. [hāts] ‘block(v)’
0275. [xáxār] ‘pity’
0274. [xáwá] ~ [háwá] ‘shame’
0125. [hàxəⁿdàr] ‘coagulate’
2124. [xéɓɛ̄ŋ] ‘type of grass’
2406. [héɛ̄èj] ‘hey!’
2150. [xɛ̄dɛ́ xɛ̄dɛ́] ‘justice, sincerity’
1957. [hèdʒè] ‘person’
2530. [hɛ̄gɛ̄ŋ] ‘boulder’
0159. [xéj] ‘run’
0613. [hɛ̄ɬékɛ̄tˀ] ‘ladle’
1437. [xɛ̄pˀ] ‘steer’
0584. [hèrgɛ̄déŋ] ‘mold’
0266. [hèʃèŋ] ~ [xèʃèŋ] ‘forget
1067. [xéxélèm] ‘eggshell’
2012. [xəʒètˀ] ‘straw for weaving’

2200. [xèʒɛ̄tˀ] ‘tear strips’
1366. [hàbā̀r] ‘watch over’
1397. [hàɓàl] ‘move’
1391. [xàƫā̀r] ‘next to’
2517. [xàƫàtˀ] ‘piece of clay pot’
0283. [xàmān] ~ [hàmān] ‘honour’
0688. [xəmās] ‘thatch’
2500. [xàtàf] ‘ashes’
2111. [xàtàj] ‘non-blacksmith’
1718. [xàtàn] ‘fog’
2259. [xàvā̀ts] ‘cut top part’
0991. [xàzā] ‘dog’
0180. [xᵑ̊ɾātˀ] ‘(be) sated’
0854. [xᵑ̊ɾāts] ‘bale out’

/xʷ/

1649. [hʷā] ‘you (sg)’
1845. [hʷā̀r] ‘serve (fufu)’
1524. [hʷōdəɾōkʷ] ‘(be) shallow’
1820. [hʷōdzóŋʷ hʷōdzóŋʷ] ‘(be) deep’
1454. [hʷòkʷ] ‘strip off(bark)’
1857. [xʷòkʷ xʷòkʷ] ‘tight’
2595. [hʷōptsá] ‘broken in piles’
2393. [xʷòpˀ] ‘fertilise’
1533 [hʷɔ̀rlàv] ‘bend (n)’
2165. [hʷɔ̄ɾōkʷ] ‘evaporate’
2094. [xʷɔ̀ɾòm] ‘bend down’
1871. [hʷòs] ‘reach’
1011. [hʷósásāpˀ] ‘cane rat’
1995. [hʷòtəmbā] ‘rock badger’
2596. [hʷœ́lɛ́lɛ́] ‘broken and scattered’
1520. [hʷùbàr] ‘widen’
1303. [hʷūbóf] ‘foam’
2250. [hʷùbōkʷ] ‘assembly place’
2023. [hʷùƫā̀m] ‘scratch(v)’
1652. [hʷùnɛ́] ‘you(pl)’
2042. [hʷūtár] ‘vampire’
1105. [hʷùzā̀m] ‘crocodile’

/z/

1942. [zəɓát] ‘a limited time’
0909. [zàɓlā] ‘ghost’
1969. [zàɗːá] ‘a bit further’
1384. [zàɗɔ̀ː] ‘night’
1825. [zàjá zàjá] ‘carefully’
1055. [zāl] ‘eagle’
0140. [zàm] ‘eat’
0841. [zàm ù.dʒɛ̄k] ‘inherit (lit. eat house)’
2072. [zāɾák] ‘horn (instrument)’
1120. [zàɾəmbākētɛ̄kētɛ́k] ‘chameleon’
2334. [zátˀ] ‘a short distance’
1463. [zàv] ‘join’
0979. [zāvān] ‘guinea fowel’
0198. [zāvā́j] ‘hunchback’
1953. [zàx] ‘pour (grain)’
0185. [zàzàk] ‘rest’
2324. [zázān] ‘type of bark’
0545. [zāzāw] ‘robe’
1140. [zāzᵑ̊rátˀ] ‘earthworm’
2114. [ʒɛ̄lʒɛ̄l] ‘column’
0038. [ʒɛ̀ᵐbɛ̄l] ‘umbilical cord’
0810. [ʒɛ̀n] ‘return’
1359. [ʒɛ̄nɛ́j] ‘again’
2442. [ʒɛ̀ᵑgɛ̀t] ‘lean over’
1443. [ʒɛ̄ŋ] ‘hang up’
1098. [ʒɛ̀ŋʒɛ̀ŋ] ‘python’
2339. [ʒɛ̄tɛ́lvɛ̄ŋ] ‘(be) up high’
1513. [ʒɛ̀tɛ̄rɛ̄ɥ] ‘(be) long’
1161. [ʒɛ̄ɥ] ‘teak tree’
0999. [ʒɛ̀ʒɛ̄ɗɛ́] ‘giraffe’
1095. [ʒɛ́ʒœ̄kʷ] ‘snake’
2153. [zəɓā̄k] ‘bean leaves’
1711. [zəhā̄j] ‘good fortune’
0790. [ʒəhɛ̄tˀ] ‘birdlime’
1779. [zəkātˀ] ‘type of wild fruit’
2010. [zəlā́j] ‘laid down’
2235. [zəᵐbàr] ‘throw from a distance’

[

0966.	[ʒìfɛ̄]	‘billy-goat’
1018.	[ʒìmɛ̄ŋ]	‘porcipine’
2160.	[ʒìndɛ̄]	‘meat craving’
2089.	[ʒìndɛ̄r]	‘hook’
1811.	[zʊ̀k^{w}ōná]	‘(be) recovered’
0691.	[zʊ̀wɑ̄j]	‘paint (n)’
0910.	[ʒɤ̀wɛ̀t]	‘soul, spirit’

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Appendices

Appendix A: Phonotactics Tables

Table A1: Phonotactics of Consonants (apart from word-initial consonant clusters)

Cons	Word-Initial	Syllable-Initial (Word medial)	Intervocal	Syllable-Final (Word-medial)	Word-Final
/p/	+	+	+		+
/b/	+	+	+		
/t/	+	+	+	+	+
/d/	+	+	+		
/k/	+	+	+	+	+
/g/	+	+	+	+	
/ɓ/	+	+	+	+	+
/ɗ/	+	+	+	+	+
/f/	+	+	+	+	+
/v/	+	+	+	+	+
/ɬ/	+	+	+		+
/ɮ/	+	+	+		+
/x/	+	+	+	+	+
/ɣ/	+	+	+		+
/kʷ/	+	+	+	+	+
/gʷ/	+	+	+	+	
/xʷ/	+	+	+		+
/ɣʷ/	+	+	+		+
/s/	+	+	+	+	+
/z/	+	+	+	+	+
/ts/	+	+	+	+	+
/dz/	+	+	+		
/m/	+	+	+	+	+
/n/	+	+	+	+	+
/ŋ/	Only before C			+	+
/ŋʷ/	Only before K^w			+	+
/mb/	+	+	+	+	
/nd/	+	+	+	+	
/ŋg/	+	+	+	+	
/ᵑgʷ/	+	+	+		
/gb/	+	+			
/ᵐᵑgb/	+	+			
/l/	+	+	+	+	+
/r/	+	+	+	+	+
/j/	+	+	+	+	+
/w/	+	+	+	+	+

Table A2: Possible Word-Initial Phonetic CC Clusters

Cons	Preceeded by Nasal	Preceeded by /s/	Followed by /r/	Followed by /l/
/p/	+	+	+	+
/b/			+	+
/t/	+		+	
/d/			+	
/k/	+	+	+	+
/g/			+	+
/ɓ/	+			
/ɗ/				
/f/	+		+	+
/v/	+		+	+
/ɬ/	+			
/ɮ/	+			
/x/	+		+	
/ɣ/	+		+	
/kʷ/	+			
/gʷ/				
/xʷ/	+			
/ɣʷ/				
/s/	+		+	
/z/	+		+	
/ts/	+		+	
/dz/			+	
/m/			+	
/n/				
/ŋ/				
/ŋʷ/				
/ᵐb/				+
/ⁿd/			+	
/ᵑg/			+	
/ᵑgʷ/				
/gb/				
/ᵐᵑgb/				
/l/				
/r/				
/j/				
/w/			+	+

Table A3: Consonant types of Following Consonants in C Clusters

C	Place of Articulation					Manner of Articulation						Voicing	
	Lab	Alv	Lam	Pal	Vel	Plos	Implos	Fric	Liq	Nas	Gld	Vd	Vl
/p/		+				+			+			+	+
/b/		+							+			+	
/t/		+							+			+	
/d/		+							+			+	
/k/		+				+			+	+		+	+
/g/		+				+			+			+	
/ɓ		+							+			+	
/ɗ/	+				+	+		+				+	+
/f/		+				+			+			+	+
/v/		+				+			+			+	
/ɬ/													
/ɮ/													
/x/		+			+	+		+	+			+	+
/ɣ/		+							+			+	
/kʷ/		+				+	+	+	+			+	+
/gʷ/													
/xʷ/													
/ɣʷ/													
/s/	+				+	+		+					+
/z/	+				+	+	+	+				+	
/ts/		+			+	+			+			+	+
/dz/		+							+			+	
/m/	+	+	+			+	+	+		+		+	+
/n/		+	+	+		+					+		+
/ŋ/	+	+	+		+	+		+				+	+
/ŋʷ/					+	+							+
/ᵐb/		+							+			+	
/ⁿd/		+							+			+	
/ᵑg/		+							+			+	
/ᵑgʷ/													
/gb/													
/ᵑᵐgb/													
/l/	+	+			+	+		+			+	+	
/r/	+	+	+		+	+	+	+	+	+	+	+	+
/j/		+			+	+		+				+	+
/w/	+	+	+			+			+	+		+	

Table A4: Consonant Types of Preceding Consonants in C Clusters

C	Place of Articulation					Manner of Articulation						Voicing	
	Lab	Alv	Lam	Pal	Vel	Plos	Implos	Fric	Liq	Nas	Gld	Vd	Vl
/p/	m	+	+					+	+	+		+	+
/b/					+						+	+	
/t/	+	n			+	+		+		+		+	+
/d/	+	+			+	+		+	+		+	+	
/k/		+			ŋ			+	+	+		+	
/g/		+			+	+		+	+			+	+
/ɓ	m	+						+	+	+		+	
/ɗ/		+			+	+			+			+	+
/f/		+	+		ŋ			+		+		+	+
/v/		+			ŋ		+		+	+		+	
/ɬ/	+	+			+			+	+	+		+	+
/ɮ/	+	+							+	+		+	
/x/					ŋ					+		+	
/ɣ/													
/kʷ/		+	+	+	ŋʷ		+	+		+	+	+	+
/gʷ/		+		+			+		+		+	+	
/xʷ/				+	ŋʷ						+	+	
/ɣʷ/		+							+			+	
/s/	m									+		+	
/z/	m	+			+	+			+	+	+	+	+
/ts/	+				ŋ			+		+		+	+
/dz/	+				+			+			+	+	
/m/		+			+				+		+	+	
/n/	+	+			+			+	+	+	+	+	+
/ŋ/													
/ŋʷ/													
/ᵐb/		+							+			+	
/ⁿd/													
/ᵑg/													
/ᵑgʷ/		+							+			+	
/gb/													
/ᵑᵐgb/													
/l/	+	+			+	+	+	+	+		+	+	+
/r/	+	+	+		+	+		+				+	+
/j/		+							+	+		+	
/w/		+							+			+	