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THE JEN LANGUAGE CLUSTER: A COMPARATIVE ANALYSIS OF WORDLISTS

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Abstract: A lexicostatistical analysis divides the Jen language cluster into two primary branches Burak-Loo-Maghdi-Mak and Kyak-Moo-Leelau-Tha-Doso-Dza. This is also supported by extensive isoglosses, replacing the older Bikwin-Jen division at least for purposes of genetic classification. For vowels, a 9-vowel system is reconstructed, but its 3-way height contrasts appear unstable in some languages, either in the central vowels or in the front and back vowels. Front and back vowels also vary widely with diphthongs. Prosodic features of nasalisation, tone, and breathiness are reconstructed, with nasalisation developing in more roots in the second primary branch. For consonants, the large inventory includes particularly unstable coronals, and development of voiceless approximants in Doso-Dza. The comparative evidence is conflicting as to whether labialised and palatalised structures are secondary modifications or onset sequences, suggesting the need for a variationist approach. Overall, riverine Jen varieties Tha, Doso, Dza show unusually extensive sound change, in contrast to the more phonologically stable Bikwin varieties. Applications to orthography development include the need to represent implosives and /r/ in languages other than Dza, where they have been lost, and the need to represent vowel nasalisation and /h/ in languages of the second branch only. Initial stem consonant alternations seen in both nouns and verbs need more investigation in Jen languages.

Key words: Jen, language cluster, Bikwin, lexicostatistics, reconstruction, orthography

1. Introduction

The Jen language cluster conventionally consists of the ten Adamawa language varieties listed in Table 1, that are considered immediately genetically related as well as geographically adjacent (Eberhard et al. 2019). Hyphenated names in the literature, Burak-Jen (Bennett 1983) or Bikwin-Jen (Kleinewillinghöfer 1996), refer to the same cluster.[1]

Table 1

Jen varieties with ISO639-3 identifier codes and elicited autonyms

[bys]	**Burak**	[ɓūːrə̀k]
[ldo]	**Loo** (Shungo Galdemaru, Shungo Waamura, Tadam)	[ʃùŋɔ́]; [lō] ‘head’
[gmd]	**Maghdi** (Tala)	[màkdī], [mâɣdī]
[pbl]	**Mak** (Lee Mak) of Panya and Zoo	[màk], [lè màk] ‘they (of) Mak’
[bka]	**Kyak** (Bambuka)	[kjə̆̀k]
[gwg]	**Moo** (Gomu)	[mɔ̄]
[ldk]	**Leelau** (Munga Leelau)	[lê ləù] ‘road (to) Lau’
[mko]	**Munga Doso**	[mɨŋgə̃ dɔsɔ] ‘river original’
[jen]	**Dza** of Jen and Joole	[i-d͡zə] (d͡zə ‘reed plant sp.’)
[thy]	**Tha** (Joole Manga)	[ðə̀], [ɲwá ðá] (ɲwá ‘mouth’)

[1] Hammarström et al. (2019) add Baa (that is, Kwa [kwb]) as an “unclassified Bikwin-Jen language”, citing Kleinewillinghöfer (1996). This seems an optimistic reading of Kleinewillinghöfer, however, who reports only that Kwa is typologically similar to Bikwin-Jen in its pluralisation strategy (1996: 98), and that Kwa lexicon resembles Adamawa languages in general (1996: 99), neither of which is evidence of a Bikwin-Jen affiliation.

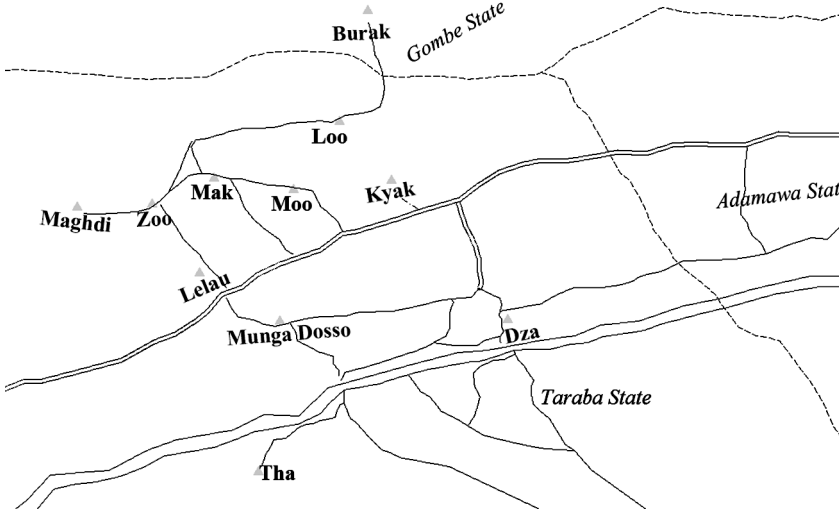

Figure 1. Map of the Jen language cluster (Othaniel 2017)

Recurrent elements in the variety names include *Munga* /mɨŋ-gə̃/ ‘river’ (*lit.* ‘big water’) used by two adjacent riverine communities, one of which asserts they are original (*Doso*) to the area, and the other is on the road to Lau (*Leelau*). The ancestral name *Mak* [mə̀k] is also present in *Maghdi* [mə̀kdī], [mə̂ɣdī], the latter with postvocalic allophonic variant [ɣ] as also observed in the Maghdi word list, [wə̀ɣmə̀ì] ‘shoe’, [g͡bə́ɣə̀] ‘scratch’.

The varieties are spoken between the Benue river and the Gombe/Taraba State border to the north (Figure 1). The Jen language cluster is in an area of high linguistic diversity, next to other Adamawa languages spoken in the east (Dadiya, Bangwinji, Tso, Kwa), West Chadic languages in the north and west (Tangale, Pero, Kushi, Kholok, Nyam), a Jarawan Bantoid language in the south-west (Kulung), Jukunoid languages (Shoo-Minda-Nye, Jiba) in the south, and a Central Sudanic language (Laka) in the south. The Central Chadic language Bachama is spoken to the east, but some of its speakers are settled in villages in the Jen language cluster area. The Atlantic language Fulfulde

is spoken by herders throughout the area. Hausa is present throughout the area as a language of wider communication, and English is present in schools and other formal settings.

In their morphological type, the Jen languages lack the noun class suffixes found in other Adamawa languages. Instead, pluralisation is expressed by the use of a 3PL pronoun before the noun. In Dza, where nouns begin with either a consonant or *i*, the noun may cliticise to the pronoun *è* causing removal of the noun's initial vowel, producing an incipient *í/è* alternation on *i*-initial nouns as shown in (1).

(1) Plural pronoun cliticisation in Dza

ífɨ̂	'person'	*è ífɨ̂*	~	*èfɨ̂*	'people'
ímwə̀	'child'	*è ímwə̀*	~	*èmwə̀*	'children'
íbwì	'male'	*è íbwì*	~	*èbwî*	'males'
íhè	'female'	*è íhè*	~	*èhê*	'females'

Across the Jen language cluster, various plural roots *e*, *le*, *ye*, *yá*, yila, or nó are used in this construction as shown in (2), often with vowel lengthening before the following noun, and/or initial vowel elision in the following noun.[2]

[2] The form le is also seen in Table 1, *Lee Mak*. Problematic in this respect is the name *Leelau*, as le is not used for the associative plural in Leelau in (2), nor do we have it in our Leelau wordlist for 'they', but Kleinewillinghöfer (1996: 96) provides the meaning of *Leelau* as 'road (to) Lau' (see **le* 'road' in our Appendix). Across the Jen language cluster, pronominal le is found either in the plural construction in (2) or for 'they' in our word list in Maghdi, Mak, Doso and Dza, widespread enough to support reconstruction of **le* 3PL, although it is unattested in Kyak-Moo-Leelau. Likewise, ye appears either in the plural construction or in the word list in Moo, Maghdi, Mak, and very similar *e* in Dza, supporting the reconstruction of **ye* 3PL as well in alternation with **le*. Another 3PL root **ní* or similar appears in our word lists, but is not used in the plural construction (unless Tha *nó* is somehow derived from *ní*).

(2) Pluralisation of 'man' in Jen varieties (Kleinewillinghöfer 1995/2015)

Dza	*ibùì / ee ibwì*	
Doso	*yíbui / lé-bui*	
Tha	*nimbi / nó nimbi*	
Kyak	*yiɓé / yáá yìɓe*	
Moo	*yiɓé / yá yìɓe*	
Leelau	*yìɓéí / yáá-ɓei*	
Mak	*liɓei / lee ləɓei*	(but *yuluŋ / yee yuluŋ* 'bird / birds')
Maghdi	*liɓei / lee ləɓei*	(but *yuluŋ / yee yuluŋ* 'bird / birds')
Loo	*lua liɓe / yila liɓə*	
Burak	*liɓe / yelaa liɓe*	

The present work is a study of sound correspondences between Jen language varieties, based on a comparative 300 wordlist collected by the second author for his BA thesis (Othaniel 2017). Our goal is to identify sound changes in the cluster and provide proto-Jen reconstructions for the items in our word list. The purpose of this study is to contribute to knowledge of the history of Adamawa languages, and also to gain insights from sound correspondences that can support efficient development of orthographies for the Jen languages (Norton & Othaniel 2018). A past-ward orientation in historical linguistics leads back to reconstruction, and a present-ward orientation leads forward to the speech forms used today, and to how these can be represented in writing. The latter is an implementation of the idea in Lewis and Stalder (2010) that language clusters can undergo co-ordinated development based on their linguistic similarity. Dza (or Jenjo[3]) has been written since 2000 through the Jenjo Language Development Project, and the phonemes are analysed in detail in Othaniel (2016). Hence, sound changes that differentiate Dza from the other varieties

[3] Jenjo is the Fulfulde word for a Dza speaker, consisting of the town name Jen and the Fulfulde person suffix *-jo*.

reveal how the Dza orthography would need to be adapted in order to write other languages of the Jen cluster in a phonemic orthography. A related question is how many other language units are candidates for development among the varieties listed for the Jen language cluster, as some varieties are actually extremely similar (Kleinewillinghöfer 2017). We consider this point using a preliminary lexicostatistical assessment prior to the analysis of sound correspondences.

We begin with a lexicostatistical assessment of the language cluster in §2, using a comparative Swadesh 100 wordlist for the Jen varieties available online (Kleinewillinghöfer 1995/2015). In §3 and §4, vowels and consonants are compared over our own 300 wordlist, followed by a conclusion in §5. and a list of reconstructed items in the Appendix.

2. Lexicon

2.1. Lexicostatistics

Lexical similarity values between the varieties were generated using the WordSurv7 program by entering cognate judgements over available Swadesh 100 wordlists for all ten varieties including two sub-varieties each of Loo, of Mak and of Dza (Kleinewillinghöfer 1995/2015). This produced the results shown in Table 2. This is a preliminary exercise in lexicostatistics (Starostin 2013), where sound correspondences and etymological structure are judged by inspection without a mature understanding of the languages. The analysis nevertheless enables us to evaluate three basic issues: status as a language cluster in terms of overall lexical cohesion, status of extremely similar varieties as dialect clusters, and intermediate relationships between different parts of the language cluster. We assume the divergences in lexicon occurred by the universal process of lexical replacement, but we do not seek to explain the replacements further as a result of word taboos, as Kleinewillinghöfer (1995) has proposed for other cultures of the Muri Mountains.

As to overall lexical cohesion, all lexical similarity values are at least 45%, a level at which linguistic relationship will be evident to

Table 2

Lexical similarity values in dialect clusters united at 95% and at 85%

	Burak	Loo(G)	Loo(W)	Maghdi	Mak(P)	Mak(Z)	Kyak	Moo	Leelau	Tha	Doso	Dza(Je)	Dza(Jo)
Burak	100	92	88	79	71	72	52	52	50	53	48	46	45
Loo(G)	92	100	95	76	72	71	52	49	48	52	48	47	47
Loo(W)	88	95	100	76	71	71	53	51	50	51	48	50	50
Maghdi	79	76	76	100	83	83	61	58	57	56	46	47	46
Mak(P)	71	72	71	83	100	97	66	61	64	59	52	55	51
Mak(Z)	72	71	71	83	97	100	66	62	65	60	52	55	51
Kyak	52	52	53	61	66	66	100	92	93	65	68	68	65
Moo	52	49	51	58	61	62	92	100	88	62	62	63	61
Leelau	50	48	50	57	64	65	93	88	100	65	66	67	63
Tha	53	52	51	56	59	60	65	62	65	100	73	70	69
Doso	48	48	48	46	52	52	68	62	66	73	100	90	91
Dza(Je)	46	47	50	47	55	55	68	63	67	70	90	100	98
Dza(Jo)	45	47	50	46	51	51	65	61	63	69	91	98	100

both linguists and speakers alike (Gell-Mann, Peiros & Starostin 2009: 14). This sufficient lexical cohesion, combined with their geographical contiguity, supports the description "language cluster".

As to dialect clustering, there is extremely high similarity between the two sub-varieties of Loo, of Mak and of Dza (at least 95%). But there is also very high similarity between Burak and Loo, between Kyak, Moo and Leelau, and between Doso and Dza. In each of these groupings, all lexical similarity values are above the threshold of 85% indicated in Eberhard et al. (2019) for dialecthood. However, this threshold should be considered together with other criteria for dialect status, and ultimately the issue can only be settled by the communities themselves. Here, we can only make preliminary observations. Geographically, Burak-Loo and Kyak-Moo form adjacent groupings so that they are able to function as larger speech communities, but the political separation of Burak and Loo by the Gombe/Taraba state boundary, and the geographical non-contiguity of Leelau with Kyak-Moo, partly compromise their respective cohesion. For Doso and Dza, extensive phonological differences make them noticeably less cohesive in their lexicon, despite their many cognates.

As to intermediate relationships, the varieties combine into successively larger subclusters according to lexical similarity, as represented by boxes in Table 3. At 80% similarity, the varieties form five clear groups, Burak-Loo, Maghi-Mak, Kyak-Moo-Leelau, Tha, and Doso-Dza. At 70% similarity, Burak-Moo combines with Maghdi-Mak, and Tha combines with Doso-Dza. At the 60% stage, the remaining subgroup Kyak-Moo-Leelau clusters with Tha-Doso-Dza to the right rather than with Burak-Loo-Maghdi-Mak to the left, as it consistently scores at 60%+ similarity with Tha-Doso-Dza. The lexicostatistical analysis therefore departs from the previous view distinguishing a Bikwin group consisting of the first seven varieties (Kleinewillinghöfer 1996: 92–94). Scores between Kyak-Moo-Leelau and Burak-Loo-Maghdi-Mak are much more variable, peaking at 66% between Kyak and Mak, but as low as 48% between Leelau and Loo, which is no higher than the base level of the whole language cluster. Hence,

Table 3

Lexical similarity values with sub-groups united at 80%, 70%, 60%

	Burak	Loo(G)	Loo(W)	Maghdi	Mak(P)	Mak(Z)	Kyak	Moo	Leelau	Tha	Doso	Dza(Je)	Dza(Jo)
Burak	100	92	88	79	71	72	52	52	50	53	48	46	45
Loo(G)	92	100	95	76	72	71	52	49	48	52	48	47	47
Loo(W)	88	95	100	76	71	71	53	51	50	51	48	50	50
Maghdi	79	76	76	100	83	83	61	58	57	56	46	47	46
Mak(P)	71	72	71	83	100	97	66	61	64	59	52	55	51
Mak(Z)	72	71	71	83	97	100	66	62	65	60	52	55	51
Kyak	52	52	53	61	66	66	100	92	93	65	68	68	65
Moo	52	49	51	58	61	62	92	100	88	62	62	63	61
Leelau	50	48	50	57	64	65	93	88	100	65	66	67	63
Tha	53	52	51	56	59	60	65	62	65	100	73	70	69
Doso	48	48	48	46	52	52	68	62	66	73	100	90	91
Dza(Je)	46	47	50	47	55	55	68	63	67	70	90	100	98
Dza(Jo)	45	47	50	46	51	51	65	61	63	69	91	98	100

although Bikwin varieties can be grouped together geographically (those communities away from the Benue river in the western Muri Mountains) and culturally (*ɓi kwin* 'we (are) one'), they are not a genetic group. The genetic unity of Kyak-Moo-Leelau with Tha-Doso-Dza implies a migration by the ancestors of Kyak-Moo-Leelau away from the riverine Jen area towards the settlements of Mak, Maghdi, Loo and Burak. After this, Mak must have increased in similarity to Kyak-Moo-Leelau due to contact. While the data in the rest of this paper and in the comparative word list in the Appendix frequently divides Burak-Loo-Maghdi-Mak and Kyak-Moo-Leelau-Tha-Doso-Dza, there are also quite a few examples where Mak patterns with the last six varieties.[4]

The lexicostatistical analysis is presented in tree format in Figure 2, annotated with branch-average percentage values for three dialect clusters and for the Jen language cluster as a whole. All sub-branches in this tree are supported by sound changes presented within the rest of this paper.

[4] An observation that we pass over in our hierarchical cluster analysis of the lexical similarities is that Kyak-Moo-Leelau is much more distant from the Burak-Loo portion of the first branch (48–53%) and noticeably closer to the Maghdi-Mak portion (57–66%). A reviewer points out that the latter numbers are similar to Kyak-Moo-Leelau's closeness to Tha-Doso-Dza (61–68%), that determines the final division between the first four varieties and the last six varieties. Although Kyak-Moo-Leelau cannot be hierarchically grouped with Maghdi-Mak because Maghdi-Mak is much closer to Burak-Loo, the data can nevertheless support a chain analysis linking one dialect cluster to the next (Burak-Loo = Maghdi-Mak = Kyak-Moo-Leelau = Tha-Doso-Dza). This has the very plausible implication that effects of contact between adjacent Jen varieties extends into the past to the proto-varieties that produced the present dialect clusters, which is just what we should expect in a language cluster environment. Nevertheless, the isoglosses and correspondences in the rest of the paper follow the divisions made in the hierarchical analysis. Thus, although we acknowledge that the chain interpretation provides additional historical insight, we also consider that the hierarchical interpretation still stands. The hierarchical interpretation provides a model of the successive formation of more and more Jen speech communities as traced in their diverging lexical choices, whereas under the chain interpretation the formation of these communities is assumed rather than explained.

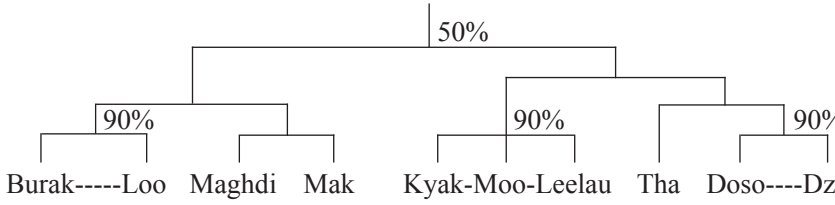

Figure 2. Jen language cluster tree

2.2. Isoglosses for the two primary branches

The proposed primary branching between the first four varieties and the last six varieties, revising the earlier Bikwin-Jen division, can be defended by evidence from various isoglosses. Some of the items considered here were already used at an earlier stage of research as evidence of a close connection between Bikwin and riverine Jen (Tha, Doso and Dza) because the links were especially evident between Tha-Doso-Dza and Kyak-Moo-Leelau (Kleinewillinghöfer 1996: 96). Table 4 presents lexical isoglosses for the two revised branches.[5]

Table 5 presents items that show two phonological isoglosses that distinguish the second branch, nasalised vowels and [h]. Exceptionally, nasalised vowels occur in some roots in Mak of the first branch as well (‘suck’, ‘many’). This can be attributed to borrowing, however, which is already invoked in §2.1 to explain the inflated lexical similarity of Mak to Kyak-Moo-Leelau.

Table 6 presents verbs with a different initial consonant in the two branches. The consonants *j/w*, *j/z*, *w/z*, *ɲ/z* are phonetically dissimilar and thus represent verbal stem alternations of unknown function. The item ‘split’ even attests alternation between *s* and zero.

Table 7 presents roots with a recurring difference **-e/*-iŋ* (or **-we/*-iŋ*) in their rhymes between the two branches, again of unknown function. This assumes that **e* is sometimes realised by a diphthong *əi* or similar (§3.2), and that **i* becomes *u* after a labial consonant in Kyak-Moo-Leelau.

[5] Here and in all our collected data, the IPA symbol [j] is transcribed for the palatal approximant.

Table 4

Lexical isoglosses for the two branches

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'belly'	*fû*	*fú*	*fū*	*fú*	*wá*	*wá*	*wá*	*ɥà*	*ɥà*	*ɥá*
'grass'	*kâ*	*kâ*	*ká*	*kâ*	*gūk*	*gūk*	*gùk*	*gù*	*vù*	*hu̱*
'take'	*pí*	*pí*	*pí*	*pɨ́*	*lē*	*lē*	*lə̀*	*jɨ̀*	*dɨ̃̀*	*dɨ̀*
'see'	*nə́ŋ*	*náŋ*	*nāŋ*	*làŋ*	*ɓî*	*ɓí*	*bjà*	*ɓì*	*ɓə̀*	*bə̀*
'seed'	*lɔ̀k*	*lɔ́k*	*lɔ́k*	*lók*	*bɛ̄*	*bjə̀*	*bé*	*ɟà*	*bjə̀*	*pjə̀*
'sour'	*nwí*	*nwí*	*nwí*	*ɲwī*	*ám*	*ám*	*àmí*	*nɨ̀ŋəi*	*àm*	*ŋá*
'Guinea corn'	*jă*	*jā*	*íʃà*	*jɨ́tā*	*mɨ̀n*	*mīn*	*mɨ̀n*	*mù*	*mùm*	*mwú*
'sibling'	*ɲínmì*	*ɲín*	*ɲîn*	*ɲîn*	*jwəŋ*	*ɲɔŋɔ̀m*	*ɥáŋə̀m*	*ɥə̀*	*ɥi̊̂*	*ɥi̊̌*
'count'	*də̀bà*	*dɨ̀bà*	*dábā*	*də̀bá*	*zēn*	*zēn*	*ðə̂n*	*hò*	*zàm*	*sạ̀*
'finish'	*fánɔ́*	*fānɛ̄*	*fáːnɛ̄*	*fánɨ́*	*ðɨ̀mmáŋ*	*zɨ̀mɨ́ŋ*	*ðəmɨ́ŋ*	*cɛ̃̀*	*tɨ̂ŋ*	*tɨ̀ŋ*

Table 5

/h/ and nasalised vowels in the second branch

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'swell'	*fú(rì)*	*fúm*	*lɔ̀k*	*fəm*	*hár*	*fə́m*	*hár*	*jē*	*həì*	*hɛ́*
'breathe'	*ú-mé*	*ú-má*	*ù-mà-lɛ̀*	*ŋə́-má*	*ŋɔ̂*	*ŋɔ́*	*ŋwə̀-ɲì*	*hṹ*	*hṹ*	*hṹ*
'shoe'	*wəŋ-mī*	*wɔŋ-mì*	*wəɣ-məì*	*wáŋ-mú*	*ɔ̃́*	*ɔ̃́*	*əǜ*	*hǜ*	*(bɨ̀m)*	*hṹ*
'big'	*(kə́mùrí)*	*(múit)*	*gɔŋ*	*gwəŋ*	*gɔ̌̃zī*	*āŋgā̃*	*áŋgā̃*	*nágò*	*áŋgà̃*	*àkā̃*
'bite$_1$'		*pəí*	*ɥí*	*ɥí*	*t͡sw̃ɛ̄*	*ɲɛ̄*	*cwɛ̀̄*		*t͡swî*	*t͡swī*
'bite$_2$'	*lúm*							*dǜ*		
'scratch'		*k͡pá-ká*	*g͡bá-ɣà*		*kwà̃*					*kwà̃*
'suck'		*aú*		*ə̃ú*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ŋəù*	*ǔ*	*ű́*
'many'				*lɨ̀-k͡pā̃-lì*	*k͡pà̃-lɛ̌*	*k͡pā̃*	*k͡pà̃-díŋ*		*k͡pà̃-ló*	

Table 6

Initial consonant alternations in verb stems

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'come'	*jí*	*jɬ*	*jí*	*já*	*wɛ̀*	*wá*	*wà*	*wà*	*wà*	*wú*
'dig'	*jă*	*jā*	*jà*	*já*	*zà*	*zà*	*ðà*	*ðà*	*hà*	*hà*
'walk'	*wē-lé*	*wē-lé*	*wé-lè*	*wo̰*	*zō*	*zɔ̀*	*ðəù*	*ðòbò*	*hò*	*hō*
'kill'	*wòb*	*wàb*	*wòp*	*wàb*	*zàp*	*zàp*	*ðâp*	*θà*	*ɟ̊à*	*jà*
'red'	*ɲūn*	*ɲɛ̄nɛ̄*	*ɲɛ́nɛ̀*	*ɲún*	*zɛ̄n*	*zēn*	*á ðánì*	*ázɛ̃̄*	*ɟ̊ɛ́*	*ɟ̊ɛ̃̄*
'split'	*àŋ*	*àŋ*			*sàŋ*	*sàŋ*	*θàŋ*			

Table 7

Items with alternating rhyme in the two branches

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'water'	*mɛ̄*	*mɛ̤̄*	*məī*	*mɨ̀ì*	*mū*	*múŋ*	*mùŋ*	*mɨ́ŋ*	*mɨ̀ŋ*	*mɨ́ŋ*
'tomorrow'	*vɛ̤̄*	*vē*	*vəì*	*vəì*	*būŋ*	*bûŋ*	*būŋ*	*báŋ*	*bɨ̀ŋ*	*bàŋ*
'faeces'	*ɓújē*	*ɓwaí*	*ɓoī*	*ɓoí*	*búŋ*	*búŋ*	*ɓúŋ*	*wì*	*ɓɨ̀ŋ*	*ɓɨ́ŋ*
'fish'	*ʃíjɛ̀*	*t͡ʃɛ̄*	*ʃəī*	*seí*	*θɨ́ŋ*	*sɨ́ŋ*	*θɨ́ŋ*	*θɨ̀ŋ*	*ɟ̊ɨ̀ŋ*	*ɟɨ̀ŋ*

The sound correspondences in the rest of the paper show many other instances where a difference occurs between the first four varieties and the last six varieties.[6]

3. Vowels

We reconstruct a 9-vowel system **i, *e, *ɛ, *ɨ, *ə, *a, *ɔ, *o, *u*. This means the Jen language cluster is of the three central vowels type, also seen in Central Chadic languages of the Bata group to the east of the Jen cluster (Ornan 2016; Gravina 2014: 147; Boyd 2002). More problematic are the non-high front and back vowels **e, *o, *ɛ, *ɔ*. We deal with the other more stable vowels first.

Table 8

Proto-Jen vowels

	front	**central**	**back**
high	*i	*ɨ	*u
mid	*e	*ə	*o
low	*ɛ	*a	*ɔ

3.1. Stable vowels

Stable vowels in the Jen language cluster are **i, *u, *a, *ə, *ɨ* as shown in Table 9. Stable examples are shown for **i, *u, *a* in open syllables. An example of **ɨ* is also given which is unstable in Kyak

[6] Set against the ample evidence for this branching are certain lexical items that distinguish the first seven Bikwin varieties from the last three riverine Jen varieties, notably 'one', 'two', 'head', 'neck', 'tooth' (Kleinewillinghöfer 1996: 95–96). However, none of these establish Bikwin as a genetic group, either because the root is actually cognate in the last three varieties but with comprehensive changes (*kwin* > *t͡sɨŋ* 'one', *dul* > *d͡ʒwi* 'neck', *le* > *dî* 'tooth'), or because the root is found in other Adamawa languages as well (*kwin* 'one', *rab* 'two', *lo* 'head'), and so are not unique to Bikwin.

Table 9

Stable vowels

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*i	*i*	*i*	*i*	*i*	*i*	*i*	*i*	*i*	*i*	*i*
‘breast’	*mî*	*mí*	*mì*	*mí*	*mí*	*mĭ*	*mí*	*mī*	*mì*	*mì*
‘liver’	*ɲĭ̄*	*ɲí*	*ɲí*	*ɲí*	*ɲwíŋwí*	*ɲí*	*ɲi*	*ɲì*	*nìnì*	*ɲíŋí*
*u	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*
‘new’	*fū̱*	*fŭ*	*fù*	*fū:*	*fú*	*fú*	*fú*	*fù*	*fû*	*hú*
*a	*a*	*a*	*a*	*a*	*a*	*a*	*a*	*a*	*a*	*a*
‘shoot’	*tá*	*tá*	*tá*	*tă*	*tà*	*tá*	*tà*	*tà*	*tà*	*tá*
‘hole’	*ɓwā*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwá*	*ɓwà*	*bwà*
*ɨ	*ɨ*	*ɨ*	*ɨ*	*ɨ*	*ə*	*ɨ*	*i*	*ɨ*	*ɨ*	*ɨ*
‘crocodile’	*ʃɨ́p*	*ʃɨ̱́p*	*ʃɨ́p*	*ʂɨ́b*	*swə́m*	*sɨ̀p*	*θìp*	*sɨ̀*	*sɨ̀*	*ʃɨ́*
*ə/_ŋ	*ə*	*ə*	*ə*	*ə*	*ə*	*ə*	*ə*	*ə*	*ə*	*ə*
‘eat’	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*tàŋ*	*táŋ*	*tàŋ*	*táŋ*
‘drum/dance’	*dàŋ*	*dàŋ*	*dāŋ*	*dāŋ*	*dàŋ*	*dâŋ*	*dàŋ*	*dáŋ*	*dâŋ*	*dàŋ*
‘leaf’	*jăŋ*	*jàŋ*	*ɲàŋ*	*jáŋ*		*jàŋ*	*jàŋ*	*jàŋ*	*jàŋ*	*jàŋ*
*ə/_#	*ɛ*	*a*	*ə*	*ə*	*ɛ*	*ə*	*ə*	*ə*	*ə*	*ə*
‘what?’	*ɓɛ̄*	*ɓă*	*ɓá*	*ɓá*	*(ɓējá)*	*má*	*ɓá*	*(ɓà)*	*ɓà*	*bádé*
‘give’	*(fɔ́-lɛ́)*	*fá*	*(ɛ̄)*	*à*	*dɛ̄*	*(dɪ̄)*	*dà*	*dâ*	*dà*	*tà*
‘stab’	*(bɛ̀t)*	*(bɛ̄t)*	*bà*	*bà*	*bɛ̄*	*(bjɛ̄)*	*(bəì)*	*bà*	*(bəù)*	*pà*
‘come’	*(jí)*	*(jɨ́)*	*(jí)*	*já*	*wɛ̀*	*(wá)*	*wà*	*wà*	*wà*	*(wú)*
‘go’				*(tá)*	*tɛ́*	*tə́*	*tà*		*tà*	*tə́*

and Leelau. The schwa **ə* is shown to be stable before **ŋ*, but this fails to provide contrast with **a*, for which there are no stable examples before **ŋ* in our wordlist. However, examples in open syllables confirm a contrastive schwa **ə* in most varieties except Burak-Loo and Kyak, with a regular shift to [ɛ] in Kyak.

Table 10 illustrates that **i*, **u* are centralised to [ɨ] in closed syllable roots in several varieties of the second branch. This seems to be conditioned by the following consonant in opposite ways in Kyak and Moo. The restriction to closed syllables is confirmed by the failure of centralisation in roots where the final consonant is lost in Tha, Doso and Dza. Centralisation co-exists with contrary processes where **ɨ* becomes [ə] or [i] (Table 9) or [u] after a labial consonant (Table 7) in Kyak-Moo-Leelau, increasing the probability that contrast between [ɨ] and neighbouring sounds has been lost in Kyak-Moo-Leelau.

Table 11 shows that the high back vowel undergoes diphthongisation **u > wi* in open syllables after an alveolar consonant, particularly in Doso-Dza, but that **u* is also renewed in Doso-Dza by mid vowel raising **o > u* in open syllables (also in §3.2).

3.2. Non-high front and back vowels

Non-high front and back vowels are problematic for two reasons. The first problem is the lack of stable correspondences contrasting **e-*ɛ* and **o-*ɔ* consistently across the language cluster. The second problem is that these vowels frequently occur in irregular correspondences with diphthongs.

ATR contrast in mid vowels is reported in Dza, with incompatibility between +ATR /e o/ and –ATR /ɛ ɔ/ in the same root (Othaniel 2016), but this is not straightforwardly replicated across the language cluster by stable correspondences. The distinction can be reconstructed in open syllable roots, but is subject to many sound changes. There is also comparative evidence for a phonological distinction of height as an alternative to ATR, as /ɛɔ/ pattern with the low central vowel /ɑ/ in

Table 10

Centralisation

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*i	*i*	*i*	*i*	*i*	*ɨ*	*i*	*wi > u*	*wi > u*	*ɨ*	*ɨ*
'one'	*kwîn*	*kwín*	*swím*	*cwîn*	*kwín*	*kwín*	*kún*	*cùŋgà*	*t͡sɨ̀ŋ*	*t͡sɨ̄ŋ*
*u	*u*	*u*	*u*	*u*	*ɨ,u*	*u,ɨ*	*u*	*ɨ*	*ɨ*	*ɨ*
'pull up'	*lūb*	*lùb*	*lúb*	*lūb*	*lɨ̀b*	*lùb*	*lùb*	*lù*	*dù*	*d͡zwū*
'pull'	*gu̱b*	*gūb*	*gúb*	*gūb*	*gɨb*	*gùb*	*gùb*	*gù*		
'eye'	*nû*	*núŋ*	*núŋ*	*núŋ*	*núŋ*	*nɨ́ŋ*	*núŋ*	*nú*	*nɨ̀ŋ*	*nɨ́ŋ*
'thing'	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nɨ̄ŋ*	*nùŋ*	*nɨ̀ŋ*	*nɨ́ŋ*	*nɨ̄ŋ*

Table 11

Renewal of [u] in Doso-Dza

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*u	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*wi*	*wi*
'bury'	*tú*	*tŭ*	*tú*	*tŭ*	*sú*	*sú*	*sú*	*tù*	*t͡swî*	*t͡swì*
'nose'	*lúrī*	*lúrī*	*lwílí*	*dūrə́*	*dúr*	*dúr*	*dúr*	*dǔ*	*dwì*	*d͡zwí*
'far'	*(gb͡ɛ̄nɛ̄)*	*túrə̄*	*túlà*	*tú*	*t͡ʃû*	*t͡ʃū*	*tû*	*cwē*	*t͡ʃwí*	*t͡swī*
*o	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*u*	*u*
'leg'	*vo̱*	*vo̱*	*vò*	*bō*	*bō*	*bō*	*bò*	*bò*	*bù*	*pū*

some data (Tables 11 and 12).[7] The contrasts are most visible in Burak-Loo on the left of the table (also in Kleinewillinghöfer 1995/2015), becoming unstable to the right of Burak-Loo, and with nearly all instances of these vowels changing in Doso-Dza. It is surprising, then, to find these contrasts repeated in Dza. Hence, although from a comparative perspective, the contrast is compromised by sound changes outside Burak-Loo, it would be worthwhile for research in any Jen variety to check carefully whether the contrast is lost or still present.

The non-high front and back vowels also frequently appear in irregular correspondences with various diphthongs. Table 12 shows correspondence with off-gliding diphthongs [əi] and [əu] in open syllables, although in some varieties the vowels **ɛ* and **ɔ* have the low central vowel in reflexes instead of the schwa, *ɔ:aw* (‘bow’) and *ɛ:a/_C* (‘left’).

Table 13 shows roots in which all four vowels have different outcomes in the second branch. The conditioning behind these changes in the second branch is unclear. Nevertheless, the data adds support for the contrasts **e-*ɛ* and **o-*ɔ*. The **o-*ɔ* contrast, preserved here in the Maghdi data, is strikingly confirmed by correspondence to different diphthongs [we] and [wɑ] respectively in the second branch. The front vowel **ɛ* shows a parallel correspondence to [jɑ] in the second branch, hence the lower vowels **ɛ, *ɔ* pattern with the low central vowel in diphthongisation to [wɑ] and [jɑ]. There is, however, an apparent neutralisation **ɛ→e* in Maghdi-Mak (compare Tables 12 and 14). The fourth vowel **e* shows a different change by raising to [i], where reconstruction of the mid vowel **e* rather than the high vowel is also supported by its role a split in **p* in Table 24.

Table 14 shows how all four vowels raise to high vowels **o,ɔ>u, *e,ɛ>i* in Doso-Dza in more open syllable roots. These series also attest changes smaller changes with apparent neutralisations of contrast in Maghdi, Mak, Leelau, and Tha (compare Tables 11 and 12) as well as Doso-Dza.

[7] Alternatively, the distinction may be between +ATR /e ə o/ and –ATR /ɛ ɑ ɔ/.

Table 12

Mid vowels in open syllables

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*o	*o, əu*	*o, əu*	*əu*	*əu*	*o*	*o*	*o*	*o, əu*	*o*	*o*
'fall'	*wō*	*wō̰*	*jəù*	*jə́w*	*ō*	*ō*	*ò*	*ʔò*	*ò*	*ō*
'cook'	*jŏ*	*jō*	*jəùwē*	*jəû*	*jō*	*jŏ*	*jò*	*jəù*	*(ụì)*	*(ụì)*
'lie (down)'	*ləú*	*ləú*	*ləú*	*lʌū*	*ló*	*lŏ*	*ló*	*ləú*	*(lweì)*	*(lwé)*
*ɔ	*əu*	*əu*	*əu*	*əu*	*ɔ*	*ɔ*	*əu*	*əu*	*ɑw*	
'bow'		*təù*	*təù*	*təû*	*tɔ̃̄*	*tɔ̀*	*təù*	*təú*	*tɑ̃̄w*	*(twəŋ)*
*e	*e*	*əi*	*əi*	*əi*	*ɛ*	*ɛ*	*əi*		*e*	*e*
'tooth'	*le᷄*	*ləí*	*ləī*	*ləì*	*lɛ̄*	*lɛ̄*	*ləí*		*(dĭ)*	*(d͡ʒī)*
*ɛ	*ɛ*	*ɛ, əi*	*e, əi*	*e, əi*	*ɛ*	*e*	*əi*	*əi*	*e*	*e*
'calabash'	*ɗɛ̄*	*ɗɛ̄*	*ɗəí*	*ɗəī*	*ɗɛ̄*	*ɗē*	*ɗəì*	*ləì*	*(lì)*	*(d͡ʒì)*
'wife'	*lí-ʃɛ̂*	*lí-ʃəí*	*ʃē*	*lɨ́-sɨ́jē*	*(ì-sí)*	*(sí)*	*(ʃɨ́m)*	*(ʃì)*	*hē*	*hē*
'left'	*mɛ̄*	*márə̀*	*màlɛ̀*	*məī*	*mɛ̄*	*mɛ̄*	*məì*	*mɨ̀*	*(mì)*	*(mì)*

Table 13

Changes in the second branch

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*o/we	*o*	*o*	*o*	*ɔ*	*we*	*(w)e*	*we*	*(w)ja*	*we*	*we*
‘snail’			*ʃó*	*sɔ̀*	*swè*	*fê*	*swē*	*n̩fjà*	*u̯ē*	*u̯è*
*ɔ/wa	*ɔ*	*ɔ*	*ɔ*	*ɔ*	*wa*	*wa*	*wa*		*wa*	*wa*
‘drink’	*ɲɔ̌*	*ɲwə́*	*ɲɔ́*		*ŋwà*	*ŋwà*	*ŋwà*		*ŋwà*	*ŋwá*
*ɛ/ya	*ɛ*	*ɛ*	*e*	*e*	*ja*	*ja*	*ja*	*ja*	*ja*	*(j)a*
‘mosquito’	*ɓɛ́*	*ɓɛ́*	*ɓē*	*ɓē*	*bjà*	*ɓjá*	*ɓjà*	*jà*	*dj̀à*	*d͡ʒá*
*e	*e*	*e*	*e*	*e*	*i*	*i*	*i*	*i*	*i*	*i*
‘sand’	*d͡ʒwe̯*	*ʒwē*	*ʒwəì*	*zwē*	*zwī*	*zí*	*zwí*	*vī*	*u̯ì*	*u̯ī*
‘spit’	*twē*	*(twî)*	*ʃwíʃwě*	*sùswê*	*t͡swìt͡swî*	*t͡ʃwìt͡ʃwî*	*tùtwî*	*twìtwì*	*t͡ʃìt͡ʃì*	*t͡ʃìt͡ʃí*
‘dry’	*kwē*	*kwəí*	*kwaí*	*kwaí*	*kwí*	*kwí*	*cwí*	*u̯ìjē*	*t͡ʃìŋ*	*t͡ʃì*
‘blood’	*wě*		*ɥe̯*	*ɥē*	*zwī*	*zǐ*	*zī̄*	*vì*	*n̩u̯ì*	*u̯ǐ*
nail ‘(v.)’			*pē*		*pì*	*pí*	*pî*		*pī*	*pí*

Table 14

Mid vowel raising

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*o	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*u*	*u*
‘leg’	*vo̰*	*vo̰*	*vò*	*bō*	*bō*	*bō*	*bò*	*bò*	*bù*	*pū*
*ɔ		*au*	*əu*	*əu*	*ɔ*	*ɔ*	*ɔ*	*əu*	*u*	*u*
‘suck’		*aú*		*ãú*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ŋəù*	*ů*	*ű*
*e	*e*	*e*	*əi*	*əi*	*ɛ*	*ɛ*	*e*		*i*	*i*
‘stand’	*dḛ̄*	*dḛ̄*	*dạ̀ì*	*dạ̀ì*	*dɛ̄*	*dɛ̄*	*dē*		*d͡ʒì*	*t͡sɨ*
‘tooth’	*lé*	*ləí*	*ləī*	*ləì*	*lɛ̄*	*lɛ̄*	*ləí*		*dǐ*	*d͡ʒī*
*ɛ	*ɛ*	*ɛ*	*əi*	*əi*	*ɛ*	*e*	*əi*	*əi*	*i*	*i*
‘calabash’	*dɛ̄*	*dɛ̄*	*dəí*	*dəī*	*dɛ̄*	*dē*	*dəì*	*ləì*	*lì*	*d͡ʒì*
‘cloud’				*teî*	*tɛ̄*	*tê*	*təì*		*t͡ʃǐ*	*t͡ʃì*
*ɛ	*ɛ*	*a*	*a*	*əi*	*ɛ*	*ɛ*	*əi*	*əi*	*i*	*i*
‘left’	*mɛ̄*	*má-ɾə*	*mà-lɛ̀*	*məī*	*mɛ̄*	*mɛ̄*	*məì*	*mɨ̀ì*	*mì*	*mì*

Table 15 shows other open syllable roots with a different process of back vowel diphthongisation **u > wi*, **o > we* in Doso-Dza. These are all after an alveolar consonant, therefore **o > we* bleeds **o > u* which is not found after alveolar consonants, unlike **e,ɛ > i* which are found after alveolar consonants (Table 14). Back vowel diphthongisation is also implicated in an apparent derivation 'head'→'on' in Burak-Loo.

Table 16 shows non-high front or back vowels in closed syllable roots. There are examples with **ɔ* raising to [o] in Tha-Doso-Dza, but others are in widespread irregular correspondence with an on-gliding diphthong [wə]. Some similar variation occurs between [ɛ], [e] and [jə] in the last six varieties of the second branch. Reconstruction of the on-gliding diphthong **wə* is favoured by its wider distribution than [ɔ], by its apparent contrast with **ɔ* in 'push' and 'basket', and because the reconstruction of **wə* after more consonants than **yə* matches the finding that many **Cw* structures are reconstructible whereas **Cy* structures are rare (§4.3).

3.2. Nasalised vowels

As already noted in 2.2, nasalised vowels are largely confined to the second branch. Table 17 shows roots with nasalised vowels grouped as to whether they can be reconstructed or are innovations. In the first group ('bite$_1$', 'scratch'), nasalised vowels correspond to oral vowels in the first branch, providing limited evidence of original nasalised vowels **ĩ, *ã* whose nasalisation has been lost in the first branch. This also raises the possibility that lexical isoglosses of the second branch with nasalised vowels like *k͡pã* 'many' may also be original. In the second group of roots, however, nasalised vowels found in the second branch (or in Mak) are innovated, because they correlate with the loss of a following nasal consonant. This process is lexically gradual, where the oldest example ('big') is inherited by all six varieties of the second branch, and the youngest examples have been innovated in varieties of today, although some are of uncertain date due to lack of attestation of the root in our wordlists for other varieties.

Table 15

Back vowel diphthongisation

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*u	*u*	*u*	*u*	*u*	*u*	*u*	*u*	*u,wi*	*wi*	*wi*
'bury'	*tú*	*tŭ*	*tú*	*tŭ*	*sú*	*sú*	*sú*	*tù*	*t͡swî*	*t͡swì*
'nose'	*lúrī*	*lúrī*	*lwílí*	*dūrə́*	*dúr*	*dúr*	*dúr*	*dǔ*	*dwì*	*d͡zwí*
'neck'	*dòl*	*dūl*	*dùl*	*dūl*	*dūl*	*dúl*	*dwùl*	*ɟwí*	*d͡zwìm*	*t͡ʃwī*
'far'		*túrə̄*	*túlà*	*tú*	*t͡ʃû*	*t͡ʃū*	*tû (lì)*	*cwē*	*t͡ʃwí*	*t͡swī*
*o	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*wei*	*we*
'lie (down)'	*ləú*	*ləú*	*ləú*	*lʌū*	*ló*	*lŏ*	*ló*	*ləú*	*lweì*	*lwé*
'do'					*tó*	*t͡ʃó*	*tó*		*t͡sweì*	*t͡swè*
*o	*o→we*	*o→we*	*o*	*o*	*o*	*o*	*o*			
'head'	*lô*	*lō*	*lō*	*ləū*	*lò*	*lô*	*lō*			
'on'	*lwē*	*lwē*	*lŏ*	*ləú*	*lō*	*lō*	*lò*			

Table 16

Mid vowels in closed syllables

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	o	o	o
'push'	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ̀k*	*tɔ́k*	*tɔ̀k*	*ló*	*tsɔ̀*	*tó*
'basket'	*dɔ́k*	*dɔ̂k*	*dɔ́k*	*dɔ́k*	*dɔ̀k*	*dɔ̀k*	*dɔ̀k*	*ləú*	*lō*	*lò*
*wə	ɔ	ɔ,wə	ɔ	ɔ,wə	wə	ɔ,wə	ɔ	wə	wə	wə
'bark'	*kɔ̀klɛ̀*	*kɔ̀lɛ̄*	*kɔ̂ŋ*	*kwə̀ŋ*	*pwə̀m*	*pɔ̀ŋ*	*kwɔ̀ŋ*	*kwə̀ŋ*	*pwə́*	*pwə̀*
'tortoise'	*kɔ̄ŋ*	*kɔ́ŋ*	*kɔ́ŋ*	*kɔ́ŋ*	*kwóŋ*	*kwáŋ*	*kɔ́ŋ*		*kwə̀ŋ*	*kwáŋ*
'ten'	*ʃɔ́b*	*ʃôb*	*ʃúwób*	*swəb*	*swə̀b*	*swəb*	*sɔ̀p*			
'spear'	*mɔ̀m*	*mwə̀m*	*mɔ́m*		*mwə̀m*	*mwəm*				
(*yə)										
'feather'					*bjə̀ŋ*	*bjəŋ*	*bjə̀ŋ*	*ɟɛ̂̀*	*dzə̀m*	*tsə̀*
'seed'					*bɛ̄*	*bjə̀*	*bé*	*ɟà*	*bjə̀*	*pjə̀*
'tongue'				*lěn*	*kīm*		*ljén*	*láŋ*	*líjɛ̄m*	*lá*

Table 17

Loss or development of nasalised vowels

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'bite$_1$'		*pəí*	*ɥī*	*ɥí*	*t͡swɛ̃̄*	*ɲɛ̄*	*cwɛ̃̀*		*t͡swî*	*t͡swī̃*
'scratch$_1$'		*k͡pá-ká kə́*	*g͡bá-ɣà*		*kwə̃̀*					*kwə̃̀*
'big'			*gɔ̀ŋ*	*gwə̂ŋ*	*gə̌̃zī*	*āŋgə̃̄*	*áŋgə̃̄*	*nágò*	*áŋgə̃̀*	*àkə̃̄*
'red'	*ɲūn*	*ɲɛ̄nɛ̄*	*ɲɛ́nɛ̀*	*ɲún*	*zɛ̄n*	*zēn*	*ðə́nì*	*ázɛ̃̄*	*jɛ̋̃*	*jɛ̃̄*
'breathe'	*ú-mé*	*ú-mə́*	*ù-mà-lɛ̀*	*ŋə́-má*				*hũ̄*	*hű*	*hű*
'suck'		*aú*		*ə̃ú*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ŋəù*	*ǔ̃*	*ű*
'thunder'	*gàm-vùrùm*	*gàm-vùrùm*		*gàm-vɨ̀r*	*kwáŋ-vɨ̀r*	*gàŋ-fɪ́r*	*gàm-vɨ̂r*	*gəŋ-vwē*	*gám-vəù*	*gə̃̀-fɪ̂*
'work'	*túmí*	*tŭmí*	*túmí*	*ṇ̀tò*	*tó*	*t͡ʃò*	*tō*		*t͡sùm*	*tű*
'feather'					*bjəŋ*	*bjəŋ*	*bjəŋ*	*ɟɛ̂̃*	*d͡zàm*	*t͡sə̰̀*
'scratch$_2$'					*fɛ̃̄*				*fəŋ*	*fəŋ*
'bite$_2$'	*lúm*							*dǔ̀*		

Nasalised vowels have also developed from the loss of a preceding nasal. Table 18 shows nasalised vowel development in Doso-Dza accompanying change to root-initial palatal nasals. In the Dza form *j̊ə̃̊* 'meat', it looks as if nasalisation could be due to the loss of the final nasal as before, but the cognate Doso form *ɥ̊ə̃̀m* (or *j̊ə̃̀m* 'animal') which preserves the final nasal reveals that this is not so. Rather, the root-initial palatal nasal has changed to a new palatal consonant in Doso-Dza. Since this new consonant is voiceless, it cannot be produced with nasality, but the nasality is preserved on the following vowel instead.[8]

Table 18

Development of nasalised vowel with [j̥]

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
'meat'	*ɲə̂m*	*ɲə́m*	*ɲə́m*	*ɲə̀m*	*ɲə̌*	*ɲə̌m*	*ɲə́m*	*ɲē*	*ɥ̊ə̃̀m*	*j̊ə̃̊*
'bad'								*ɲə́w*	*ɥ̊ĩ̂w*	

Table 19 shows that vowel nasalisation also occurred upon loss of preceding nasals intervocalically in Tha-Doso-Dza, although one of the occurrences is attested in Kyak as well.

3.3. Tone

High, mid, low, falling and rising tones were noted. Table 20 presents some roots with fairly consistent tone. High and low tones are switched in Doso, except that H does not become L after a voiced

[8] The development of [j] through **ɲV > j̊Ṽ* tends to imply that [j] occurs before nasalised vowels in Doso-Dza. Dza *j̊ɯ̃̊ŋ* 'fish' is an exception, where [j] realises initial **s*, but no other exceptions are found either in this wordlist or over a larger data set of 2600 Dza words (Othaniel 2016). Some other roots in the Appendix 'brother, sister', 'good', 'red' show more comprehensive change ɲVN > ɕ̊Ṽ in which the nasalised vowel could be derived from loss of either the preceding or the following nasal.

Table 19

Nasalisation with loss of intervocalic nasal (CV_1NV_2>$C\tilde{V}_2$)

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'cold'	*támá*	*tàmə*	*támā*	*támá*	*tém*	*tém*	*témθə́*	*tə́̃*	*tə̀̃*	*tə́̃*
'red sldr. ants'	*tùŋɛ̀*	*(t͡ʃíwā)*	*(ʃíbō)*	*(zwà)*	*sə̀̃*	*zíŋzēn*	*θíŋà*	*θə́̃*	*sə̀̃*	*sə̀̃*

obstruent. There is also some evidence of a mid tone level. Many roots, however, are more inconsistent in their tone across varieties. For now, we decline to reconstruct tone for items where tone is too inconsistent to be matched to the series below. We speculate that inconsistent tone may be the result of underlying tone sequences on monovocalic roots, as well as roots that have been reclassified for tone in some of the varieties.

3.4. Breathy voice

Vowels with breathy voice also occur. These are found sporadically, and always correspond to modal vowels of the same quality in other varieties. Table 21 shows some examples after nasal consonants.

Table 22 shows breathy voice after considerably less stable obstruent consonants. The consonant is usually voiced, except the *f in 'new', and in Dza where the consonant devoices. This rules out the possibility that breathy voice is simply an enhanced variant of modal voice, instead implying that breathy voice is a distinct laryngeal feature found in both branches (especially but not exclusively in Burak-Loo and Doso-Dza). There is some correlation with tone, as breathiness never co-occurs with high tone, but it is not exclusive to either mid or low tone, as is especially clear in Dza. The breathy feature repeatedly co-occurs with reduction of obstruents, including devoicing (or debuccalisation of *f) in Dza in the first group of roots in Table 22, and development of the voiceless labial-palatal [ɥ̥] in Doso-Dza in the second group of roots.

Table 20

Tones

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*L	*L*	*L*	*L*	*L*	*L*	*L*	*L*	*L*	*H*	*L*
‘answer’	*gàb*	*gàb*	*gàb*	*gàb*	*gwàb*	*gwàb*	*gwàb*	*gwà*	*gwáŋ*	*kwə̀*
‘bark’	*kɔ̀klɛ̀*	*kɔ̀lɛ̄*	*kɔ̂ŋ*	*kwàŋ*	*pwàm*	*pɔ̀ŋ*	*kwɔ̀ŋ*	*kwàŋ*	*pwə́*	*pwə̀*
*H (nouns)	*H͡L*	*H*	*H*	*H*	*H*	*H*	*H*	*H, L*	*L*	*H*
‘eye’	*nû*	*núŋ*	*núŋ*	*núŋ*	*núŋ*	*núŋ*	*núŋ*	*nú*	*nɨ̀ŋ*	*núŋ*
‘front’	*tî*	*tí*	*tí*	*sí*	*sí*	*sí*	*ʃí*	*cì*	*t͡ʃì*	*t͡ʃí*
‘millstone’	*nî*	*ní*	*ɲí*	*ɲí*	*ɲí*	*ɲí*	*ɲí*	*ɲwàŋwì*	*nì*	*ɲí*
‘liver’	*ɲĩ*	*ɲí*	*ɲí*	*ɲí*	*ɲwíŋwí*	*ɲí*	*ɲí*	*ɲì*	*nìnì*	*ɲíŋí*
*H (verbs)	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*L, H*	*H*
‘eat’	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*tàŋ*	*táŋ*	*tàŋ*	*táŋ*
‘push’	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ̀k*	*tɔ́k*	*tɔ̀k*	*ló*	*t͡sò*	*tó*
‘hit’	*g͡báp*	*g͡báb*	*g͡báb*	*g͡báb*	*g͡bàb*	*ɓóp*	*ɓwàp*	*g͡bá*	*g͡bá*	*g͡bá*
‘ask’	*ɓíp*	*bép*	*ɓíp*	*ɓíp*	*ɓí*	*ɓíp*	*ɓìp*	*bìm*	*ɓí*	*bí*
*M	*M*	*M*	*M*	*M*	*M*	*M?*	*L*	*M?*	*M?*	*M*
‘swallow’	*mī*	*mī*	*mī*	*mī*	*mī*	*mí*	*mì*	*mī*	*mī*	*mī*
‘thing’	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nɨ̄ŋ*	*nùŋ*	*nɨ̀ŋ*	*nɨ́ŋ*	*nɨ̄ŋ*

Table 21

Breathy vowels

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘rain’	*mɛ̄*	*mɛ̰̄*	*məī*	*mɨ̀ì*	*mū*	*múŋ*	*mùŋ*	*mɨ́ŋŋìlóˊ*	*mɨ̀ŋ*	*mɨ́ŋ*
‘hand’	*nɑ̰̂*	*nɑ̰̄ː*	*nā*	*nāː*	*ná*	*ná*	*ná*	*nà*	*nâ*	*nāː*
‘four’	*nɛ̰̄t*	*nɛ̄ːt*	*nàr*	*nēt*	*nɛ̄*	*nɛ̂*	*nəì*	*nàɲà*	*náɲà*	*ɲà*

The data suggests, albeit not conclusively, that breathy voice may be a conditioning factor behind changes in obstruents (see also §4.1).[9]

4. Consonants

Jen languages are rich in consonants and in sound changes to consonants, with the following sounds reconstructed. Palatal **ɲ* and velar **ŋ* are in complementary distribution, so no phonemic distinction is made between them in the chart.

Table 23

Proto-Jen consonants

	labial	alveolar	postalveolar	velar	labio-velar	glottal
plosives	*p *b	*t *d	*c	*k *g	(*k͡p) *g͡b	
affricates		*t͡s *d͡z	*t͡ʃ *d͡ʒ			
fricatives	*f *v	*s *z	*ʃ			(*h)
nasals	*m	*n	*ɲ			
implosives	*ɓ	*ɗ				
trill		*r				
approxi-mants		*l	*y *ɥ		*w	

[9] A related question for further research is whether breathy voice is properly associated with the vowel or with the entire root (which includes the affected initial consonant) in each variety.

Table 22

Breathy vowels after obstruents

gloss	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'leg'	*vo̤*	*vo̤*	*vò*	*bō*	*bō*	*bō*	*bò*	*bò*	*bù*	*pū*
'fencing mat'					*gē*		*gəì*	*gi̤*	*gi̤*	*ki̤*
'answer (v.)'	*gàb*	*gəb*	*gàb*	*gəb*	*gwəb*	*gwəb*	*gwəb*	*gwə*	*gwəŋ*	*kwə̰*
'neck'	*dòl*	*dūl*	*dùl*	*dūl*	*dūl*	*dúl*	*dwùl*	*ɟwí*	*d͡ʒwìm*	*t͡ʃwi̤*
'stand'	*de̤*	*de̤*	*də̤ì*	*də̤ì*	*dɛ̄*	*dɛ̄*	*dē*		*d͡ʒì*	*ts̀*
'snake'		*bjək*	*bjək*	*bjək*	*bjɔ́k*	*bjəŋ*	*bjēk*	*ɟəù*	*d͡zəù*	*ts̄o̤*
'feather'					*bjəŋ*	*bjəŋ*	*bjəŋ*	*ɟɛ̃̂*	*d͡zàm*	*ts̄ə̤*
'say'	*ge̤*	*gē*	*d͡ʒe̤*	*gəì*	*d͡ʒē*	*d͡ʒē*	*gəì*	*kìjè*	*kɬŋ-kâ*	*ts̄à*
'elephant'	*d͡ʒúk*	*d͡ʒúk*	*d͡ʒɔ̀k*	*zúk*	*zòk*	*zɔ̀k*	*zɔk*	*ðəù*	*zò*	*so̤*
'count'					*zēn*	*zēn*	*ðən*	*hò*	*zàm*	*sə̰*
'ashes, dust'					*vùk*				*vəù*	*fo̤*
'new'	*fṳ*	*fŭ*	*fù*	*fū:*	*fú*	*fú*	*fú*	*fù*	*fû*	*hú*
'blood'	*wĕ*		*ɥe̤*	*ɥē*	*zwī*	*zĭ*	*zĩ̄*	*vì*	*n̥ɥi̤*	*ɥi̤*
'sand$_B$'	*d͡ʒwe̤*	*ʒwē*	*ʒwəì*	*zwē*	*zwī*	*zí*	*zwí*	*vī*	*ɥi̤*	*ɥī*
'lion'		*d͡ʒwe̤*	*d͡ʒwə̰̀*	*zwə̰*	*zwə̰̄*	*zwà*	*zwà*	*zwà*	*ɥə̰:*	*ɥə̰̄*
'smoke'	*wṳ*	*dùŋɔ̀*	*wú lwà*	*dû*	*d͡ʒù*	*d͡ʒū*	*dù*	*ðɨ́ú*	*ɥi̤*	*ɥī*

4.1. Root-initial consonants

Root-initial consonants are presented here grouped by manner of articulation. Table 24 shows voiceless plosives. The labial **p* splits to [p] and [f] in the second branch according to the following vowel, as retained in Maghdi, and with some spirantisation to [f] borrowed into Mak. However, *t and *k occur in fully stable examples. A palatal **c* is evident in some incomplete series, contrasting with affricates listed in later tables. Labial-velar **k͡p* is poorly attested in just one root of the second primary branch (assumed borrowed into Mak, as argued in §3.3).

Table 25 shows voiced plosives. These devoice in Dza, but with exceptions — perhaps because breathy voice is a precondition for devoicing (§3.5),[10] although this is not established across all the data. The labial **b* is assumed to have split in the first branch (the [v] fits better here than under **v*, although this split is strangely contrary in its distribution from **p > f* in the second branch), but with Mak influenced by the [b] pronounciation of the second branch. The alveolar **d* develops affrication in Dza before high vowels, [d͡ʒ] before [i], or [d͡z] otherwise, as also seen in more data from deimploded **ɗ* below. The labial-velar **g͡b* develops implosivity in Kyak-Moo-Leelau (Harley (2020) has [g͡ɓ] in Kyak).

Table 26 shows three root-initial nasals **m*, **n*, **ɲ*, with other sounds developing from **ɲ*. Contrast between palatal **ɲ* and alveolar **n* is weak for lack of **n* before front vowels or **ɲ* before back vowels. However, **ɲ* is in complementary distribution with root-final **ŋ* (§4.2) and also realised as [ŋ] word-initially before [w] in both Kyak-Moo-Leelau and Doso-Dza. Therefore, instances of **ɲ* in the Jen language cluster may ultimately derive from either ***n* or ***ŋ* at higher levels of reconstruction.

[10] We are grateful to Mark van de Velde and Matthew Harley for this suggestion.

Table 24

Voiceless plosives

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*p/_e			*p*		*p*	*p*	*p*		*p*	*p*
'nail (v.)'			*pē*		*pì*	*pí*	*pî*		*pī*	*pí*
*p/_i	*p*	*p*	*p*	*p,f*	*f*	*f*	*f*	*f*	*f*	
'moon'	*pǐ*	*pí*	*pi̱*	*pī*	*fi*	*fí*	*fî*	*fǐ*	*fúu̱ìm*	*ìu̱ḯ*
'wipe'	*pērē*	*pìrɛ́*	*pìlá*	*fɛ̀rà*	*fá*	*fá*	*fá*	*fà*	*fì*	
*t	*t*	*t*	*t*	*t*	*t*	*t*	*t*	*t*	*t*	*t*
'shoot'	*tá*	*tá*	*tá*	*tă*	*tà*	*tá*	*tà*	*tà*	*tà*	*tá*
'eat'	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*tàŋ*	*táŋ*	*tàŋ*	*táŋ*
*k	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*
'squeeze'	*kám*	*kám*	*kám*	*kăm*	*kàm*	*kám*	*kàm*	*kɨ̀*	*kàm*	*kə́*
*c	*ʃ*	*ʃ*	*ʃ*	*c*	*c*	*c*	*c*	*ɟ*	*t͡s*	*c,t͡ʃ*
'shadow'	*ʃílīŋ*	*ʃílìŋ*	*ʃílíŋ*	*cɨ̀lĭŋ*	*jílìŋ*	*kúlwáŋ*	*cílíŋ*	*ɲɟíŋ*		
'wing'	*ʃínì*	*ʃínì*	*ʃénē*		*cēn*	*cèn*	*kân*		*t͡sɛ̃̄w*	*t͡ʃɛ̃̄*
'near'					*càn*	*cénsăŋ*				*cə̀*
*k͡p?				*k͡p*	*k͡p*	*k͡p*	*k͡p*		*k͡p*	*j̊*
'many'				*lɨ̀k͡pə̄lì*	*k͡pə̀lɛ̆*	*k͡pə̄*	*k͡pə̀díŋ*		*k͡pə̀ló*	*íj̊ə̀nîŋ*

Table 25

Voiced plosives

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*b	*b*	*b*	*b*	*b*	*b*	*b*	*b*	*b*	*b*	*p*
‘egg’	*bāŋ*	*bāŋ*	*bàŋ*	*báŋ*	*bùŋ*	*bùŋ*	*būŋ*	*bɨ̄ŋ*	*bɨ̀ŋ*	*pɨ̄ŋ*
‘stab’	*bɛ̀t*	*bɛ̄t*	*bà*	*bà*	*bɛ̄*	*bjɛ̄*	*bəì*	*bà*	*bəù*	*pà*
*b	*v*	*v*	*v*	*v,b*	*b*	*b*	*b*	*b*	*b*	*b,p*
‘tomorrow’	*vɐ̯̄*	*vē*	*vəì*	*vəì*	*būŋ*	*bûŋ*	*būŋ*	*báŋ*	*bɨ̀ŋ*	*bàŋ*
‘leg’	*vō̯*	*vō̯*	*vò̯*	*bō*	*bō*	*bō*	*bò*	*kábò*	*kábù*	*kápū*
*d	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
‘drum / dance’	*dəŋ*	*dəŋ*	*dāŋ*	*dāŋ*	*dəŋ*	*dâŋ*	*dəŋ*	*dáŋ*	*dâŋ*	*dəŋ*
*d/_i	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*ɟ*	*d͡z,d͡ʒ*	*t͡s,t͡ʃ*
‘stand’	*dɐ̯̄*	*dɐ̯̄*	*dɐ̯̀ì*	*dɐ̯̀ì*	*dɛ̄*	*dɛ̄*	*dē*		*d͡ʒì*	*t͡sɨ̀*
‘neck’	*dòl*	*dūl*	*dùl*	*dūl*	*dūl*	*dúl*	*dwùl*	*ɟwí*	*d͡ʒwìm*	*t͡ʃwɨ̯̄*
*g	*g*	*g*	*g*	*g*	*g*	*g*	*g*	*g*	*g*	*g,k*
‘greet’	*gùm*	*gùmē*	*gòm*	*gùm*	*gwəmbē*	*gūm*	*gūm*			
‘thunder’				*gàmvɨ̀r*		*gàŋfɨ́r*	*gàmvɨ̂r*	*gəŋvwē*	*gámvəù*	*gɐ̃fɨ*
‘big’			*gɔ̀ŋ*	*gwə̀ŋ*	*gɔ̌ɔ̌zī*	*āŋgɐ̃*	*áŋgɐ̃*	*nágò*	*áŋgɐ̀*	*àkɐ̃*
‘fencing mat’					*gē*	*d͡ʒē*	*gəì*	*gɨ̯̄*	*gɨ̯̀*	*kɨ̯̄*

End of Table 25

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*g/_u,w	*g*	*g*	*g*	*g*	*g*	*g*	*g*	*g*	*v*	*v,f*
‘king’	*gúb*	*gwə̀b*	*gu̱b*	*gūb*	*jìgwɛ̂*	*jɨgwē*	*jɨgwəì*	*kú*	*jìvə́*	*ívə̀*
‘pull’	*gu̱b*	*gūb*	*gúb*	*gūb*	*gɨ̀b*	*gùb*	*gùb*	*gù*	*vɨ̀*	*fɨ̄*
‘long’	*g͡bɛ̀nɛ́*	*g͡bɨ́nə́*	*d͡zúnā*	*d͡zúnā*	*gwɛ̀n*	*gwēn*	*gónì*		*vɨ̄̀*	*fɨ̄̀*
‘person’			*jú-gùl*	*jù-gūl*					*jí-vɨ̀*	*ì-fɨ̄*
‘grass’					*gūk*	*gūk*	*gùk*	*gù*	*vù*	*hū̱*
*g͡b	*g͡b*	*g͡b*	*g͡b*	*g͡b*	*g͡b*	*ɓw*	*ɓw*	*g͡b*	*g͡b*	*g͡b*
‘hit’	*g͡bə́p*	*g͡bə́b*	*g͡bə́b*	*g͡bə́b*	*g͡bə̀b*	*ɓóp*	*ɓwə̀p*	*g͡bə́*	*g͡bə́*	*g͡bə́*

Table 26

Nasals

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*m	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*m*
‘breast’	*mî*	*mí*	*mì*	*mí*	*mí*	*mĭ*	*mí*	*mī*	*mì*	*mì*
‘beer’	*mìn*	*mín*	*mín*	*mín*	*mín*	*mín*	*mín*	*mɨ̀*	*mìm*	*mí*
*n	*n*	*n*	*n*	*n*	*n*	*n*	*n*	*n*	*n*	*n*
‘hand’	*nə̰*	*nə̰ː*	*nā*	*nāː*	*ná*	*ná*	*ná*	*nà*	*nâ*	*nāː*
‘thing’	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nɨ̄ŋ*	*nùŋ*	*nɨ̀ŋ*	*nɨ́ŋ*	*nɨ̄ŋ*
*n/_ə	*n*	*n*	*n*	*n*	*n*	*n*	*n*	*ɲ*	*ɲ*	*ɲ*
‘four’	*nɛ̰t*	*nɛ̄ːt*	*nər*	*nēt*	*nɛ̄*	*nɛ̂*	*nəì*	*-ɲə*	*-ɲə*	*ɲə*
*ɲ/_i,e	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*n*	*ɲ*
‘liver’	*ɲī*	*ɲí*	*ɲí*	*ɲí*	*ɲwíŋwí*	*ɲí*	*ɲi*	*ɲì*	*nìnì*	*ɲíŋí*
‘bitter’		*ɲɛ̄t*			*ɲî*	*ɲì*	*ɲíθə*	*ɲwī*	*nínì*	*ɲĭ*
‘owl’				*ɲíŋī*	*ɲíŋí*	*ɲĭŋî*	*ɲíŋī*	*ṇhḯhḯ*	*nînì*	*ɲĭŋì*
*ɲ/_ə	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɲ*	*ɥ*	*j*
‘meat’	*ɲə̂m*	*ɲə́m*	*ɲə́m*	*ɲə̀m*	*ɲə̆*	*ɲə̆m*	*ɲə́m*	*ɲē*	*ɥ̊ə̃̀m*	*j̊ə̃́*
‘bad’								*ɲə́w*	*ɥ̊ĩ̂w*	
*ɲ/_w	*ɲ*	*ɲ*	*ɲ*	*n*	*ŋ*	*ŋ*	*ŋ*	*ɲ*	*ŋ*	*ŋ*
‘mouth’	*ɲwə̰́*	*ɲwá*	*ɲwà*	*nwə̰́*	*ŋwá*	*ŋwá*	*ŋwà*	*ɲwá*	*ŋwà*	*ŋwá*
‘drink’	*ɲŏ*	*ɲwə́*	*ɲɔ́*		*ŋwà*	*ŋwà*	*ŋwà*		*ŋwà*	*ŋwá*

Table 27 shows three approximant series **w, *ɥ, *y* reconstructed from incomplete examples. As in all our comparative data, the palatal approximant is transcribed using the standard IPA symbol [j], but in reconstruction the symbol **y* has been used to support integration into Africanist scholarship. The labial-palatal **ɥ* merges with *w in both Burak-Loo and Kyak-Moo-Leelau, while the structure **yu* becomes /ɥi/ in several varieties, in effect these are further instances of **u* > *wi* (this includes **yo* 'cook' affected by vowel raising **o* > *u* in Doso-Dza). In addition to these three approximants, voiceless approximants are also attested in Tha, Doso, and Dza, but these are innovations, found in other tables.

Table 28 shows two liquids **l*, **r*, but the only root containing an initial trill (**rab*) is lost in Tha and in Doso-Dza.

Table 29 shows intervocalic liquids, where a more complete series can be drawn up for **r*. The **r* appears intervocalically due to **-rV* extensions that are always present in the first branch but only sporadically in the second branch. Dza is one of the varieties where the trill merges with the lateral, a process also found in Dza loanwords (Fulfulde *màlórì* → Dza *màlólì* 'rice'), despite Dza having trills in ideophones (Benson 2020).

Table 30 shows implosives, which occur except in Dza, where they reduce to plain plosives. Deimplosion in Dza is recent because elderly Dza speakers still use implosives (Othaniel 2016). This loss is not in imitation of Hausa because Hausa has implosives, suggesting instead attrition in younger speakers. The alveolar **ɗ* is found in irregular correspondences with the lateral, implying a stem-initial consonant alternation of unknown function, so that **ɗ* can only be reliably reconstructed in 'basket' and 'calabash' (plus 'dog' in Table 35). Like the **d* series, deimploded **ɗ* in Dza is affected by affrication to [d͡ʒ] before [i] or [d͡z] before [u] or [w]. In Tha, **ɗ* reduces to [d] before [u], and to [j] otherwise, and deimplosion of *ɓ also seems underway.

Table 31 shows further examples of the irregular *l*~*ɗ* alternation with instances of [ƙ] in our data for Kyak and Moo. These roots show greater variation in their form as a whole. The [ƙ] nearly always occurs before [i], suggesting it may represent a phonologically conditioned

Table 27

Approximants

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*w	*w*	*w*	*w*	*w*	*w*	*w*	*w*	*w*	*w*	*w*
'throw'		*wá*	*wā*	*wà*	*wà*	*wá*	*wǎ*		*wà*	*wá*
'come'					*wɛ̀*	*wá*	*wə̀*	*wə̀*	*wə̀*	*wú*
'kill'	*wòb*	*wə̀b*	*wòp*	*wə̀b*						
'walk'	*wē(lé)*	*wēlé*	*wé(lè)*	*wō̤*						
*ɥ	*w*	*w*	*ɥ*	*ɥ*	*w*	*w*	*w*	*ɥ*	*ɥ*	*ɥ*
'wind'	*wə̀bɛ́*	*wúbɛ̄*	*ɥá*	*ɥâ*	*wá*	*wá*	*wà*	*(ɲàcà)*	*ɥà̤*	*ɥá*
'blood'	*wě*		*ɥē̤*	*ɥē*					*ŋ̍ɥ̥ì̤*	*ɥ̥ǐ̤*
'belly'					*wá*	*wá*	*wá*	*ɥà*	*ɥà*	*ɥá*
'tail'	*wīn*	*wēn*	*ɥén*	*ɥēn*						
*y	*j*	*j*	*j*	*j*	*j*	*j*	*j*	*j*	*j*	*j*
'leaf'	*jə̌ŋ*	*jə̀ŋ*	*(ɲə̀ŋ)*	*jə́ŋ*	*jɔ̀k*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*
'full'		*jí*	*jì̤nî*	*jìdə́*	*jɨ̀lɨ̀ŋ*	*jɨ̂ŋ*	*jìθə̀*	*jí*	*jɨ̀lə̀*	*jɨ̀lə̂*
*y/_u	*j*	*j*	*j*	*j*	*j*	*Ø*	*ɥ*	*ɥ*	*ɥ*	*ɥ*
'person / child'	*jū*	*jū*	*jú*	*jú*	*jú*	*jú,wī*	*jú,ɥì*	*ɥì*		
'cook'	*jǒ*	*jō*	*jəùwē*	*jəû*	*jō*	*jǒ*	*jò*	*jəù*	*ɥì*	*ɥì*

Table 28

Liquids

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*l	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*l*
'lie (down)'	*ləú*	*ləú*	*ləú*	*lʌū*	*ló*	*lŏ*	*ló*	*ləú*	*lweì*	*lwé*
'hear'	*lárɛ̀*	*lárə̀*	*lálɛ̄*	*làrɨ́*	*lî*	*lɨ́*	*là*	*là*	*lì*	*lí*
*r	*ɾ*	*ɾ*	*l*	*ɾ*	*r*	*r*	*ɾ*	-	-	-
'two'	*ɾàb*	*ɾàb*	*làːp*	*ɾāb*	*ràb*	*ràb*	*ɾàb*	*nə̀-jà*	*nə́-ʔiù*	*jŭŋ*

Table 29

Intervocalic liquids

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*l	*l*	*l*	*l*	*l*	*l*	*ɾ*	*l*			
'fear'	*vílí*	*vílí*	*vìlì*	*sùvɨ́lə́*	*vɨ́l*	*vìɾí*	*vɨ̀lì*			
*r	*ɾ*	*ɾ*	*l*	*ɾ*	*ɾ*	*ɾ*	*ɾ*	Ø	*ɾ*	*l*
'white'	*vùrūm*	*vɨ́rùm*	*vùlùm*	*vɨ̄rɨ̀m*	*vɨ̀rɨ̄m*	*vɨ̀rɨ̀m*	*vɨ̀rɨ̀m*	*jávù*	*vəw*	*fɨ̄*
'fly'	*wúrí*	*wùrɨ́*	*wílí*	*wùrà*	*wúréjɨ́ŋ*	*wùrínjí*	*ɨ́rɨ̄jí*	*wíjè*		
'fruit'	*túrí*	*túrí*	*ʃwírí*	*súr*	*sĭw*	*sí*	*sì*	*cì*	*t͡ʃîrɨ̀*	*t͡ʃîlɨ́*
'dream'	*mɔ́rá*	*múrà*	*mwàlà*	*mwà*	*mwèn*	*mwèn*	*mwəànì*	*mwìmwì*	*mwírɨ̀*	*mwílɨ́*
'night'	*vèrɛ̀*	*vèrɛ̀*	*vōlè*	*vōrə̀*	*vì*	*vì*	*vĩ̀*	*vē*	*dîŋvĩ̀*	*n̩vì*
'hear'	*lárɛ̀*	*lárə̀*	*lálɛ̄*	*làrɨ́*	*lî*	*lɨ́*	*là*	*là*	*lì*	*lí*
'wipe'	*pērē*	*pìrɛ́*	*pìlá*	*fèrà*	*fá*	*fá*	*fá*	*fà*	*fî*	
'know'	*érē*	*érɛ́*	*ílà*	*írà*	*í*		*ìbəí*	*n̩jē*	*íbɨ̀*	*jí*

Table 30

Implosives

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	b
‘rope’	ɓél	ɓāl	ɓāl	ɓàl	ɓíl	bál	ɓàl	ɓəì	ɓəì	bè
‘ask’	ɓíp	bép	ɓíp	ɓíp	ɓí	ɓíp	ɓìp	bìm	ɓí	bí
*ɓ/_i,j	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	ɓ	(ɓ)	ɗ	d͡ʒ
‘mosquito’	ɓɛ́	ɓɛ́	ɓē	ɓē	bjà	ɓjá	ɓjà	jà	ɗjà	d͡ʒá
‘vomit’	ɓṑm	ɓóm	ɓə́m	ɓjə́m	ɓíjém	ɓém	ɓēmē	bjē	ɗjèm	d͡ʒə́
‘horn’	ɓwɛ́k	ɓɔ̄k	ɓí	ɓī	ɓí	ɓí	ɓì	ɓì	ɗì	d͡ʒí
*ɗ	l~ɗ	l~ɗ	l~ɗ	l~ɗ	l~ɗ	l~ɗ	l~ɗ	l~j,d	l~ɗ	l~d,d͡ʒ,d͡z
‘basket’	ɗɔ́k	ɗɔ̀k	ɗɔ́k	ɗɔ́k	ɗɔ̀k	ɗɔ̀k	ɗòk	ləú	lō	lò
‘calabash’	ɗɛ̄	ɗɛ̄	ɗəí	ɗəī	ɗɛ̄	ɗē	ɗəì	ləì	lì	d͡ʒì
‘name’	lɨ̂n	lín	lɪ̄n	ɗín	ɗwín	ɗwín	ɗun	dǔ	ɗíjíŋ	d͡zúŋ
‘nose’	lúrī	lúrī	lwílí	ɗūrə́	ɗúr	ɗúr	ɗúr	dǔ	ɗwì	d͡ʒwí
‘bite’	lúm							dǔ		
‘locust bean tree’			lwəī	l̪wəī	ɗwí	ɗwí	lwí	jí	ɗwì	d͡zwì
‘fire’	lwà	lwà	lwâ	lwá	ɗwà	ɥà	lwà	ɥà	ɗwā:	d͡zwà
‘call’	lú	lú	lúvəì		lɨ̄bē	lɪ̄bē	lùbəí	dúbì	ɗúpɨ̀	d͡zúpɨ̀
‘pull up’	lūb	lùb	lúb	lūb	lɨ̀b	lùb	lùb	lù	ɗù	d͡zwū
‘tooth’	le	ləí	ləī	ləì	lɛ̄	lɛ̄	ləí	jɨ̀ɲɨ̀	ɗí	d͡ʒī
‘take’					lē	lē	ləì	jɨ̀	ɗɨ̀	dɨ̀

palatalisation of [ɗ] to [ʃ] or [ƈ], bearing in mind that other authors transcribe a palatalised implosive in Kyak [ɗyim] 'tongue' (Kleine-willinghöfer 1996, Harley 2020).

Table 32 shows fricatives in various unstable correspondence series. Devoicing is observed in Dza for **v* and **z* as seen already in voiced plosives, but again there are exceptions. There is a persistent problem of lack of attestations of **s* and **z* in the first branch, partly due to initial consonant alternations in verb stems (see Table 6 above). Postalveolars are distributed across both branches so are reconstructible; a limited contrast with alveolar is apparent in 'fish' vs. 'crocodile'. In Doso-Dza, **s, *ʃ* or **z* become [h] with unclear conditioning environment, and [j̰] before non-low central vowels [ɨ] or [ə], becoming [ɥ̰] in Doso.

Table 33 presents affricates. Affricate series are complex with plosive, fricative and affricate correspondents. We find no conditioning by the following vowel that would derive affricate correspondents from the softening of plosives. Instead, the series partly resemble the relevant fricative series **s, *z, *ʃ,* and in some cases varieties of both branches attest frication, all supporting reconstruction of affrication. Alveolar-postalveolar contrast is preserved in various ways, but is also neutralised in various contexts. We attempt to explain different correspondence series for **t͡s* and for **t͡ʃ* in terms of following vowels, this too is complex because the vowels vary from variety to variety.

4.2. Root-final consonants

Table 34 presents the limited set of consonants that are reconstructible root-finally. These are nearly all conserved in the first seven varieties, but there is extensive loss in Tha, Doso and Dza (as parallel developments rather than shared innovation, given the survival of more final consonants into Doso). Only **ŋ* is retained in all varieties. This is surprising, because **ŋ* cannot be reconstructed root-initially, although it is in complementary distribution with root-initial **ɲ* (§4.1). Root-final **r* is only supported from varieties of the second primary branch plus Mak.

Various interactions of the final consonant with the preceding vowel are also evident in Table 34. Sonorants **n, *ŋ, *l* reduce to [m] in Doso after

Table 31

Items transcribed with [ƙ] in Kyak and Moo

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'tongue'	*ɗə́k*	*ɗə́k*	*ɗə́k*	*lĕn*	*ƙīm*	*ƙík*	*ljén*	*láŋ*	*líjɛ̄m*	*lá*
'today'	*dî*	*dî*		*də̀sî*	*ƙījà*	*ƙìkà*	*dìgà*		*lìjɛ̀*	*d͡zɛ̀ní*
'yesterday'	*lɛ́*	*lɛ̄*	*líjè*	*lē*	*ƙí*	*dî*	*làlì*	*ɲɛ́*	*ɗjəù*	*dò*
'knee'	*lɔ̀k*	*lɔ́k*	*lɔ̀k*	*lwəŋ*	*ƙáŋ*	*zìɥáŋ*	*lwáŋ*	*lòjàŋ*	*ɗwàŋ*	*d͡zwáŋ*

Table 32

Fricatives

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*f	*f*	*f*	*f*	*f*	*f*	*f*	*f*	*f*	*f*	*h*
'new'	*fi̱*	*fŭ*	*fù*	*fū*	*fú*	*fú*	*fú*	*fù*	*fû*	*hú*
*v	*v*	*v*	*v*	*v*	*v*	*v*	*v*	*v*	*v*	*v,f*
'night'	*vɛ̀rɛ̀*	*vɛ̀rɛ̀*	*vōlè*	*vōrə̀*	*vì*	*vì*	*vì̱*	*vē*	*ɗi̱ŋvì̱*	*ṇ̀vì*
'white'	*vùrūm*	*vírùm*	*vùlùm*	*vu̱rù̱m*	*vi̱rū̱m*	*vi̱rù̱m*	*vi̱rù̱m*	*jə́vù*	*və̀w*	*fɪ̄*
*s	*ʃ*	*ʃ*	*ʃ*	*s*	*s*	*s*	*θ,ʃ*	*θ,ʃ*	*h,ɻ̊*	*h,j̊*
'fish'	*ʃíjɛ̀*	*t͡ʃɛ̄*	*ʃəī*	*seí*	*θɨ́ŋ*	*sɨ́ŋ*	*θɨ́ŋ*	*θì̱ŋ*	*ɻ̊ì̱ŋ*	*j̊ì̱ŋ*

End of Table 32

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
‘wife’	*ʃɛ̂*	*ʃəí*	*ʃē*	*sɨ́jē*	*sí*	*sí*	*ʃɨ́m*	*ʃì*	*hē*	*hē*
‘year’					*sá*	*sā*	*θà*	*θà*	*hà*	*há*
*ʃ	*ʃ*	*ʃ*	*ʃ*	*s*	*s*	*s*	*θ*	*s*	*s*	*ʃ*
‘croco-dile’	*ʃɨ́p*	*ʃɨ́p*	*ʃɨ́p*	*s̪ɨ̄b*	*swə́m*	*sɨ̀p*	*θɨ̀p*	*sɨ̀*	*sɨ̀*	*ʃɨ́*
*z	*d͡z*	*d͡z*	*d͡z*	*z*	*z*	*z*	*ð*	*ð,…*	*z,…*	*s,…*
‘ele-phant’	*d͡zúk*	*d͡zúk*	*d͡zɔ̀k*	*zúk*	*zòk*	*zɔ̀k*	*zɔ̀k*	*ðəù*	*zò*	*sn̪̄*
‘song’		*d͡zì*	*d͡zì*	*zi*						
‘count’					*zēn*	*zēn*	*ðə̂n*	*hò*	*zàm*	*sǹ̪*
‘dig’					*zà*	*zà*	*ðà*	*ðà*	*hà*	*hà*
‘walk’					*zō*	*zɔ̀*	*ðəù*	*ðòbò*	*hò*	*hō*
‘kill’					*zə̀p*	*zə̀p*	*ðə̂p*	*θə̀*	*j̊ə̀*	*jə̀*
‘red’					*zɛ̄n*	*zēn*	*ðə́nì*	*ázɛ̃̄*	*j̊ɛ́̃*	*j̊ɛ̃̄*

Table 33

Affricates

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*t͡s/_i,ã	*t*	*t͡ʃ*	*ʃ*		*s*	*(s)*	*θ*	*θ*	*s*	*s*
'red sp. of ants'	*tòŋɛ̀*	*t͡ʃɪ́wā*	*ʃɪ́bō*		*sɑ̃̀*	*zɨ́ŋzēn*	*θɪ́ŋà*	*θɑ̃́*	*sɑ̃̀*	*sɑ̃̀*
*t͡s/_i,ɨ			*t*	*t*	*s*	*s*	*t*	*c*	*t͡ʃ*	*t͡s*
'rabbit'			*tɪ́d͡ʒā*	*tɪ́d͡ʒà*	*sɨ́bɛ̂*	*sɨ́bɛ̂*	*tɨ̀ŋà*	*ɲcɪ́lə̀ì*	*t͡ʃɪ́dɪ̂jɛ̀*	*t͡sɨ̀lɛ̂*
*t͡ʃ/_ə	*t*		*ʃ*	*s*	*t͡ʃ*	*t͡ʃ*	*θ*	*c*	*t͡s*	*t͡s*
'tie'	*tép*	*lép*	*ʃə́b*	*sə́b*	*t͡ʃə́b*	*t͡ʃə́b*	*θə̀p*	*cà*	*t͡sə̀*	*t͡sə́*
*t͡ʃ/_i,u	*t*	*t*	*ʃ,t*	*s*	*s*	*s*	*s,ʃ*	*c*	*t͡ʃ*	*t͡ʃ*
'fruit'	*túrí*	*túrí*	*ʃwírí*	*súr*	*sŭw*	*sí*	*sì*	*cì*	*t͡ʃɪ̂*	*t͡ʃɪ̂-lɨ́*
'front'	*tɪ̂*	*tɪ́*	*tɪ́*	*sɪ́*	*sɪ́*	*sɪ́*	*ʃɪ́*	*cì*	*t͡ʃɪ̂*	*t͡ʃɪ́*
*d͡z	*d*	*d*	*d*	*d*	*z*	*z*	*z*		*t͡s*	*t*
'heart'		*dú*	*dụ̀*	*dụ̄*		*zū*	*zû*		*t͡swə̀m*	*twé*
*d͡ʒ	*d͡ʒ*	*d͡ʒ*	*d͡ʒ*	*d͡ʒ*					*d*	*d*
'when?'	*d͡ʒə̀ù*	*d͡ʒə̄ū*	*d͡ʒə́ú*	*d͡ʒə́ú*					*də̀ù*	*dó*

some (but not all) low tone vowels. There are observable co-occurrence patterns of **k* after **o*, **m* after **ə*, alveolar stops **t*, **n* after front vowels, **r* after central vowels, and **b*, **ŋ*, **l* after either **u* or **ə*. Vowel changes are also visible accompanying final consonant loss in Tha, Doso and Dza.

4.3. Labialisation and palatalisation

Palatal articulation can only be reconstructed after **b* as in Table 35, although it appears sporadically with other consonants in the data. There is a shift to a full palatal [ɟ] in Tha (or affricate in Doso-Dza).

Labial articulation is reconstructible after many more consonants. The root-initial consonant usually follows the series given above in §4.1, and the [w] is rarely lost, but may be vocalised before [i] as **wi* > *u*, or before [ə] as **wə* > *o*, and there are some other departures from this general pattern. Table 36 presents **kw* which is unstable in different ways in each root despite **k* itself being stable. For 'scratch', original **kw* allows hardening in the first branch to [p] where the opposite reconstruction is doubtful given the stability of **p* before [e] (Table 24), or in the second root with more intensive meaning, to [k͡p].

Table 37 presents labialised series in which labiodental fricatives and labial approximants emerge. The appearance of the labial-palatal [ɥ] in Tha indicates that it is functionally /jw/, so that the previously established change **ɗ* > *j* recurs as **ɗw* > *jw*. Likewise, its voiceless counterpart [ɥ̊] develops in Doso-Dza from **sw* and **zw*, hence it is functionally /j̊w/. The voiceless labial-velar [ʍ] develops in Dza in some series with single examples (also 'maize' in Table 34).

Tables 38 and 39 present labialised affricates that derive from different sources in different vowel contexts. Before [u] or [wə], affricates have plosive reflexes in the first branch, but we do not analyse this as development of affrication in the second branch, because the affricate series contrast with plain plosives *t, *d and each other in this environment, and therefore will be reconstructed as affricates. The affricates with [w] before front vowels in Table 39 are attempts to explain the contrasting series found there; these series may also be compared with affricates without [w] in Table 33.

Table 34

Root-final consonants

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*b	*b*	*b*	*b*	*b*	*b*	*b*	*b*	*Ø*	*Ø*	*Ø*
‘pull up’	*lūb*	*lùb*	*lúb*	*lūb*	*lɨ̀b*	*lùb*	*lùb*	*lù*	*ɗù*	*d͡zwū*
‘answer’	*gàb*	*gə̀b*	*gàb*	*gə̀b*	*gwə̀b*	*gwə̀b*	*gwə̀b*	*gwə̀*	*gwə́ŋ*	*kwə̤̀*
‘hit’	*g͡bə́p*	*g͡bə́b*	*g͡bə́b*	*g͡bə́b*	*g͡bə̀b*	*ɓóp*	*ɓwàp*	*g͡bá*	*g͡bə́*	*g͡bə́*
‘kill’	*wòb*	*wə̀b*	*wòp*	*wə̀b*	*zə̀p*	*zə̀p*	*ðâp*	*θə̀*	*j̥ə̀*	*jə̀*
‘tie’	*tép*	*lép*	*ʃə́b*	*sə́b*	*t͡ʃə̂b*	*t͡ʃə́b*	*θə̀p*	*cà*	*t͡sə̀*	*t͡sə́*
*t	*t*	*t*	*ɾ*	*t*	*Ø*	*Ø*	*Ø*	*Ø*	*Ø*	*Ø*
‘four’	*nɛ̤̄t*	*nɛ̄ːt*	*nə̀ɾ*	*nɛ̄t*	*nɛ̄*	*nɛ̂*	*nəì*	*nə̀ɲə̀*	*nə́ɲə̀*	*ɲə̀*
*k	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*Ø*	*Ø*	*Ø*
‘push’	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ́k*	*tɔ̀k*	*tɔ́k*	*tɔ̀k*	*ló*	*t͡sò*	*tó*
‘basket’	*ɗɔ́k*	*ɗɔ̂k*	*ɗɔ́k*	*ɗɔ́k*	*ɗɔ̂k*	*ɗɔ̂k*	*ɗòk*	*ləú*	*lō*	*lò*
‘elephant’	*d͡ʒʊ́k*	*d͡ʒʊ́k*	*d͡ʒɔ̀k*	*zʊ́k*	*zòk*	*zɔ̀k*	*zɔ̀k*	*ðəù*	*zò*	*sɔ̤̄*
*m	*m*	*m*	*m*	*m*	*m*	*m*	*m*	*Ø*	*m*	*Ø*
‘Leelaugh’	*mə́m*	*mə́m*	*mə́m*	*mə̀m*	*mə́m*	*mə̌m*	*mə̀m*	*mɨí*	*mə̀m*	*mə́*
‘meat’	*ɲə̂m*	*ɲə́m*	*ɲə́m*	*ɲə̀m*	*ɲə̌*	*ɲə̌m*	*ɲə́m*	*ɲē*	*ɰ̥ə̏m*	*j̥ə̋*
‘squeeze’	*kə́m*	*kə́m*	*kə́m*	*kə̌m*	*kə̀m*	*kə́m*	*kə̀m*	*kɨ̏*	*kə̀m*	*kə̋*

Continuation of Table 34

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*n	*n*	*n*	*m*	*n*	*n*	*n*	*n*	*(ŋ)*	*ŋ*	*ŋ*
‘one’	*kwîn*	*kwín*	*swím*	*cwîn*	*kwɨ́n*	*kwín*	*kún*	*cùŋgà*	*t͡sɨ̀ŋ*	*t͡sɨ̄ŋ*
‘name’	*lîn*	*lɨ́n*	*lɨ̄n*	*dín*	*dwín*	*dwín*	*dun*	*dǔ*	*dǐjíŋ*	*d͡zúŋ*
*n	*n*	*n*	*n*	*n*	*n*	*n*	*n*	*Ø*	*m*	*Ø*
‘beer’	*mìn*	*mín*	*mín*	*mín*	*mín*	*mín*	*mín*	*mɨ̀*	*mìm*	*mí*
‘mortar’		*dàn*	*dàn*	*dəːn*	*zwēn*	*vèn*	*zwàn*	*ìdəù*	*d͡zwàm*	*t͡swā*
‘count’					*zēn*	*zēn*	*ðân*	*hò*	*zàm*	*sa̰*
*ŋ	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*
‘eat’	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*táŋ*	*tàŋ*	*táŋ*	*tàŋ*	*táŋ*
‘thing’	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nūŋ*	*nɨ̄ŋ*	*nùŋ*	*nɨ̀ŋ*	*nɨ́ŋ*	*nɨ̄ŋ*
‘egg’	*bāŋ*	*bāŋ*	*bàŋ*	*báŋ*	*bùŋ*	*bùŋ*	*būŋ*	*bɨ̄ŋ*	*bɨ̀ŋ*	*pɨ̄ŋ*
*ŋ	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*ŋ*	*Ø*	*m*	*Ø*
‘feather’					*bjàŋ*	*bjāŋ*	*bjàŋ*	*ɟɛ̃̀*	*d͡zàm*	*t͡sa̰*
*l	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*Ø*	*Ø*	*Ø*
‘stone’	*tál*	*tál*	*tál*	*tál*	*tə̀l*	*tàl*	*tàl*	*təì*	*teì*	*té*
‘rope’	*ɓél*	*ɓāl*	*ɓāl*	*ɓàl*	*ɓɨ́l*	*bál*	*ɓàl*	*ɓəì*	*ɓəì*	*bè*

End of Table 34

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'back'	*màl*	*mál*	*dɨ́màl*	*măl*	*mwàl*	*mwăl*	*mwàl*			
'skin'					*swál*	*swál*	*swál*	*jwà*	*d͡zwà*	*t͡swà*
*l	*l*	*l*	*l*	*l*	*l*	*l*	*l*	Ø	*m*	Ø
'neck'	*dòl*	*dūl*	*dùl*	*dūl*	*dūl*	*dúl*	*dwùl*	*ɟwí*	*d͡ʒwìm*	*t͡ʃwɪ̰*
*r?				*r*	*ɾ*	*ɾ*	*ɾ*	Ø	Ø	Ø
'thunder'				*gàmvìr*	*kwáŋvìr*	*gàŋfír*	*gàmvîr*	*gəŋvwē*	*gámvəù*	*gə̃fɪ̀*
'swell'					*hár*		*hár*		*həì*	*hɛ́*

Table 35

Palatalisation with bilabial plosive

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*by		*bj*	*bj*	*bj*	*bj*	*bj*	*bj*	*ɟ*	*d͡z*	*t͡s*
'snake'		*bjə̀k*	*bjə̀k*	*bjə̀k*	*bjɔ́k*	*bjə̀ŋ*	*bjēk*	*ɟəù*	*d͡zəù*	*t͡sə̰*
'feather'					*bjə̀ŋ*	*bjāŋ*	*bjə̀ŋ*	*ɟɛ̰̂*	*d͡zàm*	*t͡sə̰̀*

Table 36

Labialisation with velar plosive

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*kw/_i	*kw*	*kw*	*kw*	*kw,cw*	*kw*	*kw*	*kw,cw*	*cw*	*t͡s,t͡ʃ*	*t͡s,t͡ʃ*
'one'	*kwîn*	*kwín*	*(swím)*	*cwîn*	*kwín*	*kwín*	*kún*	*cùŋgà*	*t͡sɨ̀ŋ*	*t͡sɨ̄ŋ*
'dry'	*kwē*	*kwəí*	*kwaí*	*kwaí*	*kwí*	*kwí*	*cwí*	*ụ̀ijē*	*t͡ʃḭ̀ŋ*	*t͡ʃī*
*kw/_ĩ					*kw*	*kw*	*kw*	*c*	*kw*	*ʍ*
'maize'					*kũ̀ná*	*kúnà*	*kúnà*	*cḯ*	*kwɛ̃̀*	*ʍɛ̃̀*
*kw/_ə́	*kw*	*kw*	*kw*	*kw*	*kw*	*kw*	*kw*	*kw*	*kw*	*kw*
'tortoise'	*kɔ̄ŋ*	*kɔ́ŋ*	*kɔ́ŋ*	*kɔ́ŋ*	*kwɔ́ŋ*	*kwə́ŋ*	*kɔ́ŋ*		*kwə̀ŋ*	*kwə́ŋ*
*kw/_ə̀	*kw*	*kw*	*kw*	*kw*	*pw*	*pw*	*kw*	*kw*	*pw*	*pw*
'bark'	*kɔ̀klɛ̀*	*kɔ̀lɛ̄*	*kɔ̂ŋ*	*kwə̀ŋ*	*pwə̀m*	*pɔ̀ŋ*	*kwɔ̀ŋ*	*kwə̀ŋkà*	*pwə́*	*pwə̀*
*kw/_e			*p*	*p*		*kw*	*kw*			
'scratch'			*pəī*	*pəí*		*kɔ̄*	*kwəì*			
*kw	*k͡p*	*k͡p*	*g͡b*		*kw*					*kw*
'scratch (destructive)'	*k͡pákə́*	*k͡pákə́*	*g͡bə́ɣà*		*kwə̃̀*					*kwə̃̀*

Table 37

Development of labiodental fricatives and labial approximants

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*ɗw	*ɗw*	*ɗw*	*ɗw*	*ɗw*	*ɗw*	*ɗw,ɥ*	*ɗw*	*ɥ (jw)*	*ɗw*	*d͡zw*
‘dog’	*ɗwǎ*	*ɗwá*	*ɗwà*	*ɗwá*	*d͡zwâ*	*wìɗwà*	*ɗwà*	*ɥìɥà*	*jíɗwà*	*ìd͡zwá*
‘fire’	*(lwà)*	*(lwà)*	*(lwâ)*	*(lwá)*	*ɗwà*	*ɥà*	*(lwà)*	*ɥà*	*ɗwāː*	*d͡zwà*
*gw	*g͡b*	*g͡b*	*d͡ʒu*	*d͡ʒu*	*gw*	*gw*	*gw*	*ɥ (jw)*	*d͡z*	*t͡s*
‘groundnuts’	*g͡bɛ̀rɛ̄*	*g͡bɨ̀rɛ̄*	*ʒùlà*	*d͡ʒúrā*	*gwī*	*gwî*	*gwì*	*ɥé*	*d͡zɛ̀ì*	*t͡sɛ̄ː*
*sw/_e#	*ʃw*	*(t)͡ʃw*	*ʃw*	*sw*	*f*	*f*	*f*	*f*	*f*	*sw*
‘gray hair’	*ʃwe᷄*	*t͡ʃwé*			*fī*	*fí*		*vɪ̄̃*	*fɪ̃*	*swɪ́*
*sw	*ʃw*	*(t)͡ʃw*	*ʃw*	*sw*	*sw*	*sw,f*	*sw*	*f.θ*	*ɥ̰ (jw)*	*ɥ̰ (jw)*
‘ten’	*ʃɔ́b*	*ʃôb*	*ʃúwób*	*swəb*	*swə̀b*	*swə̄b*	*sɔ̀p*		*ɥ̰ə̀*	*ɥ̰ə́*
‘sand$_A$’	*ʃwà*		*ʃwá*	*swà*	*swǎ*	*swà*	*swà*	*fa*	*ɥ̰ân*	*ɥ̰ǎ*
‘snail’			*ʃó*	*sɔ̀*	*swè*	*fê*	*swē*	*n̩fjà*	*ɥ̰ē*	*ɥ̰è*
‘knife’					*swèn*	*swēn*	*swàn*	*θā́*	*ɥ̰ə̀m*	*ɥ̰à*
*zw/_a	*d͡ʒw*	*d͡ʒw*	*d͡ʒw*	*zw*	*zw*	*zw*	*zw*	*zw*	*ɥ̰ (jw)*	*ɥ (jw)*
‘lion’		*d͡ʒwɛ̰̄*	*d͡ʒwà̰*	*zwɑ̰̀*	*zwɑ̰̄*	*zwà*	*zwà*	*zwà*	*ɥ̰ɑ̰̀ː*	*ɥɑ̰̄*

End of Table 37

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*zw	*d͡ʒw*	*d͡ʒw*	*d͡ʒw*	*zw*	*zw*	*z*	*z(w)*	*v*	*ɻ (jw)*	*ɻ (jw)*
‘sand$_B$’	*d͡ʒwè̱*	*ʒwē*	*ʒwəì*	*zwē*	*zwī*	*zí*	*zwí*	*vī*	*ɻ̀ì*	*ɻī*
‘wash’	*d͡ʒɔ̀b*	*d͡ʒɔ̀b*	*d͡ʒōb*	*zwáb*				*và*		
‘blood’					*zwī*	*zĭ*	*zī̆*	*vì*	*ɲɻ̀ì*	*ɻĭ*
*vw				*zw*	*v*	*v*	*v*		*vw*	*ʍ*
‘fight’				*zwə̄*	*vīm*	*vɨ̀m*	*vɨ̂m*		*vwəm*	*ʍə*
*sw	*dw*	*dw*	*ʃw*	*sw*	*sw*	*sw*	*sw*	*ɟw*	*ɻ (jw)*	*ʍ*
‘clay’	*dòp*	*dɔ̀b*	*ʃōp*	*swəb*	*swáp*	*swáp*	*swáp*	*ɟúɟwà*	*ɻə̀*	*ʍə*

Table 38

Affricates before rounded vowels or [wə]

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*t/_u	*t*	*t*	*t*	*t*	*t*	*t͡ʃ*	*t*		*t͡s*	*t*
‘work’	*túmí*	*tŭmí*	*túmí*	*ṇtò*	*tó*	*t͡ʃô*	*tō*		*t͡sùm*	*tű*
*d/_u		*d*		*d*	*d͡ʒ*	*d͡ʒ*	*d*			
‘smoke’		*dùŋɔ̀*		*dû*	*d͡ʒù*	*d͡ʒū*	*dù*			

End of Table 38

	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
*t͡s/_u,w	*t*	*t*	*t*	*t*	*s*	*s*	*s*	*t,c*	*t͡s*	*t͡s*
‘bury’	*tú*	*tŭ*	*tú*	*tŭ*	*sú*	*sú*	*sú*	*tù*	*t͡swî*	*t͡swì*
‘honey’		*tē*	*táŋ*	*tàŋ*	*swàŋ*	*sɔ̀ŋ*	*sɔ̀ŋ*	*cwáŋ*	*t͡swàŋ*	*twáŋ*
‘ashes’				*twǎŋ*		*sóŋ*	*sóŋ*	*cwáŋ*		
*t͡ʃ/_u,w	*t*	*t*	*t*	*t*	*t͡ʃ*	*t͡ʃ*	*t͡ʃ*	*c*	*t͡s*	*t͡s*
‘far’		*túrə*	*túlà*	*tú*	*t͡ʃû*	*t͡ʃū*	*tû*	*cwē*	*t͡ʃwí*	*t͡swī*
‘few’	*tòp*	*tôp*	*tóp*	*t͡swàb*	*t͡ʃwàb*	*t͡ʃwəb*	*t͡ʃwàb*		*t͡swànî*	*t͡swànî*
‘do’					*tó*	*t͡ʃó*	*tó*		*t͡sweì*	*t͡swè*
*d͡z/_u		*d*	*d*	*d*		*z*	*z*		*t͡sw*	*tw*
‘heart’		*dú*	*dụ̀*	*dụ̄*		*zū*	*zû*		*t͡swàm*	*twé*
*d͡z/_w		*d*	*d*	*d*	*zw*	*v*	*zw*	*d*	*d͡zw*	*t͡sw*
‘mortar’		*dàn*	*dàn*	*dàm*	*zwēn*	*vèn*	*zwàn*	*ìdəù*	*d͡zwàm*	*t͡swā*

We have adopted sequential structures *Cw* and *Cj* as a working hypothesis, as opposed to secondary modifications within complex root-initial consonants /C^{w}/ and /C^{j}/, although the data offers possible arguments for either analysis. As for arguments for a sequential analysis, first, the economy principle disfavours secondary articulation because it would double the size of the phoneme inventory, and this is avoided by allowing /w/ or /j/ as the second of two onset consonants. Second, this onset structure automatically derives the fact that labial articulation does not appear with coda (syllable-final) consonants. Third, vowel/diphthong alternations [o]~[wə] and [e]~[jə] in 3.2 associate the [w] or [j] with the following vowel, not with the preceding consonant. Fourth, certain sound changes to plosives and affricates take place before either [u] or [w], or before either [i] or [j], supporting an analysis in which [w] and [j] immediately follow the root-initial consonant like [u] and [i].

There are, however, counter-arguments favouring a secondary modification analysis. Many of the sound changes found in the data relate labialised or palatalised structures to unitary segments, so the simplest account of these changes would be from unit to unit, thus $b^{j}>ɟ$, $ɲ>ȷ$, $p>k^{w}$, $k^{w}>\widehat{kp}$, $g^{w}>\widehat{dz}$, $d^{w}>ɥ$, $v^{w}>ʍ$, $s^{w}>ȷ^{w}$, etc. This argument is not quite watertight, for the important reason that structural re-interpretations by speakers of one sound as two, or two sounds as one, can themselves occur as historical change (Blevins 2004). Speaker re-interpretation is suggested in our data for ‘brother, sister’, which is heard as *ɥə̀* in Tha but as *jwə̄ŋ* in Kyak. Nevertheless, the sheer number of changes linking labialised or palatalised structures to unitary segments is striking, and appears to weigh in favour of the secondary modification analysis (countering the first argument against secondary modification). A second counter-argument is that affricates are also not admitted word-finally, so that a restriction disallowing all complex consonants word-finally would be a stronger explanation for the lack of word-final labialised or palatalised consonants (countering the second argument against secondary modification). Third, some sound changes restructure a sequence of two phonemes, such as *ɲə*$>$*ȷə̃* and *ju*$>$*ɥi*, hence

Table 39

Affricates with [w] before front vowels

	Burak	**Loo**	**Maghdi**	**Mak**	**Kyak**	**Moo**	**Leelau**	**Tha**	**Doso**	**Dza**
*sw/_e,ə			*ʃw*	*sw*	*sw*	*sw*	*sw*	*cw*	*t͡sw*	*t͡sw*
‘burn’			*ʃwènɛ́*	*swēn*		*swén*		*cwē*	*t͡swə̂m*	*t͡swə́*
‘skin’					*swə́l*	*swə́l*	*swál*	*jwə̀*	*d͡zwə̀*	*t͡swə̀*
*t͡sw/_e	*tw*	*tw*	*ʃw*	*sw*	*t͡ʃw*	*f*	*sw*	*cw*	*t͡sw*	*t͡ʃw*
‘ear’	*twé*	*twí*	*ʃwê*	*swē*	*t͡ʃwī*	*fī*	*swî*	*cwì*	*t͡swì*	*t͡ʃwí*
*t͡ʃw/_e	*tw*	*tw*	*ʃw*	*sw*	*t͡sw*	*t͡ʃw*	*tw*	*tw*	*t͡ʃ*	*t͡ʃ*
‘spit$_B$’	*twē*	*twî*	*ʃwě*	*swê*	*t͡swî*	*t͡ʃwî*	*twî*	*twì*	*t͡ʃī*	*t͡ʃī*
*cw		*p*	*ɥ (jw)*	*ɥ (jw)*	*t͡sw*		*cw*		*t͡sw*	*t͡sw*
‘bite’		*pəí*	*ɥī*	*ɥí*	*t͡swɛ̃̄*	*ɲɛ̄*	*cwɛ̀̃*		*t͡swî*	*t͡swī*

alternations involving on-gliding diphthongs can be interpreted the same way, thus *kʷə > ko, bʲə > be* etc. (countering the third argument against secondary modification). Fourth, there are sound changes conditioned by a following front vowel irrespective of whether labial articulation is present, thus *dʒ(ʷ) > d͡ʒ(ʷ)/_i*. This appears to rule out [w] as the following segment, because the consonant is affricated before [i], which leaves labialisation as a feature of the consonant itself (countering the fourth argument against secondary modification).

The latter arguments suggest that our working analysis as onset CC sequences is unsatisfactory, but given the conflicting distributional and comparative evidence we suggest that phonetic evidence will be necessary to help resolve the matter in a given variety. Moreover, the variation already observed in [ɥ]~[jw] implies that a variationist approach (allowing for variation between a segment with secondary modification and sequence of two segments), with or without a stratal approach (a sequence at one level and a secondary modification at another level), may provide a more satisfactory analysis.

5. Conclusion

Jen is a language cluster whose branches are united at 50% lexical similarity. Autonyms distinguish ten communities within the cluster, but these form six language-like units at 90% lexical similarity, or more than six if for example Doso is considered distinct from Dza on phonological grounds, or if others are considered distinct on geographical grounds. A primary genetic branching between Burak-Loo-Maghdi-Mak and Kyak-Moo-Leelau-Tha-Doso-Dza is supported by lexicostatistics, lexical isoglosses, phonological isoglosses (nasalised vowels and /h/), morphological isoglosses (initial consonant alternations and rhyme alternations), and by numerous sound correspondences. Hence, the first seven Bikwin varieties are not a genetic group, although they are related culturally and geographically.

The complexity of sound change in the Jen language cluster is considerable. Some changes are conditioned by open vs. closed syllable

structure, and others involve restructuring of two adjacent segments, both demonstrating that comparative analysis in this language cluster must continually consider structural context, instead of focusing only on individual segments. Some sounds are removed by one change and replenished by another, and there are several irregular changes. The complexity of sound change is most extensive in Tha and Doso-Dza, including roots in which every segment has undergone change, and including the development of voiceless approximant sounds not found in the more phonologically stable Bikwin varieties. A matter for future researchers is how the unusually extensive degree of sound change in the riverine Jen varieties might be explained.

The sheer complexity of sound change in the Jen language cluster also limits application to alphabet development. Some points are clear: implosives and the trill are lost in Dza and absent from its alphabet, but will need to be represented in other Jen languages, for which implosive symbols are readily available from Hausa orthography. The second branch is distinguished by nasalised vowels and /h/, therefore they only need to be represented in writing in that branch, as they are in Dza orthography. Because of the complexity of sound change, the more basic methodological step of comparing sound inventories (Dimmendaal 2011: 9) often seems more helpful for identifying alphabet needs in Jen languages (Othaniel 2017). This is partly because the Dza alphabet is based on a particularly large sound inventory in Dza from which other languages can select letters they need depending on which sounds are contrastive. This includes vowels, where sound correspondences are unstable and vowel systems may or may not retain the original contrasts, particularly the non-high front and back vowel contrasts /e/-/ɛ/ and /o/-/ɔ/, and the central vowel contrasts /ɑ/-/ə/ or /ə/-/ɨ/.

Finally, irregular correspondences often suggest morphology in Jen languages that is not yet understood. Verbal stem alternations in the initial consonant are a feature of the earliest branching in the cluster, and also occur more recently in other verbs. Their functions are largely unclear here, except in two examples where consonant alternations distinguish direction (**gụ̀b* ‘pull’ vs. **lub* ‘pull up’) and transitivity

(**g͡bəb* ‘hit’ vs. **wəb/*zəb* ‘kill’). Another initial consonant alternation *l/ɗ* occurs in nouns, also of unknown function, but it has been active recently in dialect clusters of the second branch, alternating between Leelau and Kyak-Moo in several roots (‘fire’, ‘knee’, ‘locust-bean tree’, ‘tongue’, ‘yesterday’), and between Doso and Dza (‘calabash’, ‘today’). Particularly in ‘tongue’, the *l/ɗ* alternation recalls evidence from other Niger-Congo languages that the lateral is an old affix (Norton 2018: 437). Other irregular patterns involve mid vowels and diphthongs, recalling similar relations in Chadic languages (Boyd 2002). These too are recently active, but whether they have a morphophonemic basis is unclear. Breathy voice appears irregularly, but is a historic feature of many root morphemes, distinct from modal voice and tone.

Appendix. Reconstructions

Reconstructions appear with the standard starred notation as in **kwin* ‘one’. IPA symbols used in the comparative wordlist that differ from widely used Africanist symbols have been replaced by the latter symbols in the reconstructions to facilitate their integration in further scholarship as in **ya* ‘you (pl)’ (Burak *jà* etc.). Where tone fits a series for H, M or L tone, it has been reconstructed. Absence of tone from the reconstruction indicates that we do not know what tone to reconstruct.

The following additional conventions have been used. Roots supported by only one of the two primary branches are presented in brackets as in (**ka*) ‘grass’, as the latter roots are ambiguous between retentions from proto-Jen or innovations of that primary branch. Roots with alternate forms in the two primary branches, that cannot be confidently resolved into one reconstructed form, are shown with the two forms separated by a slash as in **so/*swe* ‘snail’.

On each line, forms which are not considered cognate to the reconstructed form are given in brackets. There is an element of uncertainty in this, especially given the possibility of irregular initial consonant alternations in this language cluster. I have therefore sought to avoid use of brackets whenever I can see a possibility of cognacy between forms that partially resemble each other.

Pronouns

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘I’ ‘me’	*nì *mì	mì mì	mɛ̄ mì	nì mì	má mə̀	ǹ̩ (ɓə̀ŋ)	(ɓə̀ŋ) (ɓə̀ŋ)	ǹ̩ mì	ǹ̩ mì	ǹ̩ mì	ǹ̩ mì
‘you (sg)’	*mò/*mə̀	mɔ	mò	mɔ	mwə̄	mə̀	mà	mà	mə̀	mə̀	mə̀
‘he, she’ ‘her, him’	*nə (*u)	nà ná	nə̀ nə̀	nà ná	nà nà	ú wə̀	ú wù	ù wù	ná ná	ù wə̀	ò wə̀
‘we’	*ɓi	ɓó	ɓí	ɓì	ɓí	ɓī	ɓí	bì	ɓì	ɓɨ̀	bɨ̀
‘you (pl)’	*ya/*ɓa	jà	jē	jà	ɓí	ɓà	ɓà	ɓə̀	ɓá	ɓə	bə̀
‘they’	*ní *ye/*le	nɛ́	jē	nī	ní	í	î	ì	ń̩	lè	lè

Numerals

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘one’	*kwín	kwîn	kwín	swím	cwîn	kwín	kwín	kún	cùŋ-gà	t͡sɨ̀ŋ	t͡sɨ̄ŋ
‘two’	*ràb	ɾàb	ɾàb	làːp	ɾāb	ràb	ràb	ɾàb	(nə̀-jà)	(ná-ʔiù)	(jŭŋ)
‘three’	*tət	(búnúŋ)	(búnú)	tāːr	tát	tɛ̄	tɛ̄	təì	nə̀-tə̀	ná-tə̀	tə́

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘four’	**nət*	*nɛ̰̄t*	*nēːt*	*nə̀ɾ*	*nēt*	*nɛ̄*	*nɛ̂*	*nəì*	*nə̀-ɲə̀*	*nə́-ɲə̀*	*ɲə̀*
‘five’	**nub*	*nɔ̂b*	*nôb*	*núwōp*	*núwə́b*	*(nùɲúŋ)*	*ɲǔ*	*nû*	*nə̀-nù*	*(nə̀-ɥ̥ȉ)*	*(m̥mɨ̀)*
‘six’		*ná-ʃīn*	*ní-ʃín*	*nà-ʃīn*	*ná-sɨ́n*	*nə́ɾə̀n-kwín*	*nə̀ɾàn-kwín*	*nə̀nə̀-kún*	*nē-ǹ̩cò*	*ɥ̥ī-t͡ʃùŋ*	*ɥ̥ȉ-t͡sɨ̄ŋ*
‘seven’		*ná-ɾɛ̀*	*ná-ɾə̀*	*nǎ-lɛ̀*	*nà-ɾá*	*ná-rè*	*nàn-d͡ʒēɾē*	*nə̀nə̀-íɾà*	*ɟē-dídí*	*ɥ̥ī-ʔīù*	*ɥ̥ì-jûŋ*
‘eight’		*ná-tə́t*	*nə́-tə́t*	*gɔ́nɔ̀-gɔ̀nɔ̀*	*gwə̀ŋ-nā*	*gùnɛ̄*	*gɔ̀gúnɛ̄*	*ŋ̍gùnəì*	*ɟē-dídí*	*kə̀ɲà-kə̀ɲà*	*ɥ̥ȉ-tə́*
‘nine’		*ní-nít*	*nì-nìt*	*là-ʃòŋ*	*lá-sɔ̀ŋ*	*swə̀ŋ swə̀p*	*sùsúlà*	*sɔ̀ŋ sɔ̄p*	*ɟē-nəì*	*ɥ̥ə̀ŋ-ɥ̥ə̀*	*ɥ̥ȉ-ɲə̂*
‘ten’	**swəb*	*ʃɔ́b*	*ʃôb*	*ʃúwób*	*swəb*	*swə̀b*	*swə̄b*	*sɔ̀p*	*nə̀θē*	*ɥ̥ə̀*	*ɥ̥ə́*
‘fifteen’		*ʃóp-dī́-nɔ̂b*	*swə̂b-dî-nɔ̄b*	*ʃóp-dī́-núwɔ̀b*	*swə̀bì-lí-núwə́b*	*swə̀b-dú-nùjúŋ*	*sɔ̀b-úɲú*	*lì*	*nə̀θé-dà-nə́nə́ɲù*	*lî*	*lɨ̌*
‘twenty’		*fá-kwîn*	*ʃú-ràb*	*fà-ʃwín*	*fá-cwím*	*zɨ̀m-kwɨ̀n*	*zɨ̀m-kwín*	*ðìm-kún*	*ɟɛ̏ǹ̩cò*	*hwùn-t͡ʃɨ̄ŋ*	*ŋwú-t͡sɨ̀ŋ*
‘hundred’		*fá-nɔ̂b*	*t͡ʃú-sɔ́b*	*fàː-núwòp*	*fà-núwòb*	*gɨ́ɾàɾàb*	*zɨ̀m-ɲú*	*ðìm-nú*	*jə̀ŋ-nɨ̀ŋ-nàɲù*	*hùn-ɥ̥ȋ*	*ŋwú-m̥mɨ̀*

Content words

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'answer (v.)'	*gwə̀b	gàb	gəb dɛ̄	gàb ɲwā	gəb	gwəb	gwəb	gwəb	gwə	gwáŋ	kwə̀
'arm, hand'	*nạ	nə̂	nə́	nà	nă	ná	nă	ná	nà	nà, nâ	ná
'arrow'	*ɓu	(âr-ɟjɔ́k)	ʔér-ɓwí	(təù)	(núŋ-tâu)	ɓu-t͡ʃî	ɓú-t͡ʃî	ɓú-t͡ʃî	m̀bǔ	ɓù-ts̀ə	bú-t͡ʃî
'ashes'	*gwẹ *ts̀wəŋ	gwī	gwí	d͡ʒ̀wê	twə̌ŋ	gwī	sɔ́ŋ	sóŋ	cwə́ŋ ɥá	vəù	fǭ
'ask'	*ɓíp	ɓíp	bép	ɓíp	ɓíp	ɓí	ɓíp	ɓìp bá	bìm	ɓí	bí
'back'	*məl	màl	mál	dɛ́màl	mə̌l	mwəl	mwə̌l	mwəl	(jəkǔ)	(t͡s̀wà)	(t͡s̀wà)
'bad'	*aɓo	ɓə̀k-lɛ́	àɓɔ̀	(ɲínàkō)	màɓó	àɓò	àɓɔ̀	màwó	(ɲə́w)	(ɥn̂w)	àbē
'bark' (cf. 'tree')	*kwəŋ	kɔ̀k-lɛ̀	kɔ̀-lɛ̄	kɔ̂ŋ kəp	kwəŋ kəp	pwəm	pɔ̀ŋ	kwɔŋ kəp	kwəŋ kà	pwə́	pwə̀
'basket'	*ɗok	ɗɔ́k	ɗɔk	ɗɔ́k	ɗɔ́k	kùɗɔk	kə́-ɗɔk	ɗôk	kələ́ú	kəlō	lò
'beer'	*mín	mìn	mín	mín	mín	mín	mín	mín	mɯ̀	mìm	mí
'belly, stomach'	(*fu) (*ɥá)	fû	fū	fū	fû	wá	wá	wá	ɥà	ɥà	ɥá

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'beneath'	*pi *bọ leg	bī	vō	bī	bí	pí	pī	pì-swà	bò	bù	pū
'big'	*goŋ	(kə́mùrí)	(múut)	gɔ̀ŋ	gwə̂ŋ	gɔ̌zī	āŋgā̃	áŋgā̃	nágò	áŋgà̃	àkā̃
'bite'	*lum *cwī	lúm	pəí	ɥī	ɥí	t͡swɛ̄	ɲɛ̄	cwɛ̀	dǔ	t͡swî	t͡swī̃
'bitter'	*ɲɛ	(ɥá)	ɲɛ̄t	(ɥà)	(ɥáɥà)	ɲî	ɲì	ɲí-θə	ɲwī	nínì	ɲĭ
'black'	*ɓil	ɓílīŋ	ɓíl	ɓílīm	ɓɬ̀ìm	ɓɬ̀ìm	ɓìl	à ɓìlùm	nàɓì	ɓî	bī
'blood'	*ɥẹ́/*zwị́	wě	(dùm)	ɥḛ́	ɥḛ̄	zwī	zĭ	zī̃	vì	ǹ̥ɥḭ̀	ɥḭ̆
'bone'	*kub	kúp	kúp	kóp	kwə́b	kʉ̄p	kūb	kùkùp	kùkù	kùkʊə̀	kùkú
'bow' (cf. 'arrow')	*kə(n)-to	(ká-ɟfɔ́k)	təù	káptəù	kə̀ntəû	kántɔ̃	kántɔ̀	kə̀ntəù	g͡bə̃̂təú	kə̀ntə̃̂w	kántwə̀ŋ
'break (v.)'	*ob/*ab	(kə̆)	(ká)	òp	ʔɔ́b	áb	àb	àb	gwə̀	ʊà	wə́
'breast' (cf. 'swallow')	*mi	mî	mí	mì	mí	mí	mĭ	mí	mī	mì	mì
'breathe'	*hum	úmé	úmə́	ùmà-lɛ̀	ŋə́má	ŋɔ̂	ŋɔ́	ŋwə̀ɲì	hū̃	hű	hű

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'brother, sister'	*ɲin (*ɥəŋ)	ɲín mì	ɲín	ɲîn	ɲîn	jwāŋ	(ɲɔ-ŋɔ̀m)	ɥə́-ŋə̀m	ɥə̀	ɥ̊î̃	ɥ̊ĭ̃
'burn'	*swen	(kɔ́ɾá)	(kʊ́ɾá)	ʃwɛ̀nɛ́	swēn	(lī)	swén(lĭ)	(lì)	cwē	t͡swə̂m	t͡swə̃́
'bury'	*t͡su	tú	tŭ	tú	tŭ	sú	sú	sú	tù	t͡swî	t͡swì
'bush'	*daŋ-grass	dà-kà	də̀-kà	dɨ́-kā́	dà-kà	(wɛ̄-gūk)	(wē-gūk)	dàŋ-gùk	táŋ-gù	ɓɨ́ŋ-vù	bɨ̀ŋ-hù
'calabash'	*dɛ	dɛ̄	dɛ̄	dəí	dəī	dɛ̄	dē	dəì	ləì	lì	d͡ʒì
'call (v.)'	*lu-be	lú	lú	lúvəì	vɨ́nɨ́	lɨ́bē	lībē	lùbəí	dúbì	dúpɨ̀	d͡zúpɨ̀
'carving axe'	*sa	(dùmkɔ́lɔ́)	sà	ʃà	sá	sā́	sá	θā́	ɟé á θá-nɨ̀ŋ	sà	sá
'cassava'	*we *kum	wē-kúmá	wì-kɨ́mə́	bə̃ì	ɥé-kúmá	(ɾógó)	(zə̀ŋ)-kwə̀m	(ðə̀n)	(júkə̄)	wəì	we
'child'	*yu 'person' (*mzən)	jū	jū	jú	júkúŋə̂ŋ	(wīŋðə́ŋ)	(wī)	(ɥì)-mðə̀n	(ɥì)	ìmwə̀n	ìmwə̀
'clay'	*dwəb, *swəb	dòp	dɔ̀b	ʃōp	swə̀b nɨ́ŋ-mwí	swáp	swáp	swáp	ɟúɟwà	ɥ̊ə̀	ʍə̀
'clean'	*i	dí	dí	dí nɨ̀	ɨ̂n	ɪ̆ŋ	í	ìθə́	kā̀	ì	kɪ̃́

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'cloud'	*tɛ(-rum)	túrūm	túrūm	túrúm	teî	tɛ̄	tê	tə̀	dùlè	t͡ʃî	t͡ʃî
'cobra'	*muŋ/ *ŋwam	ŋá-múk	ŋà-mɔ́k	á-mɔ̀k	ŋá-mú	bjɔ̀ŋ-mùŋ	bɛ̄k-ŋwàm	bjɛ̀k-ŋwàm	ɟəùŋù	ɲwàm	ɲwɛ́
'cold'	*tə́ma	tə́má	tə̀mə̄	tə́mā	tə́má	tém	tém	témθə́	tɛ̃́	tɛ̃̀	tɛ̃́
'come'	*yə/*wə	jí	jɨ́	jí	já	wɛ̀	wá	wə̀	wə̀	wə̀	wú
'cook'	*yo	jǒ	jō	jəùwē nūŋ	jəû	jō	jǒ	jò	jəù	ɥì	ɥì
'count'	(*dəba) (*zn̩) < *d͡zn̩?	dàbà	dɨ̀bà	dábā	dàbá	zēn	zēn	à ðân	(hò)	zàm	sǹ̩
'crab'	*bɨ̀ŋ *gn̩ŋ	d͡zɛ̀ŋɛ̀	bɨ̀ŋ	bə́ŋ	bɨ́ŋ	bûŋ	bûŋ	ǹ̩būŋ	ŋ̩̀gə̀lə̀ŋ	ǹ̩gɰ̃̀jə̀ŋ	kəŋ
'croco-dile'	*ʃɨb	ʃɨ́p	ʃɨ́p	ʃɨ́p	ś̩ɓ	swə́m	sɨ̀p	θɨ̀p	sɨ̀	sɨ̀	ʃɨ́
'cut'	*gəb	gə̀b	kə̆p	gə̀b	kɨ́p	kū	kū	(bàr)	gə̀	kwəì	kə̀
'dance' (cf. 'drum')	*dəŋ	(d͡zɨ́ nūŋ)	(d͡zɨ́ nūŋ)	dâŋ	də̀ŋ	dâŋ	dəŋ	də̀ŋ	də́ŋ	də̀ŋ	də̀ŋ
'demo-lish'	*dVre	(mōrè)	(mórè)	dú, dúlē	dúr	dɨ̀r	dɨ̂r	dɨ̀r	dwé	deì	dè

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘die’	*ɓwi	ɓwɛ́-rɛ̀	ɓú-rɛ̄	ɓí-là	ɓē-rá	ɓwì	ɓwì	ɓwì	ɓwí	ɓwîŋ	bwí
‘dig’	*ya/*za	jă	jā	jà	já	zà	zà	ðà	ðà	hà	hà
‘dirty’	*ɓil	lírīŋ	ɓíl	ɓíl	ɗĭrɨ́ŋ	ɓɨ́l	ɓìlɨ́ŋ	ɓìlìŋ	ɓì	ɓìŋ	bí
‘do’	*nə (*t͡ʃo)	nɛ̄ː	nɛ̄	naˉ	ná	tó	t͡ʃó	tó	nà	t͡swèì	t͡swè
‘dog’	*ɗwa	ɗwă	ɗwá	ɗwà	ɗwá	d͡zwâ	wìɗwà	ɗwà	ɥìɥà	jíɗwà	ìd͡zwá
‘dream’	*mu-rV	mɔ́-rá	mú-rà	mwà-là	mwà	mwèn	mwèn	mwənì	mwìmwì	mwí-rɨ̀	mwí-lɨ́
‘drink’	*ɲo/*ŋwa (*nu)	ɲɔ̆	ɲwɔ́	ɲɔ́	núʔú	ŋwà	ŋwà	ŋwà	nù	ŋwà	ŋwá
‘drum’ (cf. ‘dance’)	*dəŋ	dəŋ	dəŋ	dəŋ	dəŋ	dəŋ	dâŋ	dəŋ	(gə́ŋgəŋ)	dâŋ	dəŋ
‘dry’	*kwe	kwē-lē	kwəí	kwaí	kwaí	kwí	kwí	cwí	ɥ̊ìj̈ē	t͡ʃîŋ	t͡ʃī
‘dust’	*kuntɨr (*vọk)	kwìntɨ̀rɨ̀	cûndɨ̀rɨ̀	(bàp)	kúndúr	vùk	kúndúr	kùndùr	kúʃí	vəù	fọ̄
‘ear’	*t͡swi	twɛˉ	twí	ʃwê	dɔ̂k-swē	t͡ʃwī	dɔ̂k-fī	dɔ̂k-swî	ɓwà-cwì	t͡swì-t͡swì	t͡ʃwì-t͡ʃwí
‘earth’	*gwam	(bíjélé)	(bílɨ́)	lò-gôm	lò-gwám	lùŋ-gwəm	lò-gwə́m	lóŋ-gwàm	jəfáŋ-gwé	fàŋ-gwàm	fàŋ-gwà

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'eat'	**tə́ŋ*	*tə́ŋ*	*tə́ŋ*	*tə́ŋ*	*tə́ŋ*	*tə́ŋ*	*tə́ŋ*	*tə̀ŋ*	*tə́ŋ*	*tə̀ŋ*	*tə́ŋ*
'egg'	**bəŋ*	*bə̄ŋ*	*bə̄ŋ*	*bə̀ŋ*	*bə́ŋ*	*bùŋ*	*bùŋ*	*būŋ*	*bɨ̄ŋ*	*bɨ̀ŋ*	*pɨ̄ŋ*
'egret'	**loɲək (*t͡ʃĩŋt͡ʃõ)*	*ʃēmlòɲɛ́k*	*sèmlóɲɛ̄k*	*nūŋlòɲɛ̀k*	*(júlúŋbílà)*	*t͡ʃṹt͡ʃɔ̃̄*	*zə̆lōɲək*	*cīŋcə̃ù*	*ɲ̩ɲálē*	*t͡ʃĩnt͡ʃə̃ù*	*sɔ̃́sɔ̃̀*
'elephant'	**zọk*	*d͡ʒúk*	*d͡ʒúk˺*	*d͡ʒɔ̀k*	*zúk*	*zòk*	*zɔ̀k*	*zɔ̀k*	*ðəù*	*zò*	*sọ̄*
'eye'	**núŋ*	*nû*	*núŋ*	*núŋ*	*núŋ*	*núŋ*	*nɨ́ŋ*	*núŋ*	*ɓwá-nú*	*nɨ̀ŋ*	*nɨ́ŋ*
'fall'	**o*	*wō*	*wọ̌*	*jəù*	*jə́w*	*ō*	*ō*	*ò*	*ʔò*	*ò*	*ō*
'far'	**t͡ʃu*	*(g͡bɛ̄nɛ)*	*túrə̄*	*túlà*	*tú*	*t͡ʃû*	*t͡ʃū*	*tû*	*cwē*	*t͡ʃwí hɨ̂w*	*t͡swī*
'fat'	**ɲwi*	*nwí*	*nwī*	*ɲwɛ̂*	*ɲwí*	*ɲwī*	*ɲwī*	*nwì*	*ɲwì*	*nwì hɨ̂w*	*ɲwī*
'father'	**ta*	*tâ*	*têt*	*tá*	*tə́*	*tō*	*tâ*	*dâ*	*dà*	*dà*	*tă*
'fear'	**vɨli, *sɨ*	*vɨ́lí*	*vɨ́lí*	*vɨ̀lì*	*sùvɨ́lə́*	*vɨ́l*	*vɨ̀rí*	*vɨ̀lì*	*(núdə́)*	*(ɓì)*	*sɨ́bí*
'feather'	*(*byəŋ) = hair*	*(fī)*	*(fī)*	*(ba)*	*(bā)*	*bjə̀ŋ*	*bjə̄ŋ*	*bjə̀ŋ*	*ɟɛ̂*	*d͡zàm*	*t͡sạ̀*
'faeces'	**ɓwe/ *ɓwɨŋ*	*ɓújē*	*ɓwaí*	*ɓoī*	*ɓoí*	*búŋ*	*búŋ*	*ɓúŋ*	*wì*	*ɓɨ̀ŋ*	*bɨ́ŋ*
'fencing mat'	**ko *gẹ*	*d͡ʒī kɔ̀-rɛ̀*	*kú-rɛ̄*	*kó-lì*	*kó-rɨ̀*	*gē*	*kwə̄ŋ d͡ʒē*	*gəì*	*gɪ̄*	*gɪ̣̀*	*kɪ̣̄*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘fetch’	*nə̣	núŋ-ɲí	nɛ̄	nạ́	(ɓá)	(ɓà)	(ɓā)	(ɓà)	nə̀	tə̀	tə̀
‘few’	*t͡ʃwəb	tòp	tɔ̂p	tóp	t͡swə̀b	t͡ʃwə̀b	t͡ʃwə̀b	t͡ʃwàb	(t͡ʃídáŋ)	t͡swə̀nî	t͡swə̀nî
‘fight’	(*vwə̣m)	(ʃə́p)	(t͡ʃə̂b)	(túlà)	zwə̄	vɨ̄m	vɨ̀m	vɨ̣̀m	(m̥̀bē)	vwə̀m	ʍə̄
‘finish (v.)’	(*fanV) (*Ciŋ)	fánɔ́	fānɛ̄	fáːnɛ̄	fánɨ́	ðɨ̀m mə́ŋ	zɨ̀m(ɨ́ŋ)	ðə̀mɨ́ŋ	cɛ̏	tɨ̂ŋ	tɨ̀ŋ, jə́ŋ
‘fire’	*lwa	lwà	lwà	lwâ	lwá	ɗwà	ɥà	lwà	ɥà	ɗwāː	d͡zwà
‘fish’	*se/*siŋ	ʃíjɛ̀	t͡ʃɛ̄	ʃəī	seí	θɨ́ŋ	sɨ́ŋ	θɨ́ŋ	θɨ̀ŋ	ɥ̥ɨ̀ŋ	j̊ɨ̀ŋ
‘float’	*lo-mu	ləúnàlòmɛ̌	lwê	tòl lǒ	lómwì	lòmúŋ	lwēŋlô	lòmûŋ	wɨ́kòmɨ̀ŋ	pə̀m	pá
‘flow’	*cəl	ʃí, ʃí-lí	(jàk)	(fánɛ̄)	cál	zɛ̄l	(nàpʰin)	cə̀l	ʒì	zē	sē
‘flower’	*vɨn-lV	bìlē	bɨ̀lèlé	vìnlɛ̌	vɨ́nɨ̀ kə̀p	vɨ̀n	vìnú	vɨ̀n	fɨ̄	fɨ̄ŋ, fɨ̄ŋ-rɨ̀	fɨ́ŋ-lí
‘fly’	*wu-rV	wúrí nā	wùrɨ́	wílí	wùrà	wúré-jɨ́ŋ	wùrí-ɲjí	ɨ́rɨ̄-jí	wí-jè	(jà)	(jā)
‘fog’	*kokəm (*biCiŋ)	kɔ̄m	kɔ̄m	kɔ́kɔ̀m	kwə̀xə̀m	bɨ̀vɨ́ŋ	zɨ̀ndɨ́r	kùɣàm	(dúlé)	bùt͡sûŋ	tə̀búd͡ʒɨ̀ŋ
‘food’	thing-eat	nūŋ-tə́ŋ(ɛ̄)	nùŋ-tə́ŋ(ə́)	nūŋ-tàŋ(ɛ̀)	núŋ-tə́ŋ	nùŋ-tə́ŋ	nɨ̀ŋ-tə́ŋ	nùŋ-tə́ŋ	nɨ̀ŋ-tə̀ŋ	nɨ̀ŋ-tə̀ŋ	nɨ̀ŋ-tə́ŋ
‘front’	*t͡ʃî	tî	tí	tí	sí	sílɛ̄	sí	θǎʃí	cì	t͡ʃî	t͡ʃí

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘fruit’ (cf. ‘tree’)	**t͡ʃu-rV*	*túrí*	*túrí*	*ʃwírí*	*súr kə̀p*	*sɨ̌w*	*sí kə̀p*	*sì kə̀p*	*cì kə̀ nɨ̀ŋ*	*t͡ʃì-rɨ̀ kə̀*	*t͡ʃî-lɨ́*
‘full’	**yi,(*yɨlə)*	*(ɓɔ́t)*	*jí*	*jɪ̀̀nî*	*jìdə́*	*jɨ̀lɨ̀ŋ*	*jɨ̂ŋ*	*jìθə̀*	*jí*	*jɨ̀lə̀*	*jɨ̀lə̂*
‘give’	**(d)ə*	*fɔ́-lɛ́*	*fá*	*ɛ̄*	*ə̀*	*dɛ̄*	*dɨ̄*	*də̀*	*də̂*	*də̀*	*tə̀*
‘go’	**dV (*tə)*	*ɗót*	*ɗwát*	*ɗɔ̂*	*tá*	*tɛ́*	*tə́*	*tə̀*	*ɗɨ̂*	*tə̀*	*tə́*
‘good’	**ɲin(a)*	*ɲí, ɲí-ná*	*ɲíná*	*ɲínà*	*máʔín*	*ɲîn*	*ɲîn*	*màdíŋ*	*nálàŋ*	*y̥ṹy̥ɨ̃̀w*	*hɨ̃̌*
‘gourd’	**kuluk*	*(d͡ʒàrɛ̀)*	*(d͡ʒàrà)*	*kúlùk*	*kúlùk*	*kūlūk*	*kúlùk*	*kùlùk*	*gɨ́w*	*kù*	*là*
‘grass’	*(*ka) (*gu̞k)*	*kâ*	*kâ*	*ká*	*kâ*	*(bā)*	*gūk*	*gùk*	*gù*	*vù*	*hū̞*
‘gray hair’	**swẽ *bu*	*ʃwē*	*t͡ʃwé*	*vūŋ*	*bū*	*fī*	*fí*	*m̩̀bù*	*ʒàŋkú á vɨ̃̀*	*fɨ̃̀*	*swɨ̃́*
‘greet’	**gum*	*gùm-lí*	*gùmē*	*gòm*	*gùm*	*gwə̀mbē*	*gūm*	*gūm*	*(dè)*	*(t͡sā̞)*	*(t͡sāː)*
‘grind’	**nəm*	*nə̀m*	*ném*	*nə́m*	*nə̀m*	*nə̀m*	*nə́m*	*nə̀m*	*mè*	*nə́*	*nə́*
‘ground-nuts’	**gwɛ*	*g͡bɛ̄rɛ̄*	*g͡bɨ̀rɛ̄*	*(ʒùlà)*	*(nūŋ-d͡ʒúrā)*	*gwī*	*nɨ́ŋ-gwî*	*nùŋ-gwì*	*nú-ɥé*	*nɨ́ŋ-d͡zɛì*	*nɨ́ŋ-t͡sɛ̄ː*
‘gruel’	**dəm*	*(ɓíjà)*	*(ɓíjà)*	*də́m*	*mə̀-dám*	*mɨ̀n-də́m*	*mɨ̀n-də̃̀m*	*mùŋ-də́m*	*(mɨ̀ŋ)*	*(mɨ̀ŋ-ló)*	*(lō)*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'Guinea corn'	*(*yV) (*mɨn)*	*(jă)*	*(jā)*	*(íʃà)*	*(jɨ́tā)*	*mɨ̀n*	*nɨ́ŋ mīn*	*núŋ mɨ̀n*	*mù*	*mùm*	*mwú*
'hair'	*(*byəŋ)*	*(fē)*	*(fɪ)*	*bá*	*bā*	*bà-lò*	*bjə̄ŋ*	*bjə̀ŋ*	*ʒàŋkù*	*d͡zàm*	*t͡sà:*
'head, on'	**lo (*kuɪ)*	*lô, lwē*	*lō, lwē*	*lō*	*ləū*	*lò*	*lô*	*lō*	*jə̀-kù*	*kù*	*kú*
'hear'	**li*	*lárɛ̀*	*lárə̀*	*lálɛ̄*	*làrɨ́*	*lî*	*lɨ́*	*là*	*là*	*lì*	*lí*
'heart'	**d͡zu *ɲi*	*nígɔ̀*	*dú*	*dụ̀*	*dụ̄*	*lòɲí*	*zū*	*zû*	*ɲínà*	*t͡swàm*	*twé*
'heavy'	**ɓinə*	*ɓùnɔ́*	*ɓúnə́*	*ɓínà*	*ɓínā*	*ɓwə̀ŋdɨ̀ŋ*	*ɓwēn*	*ɓùn*	*mùmù*	*mwì*	*mwí*
'hit'	**g͡bə́b*	*g͡bə́p*	*g͡bə́b*	*g͡bə́b*	*g͡bə́b*	*g͡bə̀b*	*ɓóp*	*ɓwàp*	*g͡bə́*	*g͡bə́*	*g͡bə́*
'hoe'	*(*bəŋ)*	*(ʃùkə́)*	*(dɨ́nə́)*	*(dōp)*	*(dūp)*	*gwámbà*	*bə́ŋ*	*bɨ̀ŋà*	*bə̀ŋ*	*bɨ̀m*	*pɪ̄*
'hole'	**ɓwa*	*ɓwa˜*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwà*	*ɓwá*	*ɓwà*	*bwà*
'honey'	**t͡swəŋ*	*(ɲwìnɔ̄nɔ̀)*	*tē*	*məì-tə́ŋ*	*məí-tʌ̀ŋ*	*swə̀ŋ*	*mùŋ-sɔ̀ŋ*	*sɔ̀ŋ*	*cwə́ŋ*	*mɨ̀ŋ-t͡swə̀ŋ*	*ɲwì-twə́ŋ*
'horn'	**ɓi*	*ɓwɛ́k*	*ɓɔ̄k*	*ɓí kə̀p*	*ɓɪ̄*	*ɓí*	*ɓí*	*ɓì*	*lòɓì*	*dî*	*d͡zɪ́*
'husband'	**ɓe*	*ɓɛ̄-mì*	*lɪ́bə̄*	*ɓē*	*ɓə̀ì-mɨ̀*	*ɓɛ̄*	*ìɓēgwē*	*ɓə́m*	*ɓì*	*ɓù*	*bwū*
'hyena'	**zə-tuɪ*	*d͡zə̀d͡zú*	*(ɲwárɨ́kɪ̀m)*	*(dɪ́ɓə̀)*	*(nâdūmlì)*	*zə̀zū*	*zɔ̀zū*	*zwátù*	*tù*	*t͡ʃwî*	*t͡swí*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘kill’	**wə̀b/*zə̀b*	*wòb*	*wə̀b*	*wòp*	*wə̀b*	*zə̀p*	*zə̀p*	*ðə̂p*	*θə̀*	*j̥ə̀*	*jə̀*
‘king’	**gwə̤b*	*gúb*	*gwə̀b*	*gṳ̄b*	*gūb*	*jì-gwɛ̂*	*jɨ̀-gwē*	*jɨ̀-gwəì*	*kú*	*jì-və́*	*í-və̀*
‘knee’	**lwəŋ*	*lɔ̀k*	*ɲwálɔ́k*	*lɔ̀k*	*nwālwə̀ŋ*	*ƙə́ŋ*	*ŋwàzɪ̀ɰáŋ*	*ŋwàlwə́ŋ*	*lòjàŋ*	*ɗwə̀ŋ*	*d͡zwə́ŋ*
‘knife’	*(*swən)*	*(tɔ́lɔ́)*	*(tɔ́lɔ́)*	*(ɓí)*	*(ɓì)*	*swèn*	*swēn*	*swàn*	*θə̃́*	*ɰ̥əm*	*ɰ̥à*
‘know’	**í*	*ɛ́-ɾɛ̄*	*ɛ́-ɾɛ́ ʃɔ̄*	*í-là nɛ̄*	*í-ɾà*	*í*	*ɨ̌ŋ*	*ɪ̀bəí*	*ŋ̍jē*	*íbɨ̀*	*jí*
‘laugh’	**mə́m*	*mə́m*	*mə́m*	*mə́m*	*mə̀m*	*mə́m*	*mə̌m*	*mə̀m*	*mɨí*	*mə̀m*	*mə́*
‘leaf’	**yə̀ŋ*	*jə̌ŋ*	*jə̀ŋ*	*ɲə̀ŋ*	*jə́ŋ*	*jɔ̀k*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*	*jə̀ŋ*
‘left (side)’	**mɛ*	*mɛ̄*	*máɾə̀*	*màlɛ̀*	*məī*	*mɛ̄*	*mɛ̄*	*məì*	*mɨì*	*mì*	*mì*
‘leg, foot’	**bo̤*	*vō̤*	*vō̤*	*vò̤*	*bō*	*bō, ɓúk*	*bō*	*bò*	*kə́-bò*	*kə́-bù*	*kə́-pū*
‘lie (down)’	**ló*	*ləú*	*ləú*	*ləú*	*lʌū*	*ló*	*lǒ*	*ló swà*	*ləú*	*lweì*	*lwé*
‘light (not heavy)’	**yəb*	*jə̀blá*	*(ɓùnóbɔ̀)*	*jə́blɛ̄*	*jə̀blɨ̀*	*(wènɾû)*	*jēb*	*jə̀bí*	*(mùŋ̍́)*	*jē*	*jéfɨ́lə́ŋ*
‘lion’	**zwa̤*	*(bēdə̀ŋə̀)*	*d͡ʒwē̤*	*d͡ʒwà̤*	*zwà̤*	*zwā̤*	*zwà*	*zwà*	*zwà*	*ɰ̥à̤ː*	*ɰ̥ā̤*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘live’	*u	ú lí	wú lè	wù cí	ɓù lɨ́	kú	(ə)	(ə)	nə́wù	kú	kú lè
‘liver’	*ɲí	ɲɪ̄	ɲí	ɲí	ɲí	ɲwíŋwí	ɲí	ɲí	ɲì	nìnì	ɲíŋí
‘locust bean tree’	*lwe	(mɛ̄ʃɛ̀)	(mɛ̄ʃɛ̀)	lwəī	l̩wəī	dwí	dwí kə̀p	kə̀p lwí	kə́jí	kə́-dwì-j̊ɛ̄	d͡zwì-sɔ̀tɔ́
‘long’	*gwenV	g͡bɛ̀nɛ́	g͡bɨ́nə́	d͡zúnā	d͡zúnā	gwɛ̀n	gwēn	á gónì	ŋùŋwì	vɪ̄-là	fɪ̄
‘maize’	(*yə-bo) (*kun-a)	jàɓô	jə́bô	g͡bíg͡bànì	jɨ̀ràkwâŋ	kɪ̃́ná	mūŋ-kúnà	mìŋ-kúnà	mì-cɪ́	mìŋ-kwɛ̃̄	í-mɛ̃̄
‘man’	*li-ɓe	lí-ɓɛ̄	lú-bɨ̀	lɨ́-bəī	lɨ́-bəì	(jŭ = ‘person’)	ì-ɓé	lɪ̂-ɓeí	nɪ̀m-ɓì	jì-bwî	í-bwì
‘many’	(*k͡pā)	(wĕ)	(wé dàmàjɛ̀)	(dəŋà)	lɨ̀k͡pālì	k͡pə̀lĕ	k͡pā̄	k͡pə̃́díŋ	(bɨ́bəì)	k͡pə̀lə́	ɪ́jə̃́nɪ̂ŋ
‘meat’	*ɲə́m	ɲə̂m	ɲə́m	ɲə́m	ɲə̀m	ɲə̌	ɲə̌m	ɲə́m	ɲē	u̯ə̀̃m	j̊ə̃́
‘metal’	*bí	bít	bìp	bí	bí	ɓwí	ɓwí	ɓwí	ɓwí	ɓì	bī
‘mill-stone’	*ɲí	nî	ní	ɲí	ɲí	ɲí	ɲí	ɲí	ɲwə̀ŋwì	nì	ɲí
‘moon, month’	*pi	pĭ	pí	pí꞉	pɪ̄	fī	fí	fì	fɪ̀	fɪ́u̯ìm	ìu̯ɪ́
‘mortar’	*d͡zwən	(ʃĭ)	dàn	dàn	də̀ːn	zwēn	vèn	zwàn	ìdəù	d͡zwə̀m	ts͡wā

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'mos-quito'	*ɓɛ/ɓya	ɓɛ́	ɓɛ́	ɓē	ɓē	bjà	ɓjá	ɓjà	jà	ɗjà	d͡ʒá
'mother'	*nạ	nâ	ní	naˉ	nậ	nê	nâ	nâ	nà	ná	nă
'mouth'	*ɲwa	ɲwạˉ	ɲwá	ɲwà	nwạ̄	ŋwá	ŋwá	ŋwà	káŋwá	ŋwà	ŋwá
'mud'	*d͡zwəb	dìdób	dòb	dɔ̀ɔ̀b	swáb	swə̂b	swáb	(dìɓɔ̀k)	ɲúɟə̀	d͡ʒúd͡ʒwə̀	(bɨ̀bɔ̀)
'nail (v.)'	*pe *bək	bɛ̀-ɾɛ́	bɛ̀k	pē	ɓɔ́k	pì	pí	pî	bə̀	pī	pí
'name'	*lín/*ɗwín	lîn	lín	līn	ɗín	ɗwín	ɗwín	ɗun	dǔ	ɗíjúŋ	d͡zúŋ
'narrow'	(*təb)	(ɓɛ̀rɛ́ŋ)	(mɛ̀ʃʃ)	(ɓɔ̀nɔ̄ŋ)	(mínáɲ:)	tə̀p	tə́b	tàp	(pjɛ̃̄)	tə̀	tə̌
'near'	(*ɓə̀-di) (*pe) (*cən)	pē	pē	(gógə̄b)	ɓə̀-dí	cə̀n	cénsə̌ŋ	ɓə̀-d͡ʒì	ɓə̀-dɛ̀	bə̀-pí bə̀-pí	cə̌
'neck'	*dul	dòl	dūl	dùl	dūl	dūl	dúl	dwùl	ɟwí	d͡ʒwìm	t͡ʃwɨ̰
'new'	*fụ	ká fụ̄	ká fŭ	á fù	lə̀ fū:	à fú	à fú	á fú	à fù	à fû	à hú
'night'	*vè	vɛ̀-rɛ̀	vɛ̀-ɾɛ̀	vō-lɛ̀	vō-rə̀	vì	nɨ̀ŋ vì	núŋ vɨ̀	nɨ́ŋ vē	ɗɨŋvɨ̀	n̩vì
'nose'	*lúr(i)	lúrī	lúrī	lwílí	dūrə́	ɗúr	ɗúr	ɗúr	ɓwà-dǔ	ɓwà-ɗwì	d͡ʒwí

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘oil’	*ɲwì	nwì	nwì	ɲwié	ɲwí	ɲwì	ɲwì	nwì	ɲwì	nwì	ɲwì
‘old’	*ko	kó-ɾɛ̄	kɔ̀-rɛ̀	kó-lí	kʊ̄-ɾɨ́	à kū	kûŋ	á kú	cwɛ̀	à cwì	à cwí
‘open’	*ba/*ɓo	ɓá	bà	ábà	bà	ɓō	ɓō	ɓəù	bò	ɓəì	bē
‘open (eye/ mouth)’	*a	ɓá	bà	ábà	bà	ǎ	âː	ɓəù	bò	ɓəì	à
‘owl’	(*biʃi) (*ɲiɲi)	bíʃī	bíʃì	ɓíʃī	ɲíɲī	ɲíɲí	ɲǐɲî	ɲíɲī	ṇ̀hı̂́hı̂́	nînì	ɲǐɲì
‘person’	*gṳl *yu = child	lul	lúl	júgùl júgùl	jùgūl júgùl	jú	jú	jú	nùwà	jí-vɨ̀	ì-fɨ̄
‘play’	*bəŋ (*t͡ʃá)	(kēlē)	fɨ̄ləɓəŋ	ɓáŋ	(ɲīm-nūŋ)	nɨ́ŋ-t͡ʃá	(gə̀b-nɨ́ŋ)	(ɲìm-núŋ)	ɓə̀ŋ	nɨ́ŋ-t͡sà	nɨ́ŋ-t͡sá
‘porcu-pine’	*t͡ʃé	tɛ᷄	təí	təí	taî	t͡ʃɨ̄-ləŋ	t͡ʃɨ̄-láŋ	(làn-ðə̀)	(wəkəkì)	(fjəù)	(fjó)
‘pull’	*gṳb	gṳ̄b	gūb	gúb	gūb	gɨ̀b	gùb	gùb	gù	vɨ̀	fɨ̄
‘pull up’	*lub	lūb	lùb	lúb	lūb	lɨ̀b	lùb	lùb	lù	dù	d͡zwū
‘push’	*tɔ́k	tɔ́k	tɔ́k	tɔ́k	tɔ́k	tɔ̀k	tɔ́k	tɔ̀k	ló	t͡sò	tó

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘python’	**mi*	*mī̂*	*mílɨ̀m*	*mî*	*mí*	*mwî*	*mwì*	*ɓɨ̀ŋà*	*mwí*	*mì*	*mì*
‘rabbit’	**t͡sɨ-d͡ʒa*	*(bɨ̀rtəú)*	*(wɔ̄m)*	*tíd͡ʒā*	*tíd͡ʒà*	*sɨ́ɓɛ̂*	*sɨ́ɓê*	*tɨ̀ɲà*	*ɲ̩cíləì*	*t͡ʃídìjɛ̀*	*t͡sɨ̀lɛ̂*
‘rain’ (= ‘water’)	**mɛ/*mɨŋ*	*mɛ̄ gàk*	*mɛ̤̄*	*məī*	*mɨ̀ì*	*mū*	*múŋ*	*mùŋ*	*mɨ́ŋ-ɲìló*	*mɨ̀ŋ*	*mɨ́ŋ*
‘red’	**ɲɛn/*zɛn*	*ɲīn*	*ɲɛ̄nɛ̄*	*ɲɛ́nɛ̀*	*ɲín*	*zɛ̄n*	*zēn*	*á ðə́nì*	*ázɛ̃̄*	*j̊ɛ̃́*	*j̊ɛ̃̄*
‘red soldier ants’	**t͡sɨŋa*	*tòŋɛ̀*	*t͡ʃíwā*	*ʃíbō*	*zwə̀*	*sã̀*	*zɨ́ŋzēn*	*θíŋà*	*θã́*	*sã̀*	*sã̀*
‘refuse’	**la*	*lá*	*lá*	*(ɲóbā)*	*(jɨ̀bə̀)*	*lá*	*lá*	*là*	*(jə́)*	*là*	*lá*
‘ring’	**ku*	*(ɓwí-nâ)*	*(nùŋ ná d͡ʒùnà)*	*kú*	*nūŋ kû*	*(swə́m)*	*nɨ́ŋ kū*	*kù-ná*	*nɨ̀ŋ kə̀-nà*	*nɨ̀ŋ fī́*	*fī́*
‘river’	**dwəl *ŋwəm/ *wəm-a*	*wɔ́m-á*	*tùlɔ̀*	*wúm-á*	*wúm-à*	*d͡ʒwə́l*	*ŋwə̀m*	*dwàl*	*ŋù*	*ŋwə̀m*	*ŋwə́*
‘road’	**lɛ*	*lát*	*lát*	*lólà*	*(dɨ́rà)*	*lɛ̄*	*nɨ́ŋ lɛ̂*	*núŋ leì*	*(nàgɨ̀ŋ)*	*(nɨ́ŋgã̀)*	*(nɨ̀j̊ã̀)*
‘root’	**dík *yə́ŋ*	*(d͡ʒùmì)*	*dík*	*jə́ŋ*	*jə́ŋ*	*(pí)*	*jɨ̂ŋ kə̀p*	*dík*	*jì*	*ɥèm*	*ɥé*
‘rope’	**ɓəl*	*ɓél*	*ɓə̄l*	*ɓə̄l*	*ɓə̀l*	*ɓɨ̂l*	*bə́l*	*ɓə̀l*	*ɓəì*	*ɓəì*	*bè*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'rotten'	*zu	(òmà-lɛ́)	d͡ʒù-rə̀	d͡ʒū-là	zù-rà	zú	à zŭ:	zû	vɨɛ̀	u̯ì	u̯ī:
'round'	*lɨŋ	(gà-lɛ̄)	(gā)	gʊ́ljəŋ	(círgɨ̀)	d͡ʒɨ̄n	à d͡ʒɨ̀n	jɨ̀lɨ̀ŋ	(kwé)	(kwàm)	(kwā)
'rub'	(*ʃə) (*fi) (*Cūŋ)	ʃákɑ́	ʃákɑ́	ʃâ	zūŋ	fá	ɲū	fá	fá	fì	nū
'salt'	*dẹ	dɛ̄	dɛ̯̄	dəì	dəì	dē	dē	dəì	dwè	zɨ̀kwə̃ì	t͡ʃɪ̀kwɛ̃̀
'sand'	*swa-zwẹ	ʃwàd͡ʒwɛ̯̄	bàŋ-ʒwē	ʃwázwəì	swàzwē	swăzwī	swàzí	swàzwí	fávī	u̯âmu̯ì	u̯ău̯ī
'say' (cf. 'speak')	*gẹ	gɛ̯̄	gē	d͡ʒɛ̯̄	gəì	d͡ʒē	à d͡ʒē	gəì	kɨ̀jɛ̀	(kɨŋ kâ)	(t͡sà)
'scratch (not destructive)'	*kwe/*pe (*fəŋ)	(k͡pákɑ́)	pɨ́-rɛ̄	pəī	pəí	fɛ̃̄	kɔ̄	kwəì-lə̀	ɓə̀	fəŋ	fə̄ŋ
'scratch (destructive)'	*kwã/*k͡pa	(ílá)	k͡pákɑ́	g͡bɑ́ɣà	(pəí)	kwə̃̀	(fɛ̃̄)	(kwəì-lɔ́)	(hŭ̀)	(fəŋ)	kwə̃̀
'see'	(*nəŋ) (*ɓyə)	nəɲ̄	nɑ́ŋ	nəŋ̄	là̰ŋ	ɓî	ɓí	bjà	ɓì	ɓə̀	bə̀
'seed'	(*lok) (*byə)	lɔ̀k nūŋ	lɔ́k nùŋ	lɔ́k nūŋ	lók	bɛ̄-nūŋ	bjə̀-nɨ̄ŋ	bé-nùŋ	ɟà	bjə̀-nùŋ	pjə̀-nɨ̄ŋ

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'shadow'	*cilɨŋ	ʃílīŋ	ʃílìŋ	ʃílíŋ	cɨ̀lɨ̌ŋ	jílìŋ	(kúlwáŋ)	cílíŋ	ɲɥ́ŋ	(kwàŋ)	(kwáŋ)
'shake (object)'	*lóm(-á) *d͡ʒɛ	lámá	límá	d͡ʒɛ̀krì	(bìrí)	(wáp)	zīr	lám	ʒē	(jəú)	(jò)
'shame'	*sɨko	kɔ́-le-ʃít	kó-ló-ʃít	ʃɨkəù-lé	sɨ́kəú-lɨ́	súkú	súkú	θɨ̀kù	(nɨ́jəù)	sɨ̀kù	súkú
'sharp'	(*ləm)	(ɲēt)	(ɲēt)	(ɥá)	(ɥá:)	lám	làm (dɨ̃m)	làm	lìlē	làm	lá
'shea butter tree'	*t͡swáb	(dóm)	(dwám)	tóp	(gwàm)	(ímbɨ̀lím)	swáb	(kàp kúl)	(kà) tà	(kà) t͡swə	t͡swɔ̃́
'shield'	(*d͡ʒen)	(kɔ̀tɔ̂ŋ)	(kɔ̀tɔ̀ŋ)	(júbàb)	(jùbàb)	d͡ʒèn	d͡ʒēn	ɟēn	ɟɛ̄̀	ɲgɛ̄̀	ɲkɛ̄̀
'shoe'	*hwəŋ	wàŋmī	wɔ̀ŋmì	wàɣməì	wáŋmú	ɔ́	ɔ́	əɯ̄̀	hɯ̄̀	(bɨ̀m)	hɯ́
'shoot'	*ta	tá	tá	tá	tǎ	tà	tá	tà	tà	tà	tá
'short'	*kɨn	kɛ̄n	kɨ́n	(g͡bólà)	(tûl)	(túl)	(tùltùl)	(jàðàm)	(ŋwɨ̀ŋú)	(tɨ̀ŋtɨ̀ŋ)	kɯ̃́kɯ̃́
'sing'	(*twa zi) (*lub bín)	twǎ (bâŋ)	twá (d͡ʒì)	twá (d͡ʒì)	twǎ (zi)	lɨ̀b (bín)	lūb (bín)	lù (bìn)	d͡ʒwì(dwì)	leì (bɨ̀m)	lē (bí)
'sit'	*u	ú	wúlí (ʃwà)	wù	wɨ̣́kúlə	ɨ̀ (swà)	ə̀ (ɨ̀nə́ ə̀)	ə̀ (swà)	wáθə́	kù	kú (ɥá)
'skin'	*t͡swəl (*ləka)	tɔ́l	lákɔ́t	láká	lɨ̀ká	swə́l	swə́l	swál (θə)	jwə̀	d͡zwə̀	t͡swə̀

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‘sleep’	*lo	*núŋ-ləû*	*nūn-ləú*	*nūŋ-ləù*	*nūŋ-ləù*	*nùŋ-ló*	*nùŋ-ló*	*nùŋ-ló*	*nɨ̀ŋ-ləù*	*nɨ̀ŋ-lwəì*	*nɨ́ŋ-lwé*
‘small’	*t͡swəb	*tìjɔ̀b*	*tòp*	*tóp*	*(kɨ́ŋnâŋ)*	*à t͡ʃwə́b*	*(àn zəŋ)*	*á twàp*	*á θàŋ*	*t͡swənî*	*fɛ̋nî*
‘smell’	*jɛl	*jɛ̄lɛ̀*	*(ʃínə́)*	*jàlɛ́*	*(kūm)*	*jɛ̀l*	*(kùm)*	*jɛ̄lī*	*jē*	*jíjē*	*(tɔ̀)*
‘smoke’	*du, *wụ	*wụ̄*	*dùŋɔ̀*	*wú (lwà)*	*dû*	*d͡zù*	*d͡zū*	*dù*	*ðɨ́ú*	*ụ̀ì (ɗwâ)*	*ụ̄ī*
‘snail’	*so/*swe	*(pî)*	*(pî)*	*ʃó*	*sɔ̀*	*swè*	*fê*	*swē*	*ǹ̩fjà*	*ụ̄ē*	*ụ̄è*
‘snake’	*byək	*(kémlém)*	*bjək*	*bjə̀k*	*bjə̀k*	*bjɔ́k*	*bjəŋ*	*bjēk*	*ɟəù*	*d͡zəù*	*t͡sǭ*
‘soup’	*(*ɥa)	*(nùŋ-ʃé)*	*(nùŋ-ʃē)*	*(núŋ-və̀)*	*(nūŋ-vɨ́)*	*wá*	*wà*	*(ɓwàlì)*	*(dù)*	*ɥà*	*ɥà*
‘sour’	*(*ɲwi) *(*əm)	*nwí*	*nwí*	*nwí*	*ɲwī*	*ə́m*	*ə́m*	*əmí*	*nɨ̀ŋəi*	*ə̀m*	*ŋə́*
‘speak’ (cf. ‘say’)	*gę̱	*gę̱̄*	*gę̱̄*	*d͡zē*	*gəì*	*d͡zē*	*(bəŋ) gə̄*	*gəì*	*(hòŋwà)*	*(nə̀)*	*(nə̀)*
‘spear’	*mɔm *(*ɓwé)*	*mɔ̀m*	*mwə̀m*	*mɔ́m*	*ká-ɓé*	*mwə̀m-lò*	*mwə̄m*	*ká-ɓwì*	*bwì*	*ká-ɓwì*	*bwí*
‘spider’	*dəŋ	*(ləŋà)*	*(ʃɛ̂nìmə̀m)*	*dáŋdəŋ*	*dɨ̀ŋdáŋ*	*t͡ʃɪ̀ràndáŋ*	*(grə̀ŋgrə̀ŋ)*	*díndəŋ*	-	*kândəŋ*	*nə̌ndəŋ*
‘spit’	*t͡ʃwi-t͡ʃwe	*twē*	*twî*	*ʃwíʃwě*	*sùswê*	*t͡swìt͡swî*	*t͡ʃwìt͡ʃwî*	*tùtwî*	*twìtwì*	*t͡ʃɪ̀t͡ʃɪ̀*	*t͡ʃɪ̀t͡ʃɪ̀*

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'split'	**əŋ*	*əŋ*	*əŋ dɛ̀rɛ̀*	*(ɓàn)*	*(g͡bă)*	*sə̀ŋ*	*à sə̀ŋ*	*θə̀ŋ*	*cəúná*	*pɨ̀m*	*pɨ̏*
'squeeze'	**kəm*	*kə́m*	*kə́m*	*kə́m*	*kə̆m*	*kə̀m*	*kə́m*	*kə̀m*	*kɨ̏*	*kə̀m*	*kə̋*
'stab'	**bə*	*bɛ̀t*	*bɛ̄t*	*bə̀*	*bə̀*	*bɛ̄*	*bjɛ̄*	*bəì*	*bə̀*	*bəù*	*pə̀*
'stand'	**dẹ*	*dẹ̄*	*dẹ̄*	*dạ̀ì*	*dạ̀ì*	*dɛ̄*	*dɛ̄*	*dē*	*(cəú-θə́)*	*d͡ʒì*	*t͡sɨ̀*
'star'	**byɨn*	*(ɓə́ʃə̀l)*	*(ɓə́sə̀l)*	*bēn*	*bēn*	*bɨ̀n*	*bjɨ̂n*	*vìn*	*ŋ̍ɟɨ́ŋ*	*d͡zɨ̂ŋ*	*ŋ̍d͡zɨ̀ŋ*
'stick' (cf. 'tree')	*(*kwəb)*	*(d͡ʒàb)*	*(d͡ʒàb)*	*(ɲə́lə̀ŋ)*	*(tûl)*	*súkwə̀b*	*súkwə̀b*	*ðə̀mkə̀p*	*cwəì*	*ṳə̀kə̀*	*bwə̀kə́*
'stone, mountain'	**təl*	*tál*	*tál*	*tál*	*tál*	*tə̀l*	*tàl*	*tàl*	*təì*	*teì*	*té*
'suck'	*(*oŋ)* *(*su)*	*ʃùmì*	*aú*	*ʃú*	*ə̃ú*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ɔ̀ŋ*	*ŋəù*	*ȕ*	*ű*
'sun, daylight'	**fV*	*ɓɛ̄*	*ɓəì*	*fálɛ̀*	*fâr*	*fŭ*	*fū*	*fū*	*fē*	*fî*	*fí*
'swallow'	**mi*	*mī*	*mī*	*mī*	*mī*	*mī*	*mí*	*mì*	*mī*	*mī*	*mī*
'sweet'	*(*te)* *(*ləb-ləb)*	*(má)*	*tē*	*təí*	*tɛ̄-lə̀*	*lə̀blə̀b*	*lə̀blə̀b*	*làɗìn*	*(mɨ̀mə̀n)*	*lə̀plə̀p*	*kúlə̀lə̀*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'sweet potatoes'	*kɨta(n)-ko	ʃítəŋcəû	cítàkɨú	kítəngū	kɨ̀tágō	kátə̀kò	kítàkəú	kítágəù	kə̀rkò	kɨ̀tákəù	kálə̀kó
'swell'	*fəm (*har)	fú-rì	fúm	(lɔk)	fə̀m	hár	fə́m	hár	(jē)	hə̀ì	hɛ́
'tail'	(*ɥen) (*zɨŋ)	wn̄	wēn	ɥén	ɥēn	zɨ̀ŋ	zə́ŋ	ðíŋ	kə̀ðɨ̀ŋ	kə̀ɥ̊ɨ̂ŋ	kə́ɲì
'take'	(*pi) (*lɨ)	pí	pí	pí	pɨ́	lē	lē	lə̀ì	jɨ̀	dɨ̃̀	dɨ̀
'tears'	water-thing (*gəm)	mē-nûŋ	mē-núŋ	məí-nūŋ	nú-mwî	kə́m-bɨ̀r	gɨ̀m-bɨ́r	mùŋ-núŋ	n̩gùm-ì	nɨ̀ŋ-mɨ̀ŋ	gə̃̀m-í
'thick'	*mu	ɲím	mút	(bínà)	kə mwúrə̀	mē	à mjē	mwùdĩ̀ŋ	mùmwə̀	múmwə̀	(jɔ̀)
'thing'	*nuŋ	nūŋ	nūŋ	nūŋ	nūŋ	nūŋ	nɨ̄ŋ	nùŋ	nɨ̀ŋ	núŋ bɨ̀	nɨ̄ŋ
'think'	*ɲəm	ɲém	ɲə́m	ə́m	ŋə̀m	zí	à zí	ŋə̀m bà	(bə̀ŋ)	cèm bí	cɛ́
'throw'	*wa	(bjɨ̄ŋ)	wá	wā	wà	wà	wá	wă	tà	wà	wá
'thunder'	*gamvɨr	gàmvùrùm	gàmvùrùm	(nánì)	gàmvɨ̀r	kwə́ŋvɨ̀r	gàŋfír	gàmvî	gə̀ŋvwē	gámvəù	gə̃̂fɨ̂
'tie'	*t͡sə̂b	tép	lép	ʃə́b	sə́b	t͡ʃə̂b	t͡ʃə́b	θəp	cà	t͡sə̂	t͡sə́
'today'	*dî	dî	dî	áʃɨ	də̂sî	kɨjà	kɨkà	dîgà	ìθə̃̂nà	lɨ̀jɛ̀	d͡ʒɛ̀ní

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'tomorrow'	*vẹ̣/*biŋ	vẹ̄	vē	vàì	vəì	ìm-būŋ	bûŋ	būŋ	nám-báŋ	bìŋ	bàŋ-pìcɨ́
'tongue'	*dək (*lyəN)	də́k	də́k	də́k	lěn	kūm	kík	ljén	láŋ	líjɛ̄m	lá
'tooth'	*le	le	ləí	ləī	ləì	lɛ̄	lɛ̄	ləí	jɨ̀ɲɨ̀	dǐ	d͡ʒī
'tortoise'	*kwáŋ	kɔ̄ŋ	kɔ́ŋ	kɔ́ŋ	kɔ́ŋ	kwóŋ	kwáŋ	kɔ́ŋ	hǔ̃	kwàŋ	kwáŋ
'tree'	*kəb	(dǐt)	káp (dǐtˉ)	káp	káb	kàb	kàb	kàp	kà-nɨ̀ŋ	kà	ká
'turn'	(*mim)	(wúnɛ̀)	(kō)	(pí nā)	(bjɨ̀ nâ)	mɨ̀ràm	mɨ̀rám	mɨ̀rəm	(júŋ ŋəù)	mjêm	mjɛ̄
'twist (v.)'	*lam	ɓé-lém	pɨ́-rám	(dáp)	bɨ́-lə́m	(kɨ̀-rɛ̄)	kù-làm	kù-lwàm	làŋ	kwàm	(bɨ́ŋ)
'under'	*ɓwa *pi beneath	bì	bí	bī	ɓwâ	pí	pìw	pīswā	bò (=leg)	ɓwàw	bwà
'vomit'	*ɓyə́m	ɓoī̃m	ɓóm	ɓə́m	ɓjə́m nūŋ	ɓíjém	ɓém	ɓēmē	bjē	ɗjèm-nɨ́ŋ	d͡ʒə́
'walk'	*wọ/*zọ	wē-lé	wē-lé	wé-lè	wọ̄	zō	zɔ̀	ðəù	ðòbò	hò	hō
'warm'	*ɓum/dum (*lub/ləb)	ɓùrùm-ɓùrùm	ɓúrùm	ɓúm	dúmdúm	(swēn)	ɓɨ̀lə̀b-ɓɨ̀lə̀b	dùmdùm	lɔ̀jòŋ	lùlùb	lwùlwù
'wash'	*zwəb (*dyok)	d͡ʒɔ̀ɔ̀b	d͡ʒɔ̀ɔ̀b	d͡ʒōb	zwáb	ɗjòk	ʔijɔ̀k	dìɣà	và	lô	lŏ

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
‘water’	*mɛ/*miŋ =*rain*	*mɛ̄*	*mɛ̄*	*mìʃíjè*	*mítʃə́*	*mūŋ*	*mūŋkwàm*	*mùnkì*	*mìcà*	*mìŋ*	*míŋ*
‘well’	hole-water	*ɓwà-mɛ́*	*túŋrūŋ-mɛ̄*	*ɓwá-məì*	*ɓwà-mwìn*	*ɓwà-mūŋ*	*ɓwà-mūŋ*	*ɓwā-mū*	*wá-bù*	*ɓwá-mìŋ*	*bwà-míŋ*
‘what?’	*ɓə	*ɓɛ̄*	*ɓə̌*	*ɓə́*	*ɓə́*	*ɓējá*	*mə́*	*ɓə́*	*ɓà*	*ɓə̀*	*bádé*
‘when?’	*d͡ʒo	*d͡ʒəù*	*d͡ʒəū*	*d͡ʒəú*	*d͡ʒəú*	*(ɓílíjá)*	*(nìŋ-ŋɔ̀)*	*(nì-ɓə̂)*	*(θìŋwì)*	*dəù*	*dóní*
‘where?’	*lə (*pe)	*lá*	*lējà*	*lá*	*laɛ́*	*pə̌*	*pà*	*pìlâ*	*(ŋ̀gá)*	*pē*	*bêdé*
‘white’	*vɨ-rum	*vùrūm*	*vɨ́rùm*	*vùlùm*	*vūrùm*	*vìrūm*	*àm vìrùm*	*vìrùm*	*jə́vù*	*kɔ á vəw*	*fī*
‘who?’	*wə (*ya)	*wəī*	*wəí*	*wó*	*wəì*	*já*	*jâ*	*jìtìn*	*dàjà*	*wə̀*	*wədé*
‘wife’	*sɛ	*lí-ʃê*	*lí-ʃəí*	*ʃē*	*lí-sɨ́jē*	*ì-sí*	*sí*	*ʃím*	*ʃì*	*hē*	*hē*
‘wind’	*ɥạ	*(wəbɛ́)*	*(wúbē)*	*ɥá*	*ɥâ*	*wá*	*wá*	*wà*	*ɲàcà*	*ɥạ̀*	*ɥá*
‘wing’	*cɛn	*ʃínì*	*ʃínì*	*ʃénē*	*(laùbjēl)*	*wàŋ-cēn*	*cèn*	*(ŋwàkân)*	*(m̀bàlkàbì)*	*ŋwàkə́t͡sə̃̄w*	*ŋwákə́nt͡ʃə̃̄*
‘wipe’	*pi	*pē-rē*	*pì-ré*	*pì-lá*	*fè-rà*	*fá*	*fá*	*fá*	*fà*	*fì*	*(nū)*
‘witch-craft’	*ɓwí, *ɓwē	*ɓwī*	*ɓwí*	*ɓē*	*lē ɓjē*	*bwí ēsā*	*jê ɓwí*	*já bwí*	*bwì-tàŋ*	*ɓweì*	*bwē*

Gloss	Proto-Jen	Burak	Loo	Maghdi	Mak	Kyak	Moo	Leelau	Tha	Doso	Dza
'woman'	*i-sɛ (< 'wife')	lí-ʃê	lwâ lí-ʃəì	lí-ʃē	lí-sʲíjē	ì-sí	jɨ̀-sí	jì-sí	nì-ʃì	jɨ̀-heì	í-jè
'word, speech'	*sɔ (*bi)	ʃɔ̃	ʃɔ̃ː	ʃɔ̃	sɔ́-ká	bà	bà	bā	ɲà-hō	bì	bì
'work'	*tumi	túmí	tŭmí	túmí	nūn ṇtò	núŋ-tó	nɨ̀ŋ-t͡ʃô	nūŋ-tō	(nɨ̀ŋ-nà)	ŋwá-t͡sùm	ŋwá-tű́
'year'	*sa, (*əl)	ɛ̄	ʔēlɛ̄	ʃál	sə́l	sá	sā	θà	θà	hà	há
'yesterday'	*lɛ	lɛ̄	lɛ̄	líjè	lē	ƙí	dî	làlì	nɨ́ŋ-ɟɨ́	dʃəù	dò

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