The Lowland Kenyah posterior implosives

A typological reversal

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The Kenyah languages of central Borneo form a distinct unit within the North Sarawak group of Austronesian languages. In northern Sarawak there is a well-defined contrast between types that have been called 'Highland Kenyah' and 'Lowland Kenyah'. A key difference between these sets of closely-related languages is the reflexes of Proto-North Sarawak/Proto-Kenyah *b, *d, *j, *g and *b^{h}, *d^{h}, *j^{h}, *g^{h}, which are distinguished (usually as *b, d, j, g* vs. *p*, *t*, *c*, *k*) in Highland Kenyah, but show a complex set of innovations in some varieties of Lowland Kenyah. The most striking of these changes in the dialect spoken by the Lebu' Vu' Kenyah at Long Sela'an and Long Ikang, and the Long Tikan Kenyah at Long San, is the shift of voiced aspirates to phonetic implosives that were generalized to the reflexes of *b, *d, *j, *g as final syllable onsets, leading to merger of the two series. Because it was conditioned, this merger produced complementation between [b]/[ɓ], [ɟ]/[ʃ], and [g]/[ɠ] (*d lenited before implosion was generalized, preventing merger). Most remarkably, the reduction of Proto-Kenyah nasal-obstruent clusters in these dialects has begun to produce new instances of [ɟ] and [g], but not [b] and [d], creating contrastive implosives only at palatal and velar positions, a reversal of the distributional preference commonly associated with implosive stops in cross-linguistic perspective.

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1. Introduction

When we look at typological patterns in language we are struck by the observation that some are common while others are rare, and this naturally raises the question of cause: why are such traits not evenly distributed over the world's languages? To cite just one of many possible examples, while voiceless stops /p/, /t/, /k/ are

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cross-linguistically ubiquitous, click phonemes are extremely rare, being confined largely to southern Africa.

Whatever its ultimate biological underpinnings, there are good reasons to believe that much of language structure derives from history. Blust (1998a), for example, showed that in Seimat of the Admiralty Islands in western Melanesia, vowel nasality is phonemic, but only after /h/ and /w/. Synchronically, this is a peculiar distribution, but historically it becomes understandable when it is seen that [h] from earlier *r nasalized a following vowel through the process that Matisoff (1975) called 'rhinoglottophilia', while [h] from earlier *p did not, and that the allophonic vowel nasality that is still found after nasal consonants became phonemic when *m^{w} lenited to /w/, giving rise to nasal vowels after /w/ from *m^{w}, but to oral vowels after /w/ from *w. In the conclusion to that paper it was stated (1998a:314) "the case of Seimat should remind us that typology is ultimately a product of history, and that history is capable of producing not only the broad patterns of correlation familiar in the study of language universals, but also the isolated exceptions that continue to surprise and enlighten us." More recently Blevins (2004) has built an entire theory of synchronic phonology on this theme.

It is easy to say that structure derives from history, and that rare typological features are thus products of rare sound changes, but this simply shifts the burden of explanation from structure to history: why are some sound changes common and others rare? Although some sound changes do appear to be less common than others for reasons that remain unclear (Blust 2005), in some cases the rarity of a typological feature may arise from a sequence of more common changes which interact to produce an unusual outcome, as with the nasalization of vowels following /w/ in Seimat. The principal goal of this paper is to show that a possibly unique typological feature in some of the Kenyah languages of northern Sarawak has arisen via a series of historical changes that have collectively overcome the general resistance of languages to atypical structural traits.

2. The typology of implosives

Although Haudricourt (1950) and Wang (1971) contain important insights into the nature and historical development of implosive stops, the most comprehensive general survey of this topic is Greenberg (1970).

Greenberg uses the umbrella term 'glottalic' for both ejective and injective consonants. Ejective (often called 'glottalized') consonants are produced with a supraglottal stricture accompanied by simultaneous or closely succeeding glottal closure and release. They may include most manners of articulation, but ejective obstruents are nearly always voiceless. As first noted by Ladefoged (1968) and

reiterated by Greenberg (1970: 124), the term 'injective' covers three phonetic subtypes that are not known to contrast in any given language: "truly implosive sounds in which the larynx is lowered and ingressive air follows the oral release, sounds with laryngealized voicing, and preglottalized sounds." Although he treats these three types collectively as 'injectives', Greenberg frequently uses the more specific term 'implosive' for what appears to be the most common of the three varieties, and these terms will be used interchangeably in the following discussion.

According to Greenberg (1970: 127) "Preferences regarding point of articulation for glottalic obstruents are summarized in the following formula: injectives tend to have front articulation, ejectives to have back articulation." He illustrates this with data from languages representing a number of different families and regions of the world, and so sets up a simple typology that can be represented as follows:

Injectives	Ejectives
front of vocal tract	back of vocal tract
voiced stops	voiceless stops

Although the claim that injectives favor the front of the vocal tract appears to be well-supported, there is some question about ejectives favoring the back of the vocal tract. With regard to North America, for example, Mithun (1996: 137) notes that "Ejectives (glottalized obstruents) such as *p'*, *t'*, *c'*, *č'*, *k'*, and *q'*, appear in many families, among them Siouan, Yuchi, Caddoan, Coahuilteco, Kiowa-Tanoan, Keresan, Athapaskan, Chumashan, Salinan, Yokutsan, Maiduan, Wappo, Pomoan, Yuki, Wintuan, Washoe, Yana, Chimariko, Shastan, Klamath, Takelman, Coosan, Siuslaw, Chinookan, Sahaptian, Chimakuan, Salishan, Wakashan, Tsimshian, Tlingit and Haida." Similarly, Waimoa (Waima'a, Waimaha) and Yapese, the only Austronesian (AN) languages known to have ejectives, show no restriction on place, the former having /p/, /t/, /k/, /ʔ/, /pʰ/, /tʰ/, /kʰ/, /pʾ/, /tʾ/, /kʾ/, /b/, /d/, /g/ (Hajek & Bowden 2002), while Yapese contrasts plain and glottalized consonants at labial, labiodental, interdental, dental, palatal, velar. and labiovelar positions, and not just for obstruents, as is typical of North America, but for sonorants as well: /p/ : /pʾ/, /t/ : /tʾ/, /k/ : /kʾ/, /f/ : /fʾ/, /θ/ : /θʾ/, /m/ : /mʾ/, /n/ : /nʾ/, /ŋ/ : /ŋʾ/, /l/ : /lʾ/, /y/ : /yʾ/, and /w/ : /wʾ/ (Jensen 1977: xiv–xvi).

Maddieson (1984: 103–105) endorses Greenberg's statement by observing that even though many languages have labial ejectives, if one member of an ejective series is missing it tends to be the labial one. However, a quantitative comparison of ejective and injective stop inventories reveals an interesting asymmetry. Maddieson's study is based on the UCLA Phonological Segment Inventory Database (UPSID), a collection of data on phoneme inventories in 320 languages

representing all regions of the world. Within UPSID 52 languages are said to have ejective stops, and 34 of these, or 67% include *p'* in their system – hardly a rarity (Maddieson 1984: 104). By contrast the UPSID sample contains 42 languages with injective stops, and only 5 of these, or about 12% include *ɠ* (Maddieson (1984: 112). The evidence for ejectives favoring the back of the vocal tract thus appears much weaker than the evidence for injectives favoring the front.

Both ejective and injective consonants show strong areal tendencies, ejectives being common in western North America and the Caucasus region (somewhat less so in southern Mexico and central America), and injectives in much of West Africa, the Sudan, central America, and mainland and island Southeast Asia. These patterns suggest that one way glottalic consonants are acquired is through contact-induced change. However, where good comparative data is available it is also possible to trace the historical paths by which such consonants arose through system-internal processes.

Regardless of the situation for ejectives, then, the most typical pattern for a language with implosives is to have just /ɓ/ and /ɗ/, while the plain stops normally would include velars and perhaps palatals as well. Following Haudricourt (1950), Greenberg (1970: 129) also noted that /ɗ/ tends to be articulated further back than the corresponding plain voiced stop, a phenomenon that is very pronounced in Bimanese (eastern Sumbawa, Lesser Sundas, Indonesia), where /d/ is alveolar, but /ɗ/ is apico-domal and only lightly imploded, the radical difference of place seeming to suffice in maintaining the distinction with a minimal difference in airstream mechanism.

Wang (1971) argued further that implosive affricates are phonetically impossible, as they make contradictory articulatory demands (the release requires an egressive airstream, while implosives need an ingressive airstream), and Greenberg (1970: 130) added that where a language has a series of implosive obstruents the place where a palatal affricate would be expected is often occupied instead by a preglottalized palatal glide, a palatal stop, or occasionally some other substitute. With regard to the data in this paper it should be noted that where one finds a palatal affricate in the cognate forms of related languages, the implosive segment that corresponds to it is invariably a palatal stop. Moreover, in languages with palatal implosives, the non-implosive counterparts are also palatal stops, presumably reflecting an adaptation to the phonetic features required of the implosive.

Since implosive stops show a strong preference for anterior positions, and implosive affricates are unattested, the likelihood of finding a language with palatal and velar implosives would appear to be very small, and the discovery of contrastive implosives *only* in palatal and velar positions even smaller. Greenberg (1970: 128) is explicit about this, noting that "There is, to my knowledge, only a single exception to the generalization that the presence of at least one posterior

(compact) injective implies the presence of at least one anterior (diffuse) injective. This is Kinga, a Bantu language (Wolff 1905) which is reported to have as its only implosive a voiced velar ʔg. The velar implosive is a very infrequent sound, and with the exception of Kinga, noted above, always seems to imply the presence of bilabial, apical, and palatal members of the series."

Contrary to the expectations created by this general typological pattern, however, some of the Kenyah languages of northern Sarawak have phonetic implosives at labial, alveolar, palatal, and velar positions, and in recent decades these have begun to acquire contrastive status only in the latter two places, as shown in Table 1, where the consonant phonemes of Long Sela'an are given as representative of at least itself, Long Ikang, and Long San.[1]

Table 1. The consonant phonemes of Long Sela'an

p	t		k	ʔ
b [b, ɓ]	d [ɗ]	j	g	
		ʃ	ɠ	
m	n	ñ	ŋ	
	s			h
	l			
	r			
w		y		

From the standpoint of either phonetics or phonology, then, the typology of these languages is unusual, as phonetic implosion is uncommon in posterior position, and so far as is known no other case has ever been reported of a language with implosive phonemes only at palatal and velar places.

1. /p/, /t/, /k/ and /ʔ/ are voiceless unaspirated bilabial, postdental, velar, and glottal stops; /b/ varies positionally between a plain voiced bilabial stop and a bilabial implosive; /d/ is an alveolar implosive; /j/ and /g/ are plain voiced palatal and velar stops; and /ʃ/ and /ɠ/ are the corresponding implosives; /m/, /n/, /ñ/, and /ŋ/ are bilabial, alveolar, palatal and velar nasals; /s/ and /h/ are voiceless palatal and glottal fricatives; /l/ an alveolar lateral; /r/ an alveolar flap (medially) or trill (initially); and /w/ and /y/ labiovelar and palatal glides respectively. Data was collected in 1971, and it is possible that changes have occurred since then both in the language, and in the integrity of social groups that reportedly have begun to unravel under the pressure of 'modernization', which has begun to affect many Kenyah communities (Alex Smith, p.c., 7/18/2015).

3. The Kenyah languages: a brief history

The Kenyah languages are found over much of central Borneo on both sides of the Sarawak-Kalimantan border, where for centuries they have been in contact with other languages, most notably Kayan. Unambiguous phonological evidence places Kenyah within the North Sarawak group of languages established by Blust (1969, 1974), and Kenyah historical phonology cannot be described without reference to the immediate common ancestor of this larger group. To understand how a consonant system like that in Table 1 has arisen, it is therefore necessary to first sketch the relevant background changes that took place in Proto-North Sarawak (PNS), and then to show how the PNS system evolved into the phonologies of the modern languages. Table 2 presents the structure of North Sarawak, indicating the place of Kenyah among its closest relatives, along with the internal branching of the Kenyah group itself (upper-case labels mark subgroup names, lower-case labels languages names; starred languages are extinct, and are known primarily from data in Ray 1913).

Table 2. The North Sarawak language group (after Blust 1974)

I. BINTULU
  1. Bintulu

II. BERAWAN-LOWER BARAM
  A. BERAWAN
  a. WEST BERAWAN
  1. Long Terawan
  b. EAST BERAWAN
  1. Batu Belah
  2. Long Teru
  3. Long Jegan
  B. LOWER BARAM
  1. Kiput
  2. Lemeting/Belait
  3. Narum

2. In previous publications I have listed Long Dunin (autonym: Uma' Pawa') as a separate branch of Highland Kenyah. It is a close relative of Lebu' Kulit, spoken in Kalimantan, about which Soriente (2006: xix) says "Lebu' Kulit is only one member of the branch that includes also Lebu' Timai, Uma' Ujok, Uma' Pawa' and Uma' Kelep." In view of ongoing questions about its proper position it seems best to leave it as unclassified until more information is forthcoming.

4. *Lelak
5. Miri
6. *Dali'

III. KENYAH

A. HIGHLAND KENYAH

1. Long Anap
2. Long Atun
3. Long Jeeh
4. Long Nawang

B. LOWLAND KENYAH

a. TYPE A

1. Long Ikang
2. Long Sela'an
3. Long San

b. TYPE B

1. Long Wat
2. Long Luyang (Sebop)

c. TYPE C

1. Long Labid (Penan)
2. Long Lamai (Penan)
3. Long Merigam (Penan)

C. Unclassified

1. Long Dunin[2]

IV. DAYIC

A. MURUT GROUP

a. LUN DAYEH/LUN BAWANG

1. Long Semado

b. KELABIT GROUP

1. Long Napir
2. Long Seridan
3. Bario
4. Pa' Dalih
5. Long Lellang
6. Tring
7. Sa'ban

Reference to Table 2 shows that Kenyah is one of four primary branches of the North Sarawak group and that the primary division within it is between what I call 'Highland Kenyah' and 'Lowland Kenyah'.[3] To understand the history of implosion in Kenyah we need to begin with changes from Proto-Malayo-Polynesian (PMP), the immediate ancestor of the non-Formosan Austronesian languages, to Proto-North Sarawak (PNS), the immediate ancestor of the North Sarawak languages.

3.1 The transition from pre-PNS to PNS

As noted elsewhere (Blust 1995: 131ff, 2013: 649–650) a widespread subphonemic process in the AN languages of island Southeast Asia is the gemination of final syllable onsets after schwa, a vowel that is extra-short, and so tends to confer added length to a following consonant to maintain a duration for -əC roughly equal to that for other -VC sequences, hence CəC:VC, but CaCVC, CiCVC, CuCVC. In languages that have merged PAN schwa with a different vowel this has sometimes transformed allophonic gemination to phonemic gemination, as in PMP *ənəm > Isneg (northern Luzon), *annám*, Makasarese (south Sulawesi) *annaŋ* 'six', but PMP *anak > Isneg *aná?*, Makasarese *ana?* 'child'.

After the settlement of northern Borneo by AN speakers certain sound changes took place in PNS that had major consequences for the typology of its descendants.[4] The change most relevant to the present topic is the treatment of phonetically geminated voiced stops. As in Isneg and Makasarese, a language ancestral to PNS automatically geminated consonants after penultimate schwa. In addition, the heterorganic medial consonant clusters in reflexes of PMP reduplicated monosyllables underwent complete assimilation to produce a second class of geminates in a language immediately ancestral to PNS, as in PMP *tuktuk > *tuttuk 'knock, pound, beat', or *butbut > *bubbut 'pluck, pull out, as grass, hair, or feathers'. Where the resulting geminates were voiced obstruents they were particularly subject to the aerodynamic voicing constraint (AVC), which Ohala (to appear) describes as follows: "The "Aerodynamic Voicing Constraint (AVC) has long been recognized

3. Although all Highland Kenyah languages are located near the headwaters of the major rivers of central Borneo, not all Lowland Kenyah languages are in downriver areas. The terminological distinction is nonetheless useful for classificatory purposes, and will be retained until a better alternative is found.

4. As shown in Blust (1974: 187ff, 1998b, 2010), these changes affected Proto-North Borneo, the immediate ancestor of both the indigenous languages of Sabah (Bonggi, Dusunic, Murutic, Paitanic, Ida'anic) and northern Sarawak, but in Sabah the typological consequences are visible only in Ida'anic (Goudswaard 2005). For present purposes nothing will be lost by confining the discussion to the North Sarawak group.

in phonetics-phonology (Chao 1936; Ohala 1983; Passy 1890): voicing requires a sufficient airflow through the adducted vocal cords. The airflow requires a sufficient pressure difference (ΔP) between subglottal pressure (P_s) and oral pressure (P_o). During an obstruent, air accumulates in the oral cavity, thus increasing P_o. When the P_o approaches P_s, the airflow falls below that needed for vocal cord vibration and thus voicing is extinguished."

Voiced obstruents thus present the speaker with an inherent conflict in phonetic demands that is found in all languages, namely the need to maintain airflow to produce voice, but the simultaneous need to obstruct airflow to produce a stop. Ohala notes that speakers of many languages confront the demands of the AVC by adopting a strategy that permits them to maintain some features of the articulation while surrendering others. Examples of synchronic allophony or historical sound changes mediated by this conflict of phonetic demands are commonplace. In many languages voiced obstruent codas surrender voice in order to preserve a stop ('final devoicing'). Less common, but recurrently in AN, word-final voiced stops merge with the homorganic nasals, preserving airflow (hence voicing) while surrendering the velic closure (hence the stop). Still other languages obligatorily release word-final voiced stops (French), or lengthen vowels before them to preserve contrast even when voicing distinctions are minimal, as in English words like *write* vs. *ride*. Importantly, Ohala (to appear) adds that many languages have only voiceless obstruents, and he comments with regard to the severity of the phonetic conflict inherent in voiced obstruents that "This pattern is especially evident with voiced geminate stops where the longer duration of the stop closure aggravates the AVC."

Some languages seem able to maintain gemination with voiced obstruents, despite the AVC. Isneg (Vanoverbergh 1972), for example, has voiced geminates that arose from consonant lengthening after schwa, and subsequent phonologization when schwa merged with *a. These have remained, apparently unchanged (although Isneg is documented by a large dictionary, little phonetic information is available for this language). In other languages, however, speakers have met the challenge of the AVC with a repair strategy of some kind. One such strategy is degemination: many languages with voiceless geminate stops lack the voiced counterparts, either because these have reduced to simplex stops, or because they never developed under the conditions that created voiceless geminates. What Proto-North Sarawak did to cope with the AVC was cross-linguistically unusual, but phonetically transparent. To avoid prejudging the nature of this adaptation, Table 3 presents an overview of reflexes in North Sarawak languages for both the plain and geminated voiced stops of a language that we can call 'pre-PNS'. All pre-PNS voiced stops after penultimate schwa were geminate; Kelabit, Bintulu,

and Long Anap forms are phonemic (with /j/ = [ʤ]), but Long Sela'an forms are written in broad phonetic transcription, with irregular forms in parentheses:

Table 3. The split of PMP voiced obstruents in North Sarawak languages

pre-PNS	Kelabit	Bintulu	Long Anap	Long Sela'an	
*abu	abuh	avəw	abu	aɓu	ashes/hearth
*təbu	təbʰuh	təɓəw	təpu	təɓu	sugarcane
*bulu	buluh	vuləw	bulu	bulu	feather
*əbuk	əbʰuk	ɓuk	puk	ɓuk	head hair
*ŋadan	ŋadan	ñaran	ŋadan	ŋaran	name
*pədu	pədʰuh	lə-pəɗəw	pətu	pəɗəw	gall
*dua	duəh	ba (< gʷa)	dua	luə	two
*ədaw	ədʰo	ɗaw	taw	ɗaw	day
*tujuʔ	tuduʔ	tujuʔ	tujuʔ	(tuʃək)	seven
*əjan	ədʰan	k-əjan	can	ʃan	ladder
*jalan	dalan	–	jalan	ɟalan	road
*əja	ədʰəh	–	ca	ʃo	one
*gatəl	gatəl	–	(jatən)	gatən	itch(y)
*məgəl	məgʰəl	məgən	məkən	pəɠən	sleep[5]

This table does not represent the full range of reflexes of the pre-PNS voiced aspirates in North Sarawak languages, but it is adequate in showing the correspondence of phonemic voiced aspirates in Kelabit (/bʰ/ = [bpʰ], etc.) to phonemic implosives in Bintulu at labial and alveolar positions, voiceless obstruents in Long Anap in all positions, and finally non-contrastive anterior implosives and contrastive posterior implosives in Long Sela'an. It is clear that the Kelabit-Lun Dayeh voiced aspirates developed from voiced geminates, as nearly all consonants in these languages automatically geminate after a stressed schwa, and where a voiced geminate stop is expected we instead find /bʰ/, /dʰ/, /gʰ/ (Blust 2006). The next question, then, is what was the direction of change between the voiced aspirates, implosives and voiceless obstruents? The voiceless obstruents can be ruled out both on phonetic grounds, and because PNS had stops *p, *t, *k, *ʔ which played no role in the development of the voiced obstruents. This leaves three choices:

(1) pre-PNS voiced geminates became PNS voiced aspirates, which then evolved separately into implosives and voiceless obstruents.

5. Meanings vary across languages: Kelabit *məgʰəl* 'stay with a small child to make him sleep', Bintulu *məgən* 'to sleep', Long Sela'an *pəɠən* 'to lie down', Long Anap *məkən* 'to lie down, rest'.

(2) pre-PNS voiced geminates became PNS implosives, which then evolved separately into voiced aspirates and voiceless obstruents.
(3) pre-PNS voiced geminates split simultaneously into voiced aspirates in Kelabit, and implosives in Bintulu and Lowland Kenyah dialects such as Long Sela'an.

Alternative (3) can be ruled out, since the development of implosives from geminates was clearly independent in Bintulu and Lowland Kenyah. This leaves alternative (1), in which implosives and voiceless obstruents reflect voiced aspirates, and alternative (2), in which voiced aspirates and voiceless obstruents reflect implosives.

Ohala (to appear) notes that the voiced geminates of Prakrit became implosive stops in Sindhi, and comments that "Voiced implosives skirt the AVC by actively creating more volume in the oral cavity to accommodate the accumulating airflow." He thus implicitly favors alternative (2). Although there may be good phonetic reasons for assuming the direct change of voiced geminates to implosives, there are equally good phonetic reasons for assuming the direct change of voiced geminates to voiced aspirates, and the internal comparative evidence strongly favors alternative (1).

The phonetic basis for a change from voiced geminate stops to voiced aspirates is fairly transparent. The voiced aspirates of languages like Kelabit or Lun Dayeh begin voiced, end voiceless ([bp], [dt] ~ [dʧ], [gk]), and for some speakers produce a voiceless onset to the following vowel ([bp^{h}], [dt^{h}] ~ [dʧ^{h}], [gk^{h}]). Just as the cross-linguistically common change of final devoicing can be seen as a compromise between the need to maintain an egressive airstream to produce voice and the obstruction of that airstream to maintain a stop, the difficulty of maintaining voicing for the duration of a geminate stop would force speakers to seek some compromise, and terminal devoicing would do this by allowing the geminate to retain its distinctive duration while relieving speakers of the need to maintain voicing through an exceptionally long closure. On phonetic grounds, then, there can be little objection to a proposal that the voiced aspirates of Kelabit could have developed directly from voiced geminates. Once they existed it is easy to see how they could evolve into plain voiceless obstruents, a pattern that is well-attested in various non-standard dialects of Kelabit, as shown in Table 4, where implosives play no part:

While the phonetic mechanism leading from voiced aspirate to implosive is yet to be clarified, the reverse direction of change is at least equally difficult to model on known phonetic principles. Moreover, the development of voiceless obstruents from pre-PNS voiced geminates, a change that happened independently in most of the Kelabit-Lun Dayeh dialects in Table 4, in Highland Kenyah, and in various of the Berawan-Lower Baram languages, is far easier to explain through

Table 4. Reflexes of Proto-Kelabit-Lun Dayeh voiced aspirates in Kelabit-Lun Dayeh dialects

PKLD	*b^h	*d^h	*g^h	
Pattern 1	b^h	d^h	g^h	(Bario, Pa' Omor, Long Lellang, Long Semado LD)
Pattern 2	p	t	k	Pa' Mada
Pattern 3	p	c	k	Long Terawan Tring
Pattern 4	p	s	k	Batu Patung, Pa' Dalih, Sa'ban
Pattern 5	f	c	k	Long Pala LD
Pattern 6	f	s	k	(Long Napir, Long Seridan)

an intermediate stage with voiced aspirates than through an intermediate stage with voiced implosives. The weight of the evidence thus points to Kelabit and Lun Dayeh as retaining a feature of PNS that has been altered in other members of the North Sarawak subgroup.[6]

Apropos of the problem at hand, Proto-Kenyah must be reconstructed with both the plain voiced obstruents *b, *d, *j, *g, and a series of voiced aspirates *b^h, *d^h, *j^h, *g^h, like those still found in some Kelabit-Lun Dayeh dialects, since otherwise there would be no way to account for the correspondence of /p/, /t/, /c/, /k/ in Highland Kenyah dialects like Long Anap, with the voiced obstruents of Lowland Kenyah dialects like Long Sela'an. Although the reconstruction of Proto-Kenyah implosives might provide a more direct route to the implosives of some daughter languages, as seen already it cannot easily accommodate the change to voiceless obstruents, an innovation also found in various dialects of Kelabit-Lun Dayeh, where implosion evidently played no role. All things considered, then, the most plausible hypothesis is that voiced geminates underwent terminal devoicing to produce a novel series of PNS voiced aspirates which subsequently evolved into implosives independently in Bintulu and Lowland Kenyah dialects such as Long Sela'an, and into voiceless obstruents independently in various dialects of Kelabit and Highland Kenyah.

3.2 The transition from Proto-Kenyah to Lowland Kenyah, Type A

Since Proto-Kenyah (PK) must be reconstructed with two series of voiced obstruents, *b, *d, *j, *g and *b^h, *d^h, *j^h, *g^h, it seems clear that the implosives of Type A dialects of Lowland Kenyah arose from earlier voiced aspirates. What is unusual about these dialects is that the inherited implosives were generalized to all voiced

6. Note that Ida'an Begak, uniquely among the languages of Sabah, is similarly conservative in containing forms such as *təbpu* 'sugarcane', *bpuk* '(head) hair', and *dtow* 'day; sun' (cf. Table 3).

stops that were the onsets of final syllables. To show this, and to distinguish Type A Lowland Kenyah dialects from Types B and C, reflexes of the Proto-Kenyah voiced obstruents are given in broad phonetic transcription in Table 5 for representatives of each group:[7]

Table 5. Reflexes of Proto-Kenyah voiced obstruents in three groups of Lowland Kenyah languages

	TYPE A	TYPE B	TYPE C	
Proto-Kenyah	**Long Sela'an**	**Long Wat**	**Long Labid**	
*abu	[aɓu]	[avəw]	[aβəuʔ]	hearth
*təb^{h}u	[təɓu]	[təbəw]	[təbəuʔ]	sugarcane
*bulu	[bulu]	[bulun]	[bulun]	feather
*əb^{h}uk	[ɓuk]	[buək]	[bok]	head hair
*ŋadan	[ŋaran]	[ŋaran]	[ŋaran]	name
*pəd^{h}u	[pəɗəw]	[pədun]	[pədun]	gall (bladder)
*dua	[luə]	[luah]	[duəh]	two
*əd^{h}aw	[ɗaw]	–	[daw]	day
*tujuʔ	[tuʃək]?	[tudʒək]?	[tudʒuːʔ]	seven
*əj^{h}an	[ʃan]	–	[dʒan]	ladder
*jalan	[ɟalan]	–	[dʒalan]	road
*əj^{h}a	[ʃɔ]	[dʒah]	[dʒah]	one
*gəm	[ɠəm]	[gəm]	[gəm]	foot/leg
*məg^{h}əl	[pəɠən]	[pəgən]	[pəgən]	lie down/sleep
*gatəl	[gatən]	[katən]	[gatən]	itch(y)

As seen in Table 5, what distinguishes Long Sela'an and other Type A Lowland Kenyah dialects from Types B and C is that final syllable onsets *b, *j, *g and *b^{h}, *j^{h}, *g^{h} have merged as phonetic implosives. Since *b did not change elsewhere [b] and [ɓ] are now in complementary distribution (cf. Appendix 1 for a longer list of phonetically transcribed forms illustrating this relationship). The situation with PK *d is different: all instances of PK *d became either /l/ (initially), or /r/ (medially) before implosion was generalized. As a result, the only alveolar voiced stop in

7. As in much of Borneo, the language/dialect distinction is not always sharply drawn. While the populations at Long Ikang, Long Sela'an and Long San clearly speak dialects of a single language, it remains uncertain whether Long Wat, Sebop, and Penan dialects such as that of Long Labid are divergent dialects of the same language, or separate languages. Given these uncertainties the terms 'language' and 'dialect' will be used somewhat loosely in the following discussion.

the contemporary language is implosive. For the palatals and velars the situation is parallel to that for the labials.

This distribution raises some interesting questions about the relationship between phonetics and phonology. Based on the data considered so far it is clear that each pair [b]/[ɓ], [ɟ]/[ʄ], and [g]/[ɠ] contains allophones of a single phoneme, but how should these phonemes be represented? Phonologists have traditionally used considerations such as predictability, economy, pattern congruity, and plausibility to determine underlying representations (cf. Hyman 1975: 90ff, which provides one of the most explicit discussions of the issue). However, in the present case none of these considerations appears to offer much help. With regard to predictability, either /b/ or /ɓ/ allows the phonetic form to be predicted by an equally simple distributional statement; with regard to economy the contest ends in a draw since a single phoneme is required in either case, and with regard to plausibility there is little basis for a decision, since neither /b/ > [ɓ]/__V(C) nor /ɓ/ > [b]/__V(C) V(C)(V(C)) involves a recognized natural phonological process.

I have left pattern congruity for last, since it requires the most complex and controversial discussion. As seen in Table 5, at the developmental stage shown here there is only one voiced obstruent phoneme for each of the four places of articulation. The chief analytical question, then, is how these phonemes should be represented. Since predictability, economy and plausibility are of little assistance, we must look for other criteria as a basis for selecting underlying forms.

One possibility is to choose the unmarked member of the labial, palatal, and velar sets to represent these phonemes, hence /b/, /j/, and /g/ (with implosive allophones as the onset of a final syllable), but /ɗ/ because it is the sole realization for this phoneme. However, this analysis produces the oddly unbalanced system of stops seen in (1):

Analysis (1)

p	t		k	ʔ
b		j	g	
	ɗ			

Since analysis (1) violates pattern congruity we must consider other alternatives. If we follow the principle that a sole allophone is the phoneme we have no choice but to represent [ɗ] as /ɗ/. To achieve pattern congruity, then, we can represent all four voiced stops as phonemic implosives, as seen in (2):

Analysis(2)

p	t		k	ʔ
ɓ	ɗ	ɗʸ	ɠ	

However, in this case pattern congruity is achieved at the cost of positing a stop system with voiced implosives, but no plain voiced equivalents. While such systems exist, as in Nyang'i, an East Sudanic language of the Kuliak group spoken in Uganda (Maddieson 1984: 203), they are extremely rare.

Finally, we might choose the unmarked member of the labial, palatal, and velar sets to represent these phonemes as we did in (1), and to generalize this decision to the alveolar implosive, which is non-contrastive. This would produce the stop inventory in (3):

Analysis (3)				
p	t		k	ʔ
b	d	j	g	

Again, pattern congruity is achieved (or nearly achieved, since /c/ is missing), but at the cost of representing [ɗ] as /d/ even though the only allophone is implosive. Since systems like that of Nyang'i follow the principle that a sole allophone is the phoneme, even if this is marked (the principle evidently used by Maddieson (1984) and his source), we have little choice but to represent [ɗ] as /ɗ/. This rules out analysis (3), and since analysis (1) violates pattern congruity we are left with analysis (2) as the best of the three possible choices.

This was the situation just prior to the development of the attested Type A Lowland Kenyah dialects. However, ongoing historical change continued to alter the phonemic relationships between these phonetic segments.

4. The emergence of posterior implosive contrasts

In general, the canonical shape of Kenyah words is CVCVC, but final syllable onsets in Proto-Kenyah also included *mb, *nd, *nj and *ŋg, as reflected in Long Anap /kələmbit/ [kə.lə.mbIt] 'shield', /lundoʔ/ [lu.ndoʔ] 'to sleep', /pinjam/ [pi.nɟam] 'to borrow', or /səŋgəm/ [sə.ŋgəm] 'to grip'.

As observed by Greenberg (1970: 131–132) implosives are never prenasalized.[8] Since the same is true of the PNS/PK voiced aspirates, and the voiced geminates ancestral to them, a residue of plain voiced stops remained post-nasally after the generalization of phonetic implosion in Lowland Kenyah. So long as these medial clusters were intact they supported analysis (3) rather than (2), since an

8. Based largely on African data, Greenberg (1970: 131) also claimed that implosives prefer initial over intervocalic position. This is decidedly not the case in Austronesian languages, where the great majority of implosives in all languages are onsets of final syllables, and hence intervocalic in CVCVC forms.

allophone limited to one environment (in this case the onset of final syllables) is traditionally regarded as conditioned, and its co-allophone in the 'elsewhere' environment (viz. as the onset of non-final syllables, and following a nasal) would normally serve to represent the phoneme.

As shown in Table 6 for Long Anap and Long Sela'an, PK medial clusters are retained in Highland Kenyah but have been lost, or were being lost in Long Sela'an when I recorded my data in 1971.[9]

Table 6. Reflexes of Proto-Kenyah prenasalized voiced obstruents

Proto-Kenyah	Long Anap	Long Sela'an	
*kələmbit	kələmbit	kələvit	shield
*ləmbam	ləmbam	ləvam	a flood
*ŋətəmbu	ŋətəmbu	ŋətəvu	blow out water
*sambaw	sambaw	savaw	watery (as porridge)
*sambiʔ	sambeʔ	savɪʔ	native guitar
*səmbaʔ	səmbaʔ	səvaʔ	feel affection for
*lunduʔ	lundoʔ	luruʔ	to sleep
*məndəm	məndəm	mərəm	dark, dim
*ndaŋ	ndaŋ	raŋ	wall hook
*ndən	ndən	ulu rən	headrest, pillow
*ndiŋ	ndiŋ	riŋ	wall
*nduŋ	nduŋ	ruŋ	nose
*nduʔ	ndoʔ	ruʔ	to bathe
*kanjaw	pə-kanjaw	kajaw	show-off, flirt
*mənjam	njam	məjam	clever, skilled
*pəkənja	pəkənja	pəkəja	to quarrel
*jaŋgaw	jaŋgaw	jaŋgaw	slim and tall
*manjan	manjan	manjan	papaya[10]

9. In the Highland Kenyah dialects of Òma Lóngh (OL) and Lebu' Kulit (LK), which Soriente (2006) recorded in Kalimantan the situation is somewhat more complex, clusters sometimes being retained, as in PK *kələmbit > OL *kələmpij*, LK *kələmpit* 'shield', or PK *lunduʔ > LK *luntu* 'sleep', and sometimes lost but only after postnasal devoicing of the original voiced obstruent, as in PK *kumbin > OL *upiñ* 'how?' or PK *lunduʔ > OL *lutu* 'sleep' (Blust 2007).

10. The referents of both *sambiʔ and *manjan are foreign introductions that did not arrive in Borneo until after the breakup of Proto-Kenyah. However, both show the same sound correspondences as native forms, and it is possible that at least *manjan referred to some other plant prior to knowledge of the South American papaya.

Table 6. (*continued*)

Proto-Kenyah	Long Anap	Long Sela'an	
*iŋgiŋ	iŋgiŋ	iŋgiŋ	edge
*ŋgaŋ	ŋgaŋ	ŋgaŋ ~ gaŋ	handspan
*ŋgin	ŋgin	gin	carry, convey
*təŋgan	təŋgan	təŋgan ~ təgan	floor

A similar situation was recorded for the dialect of Long San, except that *gaŋ* 'handspan' and *təgan* 'floor' were heard without prenasalized variants, suggesting that the reduction of medial clusters in this dialect was somewhat more advanced than that in Long Sela'an. As for Long Ikang, too little data was recorded to permit confident conclusions, but the limited evidence available suggests a situation equivalent to that shared by Long Sela'an and Long San.

Although all four nasal clusters have reduced or begun to reduce in Type A Lowland Kenyah dialects, this change does not appear to have been simultaneous across all places of articulation. No unreduced reflexes of *-mb- or *-nd- were recorded, suggesting that the changes *mb > *v* and *nd > *r* happened first, while the changes *nj > *j* and *ŋg > *g* were still in progress in the early 1970's, as seen by differences across lexical items in e.g. *manjan* 'papaya' vs. *məjam* 'clever, skilled', or by variation in the shape of the same word, as with 'handspan' and 'floor'.

There is a question whether the reduction of the *-mb- and *-nd- clusters was a single-step change or a sequence of cluster reduction followed by stop lenition. An observation that might be taken to support the single-step hypothesis is that *b > [b], [ɓ], but *mb > [v]. However, if implosion was generalized to the onsets of final syllables before cluster reduction there could well have been a period after cluster reduction when *ɓ and *b contrasted in medial position (with *ɓ < *-ɓ-/-b-, and *b < *b-/-mb-). Lenition would then have affected plain voiced stops *b and *d, but not their implosive counterparts, which presumably would be more resistant to lenitive change.

The problem with this hypothesis is that *d > *-r-* clearly preceded the generalization of implosion to the onsets of final syllables, and therefore shows an ordering *opposite* to what must be assumed to account for the lenition of *mb in a phonetically natural way, as shown in Figure 1 for derivations of Long Sela'an *təbu* 'sugarcane', *abu* 'ash/hearth', and *savaw* 'watery (of porridge)' on the one hand, and, and of *pədəw* 'gall (bladder)', *paray* 'riceplant', and *luruʔ* 'to sleep' on the other (GI = generalization of implosion, CR = cluster reduction, LEN = lenition, OC = other changes):

PK	*təɓu	*abu	*sambaw	Change
1.	təɓu	aɓu	sambaw	(GI)
2.	təɓu	aɓu	sabaw	(CR)
3.	təɓu	aɓu	savaw	(LEN)

PK	*pəɗu	*paday	*lunduʔ	
1.	pəɗu	paday	luduʔ	(CR)
2.	pəɗu	paray	luruʔ	(LEN)
3.	pəɗəw	paray	luruʔ	(OC)

Figure 1. Ordering differences for *mb > -v- and *nd > -r- in Lowland Kenyah, Type A

As seen here, GI must precede CR and LEN for *mb in order to prevent *saɓaw, but CR and LEN must precede GI in order to prevent *paɗay. Since these orderings conflict, the correct forms can be derived only by allowing some changes to apply twice (CR + LEN before GI for *d/nd > *-r-*, then CR + LEN again after GI for *mb > *-v-*. To avoid this implausible analysis it seems best to assume that *mb > *-v-* was a single-step change, although *nd > *-r-* may well have been *nd > *d > *-r-*. The synchronic consequence of these differences is that the bilabial voiced stop has both plain and implosive allophones, while the alveolar voiced stop surfaces only as an implosive.

The most remarkable outcome of cluster reduction is that plain and implosive voiced obstruents now contrast at palatal and velar places, while the parallel phones at labial and alveolar places show no such contrast. This raises again in a new context the question of how the voiced obstruents of Long Sela'an and its kindred dialects should be represented phonologically.

If we return to analysis (1), including information from Table 6, we arrive at analysis (4):

Analysis (4)

p	t		k	ʔ
b		j	g	
	ɗ	ʃ	ɠ	

Analysis (4) meets the requirements of predictability, economy and plausibility fairly well, but in terms of pattern congruity it produces the oddity that /t/ lacks a voiced counterpart, and the implosive series lacks /ɓ/, the segment that normally appears in languages with only one implosive stop (Maddieson 1984: 112).

This forces us to reconsider analysis (2) in the light of the new data from Table 6, which leads to analysis (5):

Analysis(5)

p	t		k	ʔ
		j	g	
ɓ	ɗ	ʃ	ɠ	

While this analysis is in some ways the most attractive, since it fills the gap for the labial implosive, the implosive series has more place features than the plain voiced obstruents, a structural property found in only one language in UPSID, namely Ik (like Nyang'i, an East Sudanic language of the Kuliak group spoken in Uganda), where implosives occur at bilabial, dental, palatal, and uvular places, and plain voiced stops only at bilabial, dental, and velar places, although voiced affricates also occur at alveolar and palato-alveolar places (Maddieson 1984: 304).

Finally, incorporating the data from Table 6 into analysis (3) yields analysis (6):

Analysis (6)

p	t		k	ʔ
b	d	j	g	
		ʃ	ɠ	

From the standpoint of pattern congruity there is little to distinguish analyses (5) and (6). However, from the standpoint of plausibility the difference is considerable. Although analysis (6) is an improvement over (5) in having fewer place features for implosives than for plain voiced stops, it is strikingly at odds with cross-linguistically well-established patterns for implosive stop systems, where two-term systems with /ɓ/, /ɗ/ form 60% of the sample in Maddieson (1984: 112), but two-term systems with /ʃ/, /ɠ/ are unknown. Given this major departure from typological expectations we might reject analysis (6) in favor of (5), and record Lowland Kenyah Type A languages as having a plenary set of implosive stops like Swahili, Maasai, Nyang'i, and Ik in Maddieson (1984), or languages not in his sample, like Sawu/Hawu of the Lesser Sunda islands of eastern Indonesia (Walker 1982: 5).

What this option overlooks is a major structural difference between /ʃ/, /ɠ/ on the one hand, and /ɓ/, /ɗ/ on the other, namely that the posterior implosives of Type A Lowland Kenyah languages are defined by contrast with their plain voiced counterparts, while the anterior implosives are not. Linguists commonly use the terms 'phonemic', 'contrastive', and 'distinctive' interchangeably, but if analysis (5) were adopted the implosive series would be defined in three different ways: /ɓ/ by an essentially arbitrary choice of this symbol over /b/, since neither allophone has stronger claims than the other to being in an 'elsewhere' environment, /ɗ/ based on the principle that a phoneme with only one allophone must be represented by that allophone, and the posterior implosives by contrast with their plain voiced counterparts.

These considerations naturally raise questions about how the compilers of major typological surveys like Greenberg (1970) and Maddieson (1984) represent their data. Although Greenberg (1970) apparently does not refer to phonemes at all, and Maddieson (1984) rarely mentions them, both writers imply that the

units which form the basis of their surveys are defined by contrast. Greenberg (1970: 125), for example, combined laryngealized, preglottalized, and implosive obstruents as a single class of injectives reportedly because "their distinction is not relevant, and such symbolizations as ʔb, ʔd will be used for typographic convenience except where the phonetics is the explicit topic of discussion." Similarly, Maddieson (1984) repeatedly used the expression 'inventory', which most linguists confine to the expression 'phoneme inventory', to describe the units of comparison in his survey. While this usage clearly derives from his reliance on the UCLA Phonological Segment Inventory Database, which appears to be noncommittal with regard to the phonetics/phonemics distinction (it refers to 'segments' throughout), he implies that 'segment inventories' or 'phonological inventories' must be defined by contrast. With reference to a claim that the Tsimshian language Gitksan has voiced implosive variants of the voiceless ejective affricates, for example, he notes (1984:121) that "since they contrast phonetically with plain voiced affricates in certain environments, it is probable that their articulation is, if not implosive, at least accompanied by laryngeal constriction. Still, the particular allophone characterizable as "most typical" for these segments (i.e. that which would be coded by UPSID) is in both cases the voiceless ejective affricate and hence it is still true that no phonemic voiced implosive affricate segment is known to occur."

5. Conclusion

In the end the phonemic representation of the implosive stops of Long Sela'an and other Type A Lowland Kenyah dialects is crucially dependent on the assumptions we adopt for determining underlying representations in synchronic phonology. One thing is unambiguous: these languages have implosive stops that are defined by contrast with their plain voiced counterparts only at palatal and velar places of articulation, and this may very well be unique. But whether further implosive phonemes are recognized depends on the adoption or rejection of principles of phonological representation other than the principle of contrast between segments that are minimally different. If one insists that a single allophone is the phoneme, then it becomes necessary to include the alveolar stop as a third implosive phoneme, which still leaves the typologically bizarre stop system seen in analysis (4).

Finally, if one insists that the principles of pattern congruity and plausibility are inviolate we arrive at the stop system seen in analysis (5). However, as noted earlier, analyses (5) and (6) have equal claims to pattern congruity, and with regard to plausibility everything depends on the relative weight given to two different violations of typological universals: is it more costly to allow more place features

for implosive stops than for their plain voiced counterparts, or to recognize a typologically unique system of posterior implosive stops?

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Appendix. Phonetic transcriptions of the Long Sela'an voiced obstruents[11]

[b]: [baa] 'husked rice', [baaʔ] 'swollen', [baat] 'heavy', [baɓuj] 'wild boar', [bai] 'area between longhouse and river', [bajan] 'to pay' (< Malay), [bajəŋ] 'machete, bush knife', [bakUn] 'basket', [bala] 'red', [balu] 'widow', [baluj] 'wind', [baŋət] 'sea'], [baʔoʔ] 'odor, smell', [baraʔ] 'to tell, report', [basəʔ] 'wet', [bataŋ] 'log', [batək] 'belly', [batu] 'stone', [batUk] 'neck', [baʧa] 'to read' (< Malay), [bawaŋ] 'lake', [bawaŋ] 'onion' (< Malay), [bawaj] 'high', [bajə] 'crocodile', [bəkilət] 'lightning', [bəli] 'to buy', [bəlirən] 'whirlpool', [bəluɓUŋ] 'ridge of the roof', [bəŋian] 'ironwood tree', [bəsɔ] 'satiated, full from eating', [bətan] 'coconut', [bətɛ] 'calf of the leg', [bətiək] 'tattoo', [bətuʔən] 'star', [bətutuŋ] 'a hammer', [biaʔ] 'running sore', [biɓɛ] 'lip', [biləŋ] 'green/blue', [biləʔ] 'yellow', [biru] 'split bamboo used to make sun hats', [biuʔ] 'big, wide',

11. Stress was invariably recorded as final in citation forms. Forms that contain both plain and implosive obstruents are underlined.

[buaŋ] 'sun bear: *Ursus malayanus*', [buat] 'long (object)', [buaw] 'immigrants, people who have migrated', [buku] 'node, joint', [bukUt] 'to punch', [bulan] 'moon, month', [bulu] 'body hair, feather', [buluʔ] 'slender type of bamboo', [bunuʔ] 'get angry with someone', [buŋəʔ] 'flower' (< Malay), [buʔan] 'fruit', [buʔət] 'short (height, length)', [buʔIn] 'pig', [burək] 'foam, soapsuds', [burɛ] 'intestines', [burUk] 'rotten' (< Malay)

[ɓ]: [aɓət] 'loincloth', [aɓu] 'ashes; hearth', [aɓUn] 'cloud, mist', [baɓuj] 'wild boar', [ɓə] 'vagina', [bəluɓUŋ] 'ridge of the roof', [biɓɛ] 'lip', [ɓɔ] 'fishing pole', [ɓuj] 'dust (as chalk dust)', [ɓUk] 'head hair', [gaɓən] 'picture' (< Malay), [iɓu] 'thousand', [kaɓaʔ] 'downriver', [kaɓiəŋ] 'left side', [kələɓaw] 'carabao, water buffalo' (< Malay), [laɓə] 'fishing line', [laɓuʔ] 'to fall', [ləɓɔ] 'button', [liɓaw] 'shallow', [liɓəʔ] 'low', [luɓaŋ] 'hole (in ground, wall) ', [maɓaw] 'to weed a garden', [maɓUk] 'drunk, intoxicated', [ɲələɓUt] 'to come out of the water', [ɲiɓUŋ] 'a palm: *Oncosperma filimentosa*', [pəɓɔ] 'to help', [saɓaj] 'sibling-in-law', [saɓUn] 'soap' (< Malay), [siɓaʔ] 'urine', [taɓat] 'medicine', [təɓək] 'to stab', [təɓəʔ] 'traditional style haircut for men', [təɓu] 'sugarcane', [tuɓə] 'fish poison: *Derris elliptica*', [uɓan] 'because', [uɓan] 'mark (as in 'footprint')', [uɓaŋ] 'wood chip, splinter', [uɓap] 'carried on the back (child, injured person)', [uɓi] 'yam', [uɓu] 'conical bamboo basket trap for fish', [uɓUt] 'edible young plant shoots'

[ɗ]:[12] [aɗəŋ] 'kind of small stinging bee', [aɗi] 'sibling', [bəɗUk] 'large cultivated jackfruit', [bələɗi] 'bucket' (< Malay), [buɗiəŋ] 'a design', [ɗaw] 'day', [ɗək] 'dust', [ɗən] 'by (agentive marker)', [ləɗəʔ] 'boiling, of water', [ləɗɔ] 'woman', [məɗəh] 'to slap', [məɗUk] 'coconut macaque', [nəkəɗak] 'to flick with the finger', [nəkəɗiəŋ] 'to stand', [paɗaŋ] 'uncultivated field', [paɗəŋ] 'black', [paɗUŋ] 'bed', [pəɗəw] 'gall, gall bladder', [pəɗiʔ] 'painful', [səɗak] 'hiccups', [suɗuʔ] 'spoon', [təməɗɔ] 'rhinoceros', [uɗaŋ] 'shrimp'

[ɟ]:[13] [ɟaʃiʔ] 'a promise' (< Malay), [ɟalan] 'path, road', [ɟamUk] 'sandfly; housefly', [ɟaŋgaw] 'tall', [ɟaʔət] 'bad', [ɟipa] 'opposite bank', [ɟipə] 'tooth', [ɟəlaʔ] 'tongue', [ɟiʔiək] 'small', [ɟuləʔ] 'spit, saliva', [kaɟaw] 'to show off', [məɟam] 'clever, skilled', [pəkəɟa] 'to quarrel'

[ʃ]: [ɟaʃiʔ] 'a promise' (< Malay), [ʃan] 'notched log ladder', [iəʔ ʃə] 'other', [ʃɔ] 'one', [ʃap] 'ten', [ʃIn] 'from', [ʃuʔ] 'far', [kələʃa] 'to work' (< Malay), [laʃaŋ] 'cooking pot', [məʃUk] 'to push', [məʃUp] 'to blow, as the wind', [muʃu] 'mouth', [ŋaʃən] 'dull, blunt', [ŋaʃən] 'to teach' (< Malay), [ŋəʃəʔ] 'to step on', [pəʃap] 'to count', [tuʃək] 'seven' (also [nuʃək] 'to point', from the same base), [uʃuʔ] 'hand'

[g]: [gabən] 'picture' (< Malay), [gatən] 'itchy; to itch', [gərUt] 'unripe, of fruit', [giliəŋ] 'warped, of a plank', [guluəŋ] 'unbalanced (as a poorly made boat that constantly threatens to overturn)', [gutUn] 'bottle' (< Malay), [təgaaŋ] 'ribs'

[ɠ]]: [ɠəm] 'leg, foot', [ɠəŋ] 'to hold', [ɠɔ] 'rice sieve', [luɠi] 'loss (as in a business transaction)', [paɠən] 'pole used to chase off birds and chickens when paddy is being dried', [pəɠən] 'to sleep', [saɠəʔ] 'to dance', [səɠIt] 'dirty', [siɠUp] 'tobacco' (< L)

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12. *PNS *d > *l-, -r-, as in **dua* > *luə* 'two', *daRaʔ > *laaʔ* 'blood', *dədhəR *ləɗo* 'woman', *duRian > *luyan* 'durian fruit'; *m-adək > *marək* 'to smell, sniff', *m-udip > *m-urip* 'living, alive', *ŋadan > *ŋaran* 'name', *udu > *uru* 'grass'.

13. [dʲ] was recorded in free variation with [ɖʒ], but the corresponding implosive was invariably [ɗʲ].

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