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PHONOLOGY OF THE STIENG LANGUAGE: A RIME STUDY⁹

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1 Introduction: metalinguistic data

1.1 About the Stiang language

The Stiang language is a minority language belonging to the South-Bahnaric sub-group of the Mon-Khmer group in the Austro-Asiatic family¹⁰. It is spoken both in Vietnam (Binh Duong and Dong Nai provinces) and Cambodia (Kratie, Mondulhiri and Kompong Cham provinces).

The exact number of speakers is currently unknown but the community may account about 3,500 members in Cambodia and over 50,000 members in both countries¹¹.

According to Krauss' criteria (2006), Stiang is definitely endangered as the language has not been transmitted to the current generation. In Cambodia, there is a dominant bilingualism with Khmer (the official language) in Kratie and Kompong Cham provinces; and with Bu-nong (also known as Phnong and Mnong), a related language, in Mondulhiri.

Previous work on Stiang consists of lexicons and dictionaries compiled by French missionaries and administrators during the French Protectorate period¹². Then, during the 70s, 80s and 90s, Haupers & al (SIL) produced manuscripts, articles and a dictionary based on a dialect spoken in Vietnam (Stiang Bulo).

1.2 Data and Fieldwork

1.2.1 Four sets of data

This paper is based on four sets of data: two first hand data sets and two second hand data sets.

⁹ Work in progress. Follows up a presentation titled "A phonology of the Stiang language: Toward vocalic subgroupings", within the SEALS XIX Conference in Ho Chi Minh City, Vietnam (28-29 May 2009 - Bon, 2009a). This paper is also an updated version of chapter VI, MA thesis (Bon, 2009b:82-154).

¹⁰ Classification from The Mon-Khmer Languages Project, Directed by P. Sidwell, SEAlang Projects.

¹¹ Dang Nghiem Van, 1993. However, according to a recent survey from ICC - SIL (report in progress), the Stiang population might be as much as 9000 in Cambodia (personal communication, Philip Lambrecht, 2010).

¹² Azémar (1886); Morice (1875), Gerber (1937); Morere (1932). We should note that Azémar (1886) is the first published dictionary on a minority language of « Cochinchina ». This dictionary was used as a basis to the founder work of Mon-Khmer linguistics published by Schmidt in 1905 (personal communication: Gérard Diffloth, 2009).

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1.2.1.1 First hand data

a) *Bon 2007-2009*: a word list that I collected in Summer 2007 and winter 2009 among speakers of a Stieng dialect in Tro Peang Ron village (also known as Kbaal Snuol - Snuol commune, Snuol district, Kratie province, Cambodia). This data set represents the data I focus my analysis on in the present paper.

b) *Bon 2010*: a word list that I collected in 2010 among speakers of a different dialect of Stieng in the village of Dey Kraham (Pii Thnu commune, Snuol district, Kratie province, Cambodia). In the present paper, I occasionally use this recent data set for comparison purposes.

1.2.1.2 Second hand data for comparison purposes

a) *Haupers & Haupers 1991*: a Stieng dictionary compiled among speakers of the Bulo dialect of Stieng (Vietnam) between 1960 and 1975.

b) *Sidwell 2000*: Sidwell's reconstruction of Proto-South Bahnaric (PSB).

1.2.2 Fieldwork

I conducted 2007 and 2009 data collection sessions with two main speakers, both women (mother and daughter of 66 and 45 years old each). The corpus contains 1270 lexical entries collected on the basis of Greenberg's List, the EFEO List completed by Marie Martin and direct elicitation.

Then one should underline that the Stieng variety spoken in the area of Snuol is definitely influenced by the Khmer language: the contact between both communities started around the XVII^e Century¹³. Thus, many loan words from Khmer are part of the lexicon of these speakers. Consequently, one difficulty of the study was to recognize these borrowings as Stieng speakers who also speak Khmer, keep some features of their Stieng pronunciation and of their regional accent in Khmer (Snuol).

1.3 Framework

This paper aims to present my work in progress about the rime patterns of the variety of Stieng spoken in Kbaal Snuol, in both a synchronic and a diachronic point of view.

I start with briefly introducing the most salient particularities of the Stieng phonology such as word and syllabic canon and consonant systems (part 2.). The aim of the following section is to establish the native phoneme inventory of my data (07-09) (part 3.). Finally, I present the different occurring and non-occurring rime patterns and asymmetries, underlying their direct relation with vowel shifts and splits from Proto-South Bahnaric to modern Stieng.

2 Phonological features of the language

2.1 Word and syllabic canon

One areal and typological feature of Stieng is the syllabic and word structure: simple words can be monosyllabic or sesquisyllabic (i.e. one syllable and a half). The latter are composed of two types of syllables: one weak syllable, which is light, with a non-

¹³ Personal communication: Mathieu Guérin (2009).

phonemic vowel¹⁴, and one main syllable which is heavy, with a phonemic vowel - with the stress falling on the main syllable. Both type of syllable can be open or closed.

The figure below illustrates the word and syllable canon of the language:

(C(C) -ə(C)). C(C) -V(C)
(weak syllable). main syllable

Figure 1: *Word and syllable canon of Stieng*

The onsets of both types of syllables (weak and main syllable) can be a single or a sequence of two consonants. The nuclei of main syllables can be short, long vowels or diphthongs. The coda of both type of syllables are exclusively single consonants.

2.2 Consonants of Stieng

An areal feature of Sino-Tibetan and Southeast Asian languages is that consonant inventories are clearly different depending on their position in the word and in the syllable. Considering these differences, Smith (1975 in Smith 1989-1990:108) highlights the necessity of studying consonants within different subsystems depending on their position.

In Stieng, only a subset of the consonant system occurs in weak syllables. As I am not dealing with weak syllables but only with main syllables in the present paper, here are presented only the consonant subsystems of main syllables.

2.2.1 Initial consonants of Stieng

The initial consonant system (table 1) is composed of 30 units. It is different from the final consonant system (see table 2) concerning stops: it contains not only unvoiced stops but also voiced, aspirate, glottalized, and prenasalized. Within my current research, the phonological status of prenasalized remains hypothetical (Bon 2009b:77-80) and glottalized stops might come from borrowings from Khmer.

Table (1): *Initial consonants of main syllable subsystem of Stieng*

		Labial	Alveolar	Palatal	Velar	Glottal
Stop	- voiced	p	t	c	k	ʔ
	+ aspirate	ph	th	ch	kh	
	+ voiced	b	d	ɟ	g	
	glottalized	ɓ	ɗ			
	prenasalized	mb	nd, nd̥, nt		ŋg, ŋk	
Fricative			s			h
Nasal		m	n	ɲ	ŋ	
Liquid		w	l, r	j		

¹⁴ The nucleus can be deleted in realization. The result is that a weak syllable can be reduced to a single consonant. I have argued this point in Bon 2009b (chapter IV, 34-37). As the language admits also consonant clusters as onset of monosyllables, my analysis aims to determine of which type are the words that begin with consonants sequences: are they monosyllables with cluster onsets or sesquisyllables with reduced weak syllable?

The presence of voiced stops suggests that Stieng is a conservative language in a genetic and areal point of view and explains the absence of register distinction¹⁵. Here are some minimal pairs justifying the stop voicing distinction in Stieng:

	<i>MP</i>	<i>St. Bon09</i> ¹⁶	<i>Gloss</i>
(1) a.	[p] vs. [b]	pu:	<i>to suck at</i>
b.		bu:	<i>someone</i>
(2) a.	[t] vs. [d]	tə:p	<i>turtle dove</i>
b.		də:p	<i>to claim one's due</i>
(3) a.	[c] vs. [j]	caŋ	<i>to prune wood</i>
b.		jaŋ	<i>to throw</i>
(4) a.	[k] vs. [g]	kuŋ	<i>corn cob without the grains</i>
b.		guŋ	<i>stairs</i>

2.2.2 Final consonants of Stieng

Table (2): Final consonants of main syllable subsystem of Stieng

	Labial	Alveolar	Palatal	Velar	Glottal
Stop	p	t	c	k	ʔ
Fricative		s			h
Nasal	m	n	ɲ	ŋ	
Liquid	w	l, r	j		

The final consonant system contains 15 units: four stops, four nasals, one fricative, two liquids, two semi-consonants and two glottals.

Remark: a genetic feature of Mon-Khmer is the special realization of final –s: it is pronounced with a very weak friction and a palatalization: - [jç]. We will see below that final /s/ patterns with the palatals in terms of the overall rime inventory.

¹⁵ Ferlus (1979), Huffman (1976), Sidwell, (2000). One characteristic of Mon-Khmer languages is the loss of the initial stop voicing distinction: there was a confusion of voiced and unvoiced stops. Due to this phenomenon, vowels have developed a register distinction opposing vowels preceded by an original unvoiced consonant and vowels preceded by an original voiced consonant. Note that usually ‘*South-Bahnaric languages do not have registers*’ (Sidwell 2000: 6). However my second data set collected in Dey Kraham (2010) shows some distinctions that are likely to be interpreted as registers. Further data collections are planned to clarify that point in late 2010.

¹⁶ Examples are labelled as following: St. Bon09: my data (2007-2009) ; St. Bon10: my data (2010); St. Hau91: Hauper’s data (1991); *PSB Sid00: Sidwell’s reconstruction of Proto-South Bahnaric (2000).

2.3 Vowels of Stieng

Table (3): *Phonetic vowel inventory of Stieng*

	Front			Central		Back	
High	i	i:	ia	ɨ	ɨ:	u	u: ua
Mid-High	e	e:		ə	ə:	o	o:
Mid-Low	ɛ	ɛ:		ə	ə:	ɔ	ɔ:
Low				a	a:	ɑ	ɑ:

According to table (3), the phonetic vowel inventory of my Stieng data (07-09) includes 24 units.

However, this inventory does not reflect the reality: the full set never occurs either in open syllable or before any given final consonant insofar as vowel distribution is closely related to the final context.

Some gaps may be due to the small corpus available but some others are significant. A universal fact among languages of the world is that final consonants usually have many effects on the vowel. But more importantly, in the modern Stieng language (as well as other South-Bahnaric languages), the distribution of vowels depending on the final context reflects current or historical shifts in length and quality which pattern with consonants natural classes and structural hierarchies, and create structural gaps. So I aim to describe vowels depending on the way they rime with their final context to identify these structural gaps, with an attempt to give a historical explanatory account.

3 Vocalic systems

The aim of this section is to establish the native phoneme inventory of my data (07-09), and to get rid of vowels that are only on loan words, expressives or any other exceptions. As mentioned above, I aim to describe the rimes of the Stieng dialect of Kbaal Snuol in a comparative point of view, mostly regarding previous works done on the phonology of the language, that is Haupers' descriptions of Stieng Bulo (Haupers 1969 and Haupers & Haupers 1991) and Sidwell's analyses within his reconstruction of Proto-South Bahnaric (2000). Thus I start with presenting the different vocalic charts suggested in the aforementioned publications.

3.1 Vocalic systems of Stieng in the literature

3.1.1 Haupers 1969, Haupers & Haupers 1991

Haupers ends out with the following inventories:

Table (4): Stieng Bulo vowel phonemes inventory – Haupers 1969:132-133

	Front		Central		Back	
High		ii iə	ʊ	ʊʊ		uu uə
Mid	ê	êê	ɔ	ɔɔ	ô	ôô
Low	e	ee	a	aa	o	oo

Table (5): Stieng Bulo vowel phonemes inventory– Haupers 1991:vi

	Front		Central		Back	
High	i	iê	ʊ , ʊ̃	ʊʊ̃ , ʊ̃ɔ	u	uô
Mid	ê	êê	ɔ	ɔɔ	ô	ôô
Low	e	ee	a	aa	o	oo

3.1.2. Sidwell 2000

Based on Haupers & Haupers 1991, Sidwell suggests the following inventory for native Stieng vowel phonemes:

Table (6): Native stieng vowel phonemes inventory – Sidwell 2000:30

	Front		Central		Back	
High	i	iə			u	uə
Mid	e	e:	ə	ə:	o	o:
Low	ɛ	ɛ:	a	a:	ɔ	ɔ:

The lack of high central vowels is justified by the following statements:

a) The three long high central vowels listed by Haupers & Haupers (1991) as /û/, /û̃/ and /û̃ɔ/ (that is /i:/ and /iə/¹⁷) are rare and occur only in loan words from Khmer and Vietnamese or in nursery words. Consequently, Sidwell decides to ignore them in his reconstruction.

b) Concerning the short high central vowel listed as /ʊ/ by Haupers & Haupers (that is /i/), Sidwell ends out to analyse it as an allophonic realisation of /e/ after labial and velar initials:

¹⁷ The IPA transcription of /û̃/ remains unclear.

/e/ > [i̥]/ Lab. Vel. ___
 [e]/ elsewhere (Sidwell 2000:30)

The consistency of both statements within my data is tested respectively parts 3.2.2 and 4.4.

3.2 Vocalic systems of *Stieng* in my data (2007-2009)

3.2.1 Vocalic phones inventories

Here are the vowel phones which occur in my data:

Table (7): *Vocalic phones inventory in open rimes – Bon 2007-2009*

	Front		Central		Back	
High		i:		<i>ɨ̥</i>		u:
Mid-high		e:		<i>ə̥</i>		o:
Mid-low		ɛ:		<i>ɐ̥</i>		ɔ:
Low				a:		ɑ:

Table (8): *Vocalic phones inventory in closed rimes – Bon 2007-2009*

	Front		Central		Back	
High	i	ia	<i>ɨ̥</i>	<i>ɨ̥</i>	u	ua
Upper-Mid	e	e:	ə	ə:	o	o:
Lower-Mid	ɛ	ɛ:	ɐ	ɐ:	ɔ	ɔ:
Low			a	a:	ɑ	ɑ:

Remark: italicized vowels have a hypothetical status. Both inventories look quite odd compared to Haupers' and Sidwell's especially because they include four height levels for central and back vowels while only three or two would be expected.

Thus the next sub-section aims to clarify the status of these particular segments (italicized), identifying whether they only occur in loan words from Khmer or they show evident contextual variation.

Identifying whether a word is a loan word or a cognate is difficult by looking only at the Khmer translation. Thus I compared the words in question with Haupers' data, Sidwell's reconstruction of Proto-South Bahnaric and occasionally my data set (Bon 2010) when the latter was offering consistent help. Besides identifying the loan words, comparison was useful for identifying some contextual variation phenomenon as well.

3.2.2 Patterning of vowel phones

3.2.2.1 Open rimes

a) Front vowels /e:/ and /ɛ:/ in open rimes

The front vowel /e:/ occurs only in two words that can be loan words from Khmer (examples (5)). Then, words with /ɛ:/ actually correspond to words with rime -ej from Haupers and Bon10 that are reconstructed *e: by Sidwell (examples (6)):

	<i>St. Bon09</i>	<i>St. Bon10</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Khmer</i>	<i>Gloss</i>
(5) a.	phe:	phe:	---	---	phe:	otter
b.	de:	de:	---	---	te:	no
(6) a.	pɛ:	pej	pej /pe:/	*pe:	ɓæj	three
b.	chɛ:	chej	chej /cəhe:/	*kəse:	ksæ	rope, cord
c.	kɛ:	kej	kej /ke:/	*nəke:	snaŋ	horn
d.	bə.be:	bej	bej /be:/	*be:	popɛ:	goat

One should note that in Chrau, a related language, *e: shifted to /ɛ:/ in open rimes as well (Sidwell 2000:47).

So far, the status of /e:/ in my data 09 remains hypothetical but it seems consistent to maintain it in the inventory as according to Sidwell's analysis it occurs in Haupers' lexicon as well as in the pre-Stieng vocalic system:

*e:	>	e:	(Sidwell 2000:47-50)
/e:/	→	[ej] / ___#	(Sidwell 2000:30)

b) Central vowels /i:/ and /ə:/ in open rimes

As mentioned in part 3.1.2.1, Sidwell found out in Haupers' data, that /i:/ and /ə:/ occur in loan words from Khmer and Vietnamese or nursery words, both in open and closed rimes, so he does ignore them in the native vowel system of Stieng (Sidwell 2000:29).

This statement is consistent with my data where /i:/ and /ə:/ occur only in presumed loan words from Khmer, and so does /ə:/. Consequently, I remove /i:/ and /ə:/ from the phonological inventory.

The following list records all examples of these three phones in my data:

	<i>St. Bon09</i>	<i>St. Bon10</i>	<i>Khmer</i>	<i>Gloss</i>
(7) a.	chi:	chi:	chə:	tree, wood
b.	krə.ɓi:	krə.ɓi:	krəɓæj	water buffalo
c.	prə.ɗi:	prə.ɗi:	pteji	spinach
d.	rə.si:	rə.si:	risej	bamboo
(8) a.	krə.bə:	krə.bə:	krəpə:	crocodile
b.	smə:#gə.na:	smə:#gə.na:	smaə#khnɪə	to be equal to
c.	rə:	rə:	rə:	to disassemble
(9) a.	jə:	jəw	cuə	to believe
b.	lə:	ləw	lə:	above
d.	pə.jə:	pə.jəw	phɲə	to throw

The status of loan words is less clear for /ə:/, however given that the pre-Stieng vocalic system did not list *ə: in open rimes (Sidwell 2000:47), it would be plausible to omit it in the phonological system.

c) *Back vowel /ɑ:/ in open rime:*

/ɑ:/ occurs in one single word which could be a loan word from Khmer:

	<i>St. Bon09</i>	<i>Khmer</i>	<i>Gloss</i>
(10)	gɑ:	kɑo	<i>dumb</i>

Thus /ɑ:/ is omitted from the inventory for the present study.

3.2.2.2 Closed rimes

a) *Central Vowels in closed rimes:*

Firstly, the central short vowel transcribed [ɪ] occurs only in one word which is a loan from Sanskrit: bɪs ‘snake poison’.

Secondly, the central long vowel [ə:] mostly occurs in presumed loan words from Khmer in closed rimes, which is consistent with Sidwell’s statement¹⁸. There are nevertheless some exceptions that are omitted in the present paper¹⁹. Here are listed some examples:

	<i>St. Bon09</i>	<i>Khmer</i>	<i>Gloss</i>
(11) a.	kət	kaət#kɑ:n	<i>be born</i>
b.	pə:c ; bə:c	baoc	<i>remove the hair from</i>
c.	bə:k	baək	<i>to drive</i>
d.	n.cə:m	cɛŋ#caəm	<i>eyebrow</i>
e.	mə:n	mə:n	<i>ten thousand</i>
f.	pə:ŋ	paŋ	<i>to glide</i>
g.	gə:l	kə:l	<i>bumpy</i>
h.	hə:j	haoj	<i>already</i>

So it is plausible to remove it from the phonologic inventory.

Thirdly, the central long vowel [ɛ:] has a restricted distribution in closed rimes: it precedes only nasal -ŋ and rhotic -r, found in only four examples in the corpus. Two examples look like loan words from Khmer (examples (12)) but two other ones are definitely not loans (examples (13)):

¹⁸ See again 3.1.2. (a) and above: central vowels in open syllable.

¹⁹ That are: mbəj ‘to dream’ which remains unclear ; pək ‘to open’, dək ‘insolent’ and chə:c ‘sour, bitter’ which I presume to have transcription mistakes after comparison with my data 2010, Haupers’ data and Sidwell’s PSB reconstruction.

	<i>St. Bon09</i>	<i>Khmer</i>	<i>Gloss</i>
(12) a.	pə.sir	sɑːsə ; təsə	to compliment
b.	hɪr	həʔ#pə	to change color
(13) a.	cɪr	trənuŋ	backbone (fish)
b.	diːŋ	tiɛl	blunt

So the hypothesis that [iː] only comes from Khmer borrowings is not plausible²⁰. Nevertheless, I omit this vowel from the phonological system, for the present study as it is occurring in a very limited number of examples.

Finally, the status of the short central vowel [ə] remains unclear. This vowel corresponds to /u/ (/ i/) listed by Haupers apart from some rare exceptions that are omitted here. According to Sidwell (2000:30) this vowel [i] might not belong to the native vocalic system of Stieng but is rather an allophone of /e/ after labials and velars:

/e/ > [i] / Lab. Vel. ____
[e] / elsewhere (Sidwell 2000:30)

Note that this analysis assumes that [e] before palatals c, ɲ is an allophone of /ə/:

/ə/ > [e] / ____ c, ɲ
[ə] / elsewhere (ibid.)

In a broader perspective, interpretation problem related to [ə] seems to be dependant of the development of *i reconstructed by Sidwell (2000:49). I will give an in-depth demonstration to define the status of [ə] part 4.4.

b) Back vowels in closed rimes

First, long back vowel [ɑː] occurs only in presumed loan words from Khmer or Pali. Thus I omit it in the present study:

	<i>St. Bon09</i>	<i>Khmer</i> ²¹	<i>Gloss</i>
(14) a.	ʔɑːr	ʔɑː	glad
b.	ʔa.sɑːr	ʔak#sɑː	letter (alphabet)
(15) a.	chɑːk	chɑːʔ	bald
b.	kɑːk	kɑːʔ	to freeze
c.	sɑːk	sɑːʔ	to peel

²⁰ Note that [iː] is in complementary distribution with [əː] in closed rimes as [əː] never occurs in rhotic and nasal palatal rimes. Consequently we could think that [iː] is an allophone of /əː/ before -ŋ and -r. However both final consonants cannot really be grouped into natural classes and there is no articulatory or historical reason that can explain why such a phenomenon happens in these particular contexts and not in the others.

²¹ Remark: Khmer final -r was recently lost. According to Ferlus (1992:72, in Phal Sok (2004:120)) the total loss of final -r might have happened during the XXe century.

Second, short back vowels are characterized by a lower realization: [ɑ] corresponds to /ô/ (/ɔ/) described by Haupers and to *ɔ reconstructed by Sidwell. Consequently, [ɑ] is transcribed /ɔ/:

	<i>St. Bon09</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(16) a.	ʃɑk /ʃɔk/	ʃɔk /ʃɔk/	*ʃɔk	<i>long time</i>
b.	klɑʔ /klɔʔ/	klɔʔ /kəlɔʔ/	*kəlɔʔ	<i>navel</i>
c.	kə.tɑh /kətɔh/	kətɔh /kətɔh/	*gətɔh	<i>breast</i>
d.	sɑŋ /sɔŋ/	sɔŋ /sɔŋ/	*sɔŋ	<i>straight</i>

Then, [o] and [ɔ] both correspond to /ô/ (/ɔ/) described by Haupers and to *u reconstructed by Sidwell. Regardless three words that I omitted in the present study²², [o] and [ɔ] are in complementary distribution according to the final consonant:

/o/ → [ɔ] / ____ dental ; velar
[o] / elsewhere

	<i>St. Bon09</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(17) a.	sət /sot/	sot /sot/	*sut	<i>honeybee</i>
b.	sər /sor/	sor /sor/	*sur	<i>porc</i>
c.	blək /bəlɔk/	błɔk /bəlɔk/	*bəlɔk	<i>elephant tusk</i>
d.	tɔŋ /toŋ/	toŋ /toŋ/	*tuŋ	<i>steal</i>

This interesting distribution of the short back vowels makes sense in a diachronic point of view. Indeed, according to Sidwell, Proto-South Bahnaric vowel *u was affected by a lowering phenomenon to /o/ (Sidwell 2000:49). From this perspective, my data may show another stage of lowering as a feeding phenomenon: after the lowering of *u to /o/, there is currently a conditioned lowering of /o/ to [ɔ] and a systematic lowering of /ɔ/ to [ɑ] which might be a shift in progress, to ensure distinction and avoid homophony:

/o/ → [ɔ]/____ dental; velar
/ɔ/ > [ɑ]

3.2.3 Phonological vowel systems

Many segments discussed above can be removed from the system unless new data come contradict this decision, within further data collection. So far, my charts can be reshaped as following:

²² The words in question are: hɔp 'Never mind !' which is an expressive ; jon 'to offer' which might be a loan word from khmer cu:n ; and gon 'to draw water' for which I do not have any hypothesis.

Table (9): *Vowel system in open rimes – Bon 2007-2009*

	Front		Central		Back	
High		i:				u:
Mid		e:				o:
Low		ɛ:		a:		ɔ:

Table (10): *Vowel system in closed rimes – Bon 2007-2009*

	Front		Central		Back	
High	i	ia	ə		u	ua
Mid	e	e:	ə	ə:	o	o:
Low	ɛ	ɛ:	a	a:	ɔ	ɔ:

Basically, the above inventories are quite consistent with Sidwell's native phoneme inventory (Sidwell 2000:30).

4 A rime study of Stieng

4.1 Presentation and general statements

One of the essential problems in describing the segmental phonology of Stieng is the collocation restrictions on vowels and finals within rimes. Indeed, it appears that *vowels are or have been shifting in patterns that correlate with natural classes and structural hierarchies, creating structural gaps*²³.

In this section I aim to describe the patterns of occurring and non-occurring rimes, identifying structural gaps and their correlation with vowel's current and historical shifts.

4.1.1 Inventory of rimes:

Table 11 next shows the different occurring and non-occurring rimes.

4.1.2 General statements: three types of rimes

Rimes of Stieng can clearly be divided into three different types: open, glottal, and closed. These different types underline that there is a requirement for the main syllable to be heavy (while as already mentioned, the weak initial syllable can be light):

- open rimes are always long ;
- glottal rimes (with final /h/ or /ʔ/) always have a short vowel and diphthongs.
- and closed rimes with other consonants can have either short, long vowels and diphthongs.

Obviously the open rimes are in complementary distribution with glottal rimes. Then, vowel length is contrastive only in closed rimes with non-glottal finals.

Next section is a description of the rimes patterns and asymmetries found out between the rimes looking at length opposition (4.2.), articulation point (4.3.) and height (4.4.) features.

²³ Note of the reviewer.

One should already note that Sidwell (2000:47-48) argued for a chain of shifts in Stieng concerning the high vowels that is:

- a shortening of *u: and *i:, respectively to /u/ and /i/
- a lowering of *u and *i, respectively to /o/ and /e/.

These changes account for many of the synchronic asymmetries.

Table (11): Rimes of Stieng - Bon09

Nuclei			Coda			Labial			Dental			Palatal			Velar		Glottal		Zero
			p	m	w	t	n	r	l	c	ɲ	j	s ²⁴	k	ŋ	ʔ	h	∅	
S H O R T	F R O N T	High	i	---	im	---	it	in	ir	---	ic	ij			ik	---	--	ih	
		Mid	e				---	---		---	ec	eɲ	---		---	---	eʔ	eh	
		Low	ɛ														ɛʔ	ɛh	
	C E N T	High	ə	əp			ət	ən	ər							əŋ	--		
		Mid	ə	əp	əm		ət	ən	ər	əl					ək	əŋ	əʔ	əh	
		Low	a	ap	am	aw	at	an	ar	al	ac	aɲ	aj	as	ak	aŋ	aʔ	ah	
	B A C K	High	u	up	um		ut	un	ur	ul	uc		uj	us	uk	uŋ		uh	
		Mid	o	---	om	---	ot	on	or	ol	oc	oɲ	oj	os	ok	oŋ	oʔ	oh	
		Low	ɔ	---	am		---	an	ar	al	---				ak	aŋ	aʔ	ah	
L O N G	F R O N T	High	i:															i:	
		Mid	e:	e:p	---	---	e:t	e:n	--	e:l					e:k	e:ŋ			e:
		Low	ɛ:	ɛ:p		---	ɛ:t			---					ɛ:k	ɛ:ŋ			ɛ:
	C E N T	Mid	ə:	ə:p	ə:m		ə:t	ə:n	--	ə:l	ə:c	---	ə:j	ə:s	ə:k	ə:ŋ			
		Low	a:	a:p	a:m	a:w	a:t	a:n	a:r	a:l	a:c	a:ɲ	a:j	a:s	a:k	a:ŋ			a:
	B A C K	High	u:																u:
		Mid	o:	o:p	o:m		o:t	o:n	---	o:l	o:c	o:ɲ	o:j	o:s	o:k	o:ŋ			o:
		Low	ɔ:	ɔ:p	ɔ:m		---	ɔ:n	ɔ:r	---	ɔ:c	---	---	ɔ:s	ɔ:k	ɔ:ŋ			ɔ:
	Diph.	Front	High	ia	iap	iam	iaw	iat	ian	iar	ial				iak	iaŋ		iah	
Back			ua			uat	uan		ual	uac	uaɲ	uaj	uas						

--- : existing rime in Haupers and/or Sidwell's reconstruction

□ : presumably non-structural gap

■ : presumably structural gap

e: : rime with a remaining hypothetical phonological status

²⁴ Remark: as already mentioned, /s/ is realized with a weak friction and palatalized: - [jç]. Then, given its behavior within the rime patterns, it is consistent to list it in the palatal natural class.

Remark: rimes that only occur in presumed Khmer loan words as well as expressives and onomatopoeia are omitted from this table²⁵.

4.2 Length opposition asymmetries

4.2.1 High vowels /i/ and /u/

According to their distribution within the rimes, the high vowels /i/ and /u/ are in complementary distribution with their long equivalents /i:/ and /u:/: the short ones occur only in closed rimes while the long ones occur only in open rimes. Consequently, length opposition of high vowels /i/ and /u/ does not exist at all.

There are nevertheless two possible interpretations concerning the length opposition of high vowels /i/ and /u/ in closed rimes.

4.2.1.1 No length opposition

In his reconstruction of Proto-South Bahnaric, Sidwell (2000:29) suggests that the lack of long high vowels /i:/ and /u:/ in closed rimes could be due to diphthongization or shortening of both vowels. His proposal is to consider that there were a shortening of *i: and *u: respectively to /i/ and /u/²⁶ (with nevertheless a split before final glottal -h): '[...] *[T]he restructuring of Stieng which eliminated long high vowels is clearly explained as a shift from long to short*' (Sidwell 2000:47):

*i: > e / ____ h²⁷
i / elsewhere (ibid.)

*u: > o / ____ h
u / elsewhere (ibid.)

4.2.1.2 Length opposition

We can suggest to interpret the diphthongs /ia/ and /ua/ as the long equivalents of /i/ and /u/, respectively coming from the pre-Stieng long high vowels *i: and *u:. Accordingly, length opposition for high vowels does exist in closed rimes: /i/ vs. /ia/ and /u/ vs. /ua/.

Then, looking at the rimes patterns, we notice that:

-/i/ and /ia/ are in opposition in all rimes except before palatals (see part 4.3.4)

-/u/ and /ua/ are in opposition in rimes with dental and palatal rimes but not in labial (see part 4.3.4.) and velar rimes where /ua/ does not occur.

4.2.2 Mid and Low Front vowels /e/ and /ɛ/

First, short vowel /e/ and /ɛ/ have quite a marginal status, according to their limited distribution within the rimes: /e/ only occurs in palatal and glottal rimes and /ɛ/, only in

²⁵ Omitted words are listed Appendix I.

²⁶ Sidwell specifies that 'it is not clear that it is the source of all short high vowels' (Sidwell 2000: 29).

²⁷ Note that in my data (09), *i: did not lower to /e/ before -h but shortened to /i/ as elsewhere (e.g.: *pi:h > pih 'knife'). The lowering occurred for the back vowels though (e.g.: *tu:h > toh 'bean').

glottal rimes. I will discuss the status of [e] in palatal rimes more precisely part 4.3.2. and explain the limited distribution of /e/ part 4.4.

Concerning /ɛ/, it seems that the vowel comes from a split of PSB *ə in glottal rimes:

*ə > ɛ / ____ ʔ, h (ibid.)

So in my data, as well as in Hauper's, the limited distribution of /ɛ/ in glottal rimes can be consistently explained by the fact that /ɛ/ merged in the system in this particular glottal context, probably quite recently.

According to Sidwell (2000:48): '/ɛ/ is marginal phoneme in the modern languages contrasting reliably with [ə] only before glottals [...]'. This statement is consistent with my data²⁸.

Second, as /e:/ and /ɛ:/ never occur either in palatal or glottal rimes, there is no length opposition for mid and low front vowels in closed rimes.

4.2.3 Other vowels

Other vowels all show some length oppositions in closed rimes. Here are the different length opposition sets from the most frequent to the less frequent: /a/ vs. /a:/; /ə/ vs. /ə:/; /o/ vs. /o:/; /ɔ/ vs. /ɔ:/.

/a/ and /a:/ are present and in oppositions in all closed rimes, with any given final consonant. One should note that, according to Sidwell's reconstruction (2000:47), both occurred in the Proto-South Bahnaric vowel system and did not shift or split.

Length opposition is attested in every velar rime for every vowels mentioned above (/a/ vs. /a:/; /ə/ vs. /ə:/; /o/ vs. /o:/; /ɔ/ vs. /ɔ:/).

There is only one length opposition with the labial semi-consonant: –aw vs. –a:w. In a general point of view, rimes with semi-consonant -w are very limited and found only with nuclei /a/; /a:/ and /ia/. Consequently, one should address the possibility of these rimes to be triphthongs in a synchronic point of view. However, this is not the purpose of the present paper so I move on to the articulation point asymmetries.

4.3 Articulation point asymmetries

4.3.1 Front vowels

4.3.1.1 General remarks

In a general point of view, front vowels occur in a limited number of rimes in my data: in a diachronic point of view, as already specified (4.2.2.), that limitation can be explained by the fact that /e/ and /ɛ/ are new in the modern language and come from the following shifts and splits:

e < *i
 *i: / __h
 *ə / __s

²⁸ e.g.: lɛʔ 'finished completed' vs. rə.ləʔ 'water melon'; dɛh 'give birth' vs. dəh 'near'.

ε < *ə / __ ʔ, h

4.3.1.2 Front vowels in palatal rimes

There are evident asymmetries of front vowels in palatal rimes:

The only front vowels which can occur in palatal rimes (that is with –c and -ɲ) are [e] and [i]. The status of [e] in palatal rimes is clarified in the next subsection (4.3.2.).

Then, front vowels never occur in rimes with fricative –s which might be due to its palatalized realization: [jç]. Note that *s is likely to have shifted to /h/ after *ə (with *ə > e / __s):

*s > h / e__ (Sidwell 2000:39)

4.3.1.2 Special case of [i] in palatal rimes

In my data, [i] can occur before –c and -ɲ whereas it cannot in Haupers' data and Sidwell's PSB reconstruction. Thus, here I aim to give an explanation of this collocation looking at the correspondences with Haupers' data and Sidwell's reconstruction. The following list records all examples of these two rimes in my data:

	<i>St. Bon09</i>	<i>St. Bon10</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(18) a.	pic	pec	pik /pik/	*səpi:k	<i>civette cat, weasel</i>
b.	ɟic	ɟec	ɟik /ɟik/	*ɟi:k	<i>to hoe weed; to dig up</i>
c.	ric	rec	---	---	<i>to grow up, to flower</i>
d.	wic	wec	---	---	<i>nocturnal bird</i>
(19) a.	prɪɲ	preɲ	---	---	<i>vegetal oil</i>
b.	tɪɲ	teɲ	tiɲ /tiɲ/	*nəti:ɲ	<i>bone</i>
c.	hiɲ	heɲ	---	---	<i>bullfrog</i>
d.	səm.liɲ	səm.leɲ	---	---	<i>voice</i>
e.	ndə:r#wiɲ	ndər#wɛɲ	---	---	<i>big scorpion</i>

According to Sidwell's reconstruction (2000:39) there was a palatalization of final *k after long *i: in Stieng:

*k > c / *i:__

Reminder:

*i: > i (Sidwell 2000:29 and 47).

Strangely, Hauper's data do not reflect this split as the proto final velar is still a velar in the modern language:

*ɟi:k > ɟik

*səpi:k > pik

*... (Sidwell 2000:83-84)

So I presume that there is a mistake related to some transcription confusion, knowing that final –k is transcribed –c in Haupers & Haupers 1991 and the correct analysis may be:

*k > c / *i__ (ibid.)

Examples:

	<i>St. Bon09</i>	<i>St. Bon10</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(20) a.	bec	bec	bec /bæc/	*bik	to lie down
b.	tec	tec	tec /tæc/	*tik ~ *tæc	deaf

This analysis of palatalization of *k after long *i: fits in my data, except for one single example where the velar is not palatalized:

	<i>St. Bon09</i>	<i>St. Bon10</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(21)	kəm.lik	plek	pəlik /pəlik/	*pəni:k ~ *pəli:k	shoulder

Concerning the nasal velar, there is no palatalization of *ŋ either after long *i: and short *i in Stieng, according to Sidwell's reconstruction (2000:39): *ŋ > ŋ (see example 19.b. above).

One should note that [i] never occur in nasal velar rimes in my data.

So according to these different statements, I propose four interpretations:

a) Rimes -ic and -iŋ do not exist in my data, they are transcription mistakes and they should be revised respectively as -ik and -iŋ.

b) There is a synchronic palatalization of velars after /i/ - omitting the single example of rime -ik (see example (21)) - in my data.

c) In the dialect of Stieng reflected by my data, there was a diachronic palatalization of velars after *i:, followed by a shortening of *i:

*i:k > ik > ic
 *i:ŋ > iŋ > iŋ

d) In the dialect of Stieng reflected by my data, there was a diachronic palatalization of velars after long *i:

*i:k > ic
 *i:ŋ > iŋ

4.3.2 Central vowels

According to the rime table (4.1.1.), there is no short central vowel /ə/ in palatal rimes in my data.

In Haupers & Haupers' (1991) and Yeem's (1977) data, [e] is the only front vowel occurring in palatal rimes. Consequently, Sidwell interprets [e] as an allophone of /ə/ in that particular context:

/ə/ > [e]/ _ c, ɲ
 [ə]/ elsewhere (Sidwell 2000:30)

In my data, [e] is not the only front vowel occurring in palatal rimes as [i] can also occur before palatals –c and -ɲ (see above). However the status of these rimes with [i] remain unclear. Then Sidwell’s interpretations fit in my data and I assume that [e] is indeed an allophone of /ə/ before –c and -ɲ:

	<i>St. Bon09</i>	<i>St. Hau91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(22) a.	tec /təc/	tec /təc/	*tik ~ *təc	deaf
b.	bec /bəc/	bec /bəc/	*bik	to lie down
c.	dec /dəc/	dec /dəc/	*dəc	slave
d.	dɛɲ /dɛɲ/	dɛɲ /dɛɲ/	*dɛɲ	bamboo tube
e.	ɟɛɲ /ɟɛɲ/	ɟɛɲ /ɟɛɲ/	*ɟɛɲ	sew
	...			

4.3.3. Back vowels

Paralleling front vowels asymmetries with palatal rimes, we could predict less back vowels in labial rimes but it is not the case, apart from rimes with –w where back vowels never occur (see 4.3.4. below).

Then, in my corpus, there are many gaps with the short low back vowel /ɔ/ which may be meaningful as the proto-equivalent *ɔ was restricted to velar and glottal rimes (Sidwell 2000:48).

Recall the presumed lowering feeding phenomenon happening with back vowels (end of 3.2.2).

*u > o
/o/ → [ɔ]/__dental ; velar

*ɔ > ɔ
/ɔ/ > [ɑ]

4.3.4. Semi-consonant rimes and diphthongs asymmetries:

In a general point of view, a limited variety of vowels occur in semi-consonant rimes.

A noticeable asymmetry is that front vowels never occur with the semi-consonant palatal –j and similarly back vowels never occur with the semi-consonant labial –w:

*j / V [+ant; +high] ____
*w / V [+post; +high] ____²⁹

According to Swantesson (1988:72 in Sidwell 2000:13), this asymmetry is quite frequent among Mon-Khmer languages.

Another asymmetry is that front diphthong /ia/ never occurs in palatal rimes and back diphthong /ua/ never occurs in labial rimes.

4.4. Height asymmetries: the special case of [ə]

As announced part 3.2.2, we have to clarify the status of the central high vowel that I transcribed [ə] in my data, transcribed /ɨ/ (/ɨ/) in Haupers.

²⁹ Here * refers to “prohibited”.

According to Sidwell (2000:30), in Haupers' data, this vowel [ɨ] might not belong to the native vocalic system of Stieng but is rather a variant of /e/ after labials and velars:

/e/ > [ɨ]/ Lab. Vel.
[e]/ elsewhere³⁰ (ibid.)

This allophony is likely to be related to the development of the proto-front vowel *i (Sidwell 2000:49). However, both in Haupers data and my data, [ɨ] can also occur after palatal ch- and ʃ-, dental t- and s-, and glottal ʔ-:

	<i>St. Bon 09</i>	<i>St. Hau 91</i>	<i>*PSB Sid00</i>	<i>Gloss</i>
(23) a.	təp	---	*kətip	cockroach
b.	sən	sen ; sɨn /sen/	*sɨn	to cook
c.	chət	chɨt /cəhet/	*kəsɨt ~ *kəset	to die
d.	ʃəl	ʃɨl /ʃel/	*ʃɨl	deer
e.	kʔəp	kʔɨp /kʔep/	*kəʔɨp	centipede

Similarly, and regardless rimes with palatal -c, -ɲ (see rule in footnote 23), it appears that [e] can occur after labials and velars both in Haupers' data and my data:

	<i>St. Bon 09</i>	<i>St. Hau 91</i>	<i>*PSB Sid. 2000</i>	<i>Gloss</i>
(24) a.	beh	beh /beh/	*bəs	snake
b.	geh	geh /geh/	*gɨh ~ *geh	to snap
c.	pih ³¹	peh /peh/	*pih ~ *pi:h	knife
d.	---	keh	---	trigger
e.	---	kheh	---	to be poisonous
f.	---	geʔ	---	to be small

That said, according to my data, there is actually a complementary distribution between [ə] and [e] depending on the final context³²: [e] occurs only before glottal -ʔ, -h and [ə] occurs elsewhere. As [ə] occurs in the unconditioned environment I propose the following rule, in a strict synchronic point of view:

/ə/ → [e]/__ glottal
[ə] / elsewhere

But, for comparative purposes, another analysis is plausible:

³⁰ Reminder: /ə/ > [e] / __c, ɲ [ə]
/ elsewhere

³¹ Reminder : the rule *i: > e/ __h built by Sidwell (2000:47) with Haupers' data is not consistent with my data where *i: is only shortened to /i/.

³² I omit the rime -əh about which I am not quite sure comparing the words in which it occurs with Sidwell's reconstruction, Haupers data and my new data set (10). So I assume that there might be some transcription mistakes.

*i > /e/
 /e/ → [e]/__ glottal
 [ə] / elsewhere

With:

/ə/ > [e]/ _____ c, ɲ
 [ə]/ elsewhere

One should note indeed that in Chrau, a related South Bahnaric language, the system doesn't list the short front vowel /e/ (Thomas & Luc 1966 in Sidwell 2000:24). However the high front vowel /i/ has exactly the same distribution as /e/ from my data.

Then Sidwell gives the following interpretation for Chrau short vowels [i, ɨ, ə] (2000:25), which fits with mine:

/i/ > [i]/__ ʔ, h
 [ɨ]/elsewhere (Sidwell 2000:25)

/ə/ > [i]/ _____ c, ɲ
 [ə]/ elsewhere (ibid.)

As already mentioned, this problem is likely to be related to the development of *i.

One finally should note that Sidwell also found out that *i splited to /o/ before labials in Stieng Haupers' data:

*'Recalling that I reconstructed the split of *i to [e] and [ɨ] in Stieng, it appears that a further rule is required, namely *i split a third way, to [o] before labials. Consulting the Stieng lexicon, one finds no example of [e] or [ɨ] before labial terminals.'*
 Haupers (2000:48-49)

However, this statement is not consistent with my data, [ə] occurring before labial finals:

<i>Chrau</i>	<i>St. Hau91</i>	<i>St. Bon09</i>	<i>Köho</i>	<i>gloss</i>	<i>*PSB Sid00</i>
sim	com	(paj#penar)	si:m	bird	> * [ʔ] sim
kəʔip	kəʔop	kəʔop	kəʔip	centipede	> * kəʔip
cip	---	təp	tip	cockroach	> * kətɨp

5. Conclusion

We have seen that rimes first pattern depending on the length feature of vowels, into three kinds of rimes: open, glottal, closed.

In closed rimes, we notice a tendency of avoidance for vowel and consonant of same articulation point to co-occur especially with the semi-consonants (back and front vowels respectively with palatal and labial finals³³).

³³ That is not true with the fronted realization of /ə/ before palatals -c and -ɲ where, on the contrary, there is an assimilation of articulation point to [e].

Then the main point of this paper is that historical vowel shifts conditioned by the final context account for the synchronic distribution of vowels. Noticeably, the synchronic distribution of the front and back vowels is a consequence of a chain shift that involved a lowering of *u and *i to /o/ and /e/, and a shortening of *u: and *i: to /u/ and /i/ (argued by Sidwell 2000).

Thus vowels coming from *i and *u might have passed through different neutralization phenomenon, at different stages of the history of Stieng, as specified by Sidwell and outlined in this paper: ‘*There has been various neutralisations of /i/ and /u/ in the histories of Chrau and Stieng most often realized as [ɨ].*’ (Sidwell 2000: 49)

My data reflect the development of *i and *u in a split, respectively to [e] and [ə]; and [o] and [ɔ].

The paths the vowels took might not be the same from one Stieng dialect to another as we have seen by comparing my own data with Haupers’, unless my data reflect a more recent stage of Stieng evolution, as I conducted fieldwork about 50 years after Haupers. Nevertheless, it seems that in my data, vowels took paths that are more similar to Chrau’s, a related language, as we have seen with the shift of *e: in open rimes and the development of *i.

Finally, some vowel shifts or splits operating currently in the dialect of Kbaal Snul (my data 07-09) are visible, such as the lowering of /ɔ/ to [a] as a feeding phenomenon to compensate the lowered realization of /o/ before dentals and velars.

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Appendices

II. List of exceptions

Table A: *Loan words and expressives*

<i>Rime</i>	<i>Bon09</i>	<i>Bon10</i>	<i>Khmer</i>	<i>gloss</i>
ɛ:c	cɛ:c(#gə.na:)	cɛəc(#gə.na:)	ca:c	<i>to split (1)</i>
	trə.βɛ:c	tə.βeəc	traβac	<i>to split (2)</i>
	re:c(#da:k)	reəc(#da:k)	re:c(#tək)	<i>to carry water</i>
	wɛ:c	wɛəc	wɛ:c	<i>ladle</i>
ɛ:r	kβɛ:r	kβeər#gəna:	kβae	<i>near</i>
ej	sβej	sə.βej	spej	<i>mustard</i>
	pə.rej	pə.rej	barej	<i>cigaret</i>
ɛt	ʃɛt	ʃət	∅	<i>ten</i>
	grət#gret	grət#grat	kokrim#kokrəm	<i>rough</i>
ew	(paj#)mew	(pa:j#)mɛə	cma:	<i>cat</i>
ɛ:ŋ	re:ŋ	reəŋ	kra:ŋ	<i>plaited</i>
əp	həp	həp	kaɗəoj	<i>never mind ! (expressive)</i>
ɑ:k	cha:k	cha:ʔ	cha:ʔ	<i>blad</i>
	ka:k	ka:ʔ	ka:ʔ	<i>to freeze</i>
	sa:k	sa:ʔ	sa:ʔ	<i>to peel (with hand)</i>
ɑ:r	ʔɑ:r	ʔɑ:r	ʔɑ:	<i>pleased</i>
	ʔa.sa:r	ʔaʔ.sa:r	ʔak#sa:	<i>letter (alphabet)</i>
ɑ:	gɑ:	gɑ:	kɔə	<i>dumb</i>
uap	cuap	cuap	cuəp	<i>to meet</i>
	guap	---	pkuop	<i>to save</i>
uak	buak	---	puəʔ	<i>group</i>
	muak	---	muəʔ	<i>hat</i>
uaŋ	klaŋ#kluəŋ	---	laʔɑ:#laʔac	<i>Echo word - beautiful</i>
	cuaŋ	---	cuəŋ	<i>bell</i>
iac	wiac	keŋ	wiec	<i>curved</i>

Table B: Correspondence problem: presumed transcription mistake in Bon09

Rime	Bon09	Bon10	Hau91	*PSB Sid00	Khmer	Gloss
əh	təh(#piaŋ)	to:h(#piaŋ)	---	---	da:h#ba:j	to serve rice
	kəh	kəəh	(suôt)	---	kəok	dried
	ʔəh	ʔəəh	əh	---	chlaoj	answer
	təm.bəh	təm.bəəh	mbəh	---	prap	to tell, announce
	bəh	bəəh	(lôh)	(*luh)	mək	to come
	ləh	ləəh	ləh		thwə:	to do
əm	gəm	gəəm	gə:m /gə:m/	*gə:m	saoc	to laugh
	khaj#rə.ləm	khaj#rə.ləəm	rɿəm	---	khæ#wosa:	rainy season
	jəm	ɲəm(#sak)	nhôm	*ɲum	buəŋ	bun
on	kə.ŋon	n.ɲən	---	---	ceŋcu:n	to transport
	han#jon	hən#jən	---	---	cu:n	to accompany
	jon	jən	---	---	cu:n	to give sth to sb
	gon(#da:k)	gən(#da:k)	---	---	da:ŋ#tək	to draw water

Table C: Long central Vowels

Rime	Bon09	Bon10	Hau91	*PSB Sid00	Khmer	Gloss
ɿr	cɿr	ciər	crông	*kruŋ	trənuŋ	backbone (fish)
	pə.sɿr	pə.sɿər	---	---	sə:səə ; təsəə	to compliment
	hi:r	hiər	---	---	haə#poa	to change color
ɿɲ	di:ɲ	ʔa.doŋ	---	---	tiel	blunt
i:	chi:	chi:	jhú	---	chə:	tree, wood
	krə.bi:	krə.bi:	cərpú	---	krəbaej	water buffalo, carabao
	prə.ɗi:	prə.ɗi:	bərbhoe	*rum	pteji	spinach
	rə.si:	rə.si:	ʔjar ; rdéy	---	risej	bamboo
ət	kət	kiət	cət	---	kaət#ko:n	be born
ə:c	pə:c, bə:c	biəc	---	---	baoc	to remove the hair from
	chə:c	∅	srat ; chət	*srat ; *taŋ ~ *btaŋ	cat	sour, bitter
ək	pək	pək	pək	*pək	baək	to open
	bək	(pək)		---	baək	to drive
	dək	dək	dúrk	---	prohə:n	insolent
əm	n.cə:m	n.ciəm	---	---	ceŋ#caəm	eyebrow
	da:k#kə.sə:m	da:k#kə.siəm	tôc	*brju:h	tək#sənsaəm	dew
əm	sə:m	siəm	sôh	*su:h	saəm	wet
ən	blə.hə:n	blə.hiən	---	---	prohə:n	insolent
	mə:n	mən	múŋ	---	mə:n	ten thousand

ə:ŋ	pə:ŋ	pəŋ	---	---	pəəŋ	<i>to glide</i>
<i>Rime</i>	<i>Bon09</i>	<i>Bon10</i>	<i>Hau91</i>	<i>*PSB Sid00</i>	<i>Khmer</i>	<i>Gloss</i>
	(mak#)jə:ŋ	(mak#)jəŋ	---	---	khaŋ#cə:ŋ	<i>Nord</i>
	ʃim.ʎmə:ŋ	ʃim.ʎəŋ	ja ; rsôi	*gəja:	cəmbəəŋ	<i>thatch, straw</i>
ə:l	ḃə:l	ḃʎiəl	---	---	phniəp#ʎaəl	<i>to be surprised</i>
	gə:l	giəl	ndəm ləʃən	---	kə:l	<i>bumpy</i>
ə:j	hə:j	hiəj	huʃi	---	haəj	<i>already</i>
	mbə:j	mbiəj	mbəi, mbuʃi	*npa:w	jəl#səp	<i>dream</i>
ə:	krə.bə:	kə.bəw	cərbəʃ	(*ja:)	krəpə:	<i>crocodile</i>
	smə:#gə.na:	sməw#gə.na:			smaə#khniə	<i>to be equal to</i>
	rə:	rəw			rə:	<i>to disassemble</i>

II. Vowel correspondences

Table D: Long vowels

<i>PSB Sidwell (2000:47)</i>	<i>Stieng (Haupers 1991)</i>	<i>Bon (data 2007-09)</i>	<i>Chrau (Thomas & Luc 1966)</i>	<i>Environment</i>
*a: >	a:	a:	a:	
*ə: >	ə:	ə:	ə:	
*i: >	e i	i: i i	i: i: i:	/ __ Ø / __ h / elsewhere
*e: >	e: e: With: /e:/ > [ej] / __ #	ɛ: e:	ɛ: e:	/ __ Ø
*ɔ: >	ɔ:	ɔ:	ɔ:	
*u: >	o u	u: o u	u: u: u:	/ __ Ø / __ h / elsewhere
*uə >	uə	ua	uə	
*iə >	iə	ia	iə	

Table E: Short vowels

<i>Sidwell PSB (2000:47)</i>	<i>Stieng (Haupers 1991)</i>	<i>Bon (data 07-09)</i>	<i>Chrau (Thomas & Luc 1966)</i>	<i>Environnement</i>
*a >	a	a	a	
*ə >	ɛ e a ə With: *s > h / e__ /ə / > [e] / __c, ɲ [ə] / elsewhere	ɛ e o: # ə With: *s > h / e__ /ə / > [e] / __c, ɲ [ə] / elsewhere	ɛ i o ə	/ __glottals / __s / __w / elsewhere
*i >	o e With: /e / > [i] / Lab.Vel._ [e] / elsewhere	e e With: /e / > [e] / __glottal [e] / elsewhere	i i With: /i / > [e] / __glottal [i] / elsewhere	/ __Labial / elsewhere
*ɔ >	ɔ	ɔ With: ɔ > a	ɔ	/ __C [+ vel/glott]
*u >	u o o	o ɔ	i i u	/ __C [-nas, -son + dent/pal] / __C [-nas + son, + dent/pal] / elsewhere / __Dent, vel

Table F : Front Vowels - Exceptions

<i>Bon09</i>	<i>Bon10</i>	<i>Hau91</i>	<i>*PSB Sid00</i>	<i>English</i>
cim	ncem	siem, chiem /siəm/	*siəm	<i>to adopt</i>
dim	kə.dem	diem /diəm/	*diəm ~ *ʔiəm	<i>garlic</i>
(da:k#)mi:	(da:k#)mi:	mi: /mi:/	*mi:wh	<i>rain</i>
nhi:	ni:	ɲi: /ɲi:/	*həɲi:wh	<i>house</i>
gə.nɛ:ŋ	gə.neəŋ	---	*gəniəŋ ~ *gəne:ŋ	<i>tusk, canine tooth</i>

Remark: usually *iə correspond to /ia/ (Bon 09) (including -iaŋ rimes)

Table G: Central Vowels - Exceptions

<i>Bon09</i>	<i>Bon10</i>	<i>Hau91</i>	<i>*PSB Sid00</i>	<i>English</i>
wər	wər	wɔ̄ɔ̄r	cf. wər 808 p. 141 'stir'	<i>to crawl ; to go on all fours</i>
gəm	gəəm	gə:m /gə:m/	*gə:m	<i>to laugh</i>
bəh	bəəh	(lôh)	(*luh)	<i>to come</i>
ʔən	ʔəŋ	(geh)	(*geh)	<i>to have</i>
pət	pət	(tang)	(*taŋg)	<i>to close</i>
jəp	ɲɔp	nhôp	*ɲɔp	<i>to shake hands</i>
jəm	ɲəm(#sak)	nhôm	*ɲum	<i>to wear one's hair in a bun</i>
nʔnər	nʔnər	---	(*nir)	<i>catch fish with a shovel-shaped basket</i>
ʔəl		ʔil /ʔel/	*ʔil	<i>deer</i>
ndə:p	ndəəp		*nədəp	<i>to give</i>

Table H: Back Vowels - Exceptions

<i>Bon09</i>	<i>Bon10</i>	<i>Hau91</i>	<i>*PSB Sid00</i>	<i>English</i>
tur	tur	tɔ:r /tɔ:r/	*tɔ:r	<i>ear</i>
kos	ko:s	ko:s /ko:s/	*ko:s	<i>to shave</i>
(nak#)dos	(nak#)du:s	do:s /do:s/	*do:s	<i>guilty person</i>
jo:p	ɲɔp	ɲop /ɲop/	*ɲɔp	<i>catch, grab</i>
tə:m#dɔŋ	tə:m#dɔŋ	---	*dɔŋ	<i>coconut palm</i>
pə.ŋət#so:ŋ	pə.ŋət#so:ŋ	ŋɔ:t	*pəŋɔ:t	<i>to be hungry</i>
tut	tot	tɔ:t	*kətɔ:t	<i>skin sickness</i>
rəŋ.lo:ŋ#kɔ:	rəŋ.loŋ#kɔw	---	*rəŋɔŋ	<i>throat</i>