Restructured Register in Haroi: Reconstructing its Historical Origins

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1.0 THE HAROI VOWEL SYSTEM

For a Chamic language, Haroi has too many vowels. As Tegenfeldt-Mundhenk and Goschnick (1977, p.1) note at the beginning of their synchronic description of Haroi phonemes, in place of the nine or ten vowel systems found elsewhere in Chamic, Haroi has some 32 vowels. Table 1 illustrates the 16 basic vowels, each of which can occur short or long. The array of Haroi vowels is also unexpectedly rich from a diachronic perspective—most proto-Chamic (= PC) basic vowels have at least two Haroi reflexes.

Table 1. *Haroi Vowels (adapted from Tegenfeldt-Mundhenk and Goschnick, 1977)*

		front		central		back	
high:	closed	i	ia	ɨ	ɨa	u	ua
	open	ɪ				ʊ	
mid		e	eə	ə		o	oa
low		ɛ		a		ɔ	

Following the distinctions Henderson used in her survey of Southeast Asian phonetic and morphological patterns (1965, p. 402), the syllables of Haroi words are

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Symbols used: forms prefaced by a single asterisk (*) are proto-forms, forms prefaced by a double asterisk (**) are borrowings; forms followed by -i have an irregular initial, by -f have an irregular final, by -v have an irregular vowel, and by -t have an irregular tone. As the historical phonology is better understood, at least some of these apparent irregularities should disappear, while others will remain puzzles.

All the data ultimately come from the work of Tegenfeldt and Goschnick, but at various times they used different orthographical conventions for writing the forms, as have both Lee and Burnham in discussing their data. Without some sort of standardization, forms that are in reality identical look quite distinct! Thus, for the sake of sanity, the data have been converted into a single transcription system. The substitutions are transparent enough to be worked out in a couple of minutes.

either pretonic or tonic, with pretonic referring to unstressed presyllables and tonic referring to stressed main syllables. All monosyllables are tonic, that is, stressed; and, all disyllabic words consist of a pretonic presyllable followed by a tonic main syllable, with the pretonic syllable restricted to a single onset consonant followed by schwa. In the pretonic syllables, there are no vowel contrasts. However, in the tonic main syllables are some 32 contrasting vowels: 11 simple vowels, each occurring both long and short, and 10 diphthongs. If the 10 rarely occurring nasalized vowels are also counted, the total would rise to 42, a total not all that large by comparison with Mon-Khmer languages, but quite large by Austronesian standards.

Modern Haroi has what Huffman (1976) termed a restructured register system. Under influence from Mon-Khmer languages in the area, after certain classes of initials, Haroi developed certain phonation distinctions on vowels. At this point, it was still possible to predict the phonation types on vowels from the initial consonants. However, the partial merger of voiceless and voiced obstruents, coupled with borrowings from neighboring Mon-Khmer languages, left it impossible to predict the phonation distinctions from the syllable-initial consonants. At this point Haroi had developed into a register language: that is, it had two (or more) sets of vowels distinguished by phonation type. If the vowels did not do so immediately, these vowel registers came to differ not only in phonation type, but also in vowel quality. Then, with the loss of the phonation type differences, the originally predictable vowel quality differences became phonemic—Haroi was now a restructured register system.

Even in Modern Haroi, several of the phonological subsystems retain unmistakable distributional evidence of registrally-influenced restructuring. In monosyllabic words, the vowel splitting patterns correlate directly with the manner of the PC root initial consonant. In disyllabic words, there is evidence of the spreading of phonation distinctions from the pretonic syllable to the main syllable, a pattern that is inexplicable unless pre-Haroi had earlier phonation distinctions. Further, there is a pattern of vocalic assimilation that is restricted to resonant initials, a restriction that only makes sense in the context of a register system. And, finally, there is a particular distribution to the reflexes of *s- and *h- that again only makes sense if there was an earlier register system.

The distributional evidence suggests an earlier three-way phonation distinction, with each phonation type correlated with a distinct class of PC syllable-initial consonants—the voiced obstruents, the voiceless obstruents, and a third group, consisting of the glottalized obstruents and the resonants.

2.0 THE VOWEL SPLITS

There are two wide-spread vowel splits in Haroi that correlate with classes of PC initial consonants: the lowering of certain vowels after PC voiceless stops and affricates and the raising of certain vowels after PC voiced obstruents. Note that it was not the PC initials themselves that caused the vowel movements, but rather phonation distinctions that developed much, much earlier from specific classes of PC initials. In any case, these vowel splitting patterns are pervasive in the Haroi lexicon, applying not only to the entire inherited lexicon but to many of the older borrowings as well. This pattern of vowel restructuring is of a kind only associated with register

systems, and thus, almost by itself, is strong evidence that modern Haroi is a restructured register system.

For the monosyllables, the vowel splits correlate directly with the manner of articulation of the PC syllable-initial consonant. Following the voiceless obstruents— but not the other initials, the pre-Haroi high vowels *-u and *-i and the diphthong *-ui lowered. Following the voiced obstruents, but not the other initials, the mid and low vowels rose. Following both the glottalized initials and the resonants, except for some vowel harmony, all the pre-Haroi vowels stayed in place.

For many of the disyllabic roots, there is no evidence that the pretonic syllable had any effect on the main-syllable vowel-splitting pattern. As one might expect, if the initials of both syllables agree in manner of articulation, the pretonic syllable has no effect on the main-syllable vowel-split pattern. And, even if the two initials conflict in manner, the pretonic syllable-initial may have no effect on the main-syllable vowel splits; specifically, if the main syllable began with a voiced obstruent or with a voiceless obstruent, the initial of the pretonic syllable was irrelevant to the vowel splitting. In such cases, it was not necessary to draw a distinction between monosyllabic and disyllabic roots.

2.1 Vowel Lowering after Voiceless Obstruents

Vowel lowering occurred after PC voiceless obstruents. Table 2 shows that, following the voiceless obstruents but not other initials, the pre-Haroi high vowels *-u and *-i and the high diphthong *-ui lowered. Table 3 provides specific examples.

Table 2. *Vowel Splits after Voiceless Obstruents*

proto-Chamic	pre-Haroi	voiceless obstruents	glottalized obstruents	resonants	voiced obstruents
*-i >	*-i	> -ei /__ʔ, #	-i	-i	-i, -ɪ
		> -e / other			
*-u >	*-u	> -ou < *uː	-u	-u	-u
		-ou / ___#			
		-o / other			
*-uc >	*-uiʔ	> -oiʔ	-uiʔ	---	---
*-ui >	*-ui	> -oi	---	---	-ui

Note: The distinction between -i and -ɪ is problematic on at least two counts. In my data, it only occurs after the voiced obstruents, but without any apparent distribution pattern. Then, it is possible that the distinction itself does not even exist: it may be nothing more than a phantom, produced by inaccurate guesses about hard-to-read materials.

Table 3. *Splits after Voiceless Obstruents (Examples)*

	Proto-Chamic	Haroi
'a comb'	*tasi, *kasi	cəsei
'absent'	*luku:t	ləkouʔ
'bird'	**cim	cem
'bitter; bile'	*phiʔ	pheiʔ
'boil; cook''	*sitŭk	ʔatoʔ
'descend'	*trun	trŏn
'dry'	*thu	thoù
'fart'	*kutu:t	kətouʔ, tout
'fire'	*ʔapui	ʔapoi
'flour'	*tupŭŋ	cəpŏŋ
'kiss; smell'	**cŭm	cŏm
'salted; salty'	*masĭn	msĕn
'sea; ocean'	*tasiʔ	cəseiʔ
'shavings'	*ʔasu:k	ʔasouʔ
'tail'	*ʔiku	ʔakoù
'to follow'	*tui	toi (auxiliary verb)
'to pour'	*tuh	tŏh, cətŏh
'to receive'	*tu:ʔ	touʔ
'white'	*pitih	pətĕh
'year'	*thun	thŏn, thon

In both Tables 2 and 3, note that it is only the two high monophthongs and the high diphthong *-ui that were lowered after a voiceless obstruent. The forms with the double asterisk are early borrowings into pre-Chamic from Mon-Khmer, but which must be reconstructed for PC. Note that these forms are quite regular with respect to their Haroi reflexes.

2.2 Vowel raising after voiced obstruents

Vowel raising occurred after voiced obstruents. Table 4 shows that, following the voiced obstruents but not other initials, the pre-Haroi mid and low vowels rose. The vowels following other initials remained in place.

Table 4. *Splits after Voiced Obstruents (the Patterns)*

proto-Chamic		pre-Haroi		voiceless obstruents	glottalized obstruents	resonants (a)	(b)	voiced obstruents
*-ia-	>	*-ea-,	>	-ea-,	-ea-,	-ea-,		----,
		*-ɛaʔ	>	-ɛaʔ	-ɛaʔ	-ɛaʔ;	-iaʔ	-iaʔ
*-iau	>	*-eau	>	-eau	----	-ɛau;	-iau	-iau
*-iya	>	*-ɛa	>	-ɛa	----	-ɛa		-ia
*-ua	>	*-oa	>	-oa-	-oa-	-oa-;	-ua-	-ua
*-uə-	>	*-ɔɔ-	>	-ɔ-	----	----		-uɔ-
*-ə	>	*-ɔ	>	-ɔ-	----	-ɔ-		-uɔ /___l, r
*-o	>	*-o	>	-ɔ-	-ɔ-	-ɔ-;	-u-	-u, -ʊ
*-əi	>	*-ɔi	>	-ɔ̆i	----	-ɔ̆i		-ɨi; -ui
*-e	>	*-e	>	-ɛ	-ɛ	-ɛ		-ʊ
*-ə	>	*-ɔ	>	---	-i- ÷	-i-		-ɨ /___ŋ, -h
*-ə	>	*-ă	>	---	-ă-	----		-iă /___m
*-ay	>	*-ay	>	-ăi	-ăi	-ăi		-iai
*-au	>	*-au	>	-au	-au	-au		-iau
*-əu	>	*-ău	>	-ău	-ău	-ău		-ɨau
*-ac	>	*-ac	>	----	-aiʔ	----		-iaiʔ
*-a	>	*-a	>	-a	-a	-a;	-ia	-ia
*-ap	>	*-ap	>	-auʔ	----	---;	-iau/	----

Note 1: The dual reflexes in the set for *i only occur after the voiced obstruents. If the distinction in reflexes is real, it is not clear how to account for it. The -ɪ might be the result of vowel harmony since in both examples PC has a -u- in the first syllable and in both examples the medial is a voiced bilabial stop, in one case involving a plain *b- and in the other involving a *br-, but without more information, it is impossible to determine.

Note 2: The diphthongization patterns are parallel but not identical for both vowels. The *-e > *-ei word-finally and before Haroi final glottal stops, remaining e elsewhere. The vowel *-u > -ou word-finally; long *-uː > -ou before Haroi final glottal stops; elsewhere *-u and *-uː became -o (Burnham, 1976).

Note 3: Both final *-u and final *-i are secondary developments in Pre-Chamic. The earlier proto-Austronesian finals *-u and *-i first went to *-əu and *-əy, respectively, before a new set of Chamic final *-i's and *-u's developed. Some were borrowed in, and some were developed secondarily through the loss of final *-r, cf. Haroi *iku* and Malay *ekor* 'tail.'

In Table 4, there has been some internal reconstruction of the pre-Haroi values for certain vowels, given that these vowels have multiple values in modern Haroi. It is important to note that the correlations between the PC consonant manners and the Haroi vowel splits are independent of the internal reconstruction of vowels. The motivation for doing some internal reconstruction of the vowel qualities lies, not in establishing correlations, but in making sense of them. If the vowels of PC are compared directly with the vowels of modern Haroi, without any internal reconstruction whatsoever, the effects of individual registers look unaccountably random, sometimes raising vowel height and at other times lowering it. After the internal reconstruction, however, the effects of individual registers are no longer random—each of the three registers is associated with a specific pattern of change.

Specifically, the first five patterns in Table 4 (four diphthongs as well as the "constellation" *-iya) were internally reconstructed to recover their vowel quality in pre-Haroi at a time prior to the vowel splits. In the first three, the onset was lowered, in part reflecting a partial assimilation in vowel height. In both the fourth and fifth patterns, the *-ə went to ɔ. In the fourth pattern, the onset *-u of *-uə also lowered in a way paralleling the lowering of the onset in the first three patterns.

Both Lee (1977) and Burnham (1976) noticed that, if the initial of the main syllable was a PC voiced obstruent, the modern Haroi vowel was affected (Table 5).

Table 5. *Splits after Voiced Obstruents (Examples)*

	Proto-Chamic	Pre-Haroi		Haroi
'ant'	*sidəm	> *hadăm	>	ʔathĭam
'ashes'	*habəu	> *habau	>	ʔaphĭau
'awaken'	*madəh	> *mədɔh	>	mthĭh
'bring; carry'	*ba	> *ba	>	phia
'bury'	*dər	> *dɔl	>	thuɔl
'exclaim'	*driau	> *drɛau	>	trĭau
'forest; wild'	*glay	> *glay	>	tĭai cf. tlua
'look for'	*həduah	> *hadoah	>	ʔathuah
'paddy'	*paday	> *pəday	>	pəthĭai
'pole; post'	*gəŋ	> *gɔŋ	>	khĭŋ
'rain'	*hujaːn	> *hajaːn	>	ʔasĭan, ʔasian
'remember'	*sidər	> *hathɔl	>	ʔathuɔl

Table 5 continues.

	Proto-Chamic	Pre-Haroi		Haroi
'seed'	**bijeh	> *bəjeh	>	pəsɪh
'taro; yam'	*hubəi	> *habəi	>	ʔaphui
'to cover'	*gəm	> *găm	>	khɨam
'to fell'	*druəm	> *drɔɔm	>	truɔm
'tooth'	*digəi	> *cəgɔi	>	cəkhɨi
'two'	*dua	> *dɔa	>	thua

The Haroi forms all have raised vowels. The reconstructions with double asterisks are early Mon-Khmer loans into Chamic, but loans that were borrowed so early that they have undergone the register-induced vowel splitting.

Parallel developments have occurred in Western Cham, Eastern Cham, and Tsat. In Western Cham, voiced obstruents led to second register. In Eastern Cham, voiced obstruents led to reflexes with certain phonation qualities as well as lower pitch. And, in Tsat (a Chamic language of Hainan), voiced obstruents have had a tone-lowering effect.

3.0 SPREADING FROM THE PRETONIC SYLLABLE

The patterning of vowel splits after main-syllable initial resonants sometimes differed depending upon the consonant of the pretonic syllable. If the pretonic syllable initial was a *s- or *h-, the initial resonant of the main syllable still determined the vowel-split pattern. However, if the pretonic syllable initial was a voiced obstruent or a voiceless obstruent (other than *s- or *h-), *the PC initial of the pretonic syllable determined the vowel split pattern of the main syllable*. That is, some "effect" of the pretonic syllable initial seemed to "spread" to the main syllable, a process that only makes sense if we are dealing with registers. Clearly, what "spread" from the pretonic syllable was a phonation type, that is, a specific register, not the pretonic syllable manner of articulation.

In pre-Haroi, two types of spreading through resonants occurred: In the first, the effects of a pretonic syllable voiceless stop (or affricate) spread through a medial resonant. As a result, the vowel reflex of the main syllable is the reflex expected after initial voiceless stops (and affricates), not the vowel reflex expected after initial resonants. In the second pattern of spreading, the effects of a pretonic syllable voiced obstruent spread through a medial resonant. As a result, the vowel reflex of the main syllable is the reflex expected after initial voiced obstruents, not the vowel reflex expected after initial resonants.

3.1 Spreading and Voiceless Stops and Affricates

The examples in Table 6 show forms in which the vowel reflex of the main syllable is the reflex expected after initial voiceless stops (and affricates), not the vowel reflex expected after initial resonants. That is, the main vowel reflex is predictable, not from the resonant initial of the main syllable, but from the voiceless

stop initial of the pretonic syllable. Specifically, the PC high vowels *-i and *-u do not lower after resonants but do lower after voiceless stops.

In Table 6, the word for 'tree; wood' is included, not because of what happened, but because of what did not happen: despite following a medial *-y-, the **-əu > *-ău did not raise to *-iau. Parallel to the reflexes of the other words in Table 6, the vowel reflex is what is expected after a voiceless stop, but not what is expected after an initial *y- (cf. the forms discussed in section 4.0). That is, the voiceless stop initial of the pretonic syllable, not the *y- of the main syllable, is determining the vowel reflex.

Table 6. *Voiceless Stops Spreading through Resonants*

	Proto-Chamic	Haroi
'flat (of large rocks)'	*tili	cəlei
'grow'	*tumuh	cəmoh
'last, lastborn'	**taluc	cəloiʔ
'miserly'	*kalih	kəleh
'skin'	*kulit	kəleĭʔ
'we (ex.)'	*kami	kəmei hăi
'yellow; tumeric'	*kuñit	kəñeĭʔ
'tree; wood'	*kayəu	kəyău

3.2 Spreading and the Voiced Obstruents

As both Burnham (1976) and Lee (1977, p. 89) noticed, if in PC the initial of the pretonic syllable was a voiced obstruent and the initial of the main syllable was a resonant, it was the voiced obstruent of the pretonic syllable that determined the vowel reflex. This phenomenon is quite evident in the data in Table 7.

Table 7. *Voiced Obstruents Spreading through Resonants*

	Proto-Chamic	Haroi
'banana blossom'	*bumo:ŋ -f	pəmuŋ
'blood'	*darah	cəriah
'body hair'	*biləu	pəliau
'cloud'	*gunam	kəniam
'crocodile'	*biya	pəyia
'deep; inside'	*dalam	cəliam
'flower'	*buŋa	pəŋia

Table 7 continues.

	Proto-Chamic	Haroi
'lake'	*danau	cəniau 'pond'
'moon; month'	*bilaːn	pəɬian
'return; go home'	*gulac	kəɬiaiʔ
'road; path'	*jalaːn	cəɬian
'shoulder'	*bara	pria
'swell; swollen'	*barah	pəriah
'thorn'	*durəi	cərii
'tongue'	*dilah	cəliah

Parallel instances of what were presumably breathy-voiced phonation spreading through medial resonants occurred in Western Cham, where it results in second register; in Eastern Cham, where it lowers pitch; and, in Tsat, where it results in lower tones.

4.0 VOWEL ASSIMILATION AND RESONANTS

Both Lee (1977) and Burnham (1976) noticed that in the derivation of modern Haroi vowels from PC, there is a small number of forms with an unexpectedly high vowel reflex, although they were unable to formulate the precise conditions under which the assimilation took place. Note that all the forms in Table 8 show the effects of raising, including the forms with a *-ua rhyme since in pre-Haroi, the *-ua had been -oa, not -ua.

It turns out, however, this is an assimilatory vowel-raising rule that only affects vowels in syllables with resonant initials. That is, for monosyllabic roots, vowel raising occurred if the syllable onset was the resonant *y-. For disyllabic roots, the vowel raising occurs if two conditions are met: First, the process was limited to roots in which the main syllable begins with a resonant, and the pretonic syllable begins with either a resonant, a *s-, or an *h-. Then, assimilation took place if either the main syllable began with *y-, or if the vowel of the pretonic syllable was a Proto-Chamic high vowel, *-u or *-i. See Table 8.

5.0 INITIAL REFLEXES AND RESONANTS

In disyllabic forms when *s- or *h- is the initial of the pretonic syllable, there is a split in the reflexes. In pre-Haroi pretonic syllables, both PC initial *s- and *h- fell together as *h-. The modern Haroi reflexes depend upon the initial of the main syllable: in forms with main syllable initial resonants, the *h- is retained. However, in forms with voiceless stops or voiced obstruents as the initial of the main syllable, the *h- was lost, leaving the pretonic syllable without an initial consonant. In cases where

the *h- was lost, the form subsequently added a word-initial glottal stop. See Tables 9 & 10.

Table 8. *Vowel Assimilation with Resonant Initials*

		Proto-Chamic	Haroi
Set I:	'big'	*rəya ?	ləyɨa
	'count'	*yaːp	yɨauʔ
	'ginger'	*liya	ləyɨa
	'harvest (rice)'	*hayuak	yuaʔ
	'spirit; god'	*yaːŋ	yɨaŋ
	'use'	*yua	yua
	'Vietnamese'	*yuǎn	yuon -v
Set II:	'five'	*lima	ləmɨa
	'ladder'	*riɲaːn	ləɲian
	'mother; big'	*ʔina	ʔanɨa
	'to drink'	*minǎm	məɲɨam
	'elephant'	*lumaːn	ləmɨan
	'fat, grease, oil'	**lumǎʔ	ləmɨaʔ
	'snake'	*ʔula	ʔalɨa
	'tiger'	*lumoːŋ	ləmùŋ
	'day; sun'	*hurəi	hərɨi
	'dry field'	*huma	həmɨa cəla
	'prompt; on time'	*sumau	həmɨau

Table 9. *Reflexes of *s- and *h- (in the Pretonic Syllable)*

proto-Chamic	Pre-Haroi		voiceless obstruents	glottalized obstruents	resonants	voiced obstruents
*sVCV >	*hVCV	>				
*hVCV >	*hVCV	>	ʔaCV	---	haCV	ʔaCV

The absence of examples with glottalized initials reflects the fact that most glottalized forms are monosyllabic.

Table 10. *Reflexes of *s- and *h- (in the Pretonic Syllable)*

	Proto-Chamic		Pre-Haroi		Haroi
'liver'	*hatay	>	*hatăi	>	ʔatăi
'boil; cook'	*satŭk	>	*hatoʔ	>	ʔatoʔ
'rattan' (generic?)	*haway	>	*həwăi	>	həwăi
'right (side)'	*hanuaʔ	>	*hənoa/	>	hənoaʔ
'roast; parch'	*sana	>	*həna	>	həna
'sip; slurp; suck in'	*sariːp	>	*hərip	>	hərip
'how much, many?'	*haduːm	>	*hathŭm	>	ʔathŭm
'look for; search'	*həduah	>	*hathuah	>	ʔathuah
'ant'	*sidəm	>	*hathĭam	>	ʔathĭam
'remember'	*sidər	>	*hathuɔl	>	ʔathuɔl

Parallels in which distinct phonation types have resulted in distinct reflexes of initial consonants can be found in Mandarin, in Sani and Ahi (Lolo-Burmese languages), in Thai, and elsewhere (cf. Thurgood, 1980, and many other sources).

6.0 SPECULATION ON THE PHONETICS

The evidence for earlier phonation type distinctions leading to register distinctions is indisputable. The presence of classes of vowel quality distinctions correlated with specific classes of PC initial consonants would, by itself, point to earlier phonation type distinctions. The presence of "spreading," in which a set of vowel quality distinctions correlates, not with the immediately preceding initial but with a consonant beginning the preceding syllable, finds its most plausible explanation in the behavior of phonation distinctions. And, although this additional evidence is hardly necessary to establish a case for register, the distinct reflexes for *s- and *h- depending upon the nature of the initial of the main syllable, represent a phenomenon commonly associated with register distinctions. In any case, the particular constellation of features, in conjunction with the indisputable evidence of close, intimate contact with speakers of languages with register systems, makes it obvious that Haroi is a restructured register system.

Thus, the question is not whether there were earlier register distinctions in Haroi—there obviously were. Rather what remains is speculation about the precise nature of the phonetics of the three-way register distinction. That is, what were the precise phonetics of the register associated with voiced obstruents, of the register

associated with voiceless stops and affricates, and the register associated with the remaining initial consonants?

With the voiced obstruents, almost without question, the specific phonation type was breathy voice. References to associations between breathiness and the PC voiced obstruents are found scattered throughout the literature. For example, Fuller (1977, p. 85) writes of Chru:

> Chru seems to have a non-contrastive feature of register in which the vowel and sometimes the syllable has a lax, breathy quality or a tense clear quality. Often the breathy quality is a concomitant of length in the vowel and voicing of the syllable initial stop.

In addition, breathiness is in line with typological expectations. The correlation between breathiness and voiced obstruents is found in the so-called "second register" of the Mon-Khmer languages (Henderson, 1952). Extra-Chamic historical parallels for the association between voiced consonants, breathiness, and the change *b- > ph- are also relatively abundant, cf. the developments in Thai, Burmese, and so on. Parallels between voiced obstruents, breathiness, and vowel splits involving vowel raising are found in Mon-Khmer.

With the voiceless obstruents, the specific phonation type was most likely some sort of tense voice (cf. the Fuller quote, above), rather than a modal, or clear voice since, whatever the phonation was, it affected the vowel quality (in a way somewhat parallel to the "first register" of Mon-Khmer (Henderson, 1952)), while the remaining initials must be associated with clear (or, modal) voice, as the register associated with the remaining initials had no apparent affect on vowel quality. Certainly without additional instrumental investigation of the Haroi and closely-related Chamic languages, questions about the phonetics will remain speculative.

7.0 CONCLUSION

The internal path of change by which Haroi moved from Proto-Chamic to the register system of early Haroi to the restructured register system of Modern Haroi is relatively easy to discover. There is abundant distributional evidence left in the restructured register system of modern Haroi to allow us to do a remarkably good job of reconstructing an earlier three-way register distinction and even to make reasonably good guesses about the earlier phonetics. In this way, a little bit of comparative work combined with a little comparative work makes it possible to piece together a rather rich picture of a pre-Haroi phonological system that is typologically quite different from that of its modern descendant.

This is not the whole story, however. Although they have been the primary focus of this paper, the internal paths are only part of the story—language contact played an equally important role in the ultimate outcome (Thurgood, in preparation). Language contact provided both the impetus and the direction for the change.

Even more than is typical for Chamic as a whole, Haroi shows evidence of intense contact with Mon-Khmer speakers—particularly with Bahnar speakers. Tegenfeldt-Mundhenk and Goschnick (1977, p. 2), for example, note in passing that there are more Bahnar loanwords in Haroi than in either Rade or Jarai; other writers have even referred to the Haroi as Bahnar Cham. Typologically the pre-Haroi registral system brought out by the historical reconstruction converges sharply with the registral systems of the neighboring Mon-Khmer languages. Further, the typological similarities between Bahnar and Haroi are matched by parallel paths of

historical change—the evidence suggests that Bahnar, which like Haroi was once a register language, has become a restructured register language. However, the external influences are best discussed elsewhere.

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Tones in Standard Thai Connected Speech[1]

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INTRODUCTION

The five tones of Standard Thai—mid, low, falling, high, and rising—have been studied for many decades from several different angles. As far as instrumental studies are concerned, the tones were first analysed in the context of monosyllabic words spoken in isolation (Bradley, 1911; Abramson, 1962; Erickson, 1974). Later tones on longer utterances were analysed to address the issues of coarticulation (Abramson, 1979; Gandour, Potisuk, & Dechongkit, 1994) and tonal representation (Gandour, 1975). There was also a study analysing the five tones in unstressed syllables in disyllabic words spoken in isolation (Phinicharom, 1991), and there were sociolinguistic studies to correlate variation in tonal realization with speakers' age groups (Arunreung, 1990; Panroj, 1991).

In the studies mentioned above, Standard Thai was chosen because it is the official variety of Thai "spoken by educated speakers in every part of Thailand, used in news broadcasts on radio and television, taught in school, and described in grammar books and dictionaries" (Tingsabadh & Abramson, 1993). In this study we have a different reason for choosing Standard Thai. We are interested in tonal variation among the sub-dialects of Central Thai, a number of which have been analysed (Tingsabadh, 1980, 1990; Debavalya, 1983; Ratanadilok Na Phuket, 1983; Malaichalern, 1988; Nualjansaeng, 1992; Banditkul, 1993; Pornsib, 1994; Krisnapan, 1995). Although from the sociolinguistic point of view Standard Thai has a different status from that of Central Thai, it can be classified as Central Thai on the basis of its tone system and its pattern of tone splits (Gedney, 1972; Brown, 1965). Consequently, we decided to turn our attention to Standard Thai. There are two main objectives in this study: to add tonal realizations of Standard Thai to our set of results, and to test the methodology that we have developed so far.

Tones of Thai dialects have been investigated since the 1950s (Miller, 1956; Chantavibulya, 1956; Haas, 1958). Up to recently, most of the studies analysed tones auditorily and their data were limited to monosyllabic words spoken in isolation (i.e., citation forms) (Pudhitanakul, 1979; Withayasakphan, 1979; Ngourungsi, 1980; Debavalya, 1983). The methodology that we now use concentrates on instrumental analysis, and our data come mainly from connected speech. We do include a set of words minimally distinguished by tone (i.e, a tone set) in our data, as we have come to believe that the tonal realizations in these words are the base forms of the tones (Tingsabadh & Krisnapan, 1992).

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