

The –VC Rhyme Link Between Bahnaric and Katuic

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1. Background*

An incredible advance in Southeast Asian linguistics was made when bondage to alphabetical dictionaries and the resultant word-initial focus was broken and investigators started giving equal or greater priority consideration to the ends, rather than to the beginnings, of words. This attention has been increasing during the past three decades.

Without making an attempt to be exhaustive but using only the limited resources at my disposal during a time of personal transition and using (with one exception) only Vietnam language materials, note the following development:

In 1955 Lê văn Hùng's *Vietnamese-English Dictionary* included in the introductory Phonetics notes a section titled "Diphthongs" in which are listed 119 orthographic vowel plus final consonant clusters with their phonetic equivalents. Tone is not included.

In 1961 Phillips included in his Hrê dictionary a chart of "vowel-plus-consonant combinations". Using a matrix of 13 vowels (glided vowels are grouped with their unglided onset vowels) and 18 final consonants, only 190 cells (of 234 maximum) are filled. On two following pages discussion of Hrê dialects is given in terms of these final –VC combinations (see Phillips 1973).

Later Wallace and Thomas (1964) and K. Smith (1964) proposed the rhyming dictionary and the productive "word-wheel" as means to focus on the vowel plus final consonant clusters which the young SIL linguists were encountering in the Vietnam highlands.

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In the next year Thomas (1965) formally proposed the use of rhyming dictionaries, admitting: "My own work on Chrau phonology could have been shortened by a couple of months if I had used a rhyming method from the start, rather than relying on minimal pairs" (Thomas 1965:99). He describes the principle and method as follows:

The rhyming method is based on the principle that a total system must be seen in a single frame, as different frames may produce different systems. Ideally this would require that a full vowel set be found in every minimal environment. But this is an impossible requirement. To find a full set of 20-40 vowels (or vowel sequences) in just a single minimal environment seems nearly impossible, much less can they be found for every environment. In order to compensate for this lack of minimal sets, quantity of semi-contrastive material is substituted analytically for the quality of minimally-contrastive sets.

It has been observed that the final consonants in the monosyllabic or semi-monosyllabic languages of Vietnam usually have more effect on the vowel system than do the initial consonants. Final consonants are usually fairly simple and unambiguous. So assuming that the initial consonants will have relatively little effect on the total vowel system, we identify and contrast vowels in terms of the final consonants with which they occur. Vowel shiftings, neutralizations, and system changes can then be kept under control. Occasional cases where initial consonants affect the vowel analysis will usually show up fairly plainly. The simple general procedure is as follows . . . (Thomas 1965:99-100).

(His footnote 2: "The principle is of course not new. James Cooper has called to my attention the Chinese rhyme book *Ts'ie yun* of 600 A.D. [cf. Karlgren, *The Chinese Language*, p. 35.]")

In 1967 Thomas and M. Smith published a reconstruction of Proto-Jeh-Halang. Though Jeh and Halang are relatively close languages (76 percent cognate), yet vowel shifts required detailed statements in terms of the following conditioning final consonant for each reconstructed vowel. Only five (of 21) reconstructed vowels were described with a single set of vowel correspondences; seven vowels had two sets of correspondences while 8 vowels had three sets of correspondences; and one vowel even had four sets. This highlights our observation that these vowel systems are definitely and primarily affected by the following final consonant.

During the last half of that decade a number of rhyming dictionaries were begun in Southeast Asian languages (though made available only more recently); among them are the rhyming dictionaries in the Rengao, Jeh, Cua, Pacoh and Ngeq languages (see Section 2 for references).

K. Smith (1972) began a Proto-North-Bahnaric phonological reconstruction monograph with the statement:

Though opposite of normal word order it is necessary to start the presentation first with the final vowel-consonant combinations inasmuch as these most conclusively indicate the relationship between the descendant languages. The remaining sections on the initial consonants and consonant clusters and the presyllables then fall clearly in place. (p. 3)

and:

In this paper all reconstructed vowels and final consonants are brought together so that the overall effect on the vowels by a given final consonant can be clearly seen. (p. 4)

A study in 1973 by Gregerson and Smith details the development of register in Todrah and Sedang from the Proto-North-Bahnaric register system strictly in terms of 14 basic vowel plus final consonant cluster types. Each cluster type is shown to have evolved in a unique way in the descendant languages.

In 1974 attention was given to frequency as well as distribution of vowels and final consonant combinations in K. Smith (1974). The study details many aspects of phoneme frequency and distribution in Sedang because of the need in literacy materials for early introduction of productive new symbols and for avoidance of non-occurring combinations. All such statistics are incorporated in Smith (1975). This latter study states:

Vowels and final-consonants form an important –VC_f cluster requiring an interrelated discussion of both vowels and final consonants because a different set of vowels is found to occur with each final consonant; i.e. not all vowels occur with all final consonants. More important, "register" is an integral part of this –VC_f cluster in that not all final consonants or otherwise permitted vowel plus final-consonant clusters occur with both registers. . . The interdependence of each entity of the vowel plus final consonant cluster will be noted in the following subsections that discuss, in turn, register, simple vowels, vowel glides, final consonants, and nasalization.

In contrast with analyses of other Southeast Asian languages where there is an awkward attempt to equate initial, final and presyllable consonants, or to make them subsets of a single consonant inventory, this writer took a different position which further highlights the final –VC cluster:

The dissimilarity of the final consonant inventory from the initial single consonant inventory, as well as from the presyllable consonant inventory, recommends the establishment of a separate consonantal system for each consonantal position of the phonological word.

Lastly, two non-Austroasiatic works:

Rhyming Dictionary of Written Burmese (anon., 1976). James Matisoff's introduction gives the background:

The Written Burmese (WB) Rhyming Dictionary was compiled in 1940 or 1941 by a staff of anonymous drudges, who were instructed to go through the entire Burmese-English Dictionary of Adoniram Judson, putting virtually all the entries onto fileslips, and regrouping them according to their **rhyme** rather than their initial consonant... (The advantages of a rhyming dictionary for comparative-historical linguistics are obvious. Suppose you are working with a cognate set whose Loloish reflexes could point to either an **-im* or an **-in* rhyme—a search through the Burmese Rhyming Dictionary will tell you in 30 seconds whether the WB cognate [if any!] has *-im* or *-in*.)... Since everyone is unanimous in praising its usefulness, now seems the time to share it with the world at large. Perhaps it will inspire others to compile similar reworkings of the dictionaries of other TB languages.

Or, we would prefer, "of other Southeast Asian languages."

Mundhenk and Goschnick (1977) present in their phonological statement of Haroi (a Chamic language of Vietnam) a frequency and distribution chart of Haroi vowels and final consonants. The 32 x 16 matrix distinguishes between structural and non-structural holes in the chart. Only 287 of the 512 cells are filled. The high occurrence of final *-ng* (18.5% of all words end in *-ng*) and the high frequency *-VC* combinations¹ reveal the areal phonological patterns adopted by Haroi.

2. Introduction

The above background begins to show the benefits of giving special attention to the word-final *-VC* combinations. Such attention will:

- aid phonological analyses of area languages;
- call attention to the uneven occurrences of vowels and final consonants with each other;
- show some vowels and some final consonants to occur much more frequently than other vowels or final consonants;
- enable a simpler description of language dialect differences;
- assist inter-language phonological comparisons;
- provide the necessary insight to start a systematic reconstruction of Mon-Khmer vowel systems;
- show the diffusion of the areal phonological patterns upon non-Austroasiatic languages;
- enable the preparation of more effective applied linguistic materials, especially in the areas of literacy and language learning.

¹These statistics may later be compared with those developed in Section 3 of this paper: the most frequently occurring *-VC* in Haroi with their R factors are:

-ah	6.5	ə∅	4.3
ə∅	6.4	aw	4.2
aɿ	6.0	əɿ	4.0
àng	4.9	ong	4.0
ang	4.5	ia	4.0
eh	4.4	am	4.0

It is the purpose of the balance of this paper to present the distribution and frequency of the final -VC clusters of six Mon-Khmer languages and thereby (1) to emphasize the areal patterns of distribution and frequency of these elements of word phonology and (2) to use the higher frequency clusters as an aid for the discovery of cognate sets among these languages (bridging the Baharic and Katuic subfamilies) and for the establishment of some Proto-Mon-Khmer -VC clusters.

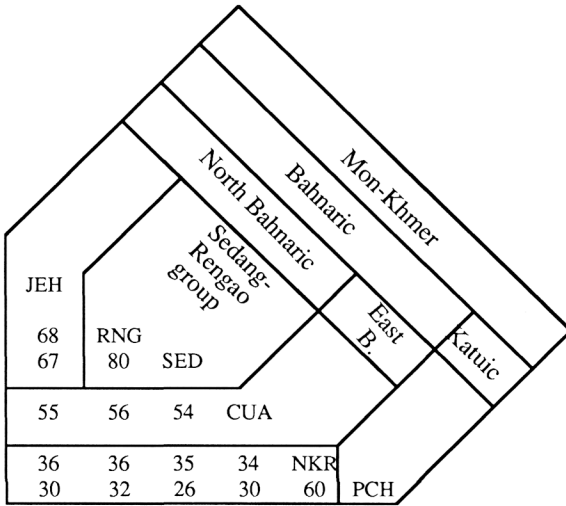


Chart 1. Cognate percentages of the six included languages (NKR=Nkring, a dialect closely related to NGQ) (taken from K.Smith, 1978)

The five rhyming dictionaries mentioned in Section 1 plus the writer’s own Sedang language material provide the convenient base for this study. These languages, the abbreviations to be used hereafter, the bibliographic reference of the rhymed dictionaries, and the number of words included in the dictionaries are:

- Cua CUA Maier and Burton (1966), 1829 words
- Jeh JEH Gradin and Cohen (1970), 6558 words
- Ngeq NGQ R. Smith (1970), 3957 words
- Pacoh PCH Watson, Watson and Cubuat (1979), 5275 words
- Rengo RING Gregerson, Gregerson and Ir (1969), 3457 words
- Sedang SED K. Smith (1975), 1367 words.²

²The unrhymed-Smith and Smith (1977) dictionary of Sedang has approximately 5500 words. But because of the unavailability of the writer’s rhymed listing of this dictionary, a tabulation of 1409 different words which occur in a 27,437-word corpus of text (of which there has been prepared a computer-processed concordance of words) is substituted as a dictionary. Frequencies of phonemes in these words on a dictionary as well as a text-basis are presented in K. Smith (1975) as taken from a computer program described in K. Smith (1974). For this present study the 1409 words are reduced to 1367 by deleting from consideration the 42 words with vowel nasalization—a small

JEH, RNG and SED are North Baharic languages, CUA is East Bahnaric, and PCH and NGQ (a dialect closely related to Nkriang) are Katuic. Their cognate relations are given in Chart 1.

No comparative study is known to have successfully compared CUA with the North Bahnaric languages, nor to have established correspondences between the Bahnaric and Katuic languages. So these materials provide opportunity to study the rhyming clusters of languages not previously phonologically compared.³

3. Statistical comparison of –VC in six languages

Both diversity and similarity characterize the word-final vowel plus final consonant clusters (–VC) in these languages. The diversity of some elements of the –VC presents the problem which the similarity of other elements and of their functioning as a unit is hoped to solve.

To spare further cluttering of the text the vowel plus final consonant matrices citing the dictionary frequency of each –VC as prepared direct from the rhymed dictionaries are given in Appendix I.⁴ All the figures cited below are derived from these matrices.

The number of potential –VC combinations in a language is a function of the number of vowels and final consonants (plus open syllable \emptyset). The number of contrastive vowels (including contrasts of short, long, and glided forms as well as of register) ranges in these six languages from 21 in RNG to 31 in SED. The number of final consonants (including \emptyset) ranges from 15 in SED to 24 in NGQ. Consequently the total number of cells in the vowel plus final consonant matrices (including cells of open syllable for only short or long vowels—not both) ranges from 368 in RNG to 705 in NGQ. This potentially great variety of –VCs is a notable feature of Southeast Asia languages and also the source of frustration in attempts to make inter-language comparisons. But not all –VC forms represented by the many cells in these matrices occur in actual language material. Cells are found empty for two reasons:

group but one which increases the number of SED vowel position contrasts out of proportion to the other languages in which nasalization may also be a small, though unreported, factor.

³Unrhymed alphabetical dictionaries, thesauruses, and phonological and comparative studies of these languages include:

CUA : Maier (1966); Maier and Dinh (1976); K. Smith (1973)

Jeh : Gradin (1965); Thomas and M. Smith (1967); Thông and Gradin (1979)

Ngeq : R. Smith (1973); R. Smith (1976)

Pacoh : Dorothy Thomas (1976); Watson (1964); Watson, Watson and Cubuat (1976)

Rengao : Gregerson and Gregerson (1977)

Sedang : K. Smith (1967); K. Smith (1968); Smith and Smith (1977)

⁴I am indebted to my daughter Linda and my wife Marilyn for their patient and persistent assistance in counting the number of words occurring in each rhymed section of these dictionaries and in searching in the relevant sections for cognate words.

(1) coincidental non-occurrence of forms in the investigator's data; with more data some missing -VCs are likely to be found;

(2) structural restrictions against their occurrence (e.g. -iy, -uw).

No attempt has been made here to categorize empty cells among these languages. The number of filled cells (i.e. the number of different occurring -VC forms) in these languages ranges from 149 in SED to 406 in NGQ. This means that the percentage of filled cells in the -VC matrices ranges from 32% in SED⁵ to 74% in PCH. Chart 2 summarizes the above -VC matrix size and content.

	SED	CUA	NGQ	RNG	JEH	PCH
No. vowel position contrasts	31	23	30	21	24	30
No. final consonants (including open syllable)	15	17	24	18	17	18
No. cells in a -VC matrix	465	382	705	368	398	528
No. of filled cells	149	197	406	230	271	390
% of cells filled	32%	52%	58%	63%	68%	74%

Chart 2. Size and content of -VC matrices (languages ordered left to right by increasing percentage of bottom row)

The great variety of vowel systems in the area has already been alluded to. Among these six languages no two vowel systems are identical. The number of vowel positions ranges from 5 in JEH to 10 in CUA (possibly 12 in PCH). SED (alone) does not have vowel length contrast. RNG (alone) does not have any glided vowels. NGQ (alone) has on-glided vowels. CUA (alone) does not have register contrast; NGQ (and possibly PCH) seems to have register contrast only in a portion of the vowel system.

One vowel position, *a*, dramatically carries more than its share in all languages; the percentage of words with an *a* vowel (long and short, both registers) ranges from 16% in PCH (if a 12 position system) and NGQ to 39% in RNG. But despite this, RNG long breathy (lax register) *à* is not correspondingly frequent compared to the other *a* position vowels (which include *ǎ*, *a*, *ǎ̃*, *à*); and JEH long breathy (lax register) *à* is the least frequent of **all** vowels and vowel glides. On the other hand SED *a* and *á* (lax and tense registers, resp.) are both the most frequent vowel of their two respective registers.⁶ Chart 3 summarizes the above vowel system differences.

⁵Including nasalized vowels in SED, 196 -VC forms have been observed in a -VC matrix of 630 cells (42 vowel position contrasts x 15 final consonants including open syllable); i.e. only 31% of the cells are filled. The vowel system would seem to permit 64 vowel position contrasts; of the resultant matrix of 960 cells, 312 seem structurally possible (32.5%); in other words, there are 116 -VC forms not yet encountered which appear to fit the system.

⁶This fact of SED poses no comparative problem because Proto-North-Bahnaric **à* is not reconstructable (Smith, 1972). SED *a*∅ which one might expect to be a reflex of hypothetical PNB **à*∅ is a reflex, instead, of PNB **ǎr*, **aq*, **ǎç*, **ǎt*, **ǎt* and **ǎp*. And closed syllable **ǎc* is not reconstructable with most final consonants. Conclusion: RNG *à* and JEH *à* are new innovative phonemes in their systems.

	JEH	RNG	SED	NGQ	CUA	PCH
No. vowel position	5	6	7	9	10	6 or 12
Long/short vowel contrast	x	x		x	x	x
Off-glided vowels	x		x	x	x	x
On-glided vowels				x		
Register contrast	x	x	x	partial		partial
%words with a-position vowel	32%	39%	25%	16%	23%	16%*

*25% if 6-position system

Chart 3. Vowel system differences (languages ordered left to right by increasing number of vowel positions)

In the five vowel systems with vowel length contrasts neither short nor long vowels are generally predominant; glided vowels as a group are always less frequent than either short or long unglided vowels. In the five vowel systems with register contrast that register (whether the tense or lax register)⁷ which is spoken clear (or normal, unaffected) is the more frequent register; the affected register (whether "breathy" lax register, laryngealized tense register, or "tense" tense register as in PCH) is the less frequently occurring register. The registers are in greatest balance in PCH (44%-56%) and greatest imbalance in SED (31%-69%).⁸ Chart 4 summarizes the vowel systems.

	PCH	JEH	NGQ	RNG	CUA	SED
Percentage of words with: short vowels	40%	43%	44%	55%	61%	81%
long vowels	47%	45%	37%	45%	34%	
glided vowels	13%	12%	19%	--	5%	19%
Percentage of words with: tense register	"tense" 44%	clear 66%	--	clear 59%	--	laryn. 31%
lax register	clear 56%	breathy 34%	--	breathy 41%	--	clear 69%

Chart 4. Percentage of occurrence of the length and register features of the vowel systems (languages ordered left to right by increasing percentage of short vowels)

There is greater similarity of final consonants among these languages, yet only PCH and RNG have identical inventories of final consonants. The following seven-teen final consonants are basic for this discussion:

- p -t -ch -k
- m -n -nh -ng
- w -l -r -y
- yh -h
- wq -yq -q

⁷Or, in the terminology of Gregerson, retracted tongue-root position or advanced tongue-root position, respectively.

⁸The register imbalance in SED is attributable to PNB tense register *VP, *Vq and *Vh merging with lax register *Vq, *V∅, *Vl, and *Vr, resulting in a neutralization of register as SED V∅. Cf. Gregerson and Smith (1973), pp. 161-162.

The final consonant inventories for these languages are:

- Sedang, 14: the above less *-ch, -nh, -wq*
 Jeh, 16: the above less *-ch, -r*, plus *-lh*
 Cua, 16: the above less *-nh, -r*, plus *-lh*
 Pacoh, 17: as above
 Rengao, 17: as above
 Ngeq, 23: the above plus *-mq, -nq, -ngq, -lq, -rq, -j*

Of particular fascination are the relative frequencies of the various final consonants (including open syllables) in the six languages. The basis for comparison here is the percentage of words in the language with each final consonant. Chart 5 plots these percentages on a crude logarithmic-like scale to avoid crowding at the low frequency end; the higher frequency final consonants should be even more emphasized than they appear in this chart.

Each final consonant may be characterized as follows ("high occurrence" is above 7% (above 5% for NGQ); "mid-range" is between 2% and 7% (2% and 5% for NGQ); "low occurrence" is less than 2%):

- ng highest occurrence in each language except SED (second highest) and CUA (mid-range); indeed *-ng* has a considerable lead: in NGQ, PCH, and SED it occurs one-third, in JEH two-thirds, in RNG four-fifths more frequently than the next most frequent final consonant. The low occurrence in CUA is attributable to a sound shift: except after initial nasals, *-h*, and glottal, Proto-North-Bahnaric final nasals have voiceless stop reflexes in CUA (K.Smith 1973). Consequently in CUA there is an inversion of final *-ng* and *-k* in this frequency ranking.
- h high occurrence in all languages, second highest in NGQ and PCH.
- k high occurrence in all languages except SED (mid-range); highest occurrence in CUA, second highest in RNG. The lower ranking in SED is attributable to the loss in words of the lax register in PNB of final stops in SED (K.Smith 1972).
- ∅ (open syllable) out of sight in SED (35.7% of all words), high occurrence in all other language except JEH (mid-range); the high occurrence in SED is attributable to the loss of many final consonants (in both registers all **-q, *-l, and *-r*; in the lax register **-p, *-t, *-č, *-k and *-h*) (K.Smith 1972).
- t high occurrence in all languages except RNG (mid-range) and SED (mid-range), second highest in CUA. For the lower ranking in SED see *-k* above.
- q (glottal) high occurrence in all languages except SED (low). The lower ranking in SED is attributable to the loss of all PNB **-q* in SED. The few *-q* now in SED are a recent phonological development.
- l mid-range occurrence in RNG and PCH, high in CUA, NGQ and JEH (second highest), but low in SED (attributable to the loss of all PNB **-l* in SED). The high occurrence in CUA and JEH is attributable to the merger of **-l* and **-r* as *-l* in each language.

		RNG	JEH	CUA	SED	PCH	NGQ
High occurrence	36%				-∅		
	18%	-ng					
	17%		-ng				
	16%			-k			
	15%				-ng		
	14%					-ng	
	13%						-ng
	12%			-t			
	11%			-l	-y		
	10%			-l	-h		
Mid-range	9%	-k		-h			
	9%	-h	-k	∅		-q	
	8%	-q		-q			-h
	8%	∅	-h				-k
	8%	-q				∅	
	7%		-t		-h		-l
	7%				-w	-t	-t
	6%	-m	-p			-k	∅
	6%	-t					-q
	6%	-l	-y			-l	-y
Low occurrence	5%		-p	-y		-r	
	5%	-n	∅		-n	-n	-y
	5%	-y	-w		-m	-p	-r
	5%	-p		-ng		-m	-m
	5%				-k		-n
4%	-r	-yh				-p	
3%	-w		-w			-ch	
3%	-yq		-ch			-yh	
3%			-m		-t	-nh	
3%					-w	-w	
2%	-yh				-p		
1%	-ch		-n				-lq
1%	-nh		-yq	-yq	-q	-wq	-mq
1%			-lh	-lh			-wq
1%			-wq	-wq	-yh		-yq
1%			-yh	-yh		-ch	-ngq
1%	-wq				-l		-nq
1%		-nh			-r		-rq
1%		-lh			-yq		-j

Chart 5. Percentage of words in each language with each final consonant (languages ordered left to right by decreasing percentage of most common final consonant)

- y mid-range occurrence in all languages except high in NGQ and SED (next most frequent after *-ng*, being the SED reflex of some PNB**-ch*,**-q*,**-h*,**-yh*,**-yq*,**-∅*, as well as as**-y*).
- m mid-range in all languages.
- n mid-range in all languages except CUA (low, see *-ng* above).
- p mid-range in all languages.
- r mid-range in RNG, PCH, NGQ, low in SED (loss of all PNB**r*), non-occurring in JEH and CUA.
- w mid-range in all languages except high in SED (being the SED reflex of some PNB**-q*,**-h*,**-l*,**-∅*, as well as**-w*).
- yh low occurrence in RNG, CUA (lowest) and SED, mid-range in JEH, PCH, NGQ.
- yq low occurrence in all languages (lowest in SED) except mid-range in RNG and PCH.
- ch low occurrence in RNG and PCH (lowest), mid-range in CUA and NGQ, non-occurring in JEH and SED (in both languages PNB**-č* becomes *-k* after) front vowels, *-t* after back vowels, though for lax register reflexes in SED see *-k* above.
- nh low occurrence in RNG and JEH, mid-range in PCH and NGQ, non-occurring in CUA and SED.
- wq low occurrence in all languages (lowest in RNG), non-occurring in SED. All other final consonants (i.e. *-lh* in JEH and CUA, *-lq*, *-rq*, *-mq*, *-nq*, *-ngq*, *-j* in NGQ) have very low occurrence.

Finally a look at the -VC combinations themselves. A casual glance at the vowel plus final consonant matrices of Appendix I shows areas of restricted co-occurrence:

(1) Final consonants which occur with few vowels (the number of such vowels is in parentheses):

- CUA: *-lh* (4), *-wq* (4), *-yh* (4), *-n* (6), *-yq* (7);
 JEH: *-lh* (1), *-nh* (2), *-wq* (6);
 NGQ: *-j*(1), *-rq* (6), *ngq* (7), *-yq* (8);
 RNG: *-wq* (3), *-yh* (7), *-y* (8), *-w* (9), *-yq* (9);
 SED: *-l* (1), *-r* (1), *-yh* (2), *-yq* (2), *-t* (6), *-w* (6), *-q* (7), *-p* (8), *-y* (9)

(2) Vowels which occur with few consonants (the number of such consonants is in parentheses):

- CUA: *î* (2), *ôa* (2), *ua* (4), *êa* (5);
 JEH: short vowels do not occur with *∅*, *-h* or *-yq*;
 NGQ: *eA* (1), *oo* (1), *ei* (4), *uo* (4), *AŌ* (4), *O* (4);
 PCH: *é* (3), *ó* (3), *ô* (4), *ó* (6), *ě* (7);
 RNG: *ĩ* (3), *ě* (3), *ò* (4), *ũ* (5), *ù* (6), *e* (6);
 SED: *óa* (1), *iô* (1), *oa* (2), *uô* (3); laryngealized vowels do not occur with final stops or glottal; front glides of both registers and back glides of the tense register occur only in open syllables; central glides only occur with stops, nasals and *-h*.

Just as certain vowels and certain final consonants have high frequency of occurrence, so some -VC combinations have high occurrence way beyond their

share. And it is this feature of these languages which provides the comparative payoff presented in the next section of this paper. In SED, for example, two –VC forms (out of 149 different –VCs, or only 1.3 % of the SED –VC types), namely *a0* and *o0*, account for 10% of all words, and 15 forms (10% of all –VCs) account for 36% of all words. In the language with least prominence of high occurring –VCs, NGQ, ten forms (of 406, or 2.5%) account for 10% of all words, and 57 forms (14%) account for 40% of all words. This aspect of high occurrence of a few –VCs in each language is summarized in Chart 6.

	SED	CUA	RNG	JEH	PCH	NGQ
10%	2	4	4	6	9	10
20%	6	10	10	15	21	23
30%	11	18	19	26	37	39
40%	?	26	30	39	57	57
total –VC forms	149	197	230	271	390	406

Chart 6. Number of –VC forms accounting for a given percentage of all words (languages ordered left to right by increasing number in each row)

To compare the occurrence of the high frequency –VCs in each language, some statistics are **not** helpful:

(1) the number of times each form is found in the rhyming dictionary (i.e. the figures given in the matrices of Appendix I), because the sizes of the dictionaries vary too greatly.

(2) the percentage of all words with the given –VC form, because with increasing numbers of total –VC forms in some languages (e.g. 149 in SED versus 406 in NGQ) the overall load of even high frequency –VCs is somewhat reduced.

To compare the occurrence of the high frequency –VCs in these languages we use the relation (R) of their occurrence to average occurrence of –VCs in the language; or,

$$\text{if } A = \text{average occurrence of } -VCs = \frac{\text{total number of words in dictionary}}{\text{total number of } -VC \text{ forms}}$$

$$\text{then, } R = \frac{\text{occurrence of given } -VC}{A}$$

$$\text{In PCH, for example, } A = \frac{5275}{390} = 13.5;$$

$$\text{then; for PCH } \textit{ang}, \text{ this determination would be: } R = \frac{87}{13.5} = 6.4$$

This means PCH *-ang* occurs 6.4 times more frequently than the average PCH –VC occurs.

Among the –VC forms in these languages, SED *a0* and *o0* have the highest R factor (8.3 and 8.0, respectively). In all languages there is a distinct small group of

-VC forms with R greater than 3. There is a spreading out with a corresponding higher number of -VCs around R=2.5 in each language (except in SED the spreading out is below R=1). Chart 7 summarizes the number of -VC forms in each language with R greater than 1, 2, . . . 8. In all languages (except SED) 36-39% of the -VC forms have R greater than 1; in SED only 13% have R greater than 1.⁹

No. -VC with R greater than	SED	PCH	JEH	RNG	CUA	NGQ
8	2	-	-	-	-	-
7	2	-	-	-	-	-
6	2	1	1	-	-	-
5	2	2	1	5	2	1
4	6	4	4	6	4	6
3	9	16	12	10	7	17
2	17	47	42	30	32	50
1	20	144	99	87	71	157
% of -VC with R greater than 1	13%	37%	37%	38%	36%	39%

Chart 7. Number of -VC forms in each language with R greater than 1, 2, . . . 8 (languages ordered left to right by increasing percentage of last row)

⁹This notably low figure in SED is probably due in part to the restricted data (see Footnote 2). A larger dictionary would include masses of technical vocabulary which more typically utilize less frequent -VC types. But, on the other hand, the noted high incidence of certain forms and the unique sound changes reflected in SED account to some degree for the low percentage of -VC forms in SED with R less than 1. They also account for the corresponding high incidence of homonyms in SED (at least ten lexical *pa*, for example).

Chart 8 lists for each language the most frequently occurring –VC forms giving the R factor for each.

SED	PCH	JEH	RNG	CUA	NGQ
aq 8.3	ang 6.4	ang 6.1	aq 5.9	ok 5.9	oh 5.5
o 8.0	áh 5.4	ah 4.5	ǎng 5.7	aak 5.1	aang 4.7
ôw 4.4	óh 4.5	a 4.4	ǎh 5.3	a 4.8	ah 4.3
êy 4.3	úng 4.1	ǎng 4.1	a 5.3	ah 4.4	o 4.3
á 4.0	ong 3.9	ong 3.9	ang 5.1	ook 3.9	oh 4.2
ay 4.0	a 3.9	ay 3.5	òng 4.6	oot 3.5	aay 4.1
u 3.5	ay 3.8	ǎng 3.5	ong 3.9	ong 3.0	ong 3.9
ó 3.2	áng 3.7	ǎl 3.4	úng 3.7	o 2.9	a 3.8
è 3.0	áq 3.7	ǎq 3.4	ǎk 3.3	e 2.8	ok 3.7
áng 2.9	éh 3.6	eng 3.2	ǎng 3.1	oot 2.8	ool 3.6
i 2.8	aq 3.5	ǎng 3.2	ǎng 2.9	uh 2.8	ong 3.6
óy 2.7	úh 3.4	oh 3.2	ing 2.9	i 2.7	ay 3.5
ang 2.7	úk 3.4	át 2.9	ǎh 2.9	ak 2.7	OOng 3.5
éang 2.5	e 3.3	úng 2.7	o 2.7	aal 2.7	E 3.2
oh 2.5	o 3.3	ǎk 2.7	i 2.5	oh 2.7	OOy 3.1
	ǎk 3.3	eh 2.7	ǎm 2.5	u 2.6	ing 3.1
	u 2.9	ǎm 2.7	úk 2.5	uk 2.6	ung 3.0
	eng 2.9	ǎn 2.6	ǎm 2.5	aq 2.6	iing 2.9
	áy 2.8	ol 2.5		aw 2.5	ul 2.9
	át 2.8	úng 2.5			Ec 2.9
	ék 2.7	ak 2.5	NGQ cont.		iat 2.8
	ó 2.7	ǎl 2.5	ar 2.6	aac 2.7	uut 2.8
	ǎng 2.7	an 2.5	Eh 2.5	oq 2.7	uk 2.8
PCH cont.	oy 2.7	ok 2.5	OOK 2.5	aat 2.6	aq 2.8
ǎq 2.6	éq 2.7	al 2.5	uh 2.5	eh 2.6	ang 2.8
ǎ 2.5	óng 2.7	úh 2.5	ooy 2.5	Eng 2.6	ial 2.7
ǎh 2.5	ong 2.7	ù 2.5		Aq 2.6	eeng 2.7

Chart 8. Most frequently occurring –VC forms in each language with R factor equal to or greater than 2.5 (languages ordered left to right as in Chart 7)

4. Rhymed cognate sets in six languages

The methodology of this aspect of the comparative linguistic study of RNG, JEH, SED, CUA, PCH and NGQ has already been suggested. It was suspected that greatest success in discovering correspondence sets of vowels in these languages would come from searching for cognates among those words having the most frequently occurring final –VCs. Whereas casual thumbing through one of these dictionaries page by page seemed fruitless and discouraging, when attention was given to those rhymed dictionary sections with the greatest number of words success and encouragement followed.

Appendix II lists 497 sets of cognate words. These sets of cognate words were culled from a larger compilation by including only those sets with at least two examples (to lessen the probability of including borrowed words) and only those sets which (1) bridge Bahnaric and Katuic languages, (2) bridge CUA with North Bahnaric languages, or (3) bridge PCH and NGQ. Each of these three areas is new for Southeast Asian comparative linguistics. (The similar order of languages left to

right in Appendix II and the following charts is Bahnaric languages to the left (with CUA on their right) and Katuic languages to the right to facilitate comparison across these "bridges".) Specifically omitted were sets including only North Bahnaric languages—which comparisons have already been made.¹⁰ The number of such sets of cognates are:

—bridging Bahnaric and Katuic languages	241	sets
—bridging CUA with North Bahnaric languages, additionally	106	sets
—bridging PCH and NGQ, additionally	<u>150</u>	sets
total	497	sets

Of 146 -VC in all six languages with R factor equal or greater than 2.5 (see Chart 8), 118 (or 81%) appear in these cognate sets. For each language the number of -VC appearing in the cognates and the specific -VC not so appearing are shown in Chart 9. One obvious set missing from the cognate sets is RNG *ǎng*, JEH *ǎng*, SED *ang*; though cognates occur across these languages with these specific -VC, inexplicably cognates could not be found in CUA, PCH or NGQ. Nevertheless the advisability of starting the search for cognates among words with frequently occurring -VC forms is substantiated.

	RNG	JEH	SED	CUA	PCH	NGQ
With relevant cognates	12	20	12	18	25	31
Without relevant cognates	6	7	3	1	4	7
	ǎh	ǎng	u	aat	ók	ok
	ǎk	eng	i		u	iing
	ǎng	ǔng	ang		ék	ul
	ing	ól			ông	aac
	oh	ún				eh
ám	an				Eng	
		ang				Aq
Total	18	27	15	19	29	38

Chart 9. -VCs with R equal to or greater than 2.5 (See Chart 8) having relevant cognates

Although high frequency -VC forms were the starting point in the search for cognate sets it should be noted (1) that a given correspondence set will not include only such high frequency -VC forms because a form which may be very frequent in one language may correspond to an infrequent form in another language; and (2) the search, as it led from a -VC form in one language to a -VC form in another language, and so on back and forth, resulted in the discovery of some correspondence sets composed entirely of less frequent -VC forms; of the 82 correspondence sets included here 22 do not have any -VC form with R equal or greater than 2.5. Some of these latter correspondence sets were discovered

¹⁰The Proto-North-Bahnaric study (Smith, 1972) included Bahnar, Proto-Jeh-Halang (Thomas and M. Smith, 1967), Hre and Sedang. The inclusion of Bahnar, now considered a Central Bahnaric language, distorted some of the reconstructions (though hopefully toward Proto-Bahnaric). The inclusion of Rengao, which material is now available, would enhance the study in that Rengao seems more similar to the reconstructed PNB than any of the other included languages. The deletion of correspondence sets with only one example (a procedure followed in this present paper to avoid use of borrowed words) would remove some other questionable PNB *-VC.

comparing short Swadesh-like wordlists.¹¹ The search for correspondence sets once started in this encouraging manner with high frequency –VCs could continue much further into the realm of less frequent –VCs once the overall patterns are discovered; the search which resulted in the correspondence sets included in this paper was prematurely terminated because of time restrictions. May the search be continued to fill out the overall picture!

To summarize and group the correspondences it is convenient to posit a representative (*) form. Considering that Bahnaric and Katuic languages are connected only through Proto-Mon-Khmer, such reconstructions may be indicative of that ultimate ancestor. But without inclusion of data from other branches of the Mon-Khmer family the forms posited here are only tentative and serve the basic function of assisting discussion of the various correspondences.

The cognate sets include words of open syllable and with all the 17 basic final consonants cited in the previous section except *-wq* and *-yq*. Though the database was somewhat artificial, yet not surprisingly the number of cognate sets found with the various final consonants somewhat parallels the frequency of occurrence of consonants in the included languages (see Chart 5):

*-ng	78	*-m	26
*-h	64	*-r	24
*-y	60	*-w	15
*-∅	57	*-p	15
*-t	39	*-n	11
*-l	33	*-yh	10
*-k	28	*-č	6
*-q	28	*-ñ	3

The final consonant correspondences are generally constant across the languages, with the following exceptions (for further details on CUA, JEH and SED see K.Smith, 1972, 1973):

- (1) All languages except RNG have both *-∅* and *-w* as reflexes of **-∅* following proto back vowels.
- (2) JEH and NGQ have both *-∅* and *-y*, whereas SED has only *-y* as reflexes of **∅* following proto front vowels.
- (3) SED drops all final **-p, *-t, *-c, *-k* of the proto tense register, retaining these final stops only in words of the lax register.
- (4) PCH has a final glottal stop reflex for **-k* in words of the tense register, but *-k* in the lax register.
- (5) SED loses all **-q*, having instead, variously, *-∅, -w* and *-y*.
- (6) CUA has voiceless stop reflexes for proto final nasals **except** if the vowel is preceded by a nasal consonant (plus other factors not shown in this data).
- (7) SED loses all **-l*, having instead, variously, *-∅* and *-w*.
- (8) SED loses all **-r*.

¹¹The 22 correspondence sets with no –VC with R equal or greater than 2.5 are **āp, *īp, *ap, *ēt, *òt, *āk, *ām, *ûm, *òm, *em, *am, *ěñ, *al, ul, *ol, *ūr, *ir, *ôr, *ih, *üy, *āw, and *aw*.

- (9) JEH and CUA do not have the proto *-l / -r* contrast, merging both to *-l*.
 (10) SED loses **-h* in words of the proto tense register, having instead, variously, *∅, -w* and *-y*; **-h* is retained only in the lax register.
 (11) RNG and SED have both *-y* and *-∅* as reflexes of **-y*.
 (12) RNG has both *-w* and *-∅* as reflexes of **-w*.
 (13) SED has *-y* and CUA has *-h* as reflexes of **-yh*.

The register of words in the North Bahnaric languages coincides in all but the following cases:

(1) In three sets JEH and in one set RNG have a clear tense register where the breathy lax register is expected, indicating neutralization to the unaffected register.

(2) In SED there is a merger of registers (to its clear lax register) in words with proto final stop, glottal, **-h* and **-yh*. As has been noted elsewhere with regard to Bahnar (Smith, 1972), CUA, PCH and NGQ here reflect the proto register by vowel height somewhat consistently (exceptions are noted following some groups of cognates in Appendix II). That is, these languages have high vowels corresponding to North Bahnaric register, and low vowels corresponding to North Bahnaric tense register. In CUA low glided vowels (e.g. *ea*) reflect the tense register whereas high glided vowels (e.g. *ia*) reflect the lax register; final *-l*, despite the presence of a high vowel, usually reflects the tense register. In Appendix II there are 117 cognate sets of the lax register, 380 of the tense register.

A question may be raised: if vowel height in some languages corresponds to register in others, how does one choose which to posit in the parent language? The question has been discussed in Appendix I (pp. 76-86) of Smith (1972) where, following an examination of register in otherwise apparently cognate words of the widely scattered Kuy, Bru, Khmer, Mon and North Bahnaric languages, it was concluded that a broadly consistent pattern of register correspondences all across the Mon-Khmer area dictates the necessity to reconstruct register more prominently than vowel height. This does not diminish the evident relation between register and vowel height, as both are functions of tongue-root position (Gregerson, 1976). A further indication of register in the parent language is that both SED and PCH have register conditioned final consonant reflexes as described above; register conditioning is much more plausible than that of vowel height alone.

Vowel length is generally consistent in all languages; SED, which alone does not have the short/long contrast, generally reflects the contrast by unglided/glided vowels. Exceptions are noted following some groups of cognates in Appendix II. There has been no attempt to posit the vowel length contrast before final **-h* and **-q* (nor, obviously, **-∅*).

In addition to registers and vowel length contrast, the reconstructed vowels seem to form a seven-position system plus two high vowel glides. The vowels shown in Chart 10 are representative of all the correspondences included in Appendix II; holes in the vowel chart presumably represent vowels occurring in -VCs of lesser frequency and not yet assembled in cognate sets.

Of the 82 -VC correspondence sets included here (represented by 82 proto -VC forms), those with the greatest number of examples are typical of what was found

in the various languages in Section 3. Those sets with more than ten cognate samples are listed below with their R factor (A = 6.06):

	Lax register			Tense register			Total	
short	-	ǎ	ǒ	32	-	ǎ	84	116
long	-	ǎ	ǒ	80	-	ǎ	271	351
glided	-	ǎ	ǒ	5	ia	ua	25	30
Total	117			380			497	

Chart 10. Reconstructed vowel system with number of occurrences in cognate sets

	no.	R		no.	R
ay	23	3.8	e	13	2.1
ang	18	3.0	eh	12	2.0
a	18	3.0	ong	12	2.0
oy	16	2.6	ǎng	12	2.0
oh	15	2.5	ǎq	11	1.8
ǒng	14	2.3			

Chart 11 summarizes the number of samples of each reconstructed –VC form in a matrix of vowels and final consonants. Chart 12 lists the correspondence sets for each reconstructed –VC form.

		p	t	c	k	q	iii	ii	ing	i	ii	v	w	x	xi	xii	Total		
Lax register	Short	-	2	2	-	-	-	2	2	7	4						17		
	ă	-	6	-	-	-	5	4	-	-	-						10		
	â	-	-	-	-	-	-	-	-	-	-						5		
	ô	4	2	4	3	3	3	2	5	5	8						16		
Lax register	Long	3	2	2	3	3	3	6	3	3	3						22		
	i	4	4	2	2	2	2	6	3	3	3						3		
	è	4	4	2	2	2	2	6	3	3	3						21		
	â	4	2	4	3	3	3	2	5	5	8						21		
Total	Glided								5								5		
	ia																5		
Total	Total																117		
	Short	-	3	8	-	8	6	3	12	6	5	-	5				9		
Tense register	ă	-	8	8	-	8	6	3	14	6	5	-	5				53		
	â	-	6	6	-	6	6	3	14	6	5	-	5				22		
	ô	13	8	3	5	11	6	4	4	4	12	23	6				30		
	Long	18	8	3	5	11	6	4	18	4	4	12	23	6			123		
Tense register	c	5	5	5	5	5	5	5	5	5	3	3	3				18		
	a	3	3	3	3	3	3	3	3	3	3	3	3				18		
	u	3	3	3	3	3	3	3	3	3	3	3	3				21		
	ô	7	6	7	7	7	7	3	12	6	6	15	16				79		
Total	Glided									6							19		
	ia																6		
Total	ua																6		
	Total	57	15	39	6	28	28	26	11	3	78	33	24	64	60	15	0	0	0
Total	Total																380		
	Total																497		

Chart II. Number of samples of each reconstructed -VC in cognate sets of Appendix II

An examination of the cognate sets also suggests correspondences in other parts of the words. While it is not the purpose of this paper to focus on initial consonants or the presyllable, the following generalizations may be made with regard to initial consonants. Initial consonants and consonant clusters are generally consistent across these languages except as follows:

- (1) CUA has *s* reflex for **ch*.
- (2) SED has voiceless stop reflexes *p, t, ch, k*, for **b, *d, *j, *g*.
- (3) JEH has *l* reflex for **hl*.
- (4) CUA has *hl* reflex for **s*.
- (5) SED has *s* reflex for **y*.

If this study has shed any light on Mon-Khmer comparative phonology it serves then as a plea for more rhymed dictionaries.

Correspondence sets (for the varied vowel symbolizations see the introductory notes to Appendices I and II):

	PNB	RNG	JEH	SED	CUA	PCH	NGQ	Word nos.
Group 1. Final *-∅								
*i∅	ì	ì	ì	ay	i	i	Ay	1-4
*ù∅	èw(?)	ù	ù	aw	u	áw	Aw	5-7
*ò∅	ò	ò	ò	ôw	u	õ	iiw	8-11
*e∅	e	i	ey	áy	e	e	E	12-24
*a∅	a	a	a	á	a	a	a	25-42
*u∅						õ	o	43-47
*o∅	o	u	ow	ów	aw	o	O	48-50
*o∅	o	o	ow	ó	o	o	O	51-57
Group 2. Final *-p								
*ǎp			ǎp	ap		áp		58-59
*ip	ìp		ip	êp			iip	60-61
*ǎp	ǎp	ǎp	ǎp	a	ap	áp	ap	62-64
*ap	ap	ap	ap	ea	aap	ap	aap	65-72
Group 3. Final *-t								
*èt	ìt	èt	iat	iat	êêt	ět	eet	73-76
*ùt						ut	uut	77-78
*òt	ùt	ùt	õt	ot	uut	õt	oot	79-82
*ăt	ăt	ăt	ăt	a	at	át	at	83-90
*at						at	aat	91-93
*ot	ot	ot	ot	ua	oot	ot	OOt	94-99
*iat	it	ět	iat	ie	iat	eat	iat	100-107
*uat	ut	õt	uat	ôe	oot	oat		108-111
Group 4. Final *-č								
*čč	čč	čk	čk	e/ê	ech	éch/ek	Ec	112-117

	PNB	RNG	JEH	SED	CUA	PCH	NGQ	Word nos.
Group 5. Final *-k								
*ăk	ăk	ăk	ăk	ak	ok	ák	ak	118-119
*ũk	ũk	ũk	ũk	ok	uk	úk	uk	120-125
*øk	øk	øk	øk	o	ok	óq	Ok	126-133
*ak	ak	ak	ak	ea	aak	aq	aak	134-138
*ok	ok	ok	ok	oa	ook	oq	OOK	139-145
Group 6. Final *-q								
*ìq	ìq	ìq	ìq	ay	iq			146-148
*òq	òq		òq	ôw	óq			149-150
*aq	ăq/aq	aq	ăq/aq	a	aq	áq	aq	151-161
*uq	uq	uq	ũq	ô	ôq	ốq	oq	162-166
*oq	oq	oq	ôq/oq	o	oq		oq	167-173
Group 7. Final *-m								
*àm	àm	èm	èm	iam	úúp	ôm	EEm	174-176
*ùm				uam	uum	um	uum	177-179
*òm	ùm	ùm	ùm	uam	ôôp	ôm	oom	180-181
*ăm	ăm	ăm	ăm	ám	ap/úm	ám	Am	182-189
*em	em	êm	iam	ém	êap	eam	iam	190-193
*am	am	am	am	éam	aap/ úúm/ im/óôm	am	aam	194-199
Group 8. Final *-n								
*ăn	ăn	ăn	ăn	án	at	án	an	200-205
*on	on	on	on	úan	oot	on	OOn	206-208
*uan	un	un	uan	úan	oot	oan	uan	209-210
Group 9. Final *-ñ								
*ěñ	ěñ	ěng	ěng	éng	ech/êng	ěnh	Eny	211-213
Group 10. Final *-ng								
*ông	òng	ũng	ung	ong	ôk	ống	ong	214-218
*èng	èng	ềng	ìang	êng	iak	eng	eeng	219-221
*ùng		ung	òng	ung	ok	úng	ung	222-226
*ùang	ùng	òng	ùang	uông	úk/uak	úng	Ing	227-231
*ăng	ăng	ăng	ăng	áng	ak	áng	ang	232-243
*ông	ông	ống	ống	óng	ok/ong	óng	ong	244-257
*eng	eng	ing	ing	íng	êêk	eng	eeng	258-261
*ang	ang	ang	ang	éang	aak	ang	aang	262-279
*ong	ong	ong	ong	óang	ook/ôôk	ong	Oong	280-291

	PNB	RNG	JEH	SED	CUA	PCH	NGQ	Word nos.
Group 11. Final *-l								
*òl	ùl	ùl	òl	ôw	uul	òl	ool	292-297
*ăl	ăl	ăl	ăl	ó	al	ál	al	298-303
*al						al	aal	304-307
*ul	ul	ól	ual	ów	ool	ul	uul	308-312
*ol						ol	OOl	313-318
*ial	ěl	ěl	il	í/w	iil	eal	ial	319-324
Group 12. Final *-r								
*ăr	ăr	ăr	ăl	a	ol	ur	Ir/Ir	325-326
*úr						ur	uur	327-330
*ir		ir	èr	il	ia	iil	iar	331-332
*ăr	ăr	ăr	ăl	á	ul/ol	ár	ar	333-337
*ar	ar	ar	al	éa	aal	ar	aar	338-341
*ôr					ôl	ôr	oor	342-348
Group 13. Final *-h								
*ih	ih	ih	ih	eh	ih	ih	ih	349-353
*ùh	ùh	ùh	ùh	òh	uh	uh	uh	354-359
*òh	ùh	ùh	ùh	òh	uh	òh	oh	360-362
*òh				oh	òh	òh	oh	363-365
*eh	eh	ih	eh	êy	eh	éh	Eh	366-374
*ah	ah	ah	ah	a	ah	áh	ah	375-386
*uh	uh	uh	uh	ów	òh	uh		387-389
*òh	uh	uh	uh	ów	òh	òh	oh	390-397
*oh	oh	oh	oh	o	oh	òh	Oh	398-412
Group 14. Final *-y								
*ây	ây	ây	ây	ê	óy	úy	AAy	413-419
*ây	èy	ì	ay	ay	ay	ay	ay	420-427
*ùy	ùy	òy	ùy	òy	uy	uy	uuy	428-430
*ay	ay	ay	ay	é	aay	ay	Aaay/aay	431-453
*òy						òy	ooy	454-456
*oy	oy	oy	oy	óy	ooy	oy	OOy	457-472
Group 15. Final *-w								
*ăw	ăw	ăw	ăw	aw	ôw	âw		473-476
*ăw	ăw	ăw	ăw	áw	aw	áw	aw	477-481
*aw	aw	aw	aw	eó	aaw	aw	aaw	482-487
Group 16. Final *-yh								
*ayh				ê		ayh	Aayh	488-492
*iayh	eyh	ih	iayh	êy	iah	eayh	iayh	493-497

Appendix I. Vowel/final-consonant frequency matrices

Five matrices here (all except SED) show the occurrence of each -VC as counted in the respective sections of the rhyming dictionaries. The data and chart for SED have been adapted from K. Smith (1975) (see footnote 2).

The order of final consonants as listed across the top of each matrix has been standardized for ease in comparison. Similarly the orthography used has been regularized somewhat: -y for -i /~-y; -w for -o ~-u~-w; -q for ~-q~?; -yh for -ih ~-yh~-s. Also one unexplained occurrence of JEH -ngh has been included with -ng.

An attempt has been made to list vowels in a structural order (high to low, front to back), separating short, long and glided vowels as well as the two registers. In NGQ, however, the vowel order is that used in the dictionary; it seems to this writer that some questions remain concerning NGQ vowel analysis as given in R. Smith (1973). The vowel chart given there is reproduced here:

		Front	Central	Back
High	Lax	/i/ /ii/ /ia/	/I/ /II/ /IA/ /IIa/	/u/ /uu/ /ua/
	Tense	/ei/		/ou/ /uo/
Low	Upper	/e/ /ee/	/A/ /AA/	/o/ /oo/
	Lower	/E/ /EE/	/Aa/ /Aaa/	/AO/ /AOO/
			/a/ /aa/	/O/ /OO/

The following are categorized as offglides: *ia*, *ua*, *IA* (short), *IIA* (long). And as onglides: *ei*, *ou*, *AO*, *Aa* (short), *Aaa* and *AOO* (both long). *uo* is not categorized. Other vowels in the chart are short/ long pairs.

SED and NGQ vowel symbols seem to have a consistency throughout their vowel systems. In each of the other languages a regularization has been attempted for ease in comparison.

In CUA *o* occurs only in open syllables, *â* elsewhere—they are written here as *o*.

In PCH -y, -yh and -yq, though written in PCH orthography with long vowels, actually occur only with short vowels; -i, -ih and -iq are the counterparts with long vowels. Similarly -u and -uq, though written with long vowels, occur only with short vowels; -o, -oq are the counterparts with long vowels.

	∅	p	t	ch	k	q	m	n	nh	ng	l	r	h	y	w	wq	yh	Total	
Tense (clear)	Short																		
	i	-	9	17	2	35	7	9	8	5	31	18	4	36	11			53	
	ɛ	-	30	26	1	49	89	38	27	3	86	25	20	80	17	27	7	192	
	ǣ	-				8							20	20	15	18	7	559	
	ö	-	4	14		35	36	13	7	1	46	27	1	43	30	11	8	68	
																		276	1148
Register	Long	38	13	20	19		2	8		43	11	9			4			167	
	i	6	6	2						14	4	4			3			39	
	e	79	19	13	6	26	17	21	26	5	76	19	19	3	34	23	15	402	
	a	12	4	12	8	8	5	4	2	6								61	
	u	40	11	18	2	30	12	11	15	2	58	2	8					219	
																		888	
Lax (breathy)	Short																		
	i	-	8	14	10	24	4	9	2	15	11	4	28	4				133	
	ɛ	-			4							9		32				45	
	ǣ	-	15	29	7	28	6	37	19	2	44	28	20	21	10	3	3	287	
	ö	-	6	20	5	37	14	13	6	5	55	20	4	30	7	3	15	240	
													16		9	10	55	760	
Register	Long	24	9	5	1	10		4	5	25		3	2					88	
	i	18	6	6	1	19	18	16	8	23	18	12	3					147	
	ɛ									1	1							7	
	ǣ	18	2	7	1	10	7	4	5	8	1	13	8	7	3	3		102	
	ö	29	1	11	7	6	4	9	1	7	5	10	5	10		10		105	
	17	11	12	4	17	10	15	13	2	69	14	8	3	17			212	661	
Total	281	154	226	37	340	300	205	161	34	606	214	133	321	158	111	99	11	66	3457

Matrix I. Rengao vowel plus final consonant forms and frequencies

Tense (clear)	Register	Long	46	6	1	22	3	47	13	38	17	3	254	
		i	9	19	31	1	5	15	20	76	64	50	9	338
		e	105	42	38	61	33	55	60	146	59	28	2	900
		a	35	2	6	13	8	43	13	46	2	7	175	
		u	7	31	43	60	26	42	89	74	54	1	554	
		o											2143	
Lax (breathy)	Register	Glided	8	19	20	8	16	14	13	32	27	1	29	216
		ia	11	3	34	8	27	8	29	21	44	18	19	254
		ua											470	
Register	Short	ɨ	-	7	9	1	16	13	5	12	7		70	
		ɛ̃	-	8	28	10	5	8	20	15	26	7	127	
		ã	-	54	48	44	53	24	85	60	32	29	466	
		ũ	-	12	14	30	44	7	61	16	2	8	188	
		õ	-	8	27	44	18	15	12	5	12	20	252	
													1103	
Register	Long	i	43	9	4	13	18	26	9	34	7	8	156	
		è	3	13	13	13	16	167	9	23	25	15	7	163
		ã	3	5	4	2	9	3	5	3	1	3	38	
		ù	60	4	7	6	5	2	8	11	59	6	175	
		õ	9	14	21	21	33	14	10	45	26	5	290	
													822	
Register	Glided	ia	6	8	7	11	6	4	3	14	8	10	1	114
	ua	16	3	7	18	12	12	16	23	17	12	41	10	191
			361	366	507	602	519	453	345	7	1128	675	3	6558
		Total												72
														34
														246

Matrix 2. Jeh vowel plus final consonant forms and frequencies

	∅	p	t	ch	k	q	m	n	ng	l	lh	h	y	w	wq	yg	yh	Total
Short																		
i	25	6	6	5	10	2	2	10	2	14	2	14						82
ɪ					6					7		5						11
ê	9			10	7			12		1		4						43
e	26	4	6	18	5	22		4	5	19	4	4						113
u'	6	16	4		19	7	6	5	7	11	4	4	4	4		2		95
o'	10		3		7	19						13	15	6		4	3	80
a	45	19	22	2	25	24	8	4	4	11		41	16	23	10	6	5	265
u	24	6	3		24	19	10	3	9			26	9					139
ô	10		2		13	6		2	9			18		5				65
o	27	12	16	1	55	20	7	28	21	6	25			3				221
																		1114
Long																		
ii	-	3	16		4		1	4	1	20				2	1			52
êê	-	8	9	4	9			4	3			1		5				43
ee	-	2	6	4	11				7					2				32
u'u'	-		6	4	1		2	4	8				2	1				28
o'o'	-	7	7		8	3	2	4	5			1	5			1		43
aa	-	9	26	7	47		2	5	25				16	11	3	1	2	154
uu	-	4	17		2	6	6		19				4					58
ôô	-	15	10	4	19	1		4	8				11					72
oo	-	9	33	4	36	5	3	9	4	22		1	16			5		147
																		629
Glided																		
ia	4	2	7		6	3	2					6						30
êa		5			2	5						6		5				23
ua			6		10	3						2						21
ôa	2					6						4						12
																		86
Total	188	127	205	63	303	172	49	28	80	193	17	190	98	64	17	23	12	1829

Matrix 3. Cua vowel plus final consonant forms and frequencies

	∅	p	t	c	k	q	m	n	ny	ng	l	r	h	y	w	wu	wq	yh	lq	rq	mq	ng	ngq	j	Total
i	20	8	5	8	4	18	2	3	3	10	7	9	17		6		2		3		2				129
ii	5	9	2	2	6	7	9	6		28	13	11	17		10		2		1						126
ia	5	11	27	4	7	5	6	8	2	21	26	3	3	2	11		1	18		2					159
e	7		1		3	10		7	7	3	3	25			4		4	1							61
ee	6	10	5	12	8	5	11	1	1	26	8	10	8	7	4						1	1		4	127
ei	20	1			1		1		1																24
eA		4																							4
E	31	3	6	28	12	5	2	4	25	15	8	3	24		3	3			6		2	4			184
EE	10	2	1	8	3	7	2			11	8				12		1		4			1			70
I	19	18	12	1	20	11	15	18		30	14	11	16	9				11				1	2		207
II	9	9	11	1	7	5	8	10	7	13	4	9	3	3				4	3	3					97
IA	2	1			6	1	9	3		6	4	2			8			3	1			2			57
IIA	1		1	2	1	1	5		1		1	1		4	1			1			1	1			22
A	19	4	12	1	10	25	8	6		21	12	18	9	9	4	1			13	4	4	1	9		190
AA	7	8	5	10	9	12	7	11		18	6	17	5	14	6	7		13	2	3	1				161
Aa	8	6	12	4	8	13	10	13		15	8	2	11					9							115
Aaa	5	13	4	12	3	10	8	5		15	5	4		13	7		1		1			1			112
a	37	16	22	3	19	27	9	13		27	19	25	42	34	17	6	18	18	3	3	1		2		340
aa	21	25	26	20	14	14	9	7		46	20	9	40	11	3	5		18	3	40	3		1		302
u	19	6	11	19	27	18	7	3		29	28	3	24	10	2			1	6	2					221
uu	9	27	6	8	10	9	12	10		14	18	17	5	14	1			3							164
ua	9	5	18	16	11	9	7	8		13	17	8	12	6	5			5			2				153
uo					5	1	2			5															13
o	42	1	9	5	36	26	2	12		38	8	4	41		1			2	7	1	12	3	5		225
oo	15	18	17	18	4	17	10	15		2	35	22	4	24				8	1	1					212
oo				1																					1
AO	5				13	7				4			21												50
AOO	1				11	1	1	6		10	1	3	5					6		1					46
O	23				18	9				35		54													139
OO	12	19	12	24	11	13	13	5		34	17	14	30					6		2		1			216
Total	265	181	283	166	337	261	189	186	117	475	293	192	347	233	106	26	26	141	45	10	33	20	21	4	3957

Matrix 5. Ngeq vowel plus final consonant forms and frequencies

	∅	p	t	k	q	m	n	ng	l	r	h	y	w	yq	yh
Simple vowels															
i	24	x	x	x	x	x	x	x			x		x		
ê	26			x	x			x			x	37			
e	13	x	x	x	x	x	x	x	x		17				
a	72	x	x	x	x	x	x	23		x	20	35	x	x	
u	30	x		x	x	x	x	x			x	x			x
ô	x	x		x	x	x	x	x			16	11	38		x
ts	69		x	x	x	x	x	x			22	x		x	
Central glides															
ia		x	x	x	x		x	x	x		x				
ea		x	x		x				22		x				
ua		x	x	x	x		x	x	x		x				
oa		x							x		x				
Back glides															
iô		x			x										
eô		x													
uô		x			x			x			x				
Front glides															
ie		x													
ôe		x													
Simple vowels															
i		x						x	x					x	
é		x										x			
é		x				x	x	x							
á	35					x	x	25				x	x		
ú		x				x	x	x							
ô	3					x						23	x		
ó	28					x	x	x				x			
Central glides															
ia		x				x	x	5							
éa		x				x	x	x							
úa		x				x	x	x							
óa								x							
Back glides															
eô		x													
uô		x													
Front glides															
ie		x													
ôe		x													
Total	504	30	40	62	15	68	72	224	3	3	108	164	103	3	10
	*	*	*								*	*	*		

x: indicates occurrence less than 2% (rounded-off), i.e. less than 22 times.
 *: includes an unrecoverable number of nasalized vowels, though the total with these six final consonants is only 42.

Matrix 6. Sedang vowel plus final consonant forms and some frequencies

In JEH a similar adjustment is necessary with the *-i/-y* and *-o/-u* finals. In addition, since ̃ plays the double function of marking short vowel and final glottal stops, to avoid ambiguity in syllables without another final consonant, short vowel with final glottal is written with a single vowel letter, whereas long vowel with final glottal is written with a double vowel letter. This is alleviated here with the use of *-q* for glottal.

In RNG the adjustments for *-i/-y* and *-o/-u* are also made. Furthermore final *-h*, *-yh* and *-q* are interpreted to occur with short vowels when written with single letter 'long' vowels since double letter vowels were used only with these finals. Also it is assumed that *ó* is the same as *à*, *â* the same as *ǎ*, *è* the same as *è*, *ē* the same as *e*, *î* the same as *ì*, *oo* the same as *o*, *ùù* the same as *ù* *ù* and the same as *ù*.

Hyphen (-) is used in the charts to mark vowels which structurally cannot occur in open syllables.

Appendix II. Cognate sets

Notes on the format:

1. In addition to the six languages, Proto-North-Bahnaric (PNB) (Smith 1972) forms are also included here, possibly indicative of a yet broader scope of the –VC form. The PNB word numbers for a given –VC form are shown.

2. The most general gloss is given at the left margin; deviant glosses are given below sample forms.

3. Similar but not strictly cognate forms are enclosed within parentheses. Such PNB forms are possibly misreconstructed. Or conditioning factors may be expressible.

4. A horizontal line across a language column (as in Cua between nos.474 and 475) indicates a division between two different reflexes for the same proto vowel in that environment. Elsewhere one language in one environment has only one reflex.

5. A horizontal line across the number sequence column (as between nos.3 and 4) indicates a different group of attesting languages. In any correspondence set the first group is attested in both Bahnaric and Katic languages, the second group is attested in only Bahnaric languages (i.e. Cua and at least one other), and the third group is attested only in the Katic languages (Pacoh and Ngeq). An entry not fully meeting the above criteria (as 141A) has an A or B number and the gloss is in parentheses.

6. A consonant is underlined if it is not consistent with the stated correspondences.

7. Diacritics have the following value:

a) grave (`): breathy vowel, lax register in PNB, RNG, JEH;

b) acute (´): laryngealized vowel, tense register in SED; short vowel in PCH;

c) breve (˘): short vowel in PNB, RNG and JEH; tense and mid vowel in PCH;

d) lowered period (˙): nasalization;

e) circumflex (ˆ): mid vowel as in Vietnamese.

8. Asterisk (*) is used only for the forms posited in this paper; to avoid confusion PNB forms, though similarly reconstructed forms, are not shown with an asterisk.

8. Asterisk (*) is used only for the forms posited in this paper; to avoid confusion PNB forms, though similarly reconstructed forms, are not shown with an asterisk.

PNB RNG JEH SED CUA PCH NGQ

Group 1. Final *-Ø

*ìØ (PNB 513-520)

1. hand	tì	tì	tì		ti	ati	tAy/te
2. banyan		jĩ		dray	(jaray)	iri	
3. up there	tì			tay		ti	'direction'
4. female	kadrì	kódrì	(dridri)	kódray	kadri		

*ùØ (PNB 429-430)

5. nest	pù	pù	kópaw	kapu			hambAw
6. thigh	blèw(?)	blù	blù	plaw		piláw	mplAw
7. rubber			kasù		su		

Note PCH low vowel with lax register.

*òØ (PNB 522-524)

8. uncle	nò	nhò	nhò		nhu	nnò	
9. cry	krò	krò	krò	krôw		'inlaws'	
10. mosquito				tritrôw		arò	jiiw
11. wine		tódrò		drôw		'scream'	riiw

Note PCH "tense" vowel with lax register.

*eØ (PNB 526-538)

12. rattan	hare	ri	rey	aráy	re	kire	krE
13. three	pe	pì	pey	páy	pe	pe	pE
14. horn	ake	ki	káy	akê	(ki)		kE
15. rat	kane	kóni	kaney	kónáy	kanê	cune	'deer'
16. sm.bamboo		pale	bóli		paláy		ale
17. vine	kase	kósi	kasey	kósáy			karsE
18. tea				(ché)	che	che	
19. husked rice		phe	phi	phey	pháy	phe	
20. boar	sake			hókáy	sake		
21. have	e	i	ey	áy	e		
22. we						he	hE
23. friend						ke	kE
24. you-pl						ipe	mpE

PNB RNG JEH SED CUA PCH NGQ

*aØ (PNB 539-557)

25. leaf	hla	hla	la	hlá	hla	ula	sala
26. eat	ča	cha	cha		sa	cha	ca
27. water turtle		tópa			tapa	tupa	tapa
28. span	saqda	hóda	ida/sida	hótá	pada	tida	
29. fish	ka	ka	ka	ká	ka	aka	
						'type of f.'	
30. oar		hóqwa			awa		carwa
31. aunt	ma		ma			ama	mma
32. blade	pla	pla	pla	plá		pla	pla
33. tiger	kla	kla		klá	(karaq)	cula	
34. rich		róqa				panha	parnya
35. different	pha	pha	pha	phá		mpha	
						'strange'	
36. bamboo				kolá		ala	
37. in-laws		kódra		kódrá			kaya
38. fence		póga			paga		
39. thornbush	jala	jóla/chóla		ilá	jalia		
40. we (dl,inc)	ba	ba		pá	bia		
41. direction, place						na	na
42. road						carna	karna

*uØ

43. stooped						cacö	toko
44. catfish						aclö	klo
45. return						chö	co
46. to roll						palö	kamplo
47. squat						tö ngö	tango

*ôØ (PNB 560-570)

48. stone	tano	hmu	tamow	hmów	phau	(búl)	tamO
49. dream	apo			pów		mpo	mpO
50. male	čano	tono		kónów	kanaw		

Note that these correspondences, except for SED and CUA, are the same as 51-57.

*oØ (PNB 560-570)

51. ashes, hearth		blo		pló	vlo		plO
52. dog		cho	chow	chó	so	acho	
53. pine		róngo		hóngó		ango	
54. stew				khó		kho	
55. bamboo	paqo	bóqo		póqó	paqo		
56. brain						bo	bO
57. year						cumo	kamO

Note that these correspondences, except for SED and CUA, are the same as 48-50.

PNB RNG JEH SED CUA PCH NGQ

Group 2. Final *-p

*ăp (PNB 179-182)

58. set in		tăp	tap		táp
59. cook			ap		áp

Note PCH low vowel corresponding with lax register.

*ip (PNB 183-186)

60. centipede	gaqjîp		kajip	kóchêp		kahiip
61. pinch		kóchêp		kajiiip		

*ăp (PNB 190-194)

62. eat, bite	kăp	kăp	kăp	ka	(kaap)	cáp	kap
63. want, promise	lăp	lăp	lăp			caláp	
64. egg	katăp	kótăp	katăp	kóta	katap		

*ap (PNB 195-200)

65. slap	tap	tap	tap	tea	(tap)'jab'		taap
66. yawn	taqap		kaqap	(kó'qa)		ngqap	harqaap
67. termite	kalap	lap	klap	kólea			kalaap
68. tasteless	sap	sap	sap				saap
69. difficult	tanap	tónap	tanap	hnea		anap'oppress'	
70. use as tweezers				kea		cap	
71. split stick (above form plus infix)		kónap	kanap	kónea		canap	
72. fish scales	kačhap	kóčhap	kachap	kóchea	kasaap		

Group 3. Final *-t

*êt (PNB 214-215)

73. die, kill			kachiat		kasêêt	cáchêt	kaceet
74. banana	přit	přèt	přiat	přiat	parêêt	(pêq)	preet
75. wax						pêt	peet
76. transplant						pêt	peet

Note PCH and NGQ low vowels corresponding with tense register.

*ût

77. smoke						puut	pluut
78. to push						catut	katuut

*ôt (PNB 212-213)

79. enter	mût	mût	môt	mot	muut	môt	moot
80. blind						xôt	soot
81. bottom, necessary						tôt	toot

	PNB	RNG	JEH	SED	CUA	PCH	NGQ
		*uat (PNB 232-234)					
<u>108.</u> tie knot		tógõt		tókôe	takoot	coat	
109. buy	rut	rõt	ruat	rôe	root		
110. half, cut off	put	põt	maquuat		põe	panoot	
111. pull out, fall apart	qdut	dõt	duat		toot		

Note RNG short vowel is not consistent.

Group 4. Final *-č
*čč (PNB 244-248)

112. flesh	sěč			<u>se</u>	hlech	<u>xěčh</u>	sEc
113. sell	těč	těk	těk	tê	tech		tEc
114. to tear		rěk				tek	hatEc
<u>115.</u> pierce			pěc				pEc
<u>116.</u> sparrow	rěč	rěk	rěk	rê	varech		
117. clean						prek	bEc

Group 5. *-k
*ăk (PNB 264-266)

118. stab	păk		păk	pak	pők	bák	bak 'wound'
119. bran		dăk		tak		alák	

Note PCH and NGQ low vowel here with lax register.

*ũk (PNB 267-269)

120. pour	ũk	ũk	ũk	ok	uk	lúk	(lok)
121. cloud	tsũk	yũk	kasũk	sok	kluk	tulúk	taluk/ (talok)
122. rotten		bũk	bũk	pok		abúk	buk
<u>123.</u> poke at		chũk		chok		trúk	(trok)
124. abdomen	badũk	pódũk	padũk	pótok	paduk		
125. necklace			nhũk		nhuk		

*ök (PNB 277-285)

126. get on	tök	tök	katök	to	tok	xóq	sOk
127. cough	kaqök		kaqök	koqo	kaqok	cahóq	(tarhAOk)
<u>128.</u> cow	rök		rök	ro		carróq	karrOk
129. to hoe	bök	qbök	bök	po	vok		
130. body louse		srök	srök		so	sarok	
131. window		mök		(bo)	mo		
<u>132.</u> take		yök	(chök)	so	sok		
133. leprosy						bóq	bOk

PNB RNG JEH SED CUA PCH NGQ

*ak (PNB 287-289)

134. water	qdak	dak	dak	tea	daak	daq	(daq)
135. crow		ak	ak	ea	aak	aaq	
136. intestines	klak	klak	klak	klea	klaak		
137. tongue						ntaq	ntaak
138. yellow						raq	raak

*ok (PNB 290-293)

139. tree bark		hmok		kómoa	kamook		lOOk
140. squirrel		prok		proa	parook		prOOk
141. white		tóbok	tabok				bOOk
141A (spear)			hok				(hOOq)
142. ashes		yok	lok		look	(rlóok)	
143. brain	qngok	ngok		ngoa	ngook	(abóok)	
144. banana bud	rok	rok	rok	roa	rook		
145. sister						amoq	mOOk

Group 6. *-q
*ìq (PNB 294-296)

146. sick	îiq	îiq	îiq	chay	jiq		(coq) 'sore'
147. sated	phìq	phìq	phìq	phay	phiq		
148. finished	qđiq	điq		tay	diq	'all'	

*òq (PNB 306-307)

149. carry on back	pòq		pòq	pôw	póq		
150. bump			taqòq		gaqóq		

*aq (PNB áq 308-315, aq 319-320)

151. like, want	wăq	waq	wăq	wa		váq	waq
152. grandmother	yăq	yaq	yăq	(ja)		(acáq)	yaq
153. don't				ma ta			maq
154. body				cha		cháq	
155. old	krăq	kraq	(drăq)	kra	karaq		
156. negative	paq/păq			pa	paq		
157. father	qbaq	baq	baq	pa	vaq		
158. expensive					kóna	khanaq	
159. silver						práq	praq
160. odor						nnáq	naaq
161. demons						xáq	saq

PNB RNG JEH SED CUA PCH NGQ

*uq (PNB 321-325)

<u>162.</u> hot	tuq	tuq	tũq	tô	tôq	atôq	toq
163. sore						chôq	coq
164. raw						hôq	hoq
165. together						mbôq	mamboq
166. rotten						nxôq	nsoq

Note CUA mid-vowel here with tense register.

*oq (PNB 326-331)

<u>167.</u> know	qloq	loq	qlôq	qlo			kloq
168. correct	troq	troq	troq	tro	troq		
179. correct	joq	joq	jôq	cho	(jôq)		
170. get	soq			xo	sok		
171. morning			sroq	so	saroq		
172. see		hloq		hlo	hloq		
173. equal		hótoq		hóto	katoq		

Group 7. *-m

*àm (PNB 11-14)

<u>174.</u> leech	plàm	plèm	plèm	pliam	plóóp	plôm	plEEm
175. liver	klàm	klèm	klèm	kliam	klóóp	(lom)	(lOOm)
176. forge		tèm		tiam	tóóp		

Note PCH and NGQ low vowels here with lax register.

*ùm

<u>177.</u> hair bun				qnhuam	nhuum		nyuum
178. fragrant						thum	tahuum
179. under the house						carrum	karuum

*òm (PNB 15-18)

180. ripe, red	qdùm	dùm	dùm	tuam	dôóp	dôm	doom
181. winnow	ùm	hóqùm	ùm	uam	ôóp	ôm	qoom

Note PCH and NGQ low vowel here with lax register.

*ãm (PNB 23-32)

182. sink	krãm		krãm	krám	karap		krAm
<u>183.</u> soak	trãm		trãm		trap		trAm
184. five	baqdãm	bónãm	padãm	pótãm	padap		
185. year	hanãm	hónãm	hnãm	hónám	sanúm		
186. in, into	lãm		lãm		pi-lap		
<u>187.</u> bachelor		tóđãm		rótãm	kadap		
<u>188.</u> go	lãm	(nãm)		lám		lám	lam
189. respect						djám	jam

Note NGQ A here with tense register.

PNB RNG JEH SED CUA PCH NGQ

*em (PNB 35-36)

190. onion	(gaqdim)	kótēm	kadiam	kótém	kadêap		katiam 'garlic'
191. feed		chēm	chiam	chém		cheam	ciam
192. good	lem	lēm	liam	lém			yiam
193. delicious						dyeam	jiam

Note that RNG short and SED unglided vowels are not consistent with the other glided vowels.

*am (PNB 37-44)

194. blood	maham	mōham	pham	mōhéam	phaap/ vahaap	aham	haam
195. sweet	qngam	ngam	qngam	ngéam	nguúm	nngam	ngaam
196. weep			nham		nhim	nhiam	nyaam
197. crab	katam		katam	kótéam		atam	
198. eight	tahngam		tōham	taham	tóhéam	thóóm	
199. fish trap						aram	raam

Group 8. Final *-n

*ăn (PNB 65-67)

200. raise animals (q)	băn	băn	băn	pán	vat	bán	ban
201. female		kăn		kán		cán	kan
202. python		klăn				tulán	
203. horizontal		pógăn	găn		pangat		
204. to cross		găn	pagăn		gat		
205. near						tumán	taman

*on (PNB 75-78)

206. nephew	mon	mon	mon	múan		amon	mOOon
207. grow				húan		hon	hOOon
208. child	kon	kon	kon	kúan	koot		(koony)

*uan (PNB 72-74)

209. four	pun	pun	puan	púan	poot	poan	puan
210. Vietnamese	yun	yun	(ywăn)	yuan	xúan	(yuwat)	yoan

Group 9. Final *-ñ

*ěñ (PNB 85-89)

211. shoot	pěñ	pěng	pěng	péng	pech	(pěch)	pEny
212. twist	kasěñ			kóséng		cuxěnh	kasEny
213. crossbow (form 211 plus infix)	maněñ	móněng	maněng	mónéng	panêng		paneny

PNB RNG JEH SED CUA PCH NGQ

Group 10. Final *-ng

*ɔ̀ng (PNB 116-121)

214. tribal land	xgòng	gùng		kong	gôk	(trúng)	krong
215. steal	_tòng	tùng	tung	tong	tôk		
216. worm	sadròng	hódrùng	idrung	hódrong	sadrôk		
217. tender, green					mống	mmong	
218. edible root					pống	pong	

Note PCH and NGQ low vowels here with lax register; JEH long vowel is not consistent with other short vowels.

*èng (PNB 109)

219. dry	tèng	tèng	tùang	têng	tiak	deng	teeng
220. rainbow		brèng			madreek	pireng	panteeng
221. rafters, branch			ikàng				hankeeng

Note that PCH and NGQ correspondences here are the same as 258-261; and note PCH, NGQ, and CUA low vowels here with lax register.

*ùng (PNB 105-107)

222. hole		prung			phok	prúng	prung
223. swollen		pung	bòng			(tung plung)	tung plung
224. in, inside				tung		callúng	kallung
225. pus, pimple						pinúng	punung
226. deaf						túng	tung

Note CUA low vowel here with lax register.

*ùang (PNB 111-1115)

227. get up	qyùng	yòng	yùang	suông	duk	tayúng	tayÍng
228. axe	çùng	chòng	chùang	chuông	suak		(coong)
229. steps	kùng	gòng	gùang	kông	guak		
230. stem				kông	kuak		
231. fish trap		sròng		sông	saruak		

*ăng (PNB 125-137)

232. bamboo sprouts	daqbăng		tòbăng	tabăng	tópáng	tavak	abáng
	bang						
233. bitter	-ăng	săng	qnhăng	sáng	phalak	atáng	hang
234. dry	răng		răng	ráng	hrak	ráng	rang
235. night	măng	măng	măng	máng		camáng	karmang
						'soot'	'soot'
236. sm.knife	çăng	chăng	chăng	cháng			cang
							'sickle'
237. partition			katăng			cartáng	

	PNB	RNG	JEH	SED	CUA	PCH	NGQ
238. stop raining		prǎng			práng		(ráng)
	prang						
239. stool		tǎng	atǎng	táng			tang
240. stiff				kháng	khak		
241. thin		rótǎng		rótáng	atak		
242. laugh						cacháng	kacang
243. laughter						carcháng	karcang

*ǒng (PNB 138-147)

244. jump		plǒng			talong	palóng	pallong
245. neck,throat	ranǒng	rǒnǒng		rǒnóng	ranong	(tikong)	takong
246. back	(ka)rǒng		rǒng	rǒng	róng	karok	cróng
247. give		dǒng	dǒng	tóng ‘serve’		dóng	dong
248. rat trap		kódǒng	kadǒng	kótǒng			tong
249. carry		pǒng				tupóng	
250. hole		hlǒng				hóng	hong
251. son-in-law		ǒng	ǒng	ǒng	óng	ok	
252. star	hanglǒng	hǒlǒng	hlǒng	hǒlóng	salok		
253. arm	kǒng	kǒng	kǒng	kóng	kok		
254. to crow		rǒng	rǒng	róng	rok		
255. eggplant	trǒng	trǒng	trǒng	tróng	trok		
256. spike	srǒng	srǒng	srǒng	sóng	sarok		
257. rich		bódrǒng	(padrǒng)		padrok		

*eng (PNB 151)

258. yellow	dreng	dring	dring	trǐng	drêêk	dyeng ‘gold’	jeeng ‘gold’
259. edge		king	king	kǐng		akeng	
260. elbow				king		talkeng	
261. peek						tileng	kaleeng

Note that PCH and NGQ correspondences here are the same as 219-221.

*ang (PNB 152-166)

262. hawk	klang	klang	klang	kléang	kalaak	calang	kallaang
263. pipe	kanlang	klang/ lang	klang	kónéang	karaak	clang/ callang	klaang
264. look			bang		tamaak	bang	mbaang ‘sun’
265. happy			talang		hlaak	alang	palaang
266. spirit	yang	yang	yang	xéang	yaak	yang	
267. chin	kang	kang	kang	kéang	kaak	ncang ‘throat’	(kAAny)
268. noise			saqang			cang	karsaang
269. tray			qrang			qrang	raang
270. sm.insect			iqalang/siqalang			itang	
271. encircle		wang				cavang	waang

	PNB	RNG	JEH	SED	CUA	PCH	NGQ
272. instead	tang	tang	tang	téang		tang	
273. thorn tree	qblang		blang			tambang	
274. clear, bright				éang		ang	qaang
275. cubit, shoulder			lang			tarlang	
276. dry	pahang	phang	phang	phéang	phaak		
277. flower	rang	rang	rang	réang	araak		
278. clear				hléang	hlaa		
279. crow		ang		éang	aak		
*ong (PNB 167-177)							
280. bee	ong	ong	ong	óang	hòok	hong	hOOng
281. tree	qlong	long	qlong	lóang	hrook	along/ llong	carrOOng
282. trunk, branch, handle, tools							
	tong	tong	tong	tóang	dook	tong	tOOng
283. bracelet	kong	kong	kong		kook	(cóng)	cOOng
284. blanket			ramong		ramook	rpong(harpaOOng)	
285. seed			klong	klóang	klook	callong	kall
286. shin			ikong		sakook	ticong	harkOOng
287. stream, gorge			hlong		alook		lOOng 'flow downstream'
288. road		trong	(trùang)	tróang	trôok/ trôok	clong 'path' (truak)	
289. gong, cymbal	gong	gong	gong	kóang		cong (kaOOng)	
290. pregnant			dong			(dandông)ndOOng	
291. matter	tadrong	tódrong	tadrong	tódróang	kadrôok		

Group 11. *-l

*òl (PNB 390)

292. be drunk	(q)bùl	bùl	bòl	pôw	vuul	bòl	bool
293. seven						tupòl	tapool
294. corner						tòl	tool
295. knee						tarcòl	tarkoo
296. slave						xòl	sool
297. anteater/wolf						yòl	yool

Note PCH and NGQ low vowel here with lax register; North Bahnaric short vowels and CUA, PCH, and NGQ long vowels are inconsistent.

*ǎl (PNB 396-398)

298. mortar	apǎl	hópǎl	apǎl	pó	pal	tupál	(tual)
299. chop large tree		kǎl	kǎl	kǎl	kó		nkal
300. each other		bǎl		bǎl	pó	(baal)	
301. in the middle						ncál	nkal
302. to be stuck in						pál	pal
303. each						tál	tal

PNB RNG JEH SED CUA PCH NGQ

*ǎi

304. illumine						bal	baal
305. pale, blind						xal	saal
306. chop down						tal	taal
307. clearing						tarpaal	tarpaal

*ul (PNB 400-401)

308. anteater		mónhǒl	manhual	mónhǒw			nyuul
309. to bark	kul	kǒl	kual	kǒw	kool		
310. gourd		hópǒl		pǒw	pool		
311. dirty						amul	muul
312. to cover						pul	puul

Note that PCH and NGQ high vowels here correspond with tense register, though the association is based on a single example; RNG short vowels are not consistent.

*ol

313. knee					takuul		tarkOOl
314. eight						(ti)col	takOOl
315. cold						croL	krOOl
316. wild pig						rmol	harmOOl
317. cross bridge						tidol	tadOOl
318. bridge						pardol	tardOOl

Note that CUA -l rather than high vowel suggests tense register.

*ial (PNB 394-395)

319. hail	prěl	prěl	pril	pri/príu	pariil	pareal	prial
320. egg						tireal	tarriial
321. cucumber						akeal	kial
322. roll up						peal	pial
323. heart, kidney						aneal	nial
324. fish scales						nseal	nseal

Note that CUA -l overrules high vowel with tense register; RNG short vowel is not consistent.

Group 12. Final *-r

*ár (PNB 402)

325. drum	hagàr	hógàr	nggàl	hóka	gol	acur	sakIr/ harkIir
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326. stutter, say something bad			póla	valol			
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Note CUA low vowel here with lax register.

PNB RNG JEH SED CUA PCH NGQ

*ur

327. to burn						hur	hur
328. cover over						bur	kabuur
329. sad						xur	suur
330. cobra						tur	tuur

*ir (PNB 405-406)

331. dig	čir	chèr	chìl	chia	siil	kh iar	
332. rib	jahmìr	mèr	mìl	mia	jamiil	nniar	

*är (PNB 412-414)

333. wing	manär	mónär	manäl	móná	panul	nnär	nar
334. to fly	pär	pär	päl		pol	pär	par
335. skin	(akar)	(hókar)		(kéa)		ncär	nkar
336. act quickly						phär	phar
337. to crow						ticär	takar

Note that CUA high vowel with *-l* corresponds here to tense register; forms of 333 are 334 plus infix.

*ar (PNB 415-418)

338. two	qbar	bar	bal	péa	vaal	bar	baar
338A (twins)		mar	mal				(kampOOar)
338B (skin)	akar	hókar		kéa		(ncär)	(nkar)
339. wild cat		char		chéa	saal		
340. rub						cutar	kataar
341. separately						amar	mmaar

*ör

342. ear					tól	cutör	katoor
343. push out, push through					lól	lör	
344. stitch						callör	kloor
345. young girl						cumör	kamoor
346. handle						cutör	kantoor
347. help		pör	poor				
348. perspiration						pahör	phahoor

Note that CUA short vowel and Katuic long vowels are not consistent.

Group 13. Final *-h

*ih (PNB 332-337)

349. return	wìh	vìh		weh	qwih	vih	
350. uncle	mìh	mìh		meh			mih
351. write	ačhìh	chìh		(chêh)	chih		
352. you(sg)	ìh	ìh	ìh	eh		(âh)	
353. exchange			palìh		salih		

PNB RNG JEH SED CUA PCH NGQ

*ùh (PNB 341-348)

354. greet	kùh	kùh	kùh	kôh	takuh	cucúh	
355. jump down			kadrùh			radýúh	hantruh
356. arrive	trùh	trùh	trùh	trôh	truh		
357. bump into						cadúh	kaduh
358. run						palúh/ parlúh	tarluh
359. crazy						yúh	yuh

Note that the Bahnaric correspondences here are the same as 360-362.

*òh (PNB 341-348)

360. ashes,roast		qbùh	bùh	bùh	pôh	buh	bóh
	boh						
361. nose	mùh	mùh	mùh	môh	muh	móh	moh
362. wash clothes	rùh	rùh	rùh		rôh	(arôh)	roh

Note that Bahnaric correspondences here are the same as 354-359; the Katuic correspondences here are the same as 363-365; note PCH and NGQ low vowels here with lax register.

*òh

363. pour water				toh	tôh	tróh	
364. used field				poh	pôh		
365. mountain						cóh	koh

Note that the Katuic correspondences here are the same as 360-362; this set is lax register as evidenced by SED retention of *-h*; thus note atypical PCH and NGQ low vowels with lax register here.

*eh (PNB 357-361)

366. horse	aseh	ósih	aseh	sêy	hleh	axéh	sEh
367. unravel			leh	'lose, less'		léh	lEh
368. animal birth				seh		hleh	ché
369. mtn.goat				kêy		kéh	kEh
370. pound rice	peh	pih	peh	pêy	peh		
371. pot						adéh	dEh
372. fireplace						tupéh	tapEh
373. cut open, scratch						réh	rEh
374. make holes						pipréh	capEh

*ah (PNB 363-371)

375. split,half	pah	pah	pah	pa	blah	tupáh	bah
376. separate		klah	klah			cláh	klah
377. fearful			adrah			adáh	dah 'daring'

	PNB	RNG	JEH	SED	CUA	PCH	NGQ
378. CL.skirt	blah	blah	blah	pla		pláh	
379. charcoal	kač(h)ah	kóchah	kachah	kócha			kajah
380. lazy		hólah	alah		alah		
381. water leech		rótah	tutah	róta	latah		
382. atmosphere		rówah	wah		rawah		
383. morning,light		módah			kadah		
384. hand bananas		kówah		kóvạ	kapah		
385. arrow						taráh	carrah
386. if						láh	lah

*uh (PNB 372-378)

387. back basket		kruh	kruh		krôw		crúh
388. pound			buh			púh	
389. waterfall			ruh		rôh	trúh	

Note except for PCH, these correspondences are the same as 390-397; note PCH high vowel here with tense register; similarly note CUA mid vowel.

*ôh (PNB 372-378)

390. breast	tuh	tuh	tuh	tôw	tôh	tốh	toh
391. spit	kačuh	(kớ)chuh	kachuh	kóchôw	kasôh	cuchốh	kacoh
392. tree bark	gaquh	kóduh	kaduh	kótôw	kadôh		
393. mountain						cốh	koh
394. pound rice						chốh	kloh
395. dismantle						lốh	loh
396. swim						pốh	poh
397. put on fire						tacốh	takoh

Note that except for PCH these correspondences are the same as 387-389 (see note there also).

*oh (PNB 379-387)

398. exit	loh	loh	loh	lo	aloh	lóh	lOh
399. chop,cut	koh	koh	koh	ko	koh	cóh	kOh
400. peck	joh		joh		choh	tóh	tOh
401. drip, sprinkle	katoh	kó'qjoh/ kó'toh	katoh	kóto	katoh	tadyóh	
402. salt	qboh	boh	boh	po	voh		bOh
403. door			ploh			plóh	parlOh
404. gouge out		choh	choh			chóh	cOh
405. dish out			oh				qOh
406. tribal shirt			ayoh				yOh
407. y. sibling	oh	oh	oh	o	oh		
408. only	sasoh	soh	sasoh	xo	hloh		
409. rich				kro	karoh		
410. teach				póto	patoh		
411. ashes						abóh	bOh
412. lungs		(kó'suh)		(xôw)		xóh	sOh

PNB RNG JEH SED CUA PCH NGQ

Group 14 . Final *-y

*ây (PNB 451-454)

413. orphan		tây		tê		pantúy	pantAAy
414. village	palây	plây	plây	poîê	palóy		
415. rest	badây	pódây	padây	potê	padóy		
416. to fan	pây			pê	póoy		
417. cabbage		hóbây		(hópe)	vóy		
417A (e. brother, b.-in-law)			ây		(ay)		
418. increase						piclúy	palAAy
419. also, agreed						túy	tAAy

Note that Bahnaric short and Katuic long vowels are not consistent.

*ây (PNB 457-459)

420. fruit	plèy	phì	play	play	play	culay	kallay
421. pestle	adrèy	hódrì	adray	dray	adray	ntray	(ntrAAy)
422. day, sun	hèy	hì	ngay	hay	hngúy	ingay	tangay
423. head louse (củi)		chì	(kadhey)	chay	say	(nchê)	ncay
424. you (sg)					may	may	may
425. brother-in-law			(ây)		ay	carlay	karlay
426. painful						aqay	qay
427. correct						kray	kray

Note CUA, PCH and NGQ low vowels here with lax register, though see 431-435 where PCH ay corresponds with tense register; North Bahnaric and PCH long vowels and CUA and NGQ short vowels are not consistent unless this set reflects a proto open syllable like RNG.

*ùy (PNB 460-461)

428. in-laws				rôy	ruy	parruy	
429. smoke	qñùy	nhòy	qnhùy	nhôy	qnhùy		
430. set trap						xuy	suuy

*ay (PNB 469-477)

431. cotton	bray	bray	bray	pré	varaay	paray	prAAay
432. spider webway		way	hay	vé	varaay	tuvay	kawAAay
433. far	saqngay	hóqngay	iqngay/ siqngay	hóngé		sanguúy	cangAAay
434. untie, unroll, split open		lay	talay	lé		lay	lAAay/ laay
435. they, person	bangay	ngay		mangay	ngé	ngay	ngaa
436. circle		way				tuvay	tawaa
437. d. -in-law	may	may	may	mé		tarmay	
438. fishhook,line		say	say	sé	hlaay	lay'cast net'	
439. argue					takaay	cay	
440. melon		pókay				paca	

	PNB	RNG	JEH	SED	CUA	PCH	NGQ
441. loincloth			hlay			(nnay)	salaay
442. saliva	hay	hay	hay	hé	rahaay	'yawn'	
443. cook with water	pay	pay	pay	pé	(a)vaay		
444. maggot, worm		hray		hré	hraay		
445. tiger						rqay	harqaay
446. friends, big brother						xixay.	nsaay
447. treat poison						palay	palaay
448. widow						cammay	kamaay
449. tell story, slander						mmay	maay
450. edible sprouts						tamay	tamaay
451. words						parnay	parnaay
452. to prune						tray	traay
453. spirit, soul						rvay	harwaay

*ôy

454. past time						lalöy	looy
455. pile						pöy	pooy
456. pick up, glean						tröy	rooy

*oy (PNB 480-488)

457. visitor	tamoy	tómoy	tamoy	tumóy	tamooy	tammoy	tamOOy
458. a fly	roy	roy	roy	róy	rooy	riroy	rOOy
459. fetish, sacrifice	soy	soy	soy	xóy	hlooy	xoy	sOOy
460. imitate, follow tracks	_oy	qboy	bboy	qbóy		boy	tabOOy
461. horns			koy			tancoy	tankOOy
462. to plant	č(h)oy	choy	choy	chóy		choy	cOOy
463. flow			hoy			hoy	hOO
464. first		hódroy	droy	hódróy	jarooy		
465. tell				tóy	tadooy		
466. salt						boy	bOOy
467. little finger						ndoy	dOOy
468. lame						dyoy	jOOy
469. glance						tiloy	tallOOy
470. row						tanoy	tOOynOOy
471. bride price						poy	pOOy
472. chew root						troy	trOOy

Group 15. Final *-w

*ăw (PNB 424-427)

473. sorcerer	pajăw	bojăw		póchaw	kajôw	dăw(short vowel)
474. thousand	rabăw	robăw		rôpaw	<u>ravôw</u>	
475. pigeon	čatrăw	(trù)	katrăw	totraw	kótraw	

PNB RNG JEH SED CUA PCH NGQ

476. easy hlăw hlaw

Note CUA low vowel here with lax register, but see 477-481 for CUA aw with tense register.

*ăw (PNB 431-434)

477. grandchild	čăw	chăw	chăw	cháv	saw	acháv	caw
478. I	ăw	ăw	(á)				kaw
479. king	patăw	pótăw		pótáv		táv	
480. rice field		qmăw	măw	báv	ma		
481. medicine						tarháv	tarhaw

*aw (PNB 438-450)

482. wash	_raw	raw	raw	seó	qphaaw	raw	raaw
483. sugarcane	kataw	kataw		kóteó	kataaw	ataw	kataaw
484. shirt	aw	aw	aw	eó	(au)	aw	
485. call	kraw	kraw	kraw	kreó		araw	
486. testicle				kleó	klaaw		
487. ignite, flame					chaw	saaw	

Group 16. Final *-yh

*ayh

488. rhinoceros			rómê		rmayh		
489. jackfruit						panayh	parAayh
490. to hammer						tayh	ntAayh
491. to kick						payh	tapAayh
492. set off						callayh	tarlAayh

*iayh (PNB 501-503)

493. fingernail	čaḡneyh	kónih	kaḡniayh	kónêy	kaniyah	carreayh	karniayh
494. root	reyh	rih	riayh	rêy	rêah	reayh	riayh
495. nine						tikeayh	takiayh
496. to pick						leayh	liayh
497. criticize						teayh	tiaih

Note CUA high glided vowel here with tense register.

Appendix III. Index to glosses of cognate sets

The reference of the glosses is to the word numbers in Appendix II.

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