PROTO-MON-KHMER VOCALISM:
MOVING ON FROM SHORTO'S 'ALTERNANCES'[1]

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1. Introduction

While we have had a century of more-or-less consensus views on the nature of the Proto-Mon-Khmer (PMK) consonant inventory, cries of exasperation have accompanied consideration of PMK vocalism. David Thomas wrote in the first issue of *Mon-Khmer Studies* that "…comparativists have stated flatly that regular sound-laws simply do not exist in Mon-Khmer vowels, and, indeed, no one has yet succeeded (in print, anyway) in establishing a regular pattern in Mon-Khmer vowel comparisons" (1964:161). Blood (1966:6) cited Piat (1962) as finding in respect of Khmer-Bru correspondences that "…vowel shifts did not conform to predictable rules". Thomas' prescription was that comparativists should proceed from the bottom up, to reconstruct small groupings and sub-branches only, to work progressively towards deeper reconstruction, "…in this way [….] will the Mon-Khmer vowels be able to be solved" (1964:161).

This advice was followed almost to the letter over the four decades, so that by the beginning of the 21st century we have access to reconstructions for various Mon-Khmer sub-groups (e.g. North Bahnaric: Smith 1972; South Bahnaric: Sidwell 2000; West Bahnaric: Sidwell & Jacq 2003; Waic: Difiloth 1980; Katuic: Difiloth 1982, Efimov 1983, Peiros 1996, Sidwell 2005; Semai: Difiloth 1977, Phillips 2005; Monic: Ferlus 1983, Difiloth 1984; Vietic: Barker 1966, Thompson 1976, Ferlus 1991[2]). Yet at this point in time there has not appeared in press a reconstruction of Proto-Mon-Khmer vocalism based upon the systematic comparison of sub-grouping reconstructions.

However, there has been at least one attempt at reconstructing the PMK vowels; this is the "teleo-reconstruction" of Shorto (1976, 2006), which triangulates from two not-so-closely related branches directly back to the proto-language, skipping over any intermediate sub-groupings. The method is both tremendously powerful and risky, since the reliability of the results depends crucially upon the choice of criterion languages. Shorto based his analysis on a binary comparison of Old Mon and Written Khmer, which produced - quite consistently with Thomas' lamentation - a body of regular correspondences and a body of more chaotic data. Shorto hypothesized that in the latter correspondences he could discern a pattern of variation, which reflected an ancient system of vowel gradation, that he called "alternances". The principal types of variation he postulated were (i) between short and long vowel: u/uu, etc.; (ii) between simple vowel and diphthong: ii/iə, uu/uə; and (iii) between diphthong and ə : iə/ə, uə/ə. In the application of

[2] The list is not exhaustive; for a more comprehensive listing and discussion see my recent ICAAL3 paper (Sidwell f.c.)

this model Shorto effectively set up a hierarchy in which, if the correspondences did not unambiguously point to a single proto-value, the presence of a diphthong reflex presumed a long-high proto-vowel (e.g. uə < *uu), and the presence of a long-low vowel presumed a proto-diphthong (e.g. ɔɔ < *uə). This approach greatly skewed his reconstruction typologically; low vowels are much less frequent in his proto-language than are typically found in the daughters.

Comparative reconstruction is inherently pursued in a staged manner; initial analyses are done with a manageable data set, preliminary results are carefully considered and revised as necessary are progressively more data is drawn in, and in this way, a coherent comprehensive hopefully picture emerges. From the perspective of approaching the present issue in a scientific manner, we can suggest that it would be especially satisfying if the results of a progressively widened teleo-reconstruction converged on those of independently pursued bottom-up studies.

I submit that Shorto's theory of alternances was too powerful. As he brought more languages into his dataset, it allowed him to neglect the reanalysis of correspondences that would otherwise be indicated by their data. Short's comparative lexicon was primarily built upon the approximately one thousand comparisons of Mon, Khmer, Bahnar and Stieng compiled by Schmidt (1905), and he used more extensive and reliable Bahnar and Stieng (and other Bahnaric) data to increase that set.[3] Therefore a logical step would have been to extend the set of criterion languages to include at least Bahnar and Stieng, in effect establishing a preliminary Proto-Bahnaric reconstruction and significantly improving the reliability of his Proto-Mon-Khmer. In this paper I offer such a reanalysis, focusing on the diphthongs which are so heavily involved in Shorto's alternances. With this first step I hope to demonstrate that we can usefully build directly upon Shorto's achievement by broadening his top-down reconstruction.

2. Discussion

In pursuing his phonological reconstruction of a language family that was (and still is) far from adequately documented, Shorto followed the well established procedure of establishing sound correspondences for several criterion languages for which extensive and reliable sources were available. In this case he selected two languages, Old Mon (for which he had compiled a dictionary) and Khmer as represented in the standard writing system (which was presumed to more or less faithfully reflect historical pronunciation).

This use of only two criterion languages stands in contrasts to the more common practice of comparing at least four languages to determine phonological correspondences, evidenced in such canonical works as Schmidt (1905), Dempwolff (1938), Li Fangkuei (1977) and other. It is also notable that these other scholars consistently assisted their interpretation of the correspondence sets by considering relevant available data from other related languages, a methodological necessity if one is to distinguish phonological history otherwise obscured by parallel changes that may have occurred among the selected criterion languages.

In this case however, Shorto implemented a novel approach; first he determined his reconstruction based solely upon the binary comparison of Mon and Khmer, and then he applied the results to his wider data set. What he found was a substantial proportion of reflexes that could be accounted for without difficulty, plus a sizable minority of

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[3] For example, the number of Bahnar items was increased nearly 50% over Schmidt to more than 1350.

apparently irregular correspondences that did not immediately sit with the preliminary reconstruction.

Table 1: *Mon-Khmer vowel correspondences from Shorto (2006)*

Table 1: *Mon : Khmer correspondences*

PMK	Old Mon orthography	Old Mon phonology	Khmer orthography
*i	*i, u, a, ī, ū, e, ui, ei*	ø	*i, ɯ*
*-iʔ	*-i(')*	*-iʔ*	*-ī*
*ii	*ī, i*	i	*i, ɯ*[1], *ī*[1], *e*[2]
*-iiʔ	*-ey*	ɔy	*-ai*
*e	*e*	e	ε[3], *e*[4]
*ee	*ī, i*	i	ε[5], *e*[6]
*a	*a; e*[7]	**a**[8]	*a, ā*[9], *ai*[10], *e*[11], *_*[12]
*aa	*ā; e*[13]	**ai**[8], **a**	*ā*
*ə	*i* etc.; *a*[14], *o*[12]	ø; ɔ[12,14]	*ɔ; ɔ̄*[9]; *a*[2]
*əə	*i* etc.; *u, ū*[10]	ø; **u**[10]	ɤ
*ɔ	*o*[8], *a*	ɔ	*ɔ; ɔ̄*[9]; *a*[2]
*ɔɔ	*o*[8], *a*	ɔ	*ɔ̄; ūv*[15]
*o	*u, ū, o*[8]; *i* etc.	ɯ[8], ø	*o*
*oo	*o; u*[15]	o; **u**[15]	*o*
*u	*u, ū, o*[8]; *i* etc.; *ū, u*[10]	ɯ[8], ø; **u**[10]	*u; ūv*[15], *ū*[16]
*uu	*ū, u*	u	*ū, u*[12]; *o*[2]
*-uuʔ	*-ow*	ɔw	*-au*
*iə	*e; a*[17]	ei; ɔ[17](?); iə[18]	*iə*
*uə	*o*	o	*uə*
*ai	*a; e*[13]	**ai**[8], **a**	ε

How was this dealt with? At this point Shorto took a crucial step - he supposed that among the problematic correspondences he could discern regular patterns that suggested an explanation which would allow him to maintain his preliminary model more or less without revision. This patterning was of the following kind: where he may have expected, for example, to see a reflex of *u, he instead sometimes saw what appeared to be a reflex of *uu, where he expected a reflex of *uu, he instead sometimes saw what appeared to be a reflex of *uə, and so forth. these patterns suggesting a pattern of vowel gradation with PMK along the lines of *u > *uu > *uə > *ɔɔ, and similarly for the front vowels. Assuming that there were co-occurring forms of the same etymon with various vowel grades within PMK, reflecting perhaps some ancient morphophonemic processes, one could posit alternate proto-forms (or alternances), without needing to posit additional proto-phonemes or complicated sound laws to account for the more problematic correspondences. Consequently when one browses Shorto's dictionary a veritable plethora

of alternate reconstructions are noted. For example, the following two entries nicely illustrate the pattern of gradation:

†**305** **tiik*; **tiək* *to lie down, sleep*.
    A: (Mon, Khmer, Aslian) Khmer **deːk**, Kensiu **tik**, (or **B**?) Semnam &c. **tɛg**; ~ (probably originally
        hypothetical) Old Mon *stik* /stik/, Modern Mon **toik**; ~ Mah Meri **gətik**, (~?) Semelai **jətek**, by
        metathesis Jah Hut **ticɛːk**.
    B: (Khasi, Nicobaric) Khasi *thiah*, Central Nicobarese **iteak**, Nancowry **ʔitiák**.

1326 **cum*; **cuum*; **cuəm*; **cəm* *matched, complete*.
    A: (Palaungic, Khmuic, ?Mon) Literary Mon *[ci] cuiṁ to be complete* (or **D**), Kammu-Yuan **cùm** (!;
        contaminated by *flock, herd* < **1338** **bjum*), Palaung **sum** *pair* (Mɪʟɴᴇ 1931).
    B: (Mon, Palaungic) Mon **cum** *pair, set; to be even in number, complete*, Palaung **sum** *pair* (Mɪʟɴᴇ 1931).
    C: (Mon) Old Mon *com* /com/ *entirely*.
    D: (Khmer, South Bahnaric) Khmer **cɔm** *exact(ly), directly*; ~ Stieng **tacəːm** *to put together again*.

So one result of this approach is that when reflexes one etymon in different languages (especially between Mon and Khmer) did not show regular correspondence, multiple proto-forms were posited rather than prompt a reanalysis the vocalism. But another striking fact is that, when Mon or Khmer were absent, the phonological hierarchy (e.g. *u > *uu > *uə > *ɔɔ) at the centre of the theory of alternances was applied in a manner that overrode the basic assumption of reconstructing the fewest number of changes needed to account for the observed correspondences (in violation of "Occam's Razor").

Referring back to Table 1, you will note the otherwise unremarkable correspondence of Old Mon orthographic o to Written Khmer uə and ɔ, ɔ̄, and parallel correspondence of Old Mon orthographic e to Written Khmer iə and ɛ. Shorto interpreted these as reflecting mergers in Mon, while Khmer retained archaic diphthongs. The straightforward consequence is that wherever the Khmer reflex is diphthonged, so the PMK reflex is presumed to be. Here is a simple example from the dictionary:

1157 **duən* *pole, lance*.
    A: (Mon, Khmer, Viet-Mường) Literary Mon *don lance, pike*, Khmer **tùːən** *fish-spear*, (**lùmpɛ̀ːŋ** —) *kind of*
        lance, Mường *tòn* (Bᴀʀᴋᴇʀ 1966 22), Vietnamese *đòn lever, carrying-pole*; → Thai **tʰuan** *tasselled*
        lance.

It happens that when Shorto began assembling MK cognate sets, he did so by first extracting the Mon, Khmer, Bahnar and Stieng comparisons compiled by Schmidt (1905) (the latter two languages being related within the Central sub-branch of Bahnaric, see Sidwell 2002). Among these comparisons Shorto noted that for proportion of etyma for which Khmer has uu and uə, a goodly number of Bahnar and Stieng reflexes show ɔɔ (or low back vowels). Shorto took this to indicate that in such cases Bahnar and Stieng ɔɔ reflect a regular development from PMK *uə - in some cases directly from a primary PMK *uə (and in some others from an uə alternant of PMK *uu). A neat example as is seen here:

822 *cnuəc *to spit, transfix.*

    A: (Mon, Khmer, North Bahnaric) Kontum Bahnar **hnɔːc** *to sharpen, to stab* (GUILLEMINET 1959-63); ~ Mon **kənot** *canat! spit* (merging **1005** *t/rn/uut *skewer*), Khmer **crənuːəc** *meat on spit* (& *tranuəc spit*, GUESDON 1930, contaminated by **trənaot** *skewer* < *t/rn/uut); ~ Khmer **crənuːəc** (& **krənuːəc**) *to roast on spit.*

So confident was Shorto that variously reconstructed PMK *uə to explain correspondences of Old Mon o to Bahnar and/or Stieng ɔɔ even when a Khmer reflex was lacking, e.g. (note alternate B.):

280 *kuk; *kuək *egret.*

    A: (Khmer, South Bahnaric) Khmer **kok** *heron, egret,* Biat **kok** *egret.*

    B: (Bahnaric) Chrau **kɔːʔ** *cattle egret,* Bahnar **[klaːŋ] kɔːk** *generic term for egrets &c.* (GUILLEMINET 1959-63); probably → Cham **kɔːʔ**; Vietnamese *cò.*

And even in cases when neither a Khmer nor Mon reflex are present:

878 *huəc *to flow.*

    A: (Bahnaric, Khasi) Central Rölöm **hʊac**, Biat **hɔːc** *to flow,* Bahnar **hɔːc** *[water] to carry away; to unroll, flow out,* Khasi **hoit** *to flow out, seep out*; ~ Bahnar **təhɔːc** *to dispose of by throwing into stream,* (GUILLEMINET 1959-63) *to overflow.*

Parallel considerations also apply to his treatment of *ii, *iə such that Bahnar/Stieng etc. εε is frequently treated as a reflex of PMK *iə even in the absence of a diphthonged Khmer reflex:

731 *[k]liəŋ *forehead.*

    A: (Bahnaric) Biat **[ndraŋ] klɛːŋ**, Bahnar **klɛŋ**, Jeh **kleːŋ**, Halang **kleaŋ**; by secondary derivation ~ Sre **biŋliaŋ**.

1010 *gtit; *gtiət *lorikeet, parakeet.*

    A: (South Bahnaric; ~ *grtit >) Sre **rətet** *green lorikeet, Loriculus vernalis.*

    B: (Bahnaric, ?Viet-Mương) Stieng, Biat **tɛːt**, Bahnar **[sɛːm] dɛːt** *parakeet* (GUILLEMINET 1959-63), perhaps by metathesis (*dkiət >) Vietnamese *két*; ~ (*grtiət >) Chrau **kətiət** *parakeet.*

On the other hand, there are examples of Bahnaric ɔɔ corresponding to ɔɔ in other MK branches, including Old Mon graphic o, and Khmer ɔɔ (and similar vowels), for which Shorto reconstructs PMK *ɔɔ, e.g.:

25 *skɔɔʔ *grey-haired.*

    A: (Mon, Khmer, Bahnaric) Khmer **skoːv** *grey-haired,* Sre **koː** *to be white-haired, albino,* Bahnar **kɔː** *grey[hair]*; ~ Old Mon *siṅko' /sənkɔʔ/ grey-haired,* Modern Mon **həkɔʔ** *to be grey-haired,* Old Khmer *saṅkū grey-haired.*

412 *prɔɔk *squirrel.*

A: (Bahnaric, Khmuic, Palaungic, Viet-Mương, North & Central Aslian). Sre **pro** (→ Stieng **prɔh**?), Chrau **prɔ:ʔ**, Biat, Bahnar **prɔ:k**, Jeh **pro:k** (GRADIN & GRADIN 1979), Kammu-Yuan **prɔ:k**, Palaung **[ə]prɔʔ** (MILNE 1931), Vietnamese *[con] sóc*, Sakai **prōk**[n] (i.e. Semai; SKEAT & BLAGDEN 1906 M 136 (c)); → Lao, Ahom ***rook** (BENEDICT 1975 226, *bat…*); Cham, Jarai **prɔ:ʔ**, Röglai **proʔ**, North Röglai **pro:ʔ**.

Cf. Khmer **kɔmprok**, apparently < ***ko:n prɔ:k**, for which cf. Vietnamese; → Thai **krarɔ̂ɔk** (with **kr-** by hypercorrection) at early stage

466 *sɔɔk *to peel.*

A: (Mon, Khmer, Katuic, North Bahnaric, Khmuic) Mon **sɔk** *to peel, skin*, Khmer **sɔ:k** *to peel, remove bark, to slough*, Kuy **sɑ:ʔ** *slough, to slough*; ~ Mon **hənok** *peel, rind, bark, shell, slough*, Khmer **sɔmnɔ:k** *slough, [onion-]skin, [bamboo-] sheath*; ~ Khmer **sɔmbɔ:k**, (→?) Kuy **mphùaʔ** *skin, bark, shell, husk*, Kammu-Yuan **həmpɔ́:k** *bark*; ~ (***smɔɔk** >) Chrau **mɔ:ʔ** *bark*, Bahnar **hmɔ:k** *thick bark of certain trees*; ~ (***srsɔɔk** >) Biat **rchɔ:k** *[egg]shell*; (?***sɔk** >) Bru **sɒʔ** *to peel.*

547 *t₁ɔɔŋ *handle.*

A: (Khmer, Katuic, Bahnaric) Khmer **dɔ:ŋ** (→ Cham *ḍauṅ*), Kuy **tɑ:ŋ**, Stieng **to:ŋ**, Chrau **tɔ:ŋ** *handle*, Biat **tɔ:ŋ** (— **jra:**) *crutch*, (—**nji:ŋ**) *balance*, Bahnar **tɔ:ŋ** *quantifier for guns, swords, axes, &c.*, Jeh **to:ŋ** *quantifier for tools*, Halang **toaŋ** *quantifier for long tools*; ~ (***tntɔɔŋ** >) Biat **ntɔ:ŋ** *handle.*

1634 *pɔɔr (& ***pɔr**?) *rice-gruel.*

A: (Khmer, Bahnaric) Stieng **pɔ:r** *soup*, Sre **por** *rice-gruel* (< variant?), Chrau **pɔ:r** *soup, gruel*, Biat **pɔ:r** *rice soup*, Bahnar **pɔ:r**, Jeh **po:l**, Halang **poar** *cooked rice*; ~ Khmer **bəbɔ:** *papar* (→ Stieng **p°bɔ:r**) *soup, rice-gruel.*

So it is evident that Bahnar (or Bahnaric?) ɔɔ can reflect both PMK *uə and *ɔɔ, evidently implying a merger of *uə and *ɔɔ > ɔɔ in (at least) Bahnar. In the absence of an indicative Khmer reflex (or other helpful indications), it would in principal be impossible to decide whether to reconstruct the diphthong or monophthong on the basis of the Bahnaric reflex. Shorto appears to have dealt with this conundrum by privileging his alternance hierarchy (*u > *uu > *uə > *ɔɔ), reconstructing the diphthong proto-vowel in various cases, e.g.:

280 *kuk; *kuək *egret.*

A: (Khmer, South Bahnaric) Khmer **kok** *heron, egret*, Biat **kok** *egret.*

B: (Bahnaric) Chrau **kɔ:ʔ** *cattle egret*, Bahnar **[kla:ŋ] kɔ:k** *generic term for egrets &c.* (GUILLEMINET 1959-63); probably → Cham **kɔ:ʔ**; Vietnamese *cò.*

475 *huək; *ʔuək *brains.*

A: (Palaungic) Palaung **hɔʔ**; ~ (***huək huək** > ***khuək** >) Riang-Lang **khuak.**

B: (North Bahnaric, Viet-Mương, ?South Bahnaric) Vietnamese *óc*; ~ Biat **rŋɔ:k** (or **A**?), Bahnar **ʔŋɔ:k.**

1273 **rup*; **ruup*; **ruəp* *to cover.*

    A: (Khmer, South Bahnaric, ?Khasi) ~ Khmer **kɔntrùp** *kandrup dark gloomy place, made dark by overhanging branches &c.*, Biat **ndrup** *lid*; ~ (**[t]rr- >*; or **B**?) Khasi **tyllup** *to cover up completely* (IVAN M. SIMON PERS. COM.).

    B: (Khmer, Kuy, ?South Bahnaric) ~ Khmer **kraop** *to cover, hide; lid*; ~ Stieng **gru:p** *to cover, stop up* (or **A**?); ~ Kuy **tro:p** *to cover with e.g. fowl-basket.*

    C: (Mon, Bahnaric) Stieng **ruɔ:p** *to hide, bury*; ~ West Bahnar **krɔ:p** *hidden, hiding* (GUILLEMINET 1959-63); ~ Middle Mon **grop** */grop/*, Modern Mon **kròp** *to cover*; ~ Old Mon **ginrop** *screen*, Modern Mon **həròp** *cloth cover.*

And the same where a monophthong is evident in South Bahanric, e.g.:

1374a **[ ]ɓuəm*; **[ ]ɓ[ə]m* *cheek.*

    A: (South Bahnaric, Khmuic) Biat **[tɒ:m] bɔ:m**, Kammu-Yuan **pɔ:m** (→ Thin **pɔm**?).

    B: (Katuic) Kuy **bam.**

       The situation may have been complicated by a lack of understanding of the phonological history of Bahnar. I have identified (e.g. Sidwell 1998, Sidwell 2002) that there is tendency to monophthongization in Bahnar, due to a broad stress shift within Bahnar mainsyllable vowels which is seen most clearly in examples such as:

Proto-Bahnaric		Bahnar	
*puan	>	pwan	"four"
*ciam	>	hjɛm	"to feed"

Where the prevocalic consonant is already a rhotic (or a glide?) the original diphthong becomes a low monophthong:

Proto-Bahnaric		Bahnar	
*ruat	>	rɔt	"to buy"
*ruay	>	rɔɔy	"fly"
*ruas	>	roih	"elephant"
*riah	>	rəh	"root"

These and other similar examples form prominent etymologies among the Bahnaric data, and if Shorto had not picked up on the phonological conditioning of the monophthongization these may well have influenced him to think that a Bahnar low back vowel is generally indicative of a PMK *uə (and similarly a low front vowel indicative of *iə).

       Shorto's analysis of the relevant phonological correspondences is schematized in the following table:

Table 2: *Shorto's Mon:Khmer:Bahnar:Stieng low back correspondences*

	Old Mon	Written Khmer	Bahnar	Stieng*	PMK
1	o	o	ɔɔ	ɔɔ	*ɔɔ
2	o	uə	ɔ(ɔ)	ɔɔ	*uə
3	o	uə	ɔ(ɔ) ~ wa	uə	*uə

*and other South Bahnaric

Lines 1 and 3 above are straightforward enough, but line 2 requires further consideration. The question reduces to whether the line 2 reconstruction should be *uə or *ɔɔ, or something else, particularly depending upon which of Khmer or Bahnaric is the innovator.

In the absence of an obvious conditioning factor it is not enough data here to decide. All other things being equal, it may be suggested that it is as likely that Khmer merged *uə and *ɔɔ to uə as it is that Bahnaric merged *uə and *ɔɔ to ɔɔ. However, not all things are equal, especially in terms of the structural imbalances within Shorto's reconstruction.

Shorto's PMK vowel inventory is as follows:

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*/    i           u           ii          uu

      e     ə     o           ee    əə    oo

            a     ɔ                 aa    ɔɔ

   iə   [ɯə]   uə

        ai              /
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Note the complete lack of low from vowels despite the frequent fact of such a contrast in MK languages. This correlates with the imbalance in frequency between Shorto's reconstruction of 365 cases of *uə versus only 80 cases of *ɔɔ, whereas it is more typical for ɔɔ to outnumber the back diphthong by about 2:1 in phonologically conservative Mon-Khmer languages (by my counts). A rough count of Shorto's *uə etymologies also finds that reflexes in Northern Mon-Khmer languages are more often *ɔɔ than diphthonged, giving further support to my hypothesis.

It is thus apparent that in respect of the line 2 correspondence, the Khmer diphthong reflex is the odd-man-out, and is much more likely to reflect a Khmer innovation via a merger with uə, although the conditioning factors are not yet clear. By implication a parallel merger of *iə and *ɛɛ to iə in Khmer is indicated, requiring us to posit an additional proto-vowel *ɛɛ (and probably also a short *ɛ) which fills the rather odd gap in an otherwise more or less normal inventory for an "unrestructured" MK language (applying the terminology of Huffman 1985).

Accepting this line of reasoning as our present working hypothesis, there is no need to posit a new back vowel phoneme to account for the line 2 correspondences, although a systematic revision and reassignment of proto-forms is indicated. More data is required to determine if a specific conditioning environment can be identified for the restricted mergers identified for Khmer.

Conclusion

Shorto most likely erred in only basing his vocalism on the comparison of two languages. In my view, if he had used the four languages as laid out in his principal source (Schmidt 1905), he could have avoided the apparently excessive application of his theory of alternances, and offered a more reasonable reconstruction. As it stands the phonological and lexical reconstruction offered by Shorto (2006) is skewed and in serious need of revision. Even within the limits of the data organised and presented by Shorto it is possible to move more or less quickly to address these issues and produce a much more satisfactory account of PMK vocalism.

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