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The Finnic ‘secondary e-stems’ and Proto-Uralic vocalism¹

It is well-known that in the Finnic languages there is group of Uralic word-roots which appear to have undergone an unexplained vowel shift in the first and second syllables: e.g., Finnish *sarvi* : *sarve-* ‘antler’ (< Proto-Uralic *šorwa) and *talvi* : *talve-* ‘winter’ (< Proto-Uralic *tälwä). These words have been referred to as ‘secondary *e*-stems’, as the shape of their cognates outside Finnic suggests a proto-form with the stem vowel *a or *ä. This paper proposes a solution which provides a regular phonological account of the development of this class of word roots. The solution involves the revision of certain aspects of the theory of historical vocalism in Saami and Mordvin.

I. Introduction

The purpose of this paper is to present a solution to a well-known problem of Uralic historical vocalism, the development of so-called ‘secondary *e*-stems’ in Finnic languages. A large majority of reconstructed Proto-Uralic noun and verb roots fall into two stem types, *i-stems (e.g. *tuli ‘fire’, *meni- ‘go’) and *A-stems (e.g. *muna ‘egg’, *kanta- ‘carry’, *šilmä ‘eye’, *elä- ‘live’), the frontness of the stem vowel in the latter type depending on vowel harmony. In most cases, these stem types are straightforwardly reflected as *e*-, *a*- and *ä*-stems in Finnic, cf. Finnish *tuli* : *tule-* ‘fire’, *mene-* ‘go’, *muna* ‘egg’, *kanta-* ‘carry’, *silmä* ‘eye’, *elä-* ‘live’. However, there is a group of roots which display an *e*-stem in Finnic even though Saami and Mordvin suggest the reconstruction of an *A-stem. In these roots, also the first-syllable vowel of the Finnic cognates unexpectedly appears as *a or *ō (> Finnish *uo*). Consider the following examples (the Proto-Uralic reconstructions are cited according to Sammallahti 1988):

Secondary *e*-stem:PU *šorwa ‘antler’ > Fi *sarvi* : *sarve-*, SaaN *čoarvi*, MdE *šuro*PU *šola ‘gut’ > Fi *suoli* : *suole-*, SaaN *čoalli*, MdE *šulo*PU *tälwä ‘winter’ > Fi *talvi* : *talve-*, SaaN *dálvi*, MdE *tél’e*No secondary *e*-stem:PU *kota ‘hut, tent’ > Fi *kota*, SaaN *goahti*, MdE *kudo*PU *kočka ‘eagle’ > Fi *kotka*, SaaN *goaskin*, MdE *kučkan*PU *päjwä ‘sun, day’ > Fi *päivä*, SaaN *beaivi*

It is traditionally assumed that the vocalism of the Finnic cognates results from a secondary shift to the *e*-stem type, which was accompanied by a change in the first syllable vowel. It is interesting that the phenomenon is attested only in combination with particular first-syllable vowels: only the PU vowel combinations *o–a and *ä–ä

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are affected. As shown in Aikio (2012: 237–239), the proposed development can be broken down into two distinct changes. First, there was an unexplained shift of stem types: a part of the occurrences of the PU vowel combinations *ä–ä and *o–a changed to Pre-Proto-Finnic *a–e. After this, Pre-Proto-Finnic *a–e of any origin regularly developed into Proto-Finnic *ō–e if the vowels were separated by a single voiced consonant other than *ŋ (Aikio 2012: 232–237). Thus, the development seems to have been as follows:

PU	Pre-PFi	PFi	Fi
*śorwa ‘antler’	> *sarve-	> *sarvi : *sarve-	> <i>sarvi</i> : <i>sarve-</i>
*śola ‘gut’	> *sale-	> *sōli : *sōle-	> <i>suoli</i> : <i>suole-</i>
*tälwä ‘winter’	> *talve-	> *talvi : talve-	> <i>talvi</i> : <i>talve-</i>
*käsä ‘moisture’	> *kase-	> *kasi : *kase-	> <i>kasi</i> : <i>kase-</i>
*pälä ‘half, side’	> *pale-	> *pōli : *pōle-	> <i>puoli</i> : <i>puole-</i>

The phenomenon is a fairly regular one: a proportionally large number of PU roots reconstructed with the vowel combination *o–a or *ä–ä show a Finnic reflex of this type. However, there is no generally accepted explanation as to why particular roots with these vowel combinations changed to ‘secondary *e*-stems’ in Finnic, while others remained unaltered.

2. Previous attempts at a solution

A theory of the development of ‘secondary *e*-stems’ has been presented by Itkonen (1977). He proposes that in these cases, the Finnic stem vowel *e* would have been analogically acquired from the oblique plural substems of nouns and past tense substems of verbs. Both the oblique plural and past tense markers had the shape *-j-. Itkonen assumes that in Pre-PFi, the difference between *A- and *e-stems was not always visible before these suffixes, because in unstressed syllables there had been a sound change *-Aj- > *-ej- under certain conditions. Thus, morphophonological alterations such as Pre-PFi *śolma : PL *śolme-j- ‘strait’ would have emerged, making the difference between *A- and *e-stems invisible in plural forms (cf. Pre-PFi *polvi : *polve- : PL *polve-j- ‘knee’). In such a situation ‘secondary *e*-stems’ could have emerged through paradigmatic analogy. While superficially attractive, under closer scrutiny this solution turns out to involve three unwarranted assumptions.

First, one must note that ‘secondary *e*-stems’ occur in words such as Fi *sappi* ‘bile’, *kansi* ‘lid’, and *salmi* ‘strait’, whose plural forms must have had a low frequency in actual language use. Thus, the assumption that plural forms formed a model for paradigmatic analogy appears implausible for semantic reasons, as has been noted by Honti (2002: 242–243).

Second, Itkonen maintains that in Proto-Finno-Ugric, vowels were divided into two classes: the short non-open vowels *i, *ü, *u, *e and *o were “light”, whereas the short open vowels *ä and *a as well as the long vowels *ī, *ū, *ē and *ō were “heavy”. He postulates a complex path of development for Pre-Proto-Finnic combinations of the stem vowels *a, *ä and *e followed by a suffixal *j, in which this distinction between “light” and “heavy” vowels in the preceding stressed syllable serves as a conditioning factor. However, the postulated classes of “light” and “heavy” vowels become meaningless as it is recognized that no long vowels can actually be reconstructed for Proto-Uralic or Proto-Finno-Ugric (Aikio 2012). Moreover, the changes Itkonen postulates are not supported by modern research on the development of unstressed vowels in Finnic. Kallio (2012a) has shown that the various Finnic outcomes of Pre-Proto-Finnic stem vowels followed by suffixal *-j- are conditioned by whether the preceding stressed syllable was open or closed, not by the “lightness” or “heaviness” of the preceding stressed vowel. This is clearly revealed, e.g., by the following contrasting pair:

- *kunta-j-ta > *kuntijta > PFi *kuncida > Fi dial. *kunsia* (PL.PART of *kunta* ‘county, municipality’)
- *muna-j-ta > Pre-PFi *munejta > PFi *muneida > Est *mune*, Vote *munõja* (PL.PART of *muna* ‘egg’)

Third, the sound changes Itkonen postulates could only account for analogical shifts of the stem vowel – they do not explain the change of the vowel in the first syllable. Thus, he resorts to the mysterious force of ‘Systemzwang’ to explain the shift of the first-syllable vowel to PFi *a ~ *ō. This is an ill-defined concept, however, and as such does not provide a genuine explanation for anything. Thus, Itkonen’s solution to the problem of ‘secondary e-stems’ is clearly untenable.

Honti (2002) has made an attempt to improve Itkonen’s explanation. He suggests that the anomalous vowel development was not caused by the plural or past tense marker *-j-, but instead by the homonymous PU nominal and verbal derivational suffixes *-j- that were added to the Uralic roots. The explanation has been supported by Saarikivi (2010: 258–261), who further explores possible connections to the development of the non-initial syllable rounded vowel *o in Proto-Finnic.

Honti’s model solves the first of the three problems mentioned above, but not the other two. At the same time, however, a new complication is introduced: derivatives with the suffix *-j- are not actually known to be reflected as Finnic *e-stems under any conditions. Instead, the derivative suffix *-j- has regularly produced Finnish *i*-stems when combined with stems with the vowel combinations *o–a and *ä–ä: e.g., Fi *koti* (GEN *kodin*) ‘home’ (< *kota-j) ← *kota* ‘hut, tent’ (< PU *kota), Fi *soti*- ‘fight a war, wage war’ (< *šod’a-j) ← *sota* ‘war’ (< PU *šod’a), Fi *säliä* ‘split wood shingles’ (< *šälä-j ← PU *šälä- ‘cut’). As pointed out by Kallio (2012a: 38; 2012b: 169), Honti’s model is thus in contradiction with the known developments of Finnic second-syllable vocalism. As its overall explanatory power is not greater than that of Itkonen’s model, it cannot be accepted; clearly, an entirely new approach to the problem is needed.

3. Secondary or primary *e*-stems?

It seems to have always been taken for granted that the unexpected occurrences of Finnic *e*-stems really are secondary, i.e., that they developed from PU *A-stems. However, there is no *a priori* reason to make such an assumption; we must also consider the possibility that the so-called ‘secondary *e*-stems’, or a part of them, represent some kind of archaism, and their cognates have merged with *A-stems in Saami and Mordvin.

It is, in fact, a methodologically dubious approach to attempt to explain the Finnic ‘secondary *e*-stems’ as a product of some sort of non-systematic (analogical or ‘sporadic’) change, because the sound correspondences displayed by these word roots are entirely regular: there are quite many examples of ‘secondary *e*-stems’ that supposedly reflect the PU vowel combinations *o–a and *ä–ä. One expects sound changes to be either regular (affecting all cases) or irregular (affecting a single lexical item or a very small number of lexical items). However, in the context of the traditional theories of Uralic historical vocalism, the ‘secondary *e*-stems’ are not irregular, but semiregular: they occur in a proportionally large number of cases, but nevertheless unpredictably. As sound change is not known to be semiregular, this suggests that there is something wrong with how the whole problem has been conceptualized.

It needs to be clarified that the notion of ‘regularity’ can be used in two quite different senses when speaking of sound correspondences. In the first sense, a correspondence is ‘regular’ whenever it is thought to be a product of regular sound change, and ‘irregular’ when it is not predictable on the basis of assumed regular changes and thus assumed to have arisen through an ‘irregular’ sound change or some non-phonological process such as paradigmatic analogy. However, correspondences can also be conceived as ‘regular’ or ‘irregular’ in a quite different sense, namely that ‘regular’ correspondences recur in the etymological material whereas ‘irregular’ correspondences do not recur. The crucial difference between these two concepts of ‘regularity’ is that the former is tied to a particular theory of historical phonology of the languages studied, whereas the latter presupposes no such theory.

As regards the ‘secondary *e*-stems’, they are only ‘irregular’ in the former sense but not in the latter sense. Let us consider the vowel correspondence between, e.g., Fi *sarvi* and MdE *šuro* ‘antler, horn’. In the classical theory of Uralic historical phonology, the vowel correspondence between these items is ‘irregular’ in the first sense: Mordvin presupposes the form *šorwa whereas Finnic points to *šarwi, and within the traditional theory there is no way to reconcile these two forms. Importantly, however, the correspondence Fi *a* ~ MdE *u* is nevertheless ‘regular’ in the latter sense: it recurs in other items, such as Fi *kansi* ‘lid’ ~ MdE *kundo* ‘lid’, Fi *tammi* ~ MdE *tumo* ‘oak’ and Fi *ammoin* ~ MdE *umok* ‘in ancient times, long ago’.

Because regular sound correspondences are a product of regular sound change, we can state that the more often a particular correspondence recurs in cognate items, the more certain it is that it also arose through regular change. On the other hand, whenever a clearly recurring correspondence nevertheless seems ‘irregular’ with

regard to our theory of historical phonology, this is indicative of a flaw in the theory. On a theoretical level this seems clear enough. On the practical level of studies in Uralic historical vocalism, however, correspondences have often been labeled simply as products of ‘irregular’ or ‘sporadic’ changes whenever they do not abide to some preconceived notion of Proto-Uralic vocalism (for discussion, see Aikio 2014c: 142).

This implies that regular sound change should be sought as an explanation for the phenomenon of ‘secondary *e*-stems’. As a starting point, I shall take the widely accepted reconstruction of Uralic vocalism by Janhunen (1981) and Sammallahti (1988), which is in many essential respects based on the theory of Finno-Permic historical vocalism proposed by Itkonen (1946; 1954). However, modifications to this reconstruction regarding assumptions of distinctive long vowels in various proto-language stages have been argued in Aikio (2012).

4. Secondary *e*-stems with back-vocalic cognates

Let us first consider those Proto-Finnic ‘secondary *e*-stems’ that have back-vocalic cognates in other Uralic branches, and which in the traditional reconstruction are thought to reflect the PU vowel combination **o*–*a*. The Saami cognates have the PSaa vowel combination **oa*–*ē*, and the Mordvin cognates have PMd **u* in the first syllable. The traditional assumption is that the PSaa second-syllable **ē* (< PU **a*) reflects the original stem type, and in Proto-Finnic there was a stem type change **o*–*a* > **a*–*e* (> **ō*–*e*) (Itkonen 1977; Aikio 2012: 237–239).

Let us first consider the problem in light of data from the West Uralic (Finno-Saami-Mordvin) group. The problem is that it is impossible to attribute the change PWU **o*–*a* > Pre-PFi **a*–*e* to any conditioning factor. Consider the following cases (for more details on the etymologies mentioned, see the research material in the Appendix):

- 1) PWU **o*–*a* > Pre-PFi **a*–*e*
 - PWU **komta* > PFi **kanci* : **kante*- ‘lid’
 - PWU **kola*- > **kale*- > PFi **kōle*- ‘die’
 - PWU **kora* > **kare*- > PFi **kōri* : **kōre*- ‘crust, peel, skin’
 - PWU **korta*- > PFi **karci* : **karte*- ‘snuff; carbon deposit’
 - PWU **ńola*- > **nale*- > PFi **nōle*- ‘lick’
 - PWU **podwa* > PFi **patvi* : **patve*- ‘outgrowth; compression wood’
 - PWU **polma* > PFi **palm-ikkoi* ‘braid’
 - PWU **pora(wa)* > PFi **parvi* : **parve*- ‘raft’
 - PWU **śola* > **sale*- > PFi **sōli* : **sōle*- ‘gut’
 - PWU **śorwa* > PFi **sarvi* : **sarve*- ‘horn’
 - PWU **śolma* > PFi **salmi* : **salme*- ‘strait’
 - PWU **tomma* > PFi **tammi* : **tamme*- ‘oak’
 - PWU **torka*- > PFi **tarke-ne*- ‘stand the cold, feel just warm enough’

- 2) PWU *o–a preserved unchanged in Finnic
 PWU *kodwa > PFi *kotva ‘short time, while’
 PWU *kočka > PFi *kocka ‘eagle’
 PWU *kojra > PFi *koira ‘dog’
 PWU *kopa > PFi *kopa ‘conifer bark’
 PWU *korja- > PFi *korja-da- ‘gather; repair’
 PWU *koška > PFi *kosk-elo ‘merganser’
 PWU *kota > PFi *kota ‘teepee’
 PWU *orawa > PFi *orava ‘squirrel’
 PWU *ora > PFi *ora ‘awl’
 PWU *orja > PFi *orja ‘slave’
 PWU *orpas > PFi *orbas-, *orp-oi ‘orphan’
 PWU *ojwa > PFi *oiva ‘good, splendid’
 PWU *oksa > PFi *oksa ‘branch’
 PWU *onša > PFi *osa ‘part, share, meat’
 PWU *počka > PFi *pocka ‘shin’
 PWU *sonta > PFi *sonta ‘muck’
 PWU *śod’a > PFi *sota ‘war’
 PWU *tora > PFi *tora ‘quarrel’
 PWU *woča > PFi *ota-va ‘salmon net, Big Dipper’
 PWU *wolka > PFi *olka ‘shoulder’

The material above reveals that no conditioning factors can account for the change *o–a > *a–e in Pre-Proto-Finnic. Let us consider the following minimal pairs:

- PWU *podwa (> PFi *patve-) vs. PWU *kodwa (> PFi *kotva)
- PWU *kora (> *kare- > PFi *kōre-) vs. PWU *tora (> PFi *tora)

In both cases, the only difference is the initial consonant, but it is clearly impossible to argue that initial *k would have triggered the change *o–a > *a–e in PWU *kora and at the same time prevented it in PWU *kodwa. Altogether, there are four instances of initial *k in the first group of word roots and seven instances in the second group. Thus, the development PWU *o–a > Pre-PFi *a–e cannot be a regular sound change.

As all attempts to provide an explanation for the assumed split of PWU *o–a > Pre-PFi *o–a ~ *a–e have failed, it is reasonable to postulate the hypothesis that the change itself is a reconstructional fiction, and in reality Finnic has preserved here an original PWU vowel opposition that was lost in Saami and Mordvin. Because it is unclear at this point how this opposition should be reconstructed at the level of PWU, let us mark the source of Pre-PFi *a–e as *?–?. Hence, we can postulate seven regular patterns of back-vowel correspondences between the West Uralic branches (on the development of PWU *o–i in Mordvin, see Aikio 2014a: 9–10):

PWU	Pre-PFi	PSaa	PMd
*a-a	*a-a	*uo-ē	*a
*a-i	*a-e	*uo-ē	*a
*o-a	*o-a	*oa-ē	*u
*o-i	*o-e	*uo-ē	*u (*o / _ŋ)
*u-a	*u-a	*o-ē	*o
*u-i	*u-e	*o-ē	*o
*?-?	*a-e	*oa-ē	*u

The seventh vowel combination *?-? is mysterious for two reasons. First, it involves an abnormal second syllable vowel correspondence between PSaa *ē (normally < PWU *a) and PFi *e (normally < PWU *i), and hence data within West Uralic does not reveal whether the correspondence reflects an original *a-stem or *i-stem. Second, regardless of whether the second syllable vowel was originally *a or *i, the correspondence lacks a pair. If we postulate a fourth Proto-West-Uralic back vowel in the first syllable to account for the correspondence *?-?, we would expect this fourth vowel to combine with both second-syllable *a and *i.

To solve the riddle of the PWU vowel combination *?-?, we need turn our attention outside West Uralic. First, one can note that the PWU vowel combinations *o-a and *?-? have distinct correspondents in Khanty. PWU *o-a corresponds to PKh *ā, whereas PWU *?-? corresponds to PKh *a, or its high ablaut grade *ĭ whenever there is PKh *ā or *ĭ in the second syllable. Consider the following examples:

PWU *o-a ~ PKh *ā

- PFi *kota, PSaa *koatē ‘teepee’, PMd *kudə ‘house’ ~ PKh *kāt ‘house’
- PFi *kotva, PSaa *koaθvē ‘while, a short time’ ~ PKh *kāl- ‘stay overnight’
- PFi *ota-va ‘salmon net’, PSaa *oacē-s ‘barrier across a river’ ~ PKh *wāč- ‘to fish’, *wāč ‘village, town’
- PFi *sotka, PSaa *čoaðkē, PMd *šulgə ~ PKh *sāj ‘goldeneye’
- PFi *koira ‘dog’, *koiras ‘male’ ~ PKh *kār ‘male, reindeer bull’
- PFi *kosk-elo ~ PKh *kās ‘merganser’

PWU *?-? ~ PKh *a / *ĭ

- PFi *kōri : *kōre- ‘peel, bark, crust’, PSaa *koarē ‘ice crust’ ~ PKh *āl-kar ‘skin, outside of body’ (cf. *āl ‘body’)
- PFi *kōle- ‘die’, PSaa *koal-ō- ‘freeze, feel cold’, PMd *kulə- ‘die’ ~ PKh *kĭlā- : *kal- ‘die’
- PFi *nōle-, PSaa *noal-ō-, PMd *nola- (irregular) ~ PKh *nĭlā- : *nal- ‘lick’
- PFi *parvi : *parve- ‘flock; raft’, PSaa *poarēvē ‘raft’ ~ PKh *pĭrā ‘flock; raft’
- PFi *sōli : *sōle-, PSaa *čoalē, PMd *šulə ~ PKh *sal ‘gut’

To the latter group we can add the following three cases, which lack Finnic cognates. On the basis of Saami and Mordvin, one cannot distinguish between PWU *o-a and *?-?, but the Khanty cognates indicate that we are dealing with the latter correspondence.

- PSaa *oaðē-, PMd *udə- ~ PKh *j̄lā- : *al- ‘sleep’
- PSaa *oahē ‘brother’s wife’ ~ PKh *j̄nk̄i ‘wife of a male relative of an older generation’
- PSaa *loañčē- ‘abated wind; loose, slack’ ~ PKh *j̄lañčV ‘lukewarm’

On the other hand, the following word lacks a Saami or Mordvin cognate, but the correspondence PFi *a-e ~ PKh *a points to PWU *?-?:

- PFi *karkeda ‘bitter’ ~ PKh *karəy- ‘ache, burn’

There is one ambiguous case, which shows irregular variation between PKh *j̄ and *ā:

- PSaa *toarkē-stē- ‘shiver, tremble’, PFi *tarke-ne- ‘stand the cold, feel just warm enough’ ~ PKh *tj̄rəy- (> VVj *tārəy-*, O *tāri-*), *tārəy- (> Sur *tārəy-*, Irt *torəj-*, Ni *tōrij-*, Kaz *tōri-*) ‘shiver, tremble’

There is no obvious explanation for this irregularity. However, the vowel correspondence between Saami and Finnic points to the PWU vowel combination *?-?, and PKh *j̄ is an expected correspondent of PFU *?-?. Hence, the variant *tārəy- must be classified as irregular.

It should be noted that in the above, I have followed Zhivlov’s (2006) theory of Proto-Khanty vocalism, which is slightly modified from Helimski (2001); there are major differences between this theory of Proto-Khanty vocalism and that proposed by Honti (1982). While there is no commonly accepted reconstruction of Proto-Khanty, this does not pose a problem for the argument presented here. It would not make a difference which reconstruction was applied, because the differences between the two reconstructions that are relevant here merely involve the reconstructed phonetic value of the Proto-Khanty vowels. Honti reconstructs PKh *ō instead of Helimski and Zhivlov’s *a, and PKh *a instead of Helimski and Zhivlov’s *j̄, so the sound correspondences established here can easily be restated according to Honti’s reconstruction.

Thus, the Khanty data prove the hypothesis that the predecessors of PWU *o-a and *?-? were somehow already distinct in Proto-Uralic. A different interpretation has been made by Honti (2002: 246–247): he observes that the verb traditionally reconstructed as PU *oda- ‘sleep’ is reflected as PKh *j̄lā- : *al-, and suggests that because PKh *k̄j̄lā- : *kal- ‘die’ and PKh *ñj̄lā- : *ñal- ‘lick’ show the same vocalism, these PU verbs should be reconstructed as *kola- and *ñola-, respectively. While it is correct to note that the verbs meaning ‘sleep’, ‘die’ and ‘lick’ display the same vowel correspondence, this interpretation of the correspondences is obviously erroneous. First, it ignores the cases where PFi *o-a corresponds to PKh *ā, not to PKh *j̄ : *a. Second, it is impossible to derive the Samoyed cognates of the latter two verbs (PSam *kââ- ‘die’, *ñââ- ‘lick’) from the proto-forms *kola- and *ñola-, because PU *l was not lost in Samoyed before the vowel *a (Janhunen 1981: 250; Aikio 2012: 245–246).

Thus, the correct conclusion is to count the verb meaning ‘sleep’ in the group of words that show ‘secondary *e*-stems’ in Finnic, in spite of it lacking a Finnic cognate.

The question is how the distinction between *o–a and *ʔ–ʔ should be reconstructed at the levels of Proto-West-Uralic and Proto-Uralic. In Proto-West-Uralic, we can reconstruct three back vowels (*a, *o, *u) which could freely combine with both second-syllable *a and *i, in addition to which there is the anomalous vowel combination *ʔ–ʔ. As has been convincingly argued by Janhunen (1981) and Sammallahti (1988), however, Proto-Uralic possessed a system of four and not three back vowels (*a, *o, *u, *j).

According to Sammallahti (1988), PU *a and *j merged into *a in Finno-Volgaic (i.e., West Uralic and Mari). As regards Mari, however, the claim of merger does not hold: PU *j is frequently reflected as PMari *ü, whereas PU *a is not (Aikio 2014b: 84–85). It is in order to examine whether this merger actually happened in West Uralic either, or whether the opposition between PU *j and *a could have something to do with the anomalous vowel combination *ʔ–ʔ. The distinction between PU *j and *a is most consistently preserved in Mansi and Samoyed, so they can be used as key branches in examining this question. Looking at PWU *a–a, we find two patterns of correspondence in Mansi and Samoyed, one reflecting PU *a–a and another reflecting PU *j–a:

PU *a–a > PWU *a–a, PMs *ū (*j before velars, which became labialized), PSam *â (*a when the second-syllable vowel became reduced or lost)

- PWU *aŋa- ‘open’ ~ PMs *iŋk^w- (< *ūŋk-) ~ PSam *(ń)añê- ‘take off’
- PWU *čača- ‘grow, yield crop’ ~ PSam *caci ‘family, tribe’
- PWU *čaŋa- ‘hit’ ~ PMs *šjŋk^w- ‘kick, shove’ (< *šūŋk-) ~ PSam *cãŋã- ‘rub’
- PWU *kada- ~ PMs *kūl’- ~ PSam *kâjã- ‘leave’
- PWU *kaja- ‘dawn, shimmer’ ~ PSam *kâjã ‘sun’
- PWU *kala ~ PMs *kūl ~ PSam *kâlã ‘fish’
- PWU *kama-ra ‘crust, skin’ ~ PSam *kamê ‘scale’
- PWU *kanta- ~ PMs *kūnt- ~ PSam *kântã- ‘carry’
- PWU *ńanča- ‘flatten’ ~ PMs *ńūnš- ‘stretch’
- PWU *pala- ‘burn’ ~ PMs *pūl-, PSam *pâlã- ‘devour, eat up’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *pata ~ PMs *pūt ‘pot’, PSam *patê- ‘put in a pot, put in water’
- PWU *sala- ~ PMs *tūləm- ~ PSam *tâlã- ‘steal’
- PWU *saŋša- ~ PMs *tūńc- ‘stand’
- PWU *sarka ~ PSam *târkã ‘branch’
- PWU *śada- ~ PSam *sârã- ‘rain’
- PWU *taka- ~ PSam *takê- ‘behind’
- PWU *talwa- ‘lead, bring’ ~ PMs *tūl- ‘bring’ ~ PSam *tâjwã- ‘fetch, bring’
- PWU *wala ‘oath, word, song’ ~ PSam *wâlã ‘song’
- PWU *wanša ~ PSam *wântã ‘old’
- PWU *watka- ~ PSam *wât- ‘debark (a tree)’
- PU *j–a > PWU *a–a, PMs *j, PSam *j

- PWU *akta- ~ PSam *j̥t̥a- ‘hang’
- PWU *ala- ~ PMs *jal- (irregular) ~ PSam *j̥l̥a- ‘under’
- PWU *aŋa ~ PSam *j̥n̥a ‘tame’
- PWU *kantaw ‘tree stump’ ~ PMs *k̥ɪnt ‘storehouse pillar’
- PWU *maksa ~ PMs *m̥j̥t, *m̥j̥ət ~ PSam *m̥j̥t̥a ‘liver’
- PWU *matka ‘isthmus, journey’ ~ PSam *m̥j̥t̥a ‘way, track’
- PWU *ńara ‘grass’ ~ PMs *ń̥r ‘bog’
- PWU *paŋka ‘mushroom’ ~ PMs *p̥ŋk ‘fly agaric’ ~ PSam *p̥eŋk̥a- (irregular) ‘get drunk’
- PWU *śalkaw ‘pole, rod’ ~ PMs *s̥j̥l̥a ‘pointed stake’
- PWU *śata ~ PMs *ś̥j̥t ‘hundred’
- PWU *walka- ~ PMs *w̥j̥əl- ‘come down’

In addition, there are two cases where Mansi and Samoyed appear to point to different PU vowels:

- PWU *śalama ‘lightning’ ~ PMs *ś̥l- ‘lighten’, PSam *ś̥al̥a- ‘flash, lighten’
- PWU *anam, *anVppi ~ PMs *ānəp ‘mother-in-law’ ~ PSam *j̥n̥əp̥a ‘father-in-law’

Of these, only the latter case seems to be genuinely irregular, whereas the former may show a conditioned development *a > PMs *j̥ after *ś- (> PMs *ś̥-) (Aikio 2002: 28).

Looking at PWU *a-i, however, reveals only one set of frequently occurring correspondents in Mansi and Samoyed, which must reflect the PU vowel combination *j̥-i:

PU *j̥-i > PWU *a-i, PMs *j̥, PSam *e (*j̥ before a consonant cluster beginning with a nasal)

- PWU *adi ‘year’ ~ PSam *eɾö ‘autumn’
- PWU *apti ~ PMs *j̥t, PSam *eɾt̥a ‘hair on the head’
- PWU *aśiw- ‘dwell’ ~ PSam *eɾso- ‘camp’
- PWU *dami ~ PMs *l̥j̥m ~ PSam *jem ‘bird-cherry’
- PWU *kaŋjiri ‘curve, bend; boat rib’ ~ PMs *k̥j̥r̥a ‘hollow of the knee’
- PWU *kačči- ‘rotten, smelly’ ~ PMs *k̥j̥š̥y̥a ‘mold’ ~ PSam *keɾə- ‘stink’
- PWU *lampi ‘pond, small lake’ ~ PSam *l̥j̥mp̥a ‘bog, mud’
- PWU *lanti ‘lowland’ ~ PSam *l̥j̥nt̥a ‘plain, valley’
- PWU *lapci ~ PSam *j̥l̥eps̥a ‘cradle’
- PWU *maxi ~ PMs *m̥j̥ ‘earth’
- PWU *ńakśimi ‘tongue’ ~ PMs *ń̥j̥k̥əɪm ‘gill’
- PWU *ńali ~ PMs *ń̥j̥l̥ ~ PSam ? *ń̥ej ‘arrow’
- PWU *ńari- ~ PMs *ń̥j̥r̥əɣ ~ PSam *ń̥er ‘cartilage’
- PWU *sani ~ PMs *t̥j̥n̥ ~ PSam *ceɪn ‘sinew’
- PWU *śami ~ PMs *ś̥j̥m ‘scale’

According to Sammallahti (1988: 504), PU *a–i yielded PMs *ā. In Samoyed, the expected reflex appears to be PSam *ā̆ or *a, as in PU *a-stems, too. In practice, however, it is difficult to show such correspondents for PWU word roots with the vowel combination *a–i. The following are the only examples I have been able to find:

- PWU *kaji ‘sedge’ ~ PMs *kāj ‘hair’ ~ PSam *kâ̆ ‘slender object’
- PWU *waji ~ PMs *wāj ‘grease’
- PWU *waj̄ni ~ PSam *waj̄n ‘breath’
- PWU *wari ‘hill’ ~ PMs *wār ‘forest’

It appears, however, that in some cases the Mansi reflex of a PU *a–i stem contains PMs short *a instead; both cases are followed by a consonant cluster, but the exact conditioning factors remain uncertain for the time being. At least the following comparisons appear convincing:

- PWU *wali- ~ PMs *wal-t- ‘carve’
- PWU *man̄si- ‘be depressed’ ~ PMs *mañć- ‘be in need’

Thus, stems with the PU vowel combination *a–a are common, whereas stems with PU *a–i are relatively rare. This is unexpected, as *a* belongs to the typologically least marked vowels and other vowels in the system show no tendency to avoid combining with second-syllable *i.

Remarkably, however, there are many stems with the Pre-Proto-Finnic vowel combination *a–e that do not reflect PU *j̄–i and which have cognates elsewhere in Uralic, including Mansi and Samoyed – namely the stems showing the PWU vowel combination *ʔ–ʔ. Thus, we can postulate the hypothesis that these reflect PU roots of the *a–i type, which are almost completely missing in Janhunen (1981) and Sammallahti’s (1988) reconstructions. This solution implies that it is Finnic and not Saami that has preserved the original stem vowel in the case of the PWU vowel combination *ʔ–ʔ. We can thus write PWU *a–i instead of *ʔ–ʔ, whereas PWU *a–i in the traditional reconstruction must be rewritten as PWU *j̄–i. However, no West Uralic language seems to have preserved a distinction between PU *a–a and *j̄–a, so it appears that a merger of PU *j̄, *a > PWU *a took place before second-syllable *a.

The remaining question is how to account for the words *kaji ‘sedge’, *man̄si- ‘be depressed’, *waji ‘grease’, *waj̄ni ‘breath’, *wali- ‘carve’ and *wari ‘hill’. The words *man̄si- and *wari, however, have no Saami or Mordvin cognates, and hence they do not oppose the interpretation that PU *a–i is reflected as PSaa *oa–ē and PMd *u. The factor uniting *kaji, *waji and *waj̄ni is that the vowel *a is followed by the palatal glide *j. Because there are no examples of the correspondence PSaa *oa–ē ~ Pre-PFi *a–e ~ PMd *u before *j, it can be assumed that in West Uralic there was a regular sound change *a > *j̄ / _j.

This leaves us with PU *wali- ‘carve’. Its assumed Saami reflex, PSaa *vuole- ‘whittle’ (> SaaN *vuollat*, etc.), would seem to be counterevidence to the idea that PU *a–i is reflected as PSaa *oa–ē. However, this turns out to be a false etymology. There is another suitable Saami cognate which shows exactly the vocalism predicted by

the hypothesis presented here, namely PSaa *oalō- (> SaaL *oallot* ‘cut off branches’, SaaN *oallut* ‘strip off the birch bark on opposite sides of a log (so that the wood dries better)’, SaaL *ualluđ* ‘scrape meat off bones with a knife’, SaaK *voallqđ* ‘gnaw; strike with a weapon’). While the meanings are somewhat diverse, they can be quite transparently derived from the original sense of ‘carving’. The vowel correspondence is the same as in PSaa *ńoalō- ~ PFi *nōle- ‘lick’ (< PU *ńali-); the second-syllable rounded vowel is probably a suffix that was secondarily added in Saami. The loss of PU *w- is regular before PSaa *oa. PSaa *vuole- ‘whittle’, in turn, must be a loan from PFi *vōle- ‘whittle’.

Finally, we need to seek further evidence for the hypothesis that Finnic, not Saami, has preserved the original stem vowel in words of the type PFi *sōle- ~ PSaa *čoalē ‘gut’. Most other branches of Uralic are not very helpful here, as vowels in non-initial syllables have often merged or become lost. Samoyed, however, has preserved the phonological oppositions of PU unstressed vowels rather well. There seem to be two etymologies which clearly indicate that the original stem vowel was PU *i and not *a:

- PU *kali- > PFi *kōle-, PMd *kulə-, PSam *kãê- ‘die’
- PU *ńali- > PFi *nōle-, PSaa *ńoalō-, PMd *nola- (irregular), PSam *ńãê- ‘lick’

The development *i > Ø reveals that the PU stem vowel cannot have been *a, because in that case PU *l would have been preserved in Samoyed: cf. PU *kala > PSam *kălã ‘fish’, PU *sala- > PSam *tălã- ‘steal’.

There are two more words which offer yet additional evidence in favor of reconstructing the PU vowel combination *a-i. As the PU verbs meaning ‘sleep’ and ‘die’ must now be reconstructed as *adi- and *kali- respectively, the nouns *adma ‘sleep, dream’ (> Komi and Udm *un*, KhVvJ *aləm*, MsSo *üləm*, Hung *álom*) and *kalma ‘death, grave’ (> Fi *kalma*, MdE *kalmo*) turn out to be fully regular consonant-stem deverbal nouns formed with the suffix *-mA. In the traditional reconstruction, the relationship between these verbs and nouns is difficult to account for, and Sammallahti (1988) in fact reconstructs PU *oda- ‘sleep’ and *alma ‘dream’, implying that the two etyma would not be related. In our revised reconstruction, the morphophonological structure of *ad-ma ‘sleep, dream’ and *kal-ma ‘death’ is identical to derivatives such as Fi *surma* ‘death’ (< *šur-ma ← PU *šuri- ‘die’), SaaN *jorbmi* ‘deep place in water, whirlpool’ (< *jur-ma ← PU *juri- ‘spin’), MdE *keíme* ‘bunch, bundle’ (< *kär-mã ← PU *kãri- ‘wrap, bind’), and SaaN *ńjálbmi* ‘mouth’, Hung *nyelv* ‘tongue’ (< *ńál-mã ← PU *ńãli- ‘swallow’).

Next, we need to deal with some potential counterexamples to the model proposed here. There are not many:

- PU ?*aški/al ‘step’ > PFi *askel, PMd *aškølda-, PMari *ãškøl, PPerm *uškVI, PMs *ũšøl, PSam *asøl- ‘step’. — Here Finnic suggests PU *a-i, but this does not match Mordvin, Permic and Mansi, which show vocalism indicating PU *a-a. The word is probably to be reconstructed as PU *aškal, with an irregular change *a > *e in the unstressed syllable in PFi.

- PU *aj̥ji (?) ‘brain’ > PSaa *vuoj̥ņeš-, PFi *aivo-, ? PMd *uj, Hung *agy* ‘brain’. — Saami suggests that this was a PU *a-i stem; in that case Fi -o- is a derivational suffix. The Saami vocalism is accounted for by the rule PU *a > PWU *j̥ / _j suggested above. A problem is posed by the Md form, which shows PMd *u as if the language had not participated in the change *a > *j̥ / _j. The change is, nevertheless, clearly visible in PMd *vaj ‘grease’ < PWU *w̥j̥ji < PU *waji. Due to this irregularity one can suggest that the Md word is perhaps not a member of this cognate set at all, but a reflex of PU *ojwa ‘head’ instead; the development PU *o(-a) > PMd *u is entirely regular. As for the semantics, cf. NenT *ηæwaj̥ʷ* ~ *ηæwej̥ʷ* ‘brain’ ← *ηæwa* ‘head’ (< PU *ojwa).
- PU ?*sa/oŋi- ‘enter’ > PSaa *suoŋe- ‘creep in’ and/or *soaŋō- ‘enter’, PMd *səva- ‘enter’, PMari *šoŋala- ‘put on (e.g., a shirt)’, PPerm *sūŋ- ~ *zūŋ- ‘dive’, PKh *L̥iŋā-, PMs *tuw- ‘enter’, Hung (obsolete) *av-* ‘penetrate, overgrow’. — The vowel correspondences in this cognate set are difficult to explain. In Saami there are two variants that unexpectedly differ in their first-syllable vowels: SaaL *suog̊nat*, N *suot̊njat* ‘crawl in or through’ (< PSaa *suoŋe-) and Sk *suāŋ̊nad*, T *soaŋ̊nad* ‘enter’ (< PSaa *soaŋō-). The former suggests PU *soŋi- or *s̥iŋi-, the latter in turn PU *saŋi- or *soŋa-. The Khanty form could reflect either PU *saŋi- or *soŋi-. The latter reconstruction has the advantage that it allows us to analyze PSaa *soaŋō- as the reflex of a Pre-PSaa derivative *soŋ-o- which has then undergone a regular metaphonic vowel change in Proto-Saami; for a parallel, cf. SaaN *vuog̊ga* ‘fishing hook’ (< PSaa *vuoj̥ke < Pre-PSaa *oŋki) ~ *oag̊gt* ‘fish (with a hook and line)’ (< PSaa *oaŋkō- < Pre-PSaa *oŋk-o-). The Mari form is ambiguous between PU *a and *o, and the Mordvin and Mansi vowels seem irregular in any case. However, Permic *sūŋ- ~ *zūŋ- rather seems to suggest PU *saŋi- because PU *o(-i) is not reflected as PPerm *ū.

There is also a small group of words that have Mansi or Khanty cognates suggesting the PU vowel combination *a-i, but they do not display the expected vocalism in Saami and Mordvin:

- PU ? *ad̥o ‘bed’ > PSaa *vuod̥ō ‘bottom, foundation’, PPerm *wul̥ ‘hide (for sleeping on)’, PMs *āl̥-āt, Hung *ágy* ‘bed’
- PU ? *pado ‘fish weir’ > PSaa *puod̥ō, PFi *pato ‘dam, fish weir’, PKh *p̥j̥l̥ ‘fish weir’, Hung *fal* ‘wall’
- PU ? *kaj̥šo ‘sickness’ > PFi *kaiho ‘longing, yearning’, PMd *kažə ‘accident, misfortune’, PPerm *k̥j̥ž̥ ‘sickness, stillborn child’, PMs *k̥ojt̥, PSam *k̥ajt̥ō, *k̥aj̥to ‘sickness’
- PU ? *asora ‘master’ > PMd *azəɾə ‘master, lord’, PPerm *uz̥j̥r̥ ‘rich’, PMs *ātəɾ ‘master, lord, hero’, ? Hung *úr* ‘gentleman, mister, master’

In these cases, both Finnic and Saami point to a rounded vowel *o in the second syllable; the last word has no cognates in Finnic and Saami, but a second-syllable rounded vowel would be matched by the Indo-Iranian loan original *asura- (> Sanskrit *ásuraḥ*)

‘powerful; master; evil spirit, demon’, Avestan *ahuro* ‘master, lord’). No rounded vowels are usually reconstructed for Proto-Uralic unstressed syllables, but it can be tentatively suggested that these words contained a Proto-Uralic unstressed rounded vowel *o, distinct from both *i and *a/*ä. This rounded vowel would have been preserved in Finnic and Saami, but merged with *a in Mordvin and with *i in Ob-Ugric. Additionally, it can be proposed that the following root also belongs in this class:

- PU *wajo- ‘sink’ > PSaa *vuojō-, PFi *vajo-, PMd *vaja-, PPerm *vjj-, PMs *uj-

In this case, the Mansi verb shows a different vocalism, but this is probably somehow conditioned by the initial *w-. According to Sammallahti (1988: 500), initial *wa- became *wo- in Proto-Ugric. The sequence *-oji- regularly developed into PMs *-uj-: cf. PU *koji ‘male’ > PMs *kuj, PU *koji ‘dawn’ > PMs *kuj, PU *šoji ‘sound’ > PMs *suj. As *o-stems apparently developed like *i-stems in Ob-Ugric, the development could have been *wajo- > *wojo- > PMs *uj-. However, the assumption is complicated by the fact that no change *wa- > *wo- took place in *waji ‘grease’ (> PMs *wāj) and *wari ‘hill / forest’ (> PMs *wār) (cf. Aikio 2014a: 4).

To sum up, there are only very few word roots which cannot be fully reconciled with the reconstruction of a West Uralic vowel opposition *a(-i) : *i(-i). However, for the most part these etymologies do not offer any support to the traditional interpretation either. Those reflexes of PU *aški/al ‘step’ and *ajni ‘brain’, which remain irregular in the present model, are equally irregular in Sammallahti’s (1988) model of historical vocalism. In the case of PU ?*sa/oŋi- ‘enter’, we cannot even be certain that verb originally had *a in the first syllable. If it did, then West Saami *suonje- would be the regular reflex in Sammallahti’s model, whereas in the present framework East Saami *soaŋō- is the expected form, so even in this case there is no change in the number of assumed irregular forms.

The remaining five cases (*adō ‘bed’, *pado ‘fish weir’, *kajšo ‘sickness’, *asora ‘lord’ and *wajo- ‘sink’) seem to reflect neither PU *i- nor *a-stems, but instead a distinct class of *o-stems not acknowledged in the traditional reconstruction. The tentative reconstruction of a new PU vowel combination *a–o poses the intriguing question of how such assumed *o-stems are reflected in combination with first-syllable vowels other than *a. The issue is too complicated to be examined in this connection and must be left for future research. However, it is worth noting that in Finnic vocabulary of Uralic origin, second-syllable *o* also appears in combination with other first-syllable vowels, for example *i* (Fi *iho* ‘outer skin’, *hio*- ‘grind’, *kisko*- ‘tear, pull’, *kiro* ‘curse’, *nito*- ‘stitch’, *vito*- ‘clean flax’) and *u* (Fi *ulko*- ‘outside’, *kuto*- ‘weave’, *puno*- ‘plait’, *tuhto* ‘rower’s seat’). It can hardly be assumed that *o* in such cases would always be a suffix, as no corresponding *e*- or *A*-roots are attested in Finnic. The reconstruction of the highly productive Finnic deverbal noun suffix *-o ~ *-u ~ *-ü (cognate with Proto-Saami *-ō and Proto-Samoyed *-u ~ *-ü) would also need to be reevaluated in relation to this. The suffix has been usually reconstructed as PU *-w (see, e.g., Salminen 2012: 344), but this is a problematic solution because other known cases of PU *w-stems show a stem-final *-ōj : *-ujē- in Proto-Saami. This development

is found both in PU monomorphemic *w-stem nouns (e.g. SaaN *gáloj-eatni* (< PSaa *kālōj) ~ Fi *käly* ‘sister-in-law’, PSam *kälü ‘brother-in-law’ < PU *kälw) and in stative or automative passive verbs derived with the suffix *-w- (e.g., SaaN *guđđot* ‘be left’, SaaSk *kuâđ’đjed* ‘remain’ (< PSaa *kuođuję-) ~ PFi *kato- ‘disappear’ ~ PSam *kâjo- ‘remain’ < PU *kad’a-w-).

To conclude, the solution proposed above to the development of words of the type *sarvi* ‘antler’ and *suoli* ‘gut’ has obviously greater explanatory power than the traditional reconstruction: it explains the entire group of Finnish ‘secondary e-stems’ previously thought to reflect *o→a as results of regular phonological development, and accounts for the puzzling vowel correspondences displayed by the reflexes of the Uralic verbs *kali- ‘die’ and *ńali- ‘lick’ (cf. Aikio 2012: 231). In addition, the unexpected scarcity of PU *a→i stems in the earlier model is revealed to be a reconstructural error. On the basis of the analysis above, the following system of back-vowel correspondences between Proto-Uralic and the branches of West Uralic can be established:

PU	PWU	Pre-PFi	PSaa	PMd
*a→a	*a→a	*a→a	*uo→ē	*a
*a→i	1) *a→i 2) *i→i / _j	*a→e *a→e	*oa→ē *uo→ę	*u *a
*o→a *o→i	*o→a *o→i	*o→a *o→e	*oa→ē *uo→ę	*u *u (*o / _ŋ)
*u→a *u→i	*u→a *u→i	*u→a *u→i	*o→ē *o→ę	*o *o
*j→a *j→i	*a→a *j→i	*a→a *a→e	*uo→ē *uo→ę	*a *a

5. Secondary e-stems with front-vocalic cognates

Next we have to deal with those cases of assumed secondary e-stems which have front-vocalic cognates in the Uralic languages – i.e., the type *talvi* ‘winter’ and *sappi* ‘bile’, which have been reconstructed as PU *tälwä and *säppä, respectively. First, it is useful to draw attention to Samoyed, which has preserved the distinction between Uralic *A- and *i-stems well. There seems to be only one example of a Finnic e-stem of this type for which a Samoyed cognate preserving the stem vowel has been identified. Fortunately, though, this case is very revealing: Fi *puoli* : *puole-* ‘half, side’ (< Pre-PFi *pale-) ~ PSam *pälä (> NenT *pēla*, Ngan *hel̄i* ‘half, part’). It is immediately obvious that the phonological structure of this root in Proto-Uralic must have been quite different from that of Fi *kuole-* ‘die’ and *nuole-* ‘lick’, the Samoyed cognates of

which show a loss of PU *l and the emergence of a vowel sequence: PSam *kâô- ‘die’ (> NenT *χa-*, Ngan *kuo-*), PSam *ńâô- ‘lick’ (> SlkTaz *ńu-*, *ńû-*, Kam *nü-*). Fi *puoli* clearly cannot reflect a PU *i-stem because its Samoyed cognate *pälä is an *ä-stem; the stem vowel *ä is unambiguously reflected in NenT *-(C)a* and Ngan *-j*. Also, PU intervocalic *-l- would not have been preserved unchanged in an *i-stem in Samoyed: cf. PU *peli- ‘be afraid’ > PSam *pej-, PU *käli ‘tongue’ > PSam *kâô(j). Thus, Samoyed confirms that in the root type represented by Fi *puoli*, it is Saami and not Finnic which shows the normal reflex of the stem vowel: cf. SaaN *bealli* ‘side, half’ < PSaa *pealē < Pre-PSaa *pälä.

Thus, there seems to be one true type of secondary *e*-stem in Finnic after all, namely those cases where other Uralic languages point to the front-vocalic vowel combination *ä-ä. The problem, then, is to explain under what conditions PU *ä-ä developed into Pre-PFi *a-e, as there are also examples of the retention of PU *ä-ä in Finnic. A solution has recently been proposed by Zhivlov (2014: 114–115). He suggests that the default development was PU *ä-ä > Pre-PFi *a-e, but there were two conditioned exceptions:

- PU *ä-ä > Pre-PFi *ä-e after palatalized consonants (*j and *ś)
- PU *ä-ä is preserved unchanged when the first-syllable vowel was followed by *j or *ś

It is worthwhile to discuss these proposed exceptions. As regards the first condition, this is supported by only two examples: PU *jâwrä ‘lake’ > Fi *järvi* : *järve-*; PU *śänä ‘bracket fungus’ > Pre-PFi *śäni > PFi *sēni : *sēne- > Fi *sieni* : *siene-* ‘mushroom’. The issue is further obscured by irregularities in both examples. The word for ‘lake’ also has back-vocalic forms in Finnic (Vote *jarvi*, Liv *jōra* ‘lake’ < *jarvi). The word for ‘bracket fungus’ has Ob-Ugric cognates that do not support the reconstruction of PU *ä in the first syllable: PKh *sâñəy (> VVj *sâñəy*, Trj *sâñəy*, Irt *sânə*, Ni *sanə*, Kaz *sañ*, O *sân* ‘bracket fungus’), PMs *śīnəy (> T *śīnū*, KL VN VS *śēni*, KM KU *sēni*, P *śēñy*, LU S *sēñy* ‘bracket fungus’). The regular reflexes of PU *ä are PKh *ä and PMs *ä. Thus, neither of these words offers completely clear evidence of the regularity of this development.

It appears, however, that we can find a couple of other examples which suggest that after palatalized consonants, not only was first-syllable *ä retained in Pre-PFi, but there appears to have been no change in the second-syllable vowel either. At least the following cases can be seen to point to such a conclusion:

- Fi *jämäkkä* ‘stiff, sturdy’ ← PU *jämä- ‘turn stiff, go numb’ (Aikio 2014b: 81–82).
- Fi *nälkä* ‘hunger’ < Finno-Saamic *ńälkä, cognate with SaaS *njaelkie*, SaaN *njälggis* ‘tasty, sweet’; perhaps a consonant-stem derivative of PU *ńäli- ‘swallow’ (Aikio 2002: 53). SaaN *nealgi* ‘hunger’ must be interpreted as a Finnic loanword.

- Est *närb* (GEN *närva*) ‘lacking appetite; feeble, languid’ < Finno-Saamic **närpä*, cognate with SaaS *njaerpie*, SaaL *njərbbe* ‘thin (of hair), sparse (of vegetation); watery, thin (of porridge, dough, etc.)’ (a new etymological comparison).
- Fi *säle* ‘lath’, *säli-* ‘cut (laths), chop (wood shingles)’, derived from **sälä-* < PU **šälä-* (UEW: 470–471). Zhivlov (2014: 115) suggests that the absence of vowel lengthening and raising (**säle-* > **sēle-*) in this word is “due to the fact that *e-* here belongs to the suffix”, and that “lengthening operates only if *e-* of the second syllable belongs to the root”. This ad hoc qualification becomes unnecessary if we accept that there never was any regular change **ä-ä* > **ä-e* in the first place. However, it does appear that vowels belonging to derivative suffixes could block the backing of **ä* to **a*; this explains the exceptions Fi *sälyttää* ‘put a burden on’ (← PU **sälä-*) and *tähde* ‘leftover’ (← PU **täktä* ‘bone’), as maintained by Zhivlov.

There is also one ambiguous case, Fi *sääri* : *sääre-* ‘shank, shin’ (< PU **čäñäri*), which shows a contracted vowel. It is impossible to solve whether **čäñäri* had changed to **čäñere-* before the contraction or not, because the latter would also have produced Fi *sääri* (cf. Fi *jää* ‘ice’ < Pre-PFi **jäñe-* < PU **jäñi*). As a side note, the word is traditionally reconstructed as **čäjäri* or **čäjiri*, but **čäñäri* seems more probable because the sequences **-äjä-* and **-äji-* are not known to have produced the contracted vowel **-ä-* in Finnic. A problematic example is Fi (obsolete) *säkä* ‘Wels catfish’, which has been thought to reflect PU **šäkä* (UEW: 469). In this case, no change **ä-ä* > **ä-e* can be seen, but the reconstruction of PU first-syllable **ä* remains uncertain, as it is incongruent with the forms in other branches: cf. MdE *šije*, MariE *ši-kol* ‘Wels catfish’, PKh **siχ* (> VVj *sěj*, Irt *sějχ*), PMs **siχ* (> T *šüw*, KL *šiy*, So *siw* ‘burbot’), which point to PU **šekä/i*.

Due to the scarcity of examples, the development of PU **ä-ä* after palatalized consonants remains somewhat unclear, but Fi *jämäkkä* ‘stiff, sturdy’, *nälkä* ‘hunger’, *säle* ‘lath’ and Est *närb* ‘lacking appetite, feeble’ support the view that no regular vowel change in either the first or the second syllable took place in this context. The phonological development of PFi **sēni* ‘mushroom’ and **järvi* ~ **jarvi* ‘lake’, however, remains obscure.

Connected to this, it can be added that there is yet one more proposed case of the development **ä-ä* > PFi **ä-e* which is not mentioned by Zhivlov (2014). Fi *särki* : *särke-* ‘roach’ has been claimed to go back to PU **särkä* (UEW: 436–437; Saarikivi 2010: 259). This, however, turns out to be a reconstructional error: MdE *serge*, M *šärgä* : PL *šärkt* (< PMd **särgə* : **särk-t*) goes quite regularly back to a proto-form **särki*. The remaining cognates are found in Ob-Ugric: Kh V *lärəy*, Vj *järəy*, Sur *lärəy*, etc. ‘ruffe’ (< PKh **Lärəy*), Ms T *tärü* (PL *terkət*), KL *töäri*, etc. ‘ruffe’ (< PMs **tärəy*). These forms seem to reveal nothing of the original second-syllable vowel. Hence, there is no actual reason to include Fi *särki* ‘roach’ in the group of words with secondary *e*-stems.

As regards the preservation of PU **ä-ä* when the first-syllable vowel was followed **j*, this is evidently regular on the basis of three examples: PU **äjmä* ‘needle’ >

Fi *äimä*, PU **äjjä* ‘old man’ > Fi *äijä*, PU **päjwä* ‘day, sun’ > Fi *päivä*. However, we can add that only *j in the syllable coda has blocked the change **ä–ä* > **a–e*, as has been cautiously proposed by Kallio (2012b: 168). There are two probable examples of the shift **ä–ä* > Pre-PFi **a–e* in cases where *j occurred in the onset of the second syllable. Fi *koi* ‘moth’ probably goes back **kōje-* < **kaje-* < PU **käjä*, as its cognates in Volgaic (MdE, MdM *ki*, MariBK *kije* ‘moth’) and Ob-Ugric (KhV *kej*, MsT *käj*, *kij* ‘moth’) consistently point to a front-vocalic form. Another example is Fi *voi-* ‘can, be able to, be possible’ < **vōje-* < Pre-PFi **vaje-* < Finno-Saamic **wäjä-* ‘be able to’. The original form **wäjä-* is, apparently, recoverable from the Saami cognate (SaaS *viejedh*, SaaN *veadjit* ‘manage to, have the energy or strength to; be possible, may, might’ < PSaa **veajē-*), even though the issue is somewhat complicated by the vocalism of the East Saami forms: cf. SaaI *vajjeed*, SaaSk *vää’jjed* (< **vejē-*), SaaK *vuajjed*, T *vjajjed* (< *(v)ojē-). However, the irregular vowel reduction in Inari and Skolt Saami and the irregular vowel rounding in Kola Saami can be assumed to result from the high frequency of this modal auxiliary verb. No cognates of this verb seem to occur in other branches of Uralic. The earlier etymology that connects Fi *voi-* with Hungarian *vív* ‘fences, fights’ (UEW: 579) is certainly incorrect, as it involves a scarce distribution combined with both phonological and semantic problems.

The interpretation above raises the question of whether other tautosyllabic palatalized consonants also caused **ä(-ä)* to be preserved unchanged in Finnic. It appears, however, that the question cannot be answered due to lack of evidence. It is true that Zhivlov’s (2014: 115) material contains one example of tautosyllabic **ś* (**ć* in his notation): PU **wäskä* ‘metal’ > Fi *vaski* : *vaske-* ‘copper’. However, it is very uncertain whether this word is a genuine example of the change PU **ä–ä* > PFi **a–e*. The cognate set displays multiple irregularities in vocalism due to which the attested forms cannot be reconciled into a single proto-form. Notably, there are also back-vocalic forms, namely Hung *vas* ‘iron’ and MdE *uške*, MdM *uškä* ‘chain’ (< PMd **uškə*), which together with PFi **vaski* could be seen to support a back-vocalic reconstruction **waški*; the development **a(-i)* > PMd **u* would be regular.

Regarding the Mordvin form, Häkkinen (2012: 18) has suggested that the variant *viškä* in the Kazhloodka dialect represents an archaism. In his view, Kazhloodka *vi-* goes back to Pre-PMd **we-*, and *viškä* can be analyzed as the regular cognate of SaaN *veaiki* ‘copper’ (< Pre-PSaa **weškä*); the same interpretation could also be made of Kazhloodka and Koljajevo dialect *vižir* ‘ax’ (~ MdE *užer*, MdM *užər*) and SaaN *veahčir* ‘hammer’ < **wešärä* (~ **wašara* > Fi *vasara* ‘hammer’). Häkkinen attributes the front vocalism of these two words to a change **waš-* >> **weš-* that was supposedly shared between the predecessor of Saami and the Kazhloodka-Koljajevo dialects of Mordvin. This, however, seems to be an illusory parallel because the Kazhloodka and Koljajevo forms are better explained as results of a sound change PMd **u-* > *vi-* before palatalized consonants: cf. Kazhloodka and Koljajevo *vil'i-* ‘be’ (~ MdE *ule-*, MdM *ulə-* < PU **woli-*; UEW: 580–581), a form for which Häkkinen’s hypothesis offers no explanation. On the other hand, Grünthal (2012) has suggested that PMd **uškə* ‘chain’ is a derivative of PMd **uskə-* ‘pull, draw’ (> MdE *uski-*, MdM *uskə-*), but because of the mismatch of sibilants this etymology is impossible to justify.

It has been claimed that PSaa *veaškē ‘copper’ (> SaaN *veaiki*) shows a phonologically exact match with the Samoyed forms, thus proving PU *wāškā as the original form regardless of irregularities in other branches (Kallio 2006: 6). This claim does not hold, however, because the sound correspondence between NenT *jeśa* and Ngan *basa* ‘iron, metal’ shows that the root had the anomalous disharmonic shape *wāsa in Proto-Samoyed (Aikio 2006: 31); the expected reflex of PU *wāškā is PSam *wāsā, which would regularly yield Ngan *besj. The reconstruction of the second-syllable back vowel is further confirmed by its regular backing effect on the first-syllable *ā in Selkup and Kamas (cf. SlkTaz *kēsij* ‘iron, metal’, Kam *bāzā* ‘iron’). The pervasive irregularities in this lexical set indicate that we are not dealing with a Proto-Uralic item but a Wanderwort that has separately entered the already differentiated branches of the family – as has already been suggested long ago. That words designating metals turn out to be borrowings is, of course, not unexpected in the least.

Last, we have to examine Zhivlov’s claim that PU *ā(–ā) was preserved before *š in Finnic. This proposed conditioning factor, unlike preservation before tautosyllabic *j, lacks a clear phonetic basis. Superficially, however, the correspondence seems to be supported by four examples:

- PU *pākšnā > *päšnā > Võro *pähn* ‘linden’
- PU *wāšā- ‘little’ > Fi *vähä*
- PU *šāšnā ‘woodpecker’ > Fi *hähnä* ~ *häähnä*
- PU *täštā ‘star, mark’ > Fi *tähti* : *tähte-* ‘star’, *tähtää-* ‘aim’.

Not all these examples are entirely clear, however. The following phonological problems can be pointed out:

- The word for ‘linden’ shows a unique consonant cluster correspondence: PFi *hn ~ PMd *kš (MdE *pekše*, M *päšä*) ~ PMari *st (MariE *piste*, *pište*, W *pistə*). On the partial analogy of PFi *vehnä* ‘wheat’ ~ MdE *viš* ~ MariE *wiste*, W *wištə* ‘spelt’ this could be resolved by postulating the three-consonant cluster *kšn, but such a cluster is completely anomalous in regard to Uralic phonotaxis.
- The word for ‘star’ shows much obscure phonological variation. In Saami one can distinguish three forms: 1) SaaS *daasta*, SaaK *tāšt*, SaaT *tāštē* ‘star’ (< PSaa *tästē(s)); 2) SaaI *tāsni*, SaaSk *tä’snn* ‘star, spot’ (< PSaa *täsnē); 3) SaaL *nástte*, SaaN *násti* ‘star’ (< PSaa *nāstē). While the last form can simply have been metathesized from the second one, the first two forms can hardly be reconciled. In Finnic we find *št in Fi *tähti* ‘star’ (< Pre-PFi *täšte-), but *šn in Fi *tähne*, Est *tähn* ‘spot’ (< Pre-PFi *täšn—). Furthermore, the stem vowel relationship between Fi *tähti* ‘star’ (< *täšte-), *tähdätä* ‘aim’ (< *täštä-tä-) and Veps *tähtaz* ‘star’ (< *täštäs) is irregular. The Mordvin form *tāšt’ə can apparently reflect only *täštV because *šn seems to have yielded PMd *š (cf. PMd *viš ‘spelt’ ~ Fi *vehnä* ‘wheat’ mentioned above). What form PMari *tištə ‘cut, notch, sign’ goes back to is less clear, as both *šn and *št would have yielded PMari *št.

- As regards the word for ‘woodpecker’, it is noteworthy that none of the forms in other branches suggest that there ever was an *š in this word either in word-internal or in word-initial position. PSaa *čāšnē (> SaaN *čáihni*, SaaI *čāšni*), PMari *šišṭə (> MariE *šište*, MariW *šištə*) and PPerm *šíz ‘woodpecker’ (> Komi, Udm *šíz*) can be traced back to PU *šāšnā; the first-syllable *i* in the Permic forms is unusual, but perhaps resulted from the vowel being flanked by palatalized consonants. On the basis of loanword evidence, it actually seems probable that any PU sibilant followed by a sonorant developed into PFi *h: Proto-Indo-Iranian *ačnas (> Sanskrit *áśna-* ‘hungry’) > Pre-PFi *ašnas > Fi *ahnas* ‘greedy, voracious’ (cf. Koivulehto 1999, who reconstructs the Pre-PFi proto-form as *ačnas and suggests borrowing from the Iranian reflex *acnas); Proto-Baltic *baslja- (> Lithuanian *basl̥ys* ‘pole, stake’) > Pre-PFi *pasla > Fi *pahla* ‘fishing rod, pole, stake’ (SSA s.v. *pahla*). A Uralic word that seems to show the same development is *pišlā (~ ? *pičlā, ? *pičrā) ‘rowan’ > PFi *pihlā > Veps *pihl’*: GEN *pihlän* (the back harmony of Fi *pihlaja* is presumably a secondary development) (UEW: 376). Thus, the medial *-h- in PFi *hāhnā ‘woodpecker’ is actually a regular reflex of PU *š, but the initial *h- remains unexpected. It could have developed either via assimilation (*šāhnā >> *hāhnā) or via dissimilation (Pre-PFi *šāšnā >> *šāšnā > *hāhnā).

We can add, moreover, that there is even a possible counterexample in which the development *ä-ä may have taken place regardless of following *š: PFi *ahtera ‘barren, sterile’ may reflect a form *äkštärä, as suggested by its front-vocalic Mordvin cognate: MdE *ekštér, jekštér, jakštér*, MdM *jäštér* ‘barren, sterile’ (< PMd *jäkštér). The word has formerly been reconstructed as back vocalic (*akštira; cf. UEW: 606), apparently on the basis of the MdE dialectal variant *jakštér*. However, the palatalized consonants reveal that this form must also originally have been front vocalic. Moreover, the initial *j-* can be analyzed as a secondary prothetic consonant which developed before word-initial *ä-, but if one postulated a back-vocalic proto-form, it would remain without explanation. The word is ultimately a loan from Proto-Indo-Iranian *a-kšaitra- (> Sanskrit *á-kṣetra* ‘destitute of fields, uncultivated’) (Blažek 1990: 40).

Thus, the suggestion that PU *ä-ä was retained when *š followed the first-syllable vowel remains ambiguous. An alternative explanation can be proposed for the apparent cases of retention in this context. It is notable that the phoneme *š is very uncommon in vocabulary that is widespread in Uralic. Only a handful of plausible examples with a distribution reaching from at least Finnic to Ugric can be found: *šijiri ‘mouse’ (UEW: 500), *šuwli ‘lip / mouth’ (UEW: 903), *kajšo ‘sickness’ (Aikio 2014a: 3–5), *jäkšV- ‘cold’ (UEW: 90–91), *mekši ‘bee’ (an Indo-Iranian loanword; UEW: 271), *pušV- ‘blow’ (probably an onomatopoeic formation; UEW: 409–410). Most roots in which *š can be reconstructed, however, have only a limited distribution and display phonological irregularities. The following examples are illuminating:

- *čaši ~ *šaši ‘barley / malt’: MdE *čuž*, MariE, W *šož* ‘barley’, Komi *čuž*, Udm *čužjem* ‘malt’ (UEW: 622)
- *jaŋša- ~ *jaša- ‘grind’: Fi *jauha-*, MdE *jaža-*, MariE *joŋəže-*, W *jaŋgəže-* ‘grind’ (UEW: 631–632)
- *makša ~ *mäkšä ‘rotten wood’: Fi *mahi*, MdE *makšo*, MariE *mekš*, W *mäkš* (cf. UEW: 698, 700). — The Mari form has previously been considered cognate with SaaN *mieskkas* ‘rotten (of wood)’, which is not possible due to the mismatch in consonantism (SaaN *sk* < PSaa *ck ~ PMari *kš).
- *lešmä ‘large domestic animal’: Fi *lehmä* ‘cow’, MdE *lišme* ‘horse’ (UEW: 689)
- *pišti ~ *pikši ‘pliers, splint holder’: SaaN *basttat*, Fi *pihdit* ‘pliers’, *päre-pihti* ‘splint holder’, MdE *pekš*, M *peš*, Komi *peš* ‘splint holder’ (UEW: 733)
- *päški(nä) ~ *päšti ~ *päkši ‘hazelnut’: Fi *pähkinä*, MdE *peš’te*, *peš’ce*, MariE, W *pükš*, Udm *paš-pu* (UEW: 726–727)
- *püşä ‘sacred’: SaaN *bassi*, Fi *pyhä* ‘sacred’, MdE *pežed’e-*, M *pežəkstə-* ‘swear, take an oath’ (Saarikivi 2007: 327–331)
- *raško ‘forked thing, splint holder’: Fi *rahko* ‘splint holder’, MdE *raško* ‘fork, branch, groin, crotch’ (SSA s.v. *rahko*)
- *riŋiši ~ *ru/ünjši ‘drying barn’: Fi *riihi*, Komi *rjnjš*, Udm *inšjr*, *šjnjr* (UEW: 745)
- *šappa ‘sour’: Fi *hapan*, MdE *čapamo*, MariE *šowo*, *šopo*, W *šapê* (UEW: 54)
- *šuwpa ~ *šaxipa ~ *šapkv ‘aspen’: SaaN *suhpi*, Fi *haapa*, MariE *šopke*, W *šapki* (UEW: 783)
- *šija- ~ *šijo- ~ *šiwa- ‘grind, whet’: SaaN *sadji-*, Fi *hio-*, MdE *čovams* (UEW: 784–785)
- *šiša ~ *iša ‘sleeve’: SaaL *sasse*, Fi *hiha*, *hia*, MdE *oža* (UEW: 629)
- *šukšto- ~ *šukšta- ‘rinse / wash’: Fi *huhuhto-* ‘rinse’, MdE *kštams* ‘wash’ (UEW: 788)
- *šušmar ~ *šuwar ‘masher’: Fi *huhmar*, MdE *čovar*, MariE *šuar*, W *šuer* (UEW: 789)
- *šVškä ‘European mink’: Fi (obsolete) *hähkä*, *häähkä*, MariE *šaške*, W *šäškä*. — SlkTym *tōt* and Kam *čaʔn* ‘otter’ are also mentioned in UEW (498), but they cannot belong here due to phonological difficulties.
- *šVra ‘grindstone’: Fi *hiera* ‘grindstone’, *hieroa* ‘rub’, Udm *šer* ‘grindstone’, *šerj-* ‘grind, whet’ (UEW: 783–784)
- *taško ~ *tašV ~ *tuškV ‘grindstone’: Fi *tahko*, MariE, W *toš*, Komi, Udm *tjš* (*tjšk-*) (UEW: 793)
- *uwši ~ *oča ‘sheep’: Fi *uuhi*, MdE *uča*, Komi, Udm *jž* (UEW: 541)
- *wešnä ‘spelt / wheat’: Fi *vehnä* ‘wheat’, MdE *viš*, MariE *wiste*, W *wištə* ‘spelt’ (UEW: 821)
- *wa(k)štira ~ *wa(k)štara ‘maple’: Fi *vaahtera*, MdE *ukštor*, MariE, W *waštar* (UEW: 812)

This vocabulary shows several notable features besides having the rare phoneme *š. There are also other features of phonological structure foreign to Uralic, most notably three-consonant clusters (*kšt, *kšn) and clusters containing a nasal and a sibilant

(*ŋš, *šm, *šn). On the whole, the sound correspondences are anomalous: in most cases, a single proto-form cannot be postulated without ad hoc recourse to irregular sound change. The meanings of the words cluster in particular semantic groups such as animal husbandry, agriculture, the natural environment, and certain types of primitive tools. In nearly all cases a Saami cognate is lacking.

As this vocabulary is deviant in regard to phonological structure, sound correspondences, distribution, and semantics, there are good reasons to postulate the hypothesis that these are not words of Uralic origin, but instead borrowings from some unknown source. It is possible that they derive from extinct substrate languages spoken in Bronze Age agricultural communities somewhere in the area between the Baltic Sea and the Ural Mountains. In any case, the phonological irregularities are likely to result from these words having been adopted separately into already differentiated Uralic dialects, and perhaps also from distinct but mutually related source languages. That they lack the change *ä-ä > Pre-PFi *a-e is merely one of several phonological irregularities characteristic of this vocabulary. Substrate origin has been recently proposed for some of these words (e.g., *wakšti/ara ‘maple’, *lešmä ‘cow / horse’, *wešnä ‘wheat’) also by Häkkinen (2009: 37–40).

The advantage of this hypothesis is that it also provides a potential explanation for the exceptional case of Fi *räppänä* ‘smoke vent in a sauna or a drying barn’, which likewise lacks the change *ä-ä > *a-e. Zhivlov (2014: 115) cautiously suggests that this could be viewed as a conditioned exception if one postulated that the change did not affect trisyllabic roots. However, in addition to the lack of this change, the word also displays an initial *r- and an unidentified suffix-like element *-nä (also found in Fi *pähkinä* ‘nut’), which all suggest non-Uralic origin. Also *šäšnä ‘woodpecker’ with its unique cluster *šn is a candidate for a substrate word. There are many more words that can be suspected to belong to the same stratum on the basis of their distribution, meaning and phonological irregularity, for example the following:

- *enäsäj ~ *äñäńšV ‘raspberry’: MdE *inzej*, MariE *eñäž*, W *əñgəž*, Komi *emijž*, Udm *emež* (UEW: 26)
- *jekäl ~ *jäkälä ‘lichen’: SaaN *jeagil*, Fi *jäkälä*, Komi *jal-*, *jala* (UEW: 632)
- *kički- ~ *kička- ‘weed’: Fi *kitke-*, MdE *kočkoms* (UEW: 662)
- *lүpsä- ~ *lupsa ~ *lү(p)š-tä- ‘milk’: Fi *lypsä-*, MdE *lovco*, MariE *lüšte-*, Komi *lįštj-* (cf. UEW: 691, 695)
- *majaka ~ *mejä(kä) ‘beaver’: Fi *majava*, MdE *mijav*, Komi *moj*, Udm *mijj* (UEW: 697; Sammallahti 1988: 552)
- *olki ~ *ulki ‘straw’: Fi *olki*, MdE *olgo* (UEW: 717)
- *tika ~ *toka ‘pig’: Fi *sika*, MdE *tuvo* (UEW: 796)
- *wala- ~ *wälä- ‘pour; cast (metal)’ > Fi *valaa*, MdE *valoms*, MariE *wele-*, W *wile-* (UEW: 812). — The Mari verb has not been previously compared to the Fi and Md ones.

In general, a surprisingly large part of the vocabulary traditionally reconstructed for ‘Finno-Volgaic’ and ‘Finno-Permic’ (UEW: 605–827) involves irregular sound correspondences and other etymological difficulties. While some of this material can no

doubt be explained as borrowings between Uralic branches and even simply wrong etymologies, for a sizable portion of this lexicon a substrate explanation appears plausible and should be further explored; a thorough reanalysis of the relevant etymological material from this perspective would be highly desirable.

6. Conclusion

Two types of sound correspondences have been traditionally connected with the hypothesized development of ‘secondary *e*-stems’ in Finnic. The first correspondence occurs in Finnic roots of the type *kansi* : *kante*- ‘lid’, *sarvi* : *sarve*- ‘horn’ and *suoli* : *suole*- ‘gut’, the Saami and Mordvin cognates of which appear to point to the PU vowel combination *o–a. The second involves Finnic roots such as *talvi* : *talve*- ‘winter’, *sappi* : *sappe*- ‘bile’ and *puoli* : *puole*- ‘half, side’, which show front-vocalic cognates elsewhere in Uralic, pointing to the PU vowel combination *ä–ā. The analysis presented in this study has shown, however, that these two correspondences are best explained as results of two entirely distinct phonological developments. In the former type, the Finnic *e*-stem is not secondary at all, but instead Saami (and possibly also Mordvin) have developed a secondary *a-stem in the reflexes of PU roots with the vowel combination *a–i. Words showing the latter type of correspondence, however, are true secondary *e*-stems in Finnic, and their development can be explained as a result of regular sound change.

The reason the proposed solution has remained overlooked in previous research might be that these two different vowel correspondences indeed seem very similar. As long as the analysis is restricted to West Uralic languages, it appears natural to view the unusual vowel correspondences displayed by, e.g., *sarvi* ‘horn’ and *talvi* ‘winter’ as a result of some single phenomenon. However, when evidence from more eastern branches of Uralic, especially from Ob-Ugric and Samoyed, is also taken into account, it becomes clear that we are dealing with two quite different stem types on the Proto-Uralic level. This is most obvious in light of the Samoyed cognates of the following three rhyming roots in Finnish:

Finnish:	Proto-Samoyed:
<i>kuole</i> - ‘die’	*kãã- ‘die’
<i>nuole</i> - ‘lick’	*ńãã- ‘lick’
<i>puole</i> - ‘side, half’	*pãã- ‘half’

The solution proposed here is entirely based on the principle of regular sound change, and removes any need to resort to ‘sporadic’, ‘irregular’ or ‘analogical’ developments to explain the so-called ‘secondary *e*-stems’ in Finnic. The model is completely congruent with Janhunen (1981) and Sammallahti’s (1988) theory of Proto-Uralic phonology which recognizes eight vowel phonemes, and specifically requires the vowel phoneme *j to be reconstructed into Proto-Uralic. Contrary to Janhunen and Sammallahti, however, PU *j has not fully merged with PU *a even in West Uralic languages; the two phonemes can be partially distinguished on the basis of one subclass of roots that

have traditionally been thought to represent ‘secondary *e*-stems’ in Finnic. Also, as the presented model is combined with my earlier explanation of the development of long vowels in Finnic languages (Aikio 2012), it fully accounts for the initially very puzzling cases where Proto-Finnic **ō* (> Finnish *uo*) has developed from PU **ä*: Fi *puoli* ‘side, half’ (< PU **pälä*), *luomi* ‘birthmark; eyelid’ (< PU **lämä*), Est *koole* ‘ford’ (< PU **kälä*-).

Besides providing a solution to the long-standing mystery of ‘secondary *e*-stems’, the results of the present study also raise an issue of more general methodological significance for Uralic historical phonology. The treatment of the problem by earlier research has been based on an axiomatic premise that ‘secondary *e*-stems’ represent an irregular phenomenon, and thus must be explained as a result of some sort of analogical or ‘sporadic’ development motivated by obscure forces such as ‘Systemzwang’ (cf. Itkonen 1973). This approach reflects a general tendency in Uralic studies to treat sound change as a sort of semiregular process obscured by numerous unexplained and inexplicable exceptions. However, as noted in Aikio (2014c: 142; cf. also Zhivlov 2014: 114–115), such a theoretical premise easily leads to ad hoc assumptions and a general lack of methodological rigor, resulting in the impossibility to consistently apply the comparative method. In the case of ‘secondary *e*-stems’, this premise even led to a failure to perceive that the phenomenon involves sets of entirely regular sound correspondences. Thus, it would seem that the potential of the comparative method in Uralic historical phonology is still far from exhausted, but our understanding of the phonological development of the Uralic languages will only be significantly improved if future research strictly adheres to the premise of regularity of sound change.

Abbreviations

EnF = Forest Enets	MsKM = Middle Konda Mansi
Est = Estonian	MsKU = Upper Konda Mansi
Fi = Finnish	MsLL = Lower Lozva Mansi
Hung = Hungarian	MsLU = Upper Lozva Mansi
Kam = Kamas	MsP = Pelymka Mansi
Kar = Karelian	MsSo = Sosva Mansi
KhIrt = Irtyskh Khanty	MsT = Tavda Mansi
KhKaz = Kazym Khanty	NenT = Tundra Nenets
KhNi = Nizjam Khanty	Ngan = Nganasan
KhO = Obdorsk Khanty	PFi = Proto-Finnic
KhSur = Surgut Khanty	PKh = Proto-Khanty
KhVVj = Vakh-Vasjugan Khanty	PMari = Proto-Mari
Liv = Livonian	PMd = Proto-Mordvin
MariE = East (Meadow) Mari	PMs = Proto-Mansi
MariW = West (Hill) Mari	PPerm = Proto-Permic
Mat = Mator	PSaa = Proto-Saami
MdE = Erzya Mordvin	PSam = Proto-Samoyed
MdM = Moksha Mordvin	PU = Proto-Uralic
MsKL = Lower Konda Mansi	PWU = Proto-West-Uralic

SaaI = Inari Saami	SaaT = Ter Saami
SaaK = Kildin Saami	SlkKet = Ket Selkup
SaaL = Lule Saami	SlkTaz = Taz Selkup
SaaN = North Saami	SlkTym = Tym Selkup
SaaS = South Saami	Udm = Udmurt
SaaSk = Skolt Saami	

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Appendix: etymological material

The research material is grouped according to the combinations of first- and second-syllable vowels that can be reconstructed for each word root.

PU *a-i:

- *adi- ‘sleep’ || SaaN *oaddit* | MdE *udoms* | KhVVj *äla-* (< PKh *jīlā-) | MsT (obsolete) <ололанты>, <алалахъ> (< PMs ?*āl-) | Hung *alszik* (UEW: 334; Sammallahti 1988: 542).
- *ajji ‘brain’ || SaaN *vuoighašat* | Fi *aivot* | ? MdM *uj* | Hung *agy* (UEW: 5; Sammallahti 1988: 542; Aikio, forthcoming) — The Md word shows an irregular vowel, and is thus perhaps better explained as a reflex of *ojwa ‘head’.
- *ammi- ‘old’ || SaaN *oamis* ‘old (of things)’ | Fi *ammoin* ‘in ancient times, long ago’ | MdE *umok* ‘long ago’ | Hung *ó* ‘old, ancient’ (UEW 337–338; Sammallahti 1988: 542). — The Finnic word can be included in the cognate set by reconstructing *ammi- and postulating an underlying *e*-stem in Finnic, which became obscured by derivational processes. MariW *imeštə* ‘last year’ cannot belong here due to its vowel *i*. Mat “*umo*”, “*umu*” is a ghost word falsely extracted from <*hik-umo*>, <*hik^h-umu*> ‘early in the morning’, the correct reading of which is /*hij kūmu(n)*/ (Helimski 1997: 245).
- *aŋi ‘female in-law’ || SaaK *vuəññ* ‘brother’s wife’ (< PSaa *oəñē) | Komi *oña* ‘older brother’s wife’ | KhVVj *āñəkj* ‘wife of a male relative of an older generation’ (< PKh *jñkĭ) | MsT *āñi* ‘paternal uncle’s wife’, So *ññj* ‘stepmother, older brother’s wife’ (< PMs *āñəŋ) | Hung *ángy* ‘sister-in-law’ | SlkTaz *ōña* ‘older brother’s wife’ (< PSam ?*oñV) (UEW: 10; Sammallahti 1988: 542). — Contrary to UEW, NenT *heja* ‘aunt (mother’s younger sister)’ cannot belong here due to its irregular vocalism; instead, it is cognate with EnF *eja*, Ngan *ŋaaga* ‘aunt (mother’s younger sister)’, and SlkTym *ēña* ‘older sister’ (< PSam *āña).

- *aŋti ‘spear / blade’ || KhVVj *oŋtaw*, Sur *ǎŋ^wtəp* (< PKh *aŋtəp) | MsT *awtā*, So *owta* ‘spear; iron tip of a goad’ (< PMs *awtā) | NenT *ńant^ə* ‘blade, point’, SlkTa *əŋtj* ‘blade’ (< PSam *aŋtā) (UEW: 342). — Mari E *undo*, *umdo* ‘thorn, stinger’ cannot belong here due to its consonant cluster.
- *čaši ‘malt, barley’ || MdE *čuž* | MariE, W *šož* ‘barley’ | Komi *čuž*, Udm *čužjem* ‘malt’ (UEW: 622; Sammallahti 1988: 552).
- *jadi- ‘ask’ || MariE *jođam*, W *jađam* ‘I ask’ | Komi *juav-*, Udm *jua-* ‘ask’ | MsT *jäləmt-*, LU *jōlənt-* ‘talk into, persuade’ (< PMs *jäləmt-), KL *jōləs-* ‘ask for, talk into’ (< PMs *jäləs-) (UEW: 622; Sammallahti 1988: 552). — The Mansi cognate is a new addition to this etymological set.
- *jasi ‘chilly weather’ || SaaL *joasso* ‘chilly weather’ | MariE *juž*, W *jož* ‘cool air, cool wind’ | Udm *juž* ‘cool, fresh’ | SlkTym *tāt* ‘early winter (when there is no snow yet)’ (< PSam *jat) (UEW: 637). — The Saami and Samoyed cognates are new additions to the etymological set.
- *kaji ‘grass, stalk, awn’ || SaaN *guodja* ‘seed shell of a sedge’, SaaI *kuojā* ‘sedge’ | Komi, Udm *kj* ‘awn’ | MsLL *kōj* ‘hair (on the head)’ (< PMs *kāj) | Hung *haj* ‘hair’ | SlkTaz *qu* ‘stalk, stem, oblong or slender object’ (< PSam *kââ) (Aikio 2013a: 166–167).
- *kali- ‘die’ || SaaN *goallut* ‘feel cold, be freezing’ | Fi *kuole-* | MdE *kuloms* | MariE, W *kolem* | Komi *kuv-*, Udm *kulj-* | KhVVj *kāla-* (< PKh *kjlā-) | MsT *kāl-*, So *χāl-* (< PMs *kāl-) | Hung *hal* | NenT *χα-*, Ngan *kuo-*, SlkTaz *qu-* ‘die’ (< PSam *kââ-) (UEW: 173; Sammallahti 1988: 538).
- *kamti ‘lid’ || SaaN *goavdi* ‘shelter, canopy’ | Fi *kansi* | MdE *kundo* | MariE W *komδâš* ‘lid’ | Komi *kud*, Udm *kudj* ‘birch-bark container’ (UEW 671; Sammallahti 1988: 552).
- *kari ‘skin, bark’ || SaaL *goarre* ‘ice-crust’ | Fi *kuori* ‘crust, skin, bark’ | KhKaz *εL-χor* ‘(human) skin’ (*εL* ‘body’) (< PKh *-kar) | NenT *śar* ‘surface; skin (under the hair)’ (< PSam *kar). — The Finnic and Nenets forms are equated in Aikio (2012: 233), and the reconstruction of PU *kari is further verified by the previously unnoticed Saami and Khanty cognates. The appurtenance of MdE *kar* ‘birch-bark shoe’ is unlikely for both phonological and semantic reasons; PU *kari would predictably yield MdE *kur (cf. SSA s.v. *kuori*).
- *karki- ‘bitter’ || Fi *karkea* ‘coarse; bitter’ | Komi *kurjđ*, Udm *kurjđ* ‘bitter’ | KhVVj *korəy-* ‘burn (e.g., salt in a wound), ache’ (< PKh *karəy-). — UEW (128) gives Fi *karvas* ‘bitter’ as the Finnic cognate, but this is an unrelated borrowing from Proto-Germanic *χarwaz (> Old High German *har*, *herbe*, German *herb*, Dutch (dial.) *haar* ‘bitter’).
- *karti- ‘roast, burn’ || SaaN *goardit* ‘roast’ | Fi *karsi* ‘burnt crust’ | MariE *kordem* ‘I burn incense (before praying), I sanctify (an item by moving a burning incense stick around it)’ (Aikio 2009: 99).
- *laŋši- ‘soft, mild’ || SaaN *loažži* ‘abated wind’, *loažžat* ‘loose, slack’ | KhIrt *luńtə* (< PKh *lańćV) | MsT *lańćəŋ*, So *lónšij* ‘lukewarm’ (< PMs *lańćəŋ) | Hung *lágý* ‘soft, gentle’ (UEW: 250–251; Sammallahti 1988: 545). — In this case, one could theoretically also reconstruct PKh *lāńćV, as the word is only attested in South and North Khanty, where PKh *a and *ā have merged. However, PKh *ā is not a regular correspondent of either PU *a-i or *o-a. Also the Mansi cognate strongly supports the reconstruction of PKh *a, because PMs *a ~ PKh *a is a regular correspondence, whereas the correspondence PMs *a ~ PKh *ā is not attested at all (Honti 1982 *passim*).
- *maŋši- ‘be tired?’ || Fi *masea* ‘depressed, moody’ | Komi *muž-*, *mjž-* ‘get tired’ | KhIrt *māńt-* (< PKh *mājńć-) | MsKL *māńš-*, LU *mońš-* ‘be in need, be in distress’ (< PMs *mańć-) (SSA s.v. *masea*).

- **hali-* ‘lick’ || SaaN *njoallut* | Fi *nuole-* | MdE *nola-* | MariE *nule-*, W *nêle-* | Komi *huv-*, Udm *hulj-* | KhVVj *hâla-* (< PKh **hîlâ-*) | MsKU *hâlâmt-* (< PMs **hâlâmt-*) | SlkTaz *hû-*, *hû-* (< PSam **hââ-*) (UEW: 321; Sammallahti 1988: 539).
- **pariwa/i* ‘raft; flock’ || SaaN *boar’ri* ‘raft’ | Fi *parvi* ‘loft; flock’, Est *parv* ‘raft’ | Komi, Udm *pur* ‘raft’ | KhVVj *pârə, pāra* ‘raft; flock’ | < PKh **pirā* | MsT *pārā*, So *pōra* ‘raft’ (< PMs **pārā*) | NenT *paŕa, paŕe*, Ngan *horj* ‘storage platform’, SlkTaz *pōrj* ‘rack for drying fish’ (< PSam **pārā*) (UEW 356–357; Sammallahti 1988: 547). — The PSam stem-final **-ä* has to be interpreted as a result of contraction of the sequence **-iwa/i* (Zhivlov 2014: 131). No parallels for such a development are known, however. In any case, PSam **pārā* does not support the reconstruction of a plain PU **-a*-stem because the disharmonic vowel combination **â-ä* has regularly developed in PSam stems with intervocalic **l* but not **r*.
- **saxi-* ‘arrive; get’ || SaaK *sāggä* ‘get, catch’ | Fi *saa-* ‘get; be allowed to’ | MdE *sams* ‘come, arrive’ | MariE *šua-*, W *šoa-* ‘arrive’ | Komi *su-* ‘catch up with, meet, arrive’ (UEW: 429; Sammallahti 1988: 553). — The Samoyed forms mentioned in UEW reflect PSam **tājwā-* ~ **tājwâ-*, which goes back to PU **talwa-*.
- **šali* ‘gut’ || SaaN *čoaali* | Fi *suoli* | MdE *šulo* | MariE *šolo*, W *šolê* | Komi *šuv*, Udm *šul* | KhVVj *sol* ‘gut’ (< PKh **sal*) (UEW: 483–484; Sammallahti 1988: 549).
- **šarwi* ‘horn, antler’ || SaaN *čoarvi* | Fi *sarvi* | MdE *šuro* | MariE, W *šur* | Komi, Udm *šur* | Hung *szarv* (UEW: 486–487; Sammallahti 1988: 549).
- **tammi* ‘oak’ || Fi *tammi* | MdE *tumo* | MariE *tumo*, W *tum* (UEW: 798).
- **tarki-* ‘tremble’ || SaaN *doarggistit* ‘tremble’ | Fi *tarkene-* ‘stand the cold, feel just warm enough’ | Komi *tural-* ‘get stiff (from cold)’ | KhVVj *tārəy-*, Sur *tārəy-* (< PKh **tīrəy-* ~ **tārəy-*) | MsT *tark-*, So *tōry-* ‘tremble’ (< PMs **tārəy-*). — The Finnish and Komi words are new additions to this cognate set.
- **waji* ‘grease’ || SaaN *vuodja* | Fi *voi* | MdE *oj*, M *vaj* | MariE *ūj*, W *ū* | Komi *vij*, Udm *vej* | KhVVj *voj* (< PKh **waj*) | MsT *wāj*, P *wōj* (< PMs **wāj*) | Hung *vaj* (Sammallahti 1988: 551; UEW 578).
- **wajŋi* ‘breath, spirit’ || SaaN *vuoiŋa* ‘breath, spirit’ | Hung *vágy* ‘desire, wish, eagerness’ | SlkTaz *keji* ‘breath, steam’ (< PSam **wajŋ*), NenT *jīntʰ?* ‘breath, steam, air’, Ngan *bačü?* ‘soul’ (< PSam **wajŋtut*) (UEW: 552; Sammallahti 1988: 541; Aikio, forthcoming).
- **wali-* ‘carve’ || SaaL *oallot* ‘cut off (branches)’ | Fi *vuole-* ‘whittle’ | Komi *velal-*, Udm *velj-* ‘carve (with a knife), whittle’ | KhVVj *wält-* ‘carve (with a chisel); plane’ (< PKh **wjlt-*) | MsKL *wält-*, So *wölt-* (< PMs **walt-*) (UEW: 579–580; Sammallahti 1988: 554).
- **wari* ‘hill’ || Fi *vuori* ‘rocky hill, mountain’ | Komi *ver* ‘forest’, Udm *vir* ‘hill, highland’ | KhVVj *wor* ‘ridge, range of hills’ (< PKh **war*) | MsT *wār*, So *wōr* ‘forest’ (< PMs **wār*) (UEW: 571; Sammallahti 1988: 551).

PU **a*–*a*:

- **adma* ‘sleep, dream’ || MariE *omo*, W *om* | Komi *on*, *un*, Udm *um* | KhVVj *aləm* (< PKh **āləm*) | MsT *ōləm*, So *ūləm* (< PMs **ūləm*) | Hung *álom* (UEW: 335; Sammallahti 1988: 542). — A deverbal noun derived from **adi-* ‘sleep’. UEW also gives MdE *udomo* ‘sleep (N)’ as cognate, but this is a synchronically fully transparent vowel stem derivative of MdE *udoms* ‘sleep (V)’ (< PU **adi-*), and does not reflect the PU consonant stem formation **ad-ma*.
- **amma-* ‘scoop’ || Fi *ammenta-*, Veps *ammunda-* | MdE *amol’da-* | KhVVj *um-* (< PKh **üm-*) | MsSo *ūm-* (< PMs **üm-*) (UEW: 7–8).

- *aja- ‘drive, flee’ || SaaN *vuodjit* | Fi *aja-* ‘drive’ | Komi *voj-* ‘bolt (of horses)’, Udm *uj-* ‘pursue, chase’ | MsKU *jit-wujt-* ‘hunt, pursue, chase’ (< PMs *-ūt-) (UEW: 4; Sammallahti 1988: 542).
- *aŋa- ‘open, take off’ || Fi *avaa-* ‘open’ | KhIrt *eŋχ-* ‘untie, take off’ (< PKh * ɪŋk-) | MsT *āŋk-*, So *āŋχ^w-* ‘take off’ (< PMs *ɪŋk^w-) | NenT *háŋə-* ‘open (e.g. a door, one’s mouth)’ (< PSam *aŋə- (UEW: 11; Sammallahti 1988: 542; Aikio 2002: 50).
- *aŋta- ‘open, untie’ || MdE *avto-* ‘open wide; yawn’ | KhVVj *aŋət-* (< PKh *ɪŋət-) | Hung *old* ‘untie’ (Aikio, forthcoming). — Derived from *aŋa-.
- *apta- ‘bark’ || MariE, W *opte-* | Komi *uvt-, ut-*, Udm *utj-, uvtj-* | KhKaz *ɔpət-* (< PKh *āpət-) | MsSo *ūt-* (< PMs *ūt-) (UEW: 14). — Liv *uttō* ‘bark’ is probably unrelated, because the vowel *u* does not match.
- *aška-, *aška/il ‘step’ | Fi *astu-, askel* | MdM *aškald-* | MariE *oškâl*, W *aškâl* | Komi *voškov* | MsSo *ūs-* (< PMs *ūš-), P *ūšəl* (< PMs *ūšəl) | SlkTaz *āsjl-* (< PSam *asəl-) (UEW: 19; Sammallahti 1988: 542; Aikio 2002: 40–41).
- *čača- ‘grow’ || Fi *sata-* ‘yield crop’, *sato* ‘crops’ | MdE *čačoms* | MariE, W *šoča-* | Komi *čuž-* ‘be born, grow’, Udm *čjžj-vjžj* ‘relative’ | KhVVj *čjčjm* ‘bear cub’ (< PKh *čjčjm) | MsSo *sūs-, sūns-* ‘grow, increase; have cubs (of a bear)’ (< PMs *šū(n)š-) | SlkKet *čāži* ‘family, tribe’ (< PSam *caci) (UEW: 52; Sammallahti 1988: 552; Aikio 2014a: 14–17).
- *čaŋa- ‘hit’ || MdE *čavoms* ‘strike, hit, beat’ | MariE *čoŋe-*, W *čange-* ‘notch (building logs), set up (corner posts for a log house)’ | KhVVj *čɔɣ-*, Irt *čoŋχ-* (< PKh *čšŋk-) | MsP *šəŋk^w-*, LU *šəŋkw-* ‘kick’ (< PMs *šjŋk^w-) | NenT *taŋa-* ‘rub, wear out’ (< PSam *cāŋa-) (UEW: 53–54; Aikio 2002: 11–12).
- *kaća- ‘give (as a gift)’ || MdE *kažems* ‘give (as a gift)’ | Komi *kožin* ‘dowry’, Udm *kužim* ‘gift’ | Hung *haszon* ‘advantage, profit, gain’ | NenT *χaso* ‘payment to a shaman’, SlkTaz *qossj* ‘sacrifice; gift’ (< PSam *kâso) (UEW: 111; Sammallahti 1988: 538). — Mari E *kuzuk*, W *kuzək* ‘dowry’ has also been considered cognate, but it must be a Permic loanword because of its vocalism and irregular *z* (Bereczki 2013 s.v. *kuzuk*).
- *kačka- ‘bite’ || SaaN *gáskit* ‘bite’ | Fi *katkera* ‘bitter’, *katku* ‘burnt smell’ | MariE *kočka-*, W *kačka-* ‘eat’ | KhVVj *kjč-* ‘hurt, ache; sting (nettles)’ (< PKh * *kjč-) | MsT *kōš-*, So *χūs-* ‘sting (of nettles)’ (< PMs *kūš-) (Aikio 2014a: 5–8).
- *kaďa- ‘leave’ || SaaN *guodđit* ‘leave’ | Fi *katoa-* ‘disappear’ | MdE *kadoms* | MariE, W *kode-* ‘leave’ | Komi *kol-* ‘leave; stay’, Udm *kjľj-* ‘stay’ | KhVVj *kăj-*, Sur *kjj-* ‘leave’ (< PKh *kľj- ~ *kjj-) | MsT *kōľ-*, So *χül-* (< PMs *kül-) | Hung *hagy* | NenT *χaje-*, Ngan *koi-*, SlkTaz *qēčj-* ‘leave’ (< PSam *kăjă-) (UEW: 115–116; Sammallahti 1988: 537–538).
- *kaja- ‘sun, dawn’ || SaaL *guojjdit* ‘rise (of moon); break (of day)’ | Fi *kajasta-* ‘shimmer’ | MdE *kaje-* ‘sprout’ | MariE *koja-*, W *kaja-* ‘appear’ | Ngan *kou* ‘sun’, SlkTaz *qēčj* ‘heat’ (< PSam *kăjă) (UEW 642; Sammallahti 1988: 538).
- *kajwa- ‘dig’ || SaaN *goaivut* | Fi *kaiva-* ‘dig’ | MdE *kajams* ‘throw’ | MariE *kue-*, W *koe-* ‘shovel’ | Komi *koj-* ‘pour, scoop out’, Udm *kuja-* | Hung *hajít* ‘throw’ | NenT *síwa* ‘shovel’, Ngan *kajbu* ‘shovel’ (< PSam *kajwă) (UEW 116–117, 170–171; Sammallahti 1988: 552; Aikio 2002: 41–42). — The Saami form shows a development *-aCwa- > Pre-PSaa *-oCwo-, which is also found in *talwa- ‘bring, take’ > SaaN *doalvut*.
- *kala ‘fish’ || SaaN *guolli* | Fi *kala* | MdE *kal* | MariE, W *kol* | KhVVj *kul* (< PKh *kūl) | MsT *kōl*, So *χül* (< PMs *kūl) | Hung *hal* | NenT *χal’a*, Ngan *kolj*, SlkTaz *qēlj* (< PSam *kâlă) (UEW: 119; Sammallahti 1988: 538). — Related to *kala ‘fish’.
- *kala- ‘fish with a net’ || Fi *kalin* | Komi *kuľim* | KhVVj *kaləw* (< PKh *kāləp) | MsKU *kulp*, So *χüləp* (< PMs *kūləp) | Hung *háló* (UEW: 121; Sammallahti 1988: 545; Zhivlov 2014: 136).

- *kama ‘skin, shell’ || Fi *kamara* ‘crust (e.g. of the earth); rind’ | MariE, W *kom* ‘crust, peel’ | Hung *hámlík* ‘peel’ | NenT *śaw*^o, SlkTaz *qāmj* ‘scale’ (< PSam *kamā) (UEW: 120; Sammallahti 1988: 544).
- *kanta- ‘carry’ || SaaN *guoddit* | Fi *kanta-* ‘carry’ | MdE *kandoms* | MariE *konde-*, W *kande-* ‘carry, bring’ | KhVVj *kantəm-* ‘lift on one’s back’ (< PKh *kāntəm-) | MsP *kunt-*, LU *χūnt-* ‘carry (on one’s back)’ (< PMs *kūnt-) | NenT *χana-*, Ngan *kontu-*, SlkTaz *qentj-* ‘carry (away), take’ (< PSam *kāntā-) (UEW: 124; Sammallahti 1988: 538). — The verb is a consonant stem causative of PU *kani- ‘go away’; the underived form is preserved only in Samoyed (Janhunen 1981: 221, 231).
- *kara- ‘dig’ || MdE *karams* | MariE *kore-*, W *kare-* ‘hollow out, dig’ | ? Komi *kjr-*, Udm *kjri-* | KhIrt *χer-* ‘dig, shovel’ (< PKh *kīr-) (cf. UEW: 221).
- *lapa ‘shoulder-blade’ || SaaL *lyepi* | Fi *lapa* | MsKU *lup-lō* (< PMs *lūp-) (Aikio 2015: 13).
- *mašta- ‘be able to’ || Fi *mahta-* | MdE *maštoms* | MariE *moštem*, W *māštem* (UEW: 265).
- *nataw ‘in-law’ || SaaS *nāāte* ‘younger female relative of one’s wife’ (< PSaa *nuotōj) | Fi *nato* ‘sister of one’s spouse; brother’s wife’ | MariE *nudo*, W *nudā* ‘younger sister of one’s spouse’ | NenT *nado* ‘younger brother of one’s spouse’ (< PSam *nāto) (Sammallahti 1988: 539; UEW: 299–300).
- *pakta- ‘pursue’ || SaaS *buektedh*, N *buktit* ‘bring’ | MariE, W *pokte-* ‘pursue, chase, drive’. — A new etymological comparison; as for the semantics, cf. Fi *noutaa* ‘fetch, go and get’ ~ KhVVj *nuyəl-*, MsSo *nawl-*, SlkTaz *nō-* ‘pursue’.
- *pala ‘piece (of food)’ || SaaT *pīlle* (< PSaa *puolē) | Fi *pala* ‘piece, bit’ | MdE *pal* ‘piece (of food)’ | KhVVj *pu!* ‘bit, mouthful, food chewed for the baby’ (< PKh *pūl) | MsT *pōl*, So *pūl* ‘piece, portion’ (< PMs *pūl) | Hung *falat* ‘mouthful, bit, bite’ (UEW: 350; Sammallahti 1988: 540).
- *pala- ‘eat up’ || SaaN *buollit* | Fi *pala-* | MdE *paloms* ‘burn’ | KhVVj *puļj-* ‘gobble’ (< PKh *pūļj-) | MsSo *pūl-* ‘eat’ (< PMs *pūl-) | Hung *fal* ‘devours, eats ravenously’ | NenT *pal’e-*, SlkTaz *pōļj-* ‘swallow’ (< PSam *pālā-) (Janhunen 1981: 222; Sammallahti 1988: 540; UEW: 350). — The verbal correlate of *pala ‘piece (of food)’. The meaning ‘burn’ in West Uralic derives from a metaphorical expression “fire eats”, which has parallels in Ob-Ugric and Samoyed languages. The suggested comparison of the verbs meaning ‘burn’ to Ugric *pad’i- ‘freeze’ (UEW: 352) is phonologically impossible.
- *panča- ‘open’ || SaaL *buottsos* ‘bare, naked’ | MdE *panžoms* | MariE *poča-*, W *pača-* ‘open’ | Komi *puž-* ‘roll up, fold back’, Udm *pužaltj-* ‘roll up, wrap up’ | KhVVj *puņč-* (< PKh *pūņč-) | MsT *pōnš-*, So *pūns-* ‘open’ (< PMs *pūnš-) (UEW: 352; Sammallahti 1988: 548; Abondolo 1996: 101).
- *pata ‘pot’ || Fi *pata* ‘caldron’ | MariE *pot*, W *pat* | KhVVj *put* (< PKh *pūt) | MsT *pōt*, So *pūt* (< PMs *pūt) | Hung *fazék* ‘pot’ | NenT *pad-*, SlkTaz *pot-* ‘put in a pot’ (< PSam *patā-) (UEW: 358; Sammallahti 1988: 548).
- *sala- ‘steal’ || SaaN *suoládit* ‘steal’ | Fi *salaa* ‘secretly’ | Md *salams* | MariE, W *šolāštam* | KhV *laləm-*, Vj *jaləm-* | MsKL *tulmāχ*, So *tūlmāχ* ‘thief’ (< PMs *tūlmāk) | NenT *tal’e-*, Ngan *tolj-* ‘steal’, SlkTaz *tēļj-* ‘steal’ (< PSam *tālā- ‘steal’) (UEW 430–431; Sammallahti 1988: 540).
- *saņša- ‘stand’ || SaaN *čuožžut* | Fi *seiso-*, Võro *saisa-* ‘stand’ | KhVVj *lijnt-*, *jjjnt-*, Sur *luñt-* ‘set up’ (< PKh *Līñć- ~ *Lāñć-) | MsT *tōñć-*, KL *tuñš-* ‘stand’ (< PMs *tūñć-) (UEW 431–432; Sammallahti 1988: 549). — Cf. *saņša- ‘sit down, stop’.

- *sarka ‘branch’ || SaaN *suorgi* ‘fork, branch’ (< PSaa *suorkē) | Fi *sarka* ‘patch, strip (of field)’ | ? MariE *šor-wondo* ‘rake’ (-wondo < pondo ‘shaft’) | NenT *tarka* ‘fork, branch’ (< PSam *tårkâ) (Sammallahti 1988: 540). — As argued by Bereczki (2013 s.v. *šor-wondo*), the earlier comparison of the Mari word to SaaN *suorri* and Fi *haara*, *hara* ‘fork, branch’ (UEW: 783; SSA s.v. *hara*) is false. The Saami and Finnic words reflect *šara, but the Mari word has the form *šor-* in the Malmyzh dialect, which points to PU *s-, not *š-. Moreover, Saami-Finnic *šara is a loan from Proto-Baltic *žarā- > Lithuanian *žarà* ‘fork, branch’ (Koivulehto *apud* Aikio 2009: 149).
- *šada- ‘rain’ || Fi *sata-* | Ngan *soru-*, SlkTaz *sērij-* (< PSam *sårâ-) (Sammallahti 1988: 540).
- *šala- ‘flash’ || Fi *salama* ‘lightning’ | KhVVj *sal-* ‘shimmer’ (< PKh *sāl-, *sāl-* ‘lighten’ (< PKh *sǝl-) | MsKU *sēl-*, So *sāl-* ‘lighten’ (< PMs *sǝl-) | NenT *salʷa-* ‘flash, shimmer’, Ngan *solə* ‘shine, brightness’ (< PSam *sål̥) (UEW: 459; Sammallahti 1988: 549; Aikio 2002: 27–29).
- *šara- ‘dry’ || Komi *šur-* ‘become stale, harden’, Udm *šurmi-* ‘harden (of skin)’ | KhSur *sâr-* ‘dry’ (< PKh *sār-) | MsKU *sūrə*, P *sūra* ‘dry, soft, boneless’ (< PMs *sūrā) | Hung *száraz* ‘dries’ (UEW: 466).
- *šara- ‘shit’ || MdM *šarəndəms*, *šārəndəms* | MariE *šora-*, W *šara-* | Hung *szarik* (UEW: 465).
- *šarja ‘beam’ || Fi *sarja* ‘series, sequence; lathwork bottom in a sled’ | Komi *šor*, Udm *šuri* ‘cross-beam’ (UEW: 770–771; Sammallahti 1988: 553).
- *šąŋka- ‘sting, stick’ || SaaN *čuoggut* | SlkTaz *seŋki-* (< PSam *šąŋkâ-) (Aikio 2006: 24).
- *taka- ‘behind (relational noun)’ || SaaN *duohki-* | Fi *taka-* | NenT *taxə-*, Ngan *takə-*, SlkTaz *tɔk-* (< PSam *tak(ə)-) (UEW: 506–507)
- *tala ‘shelter?’ || Fi *talas* ‘boat shed’, *talo* ‘house’ | Udm *tǝlǝs* ‘tent, hut made of branches, cabin’ (UEW: 506–507; Sammallahti 1988: 550)
- *talwa- ‘bring, take’ || SaaN *doalvut* ‘take, transport (away)’ | Fi *talu-* ‘lead; allow to be lead’ (PFi *talu- < *talv-u-, originally an automative passive) | MsT *tōl-*, So *tūl-* ‘bring, lead, fetch’ (< PMs *tūl-) | NenT *tæwə-* ‘reach; catch up, overtake’, Ngan *tojbusa* ‘transport’ (< PSam *tǝjwǝ- ~ *tǝjwǝ-) (Aikio 2002: 29–30). — The Fi and Ms forms are new additions to this etymology. Saami appears to show a development *-aCwa- > Pre-PSaa *-oCwo-, another example of which is *kajwa- ‘dig’ > Pre-PSaa *kojwo- > SaaN *goaivut* (Zhivlov 2014: 124).
- *wala ‘song’ || SaaL *vuolle* ‘Saami song’ | Fi *vala* ‘oath’ | MdE *val* ‘word’ | Ngan *bəlj* ‘song’ (< PSam *wālā) (UEW: 812; Aikio 2006: 26–27).
- *wanča- ‘move cautiously’ || SaaN *vázzit* (!) ‘walk’ | MariE *wońče-*, W *wanče-* | Komi *vuž-*, Udm *vǝžǝ-* | KhVVj *uńč-* (< PKh *wūńč-) | MsT *onš-*, So *uns-* ‘cross’ (< PMs *unš-) | SlkTaz *kəntal-* ‘sneak up on’ (< PSam *wǝncVl-) (UEW: 557; Sammallahti 1988: 551; Aikio 2002: 36–38).
- *wančaw ‘root’ || Komi *vuž*, Udm *vǝžǝ* ‘root’ | NenT *wano*, Ngan *bəntu*, SlkKet *qonžə* ‘root’ (< PSam *wǝnco) (UEW 548–549; Sammallahti 1988: 541). — MariE *wož*, W *waž* ‘root’ and KhNi *wōš* ‘tongue root’ are phonologically irregular, and seem best explained as Permic loanwords.
- *wara ‘edge, ridge’ || SaaN *várri* (!) ‘hill, mountain’ | KhVVj *ur* ‘sharp edge’, Irt *ūr* ‘wooded ridge’ (< PKh *wūr) | MsT *or*, So *ur* ‘hill, mountain, ridge’ (< PMs *ur) | Ngan *bəru* ‘mountain, cliff’ (< PSam *wǝrǝ) (Sammallahti 1988: 551; Aikio 2006: 27–28).
- *wasta- ‘opposite’ || SaaN *vuoste-* | Fi *vasta-* ‘counter-, opposite’ | MdE *vastoms* ‘meet’ | MariE, W *waštareš* ‘against’ (UEW: 815).
- *watka- ‘debark (a tree)’ || SaaL *vyetki-* ‘debark’ | MdE *vatka-* ‘peel, skin, beat’ | MariE *wotke-*, W *wakta-* (!) | NenT *waʔ-* ‘debark’ (< PSam *wât-) (UEW: 561).

PU *a–o:

- *adʷo ‘bed’ || SaaN *vuodđu* ‘bottom, foundation’ | Komi *vol’* ‘reindeer or moose hide’ | MsT *alāt*, So *ōlat* (< PMs *ālāt) | Hung *ágy* ‘bed’ (UEW: 4; Sammallahti 1988: 542; Aikio 2013: 171–172). — Fi *vuode* ‘bed’ can be related only if *adʷo was derived from an underlying verb *adʷi- (? > Udm *walj-* ‘spread out; make the bed’); in this case Fi *vuode* word represents a parallel derivative *adʷik. It can, however, also be a derivative of the Baltic loanword *vuota* ‘hide’.
- *asora ‘lord’ || MdE *azor* ‘master, lord’ | Komi *ozjr*, Udm *uzjr* ‘rich’ | MsT *ātər*, So *ōtər* ‘master, lord’ (< PMs *ātər) | ? Hung *úr* ‘gentleman, mister, master’ (UEW: 18; Sammallahti 1988: 542). — This is a new etymological suggestion regarding the Hungarian word. Alternatively, however, Hung *úr* may be a reflex of PU *ura- ‘man, male’, and cognate with SaaL *āres* and Fi *uros* ‘male’ (UEW: 545). If it reflects PU *asora, it has undergone regular loss of *s. There could have been a contraction of the resulting vowel sequence: ?*asora > ?*aura > *úr*. There are also other examples of a similar vowel contraction: Hung *húz* ‘pull, drag, haul’ < ?*kautV- < ?*kavotV- < ?*kapotV- (cognate with KhIrt *χǎpət-* ‘tear or shake loose, knock over’ < PKh *kǎpət- and MsT *kat-*, So *χat-* ‘tear’ < PMs *kat-), Hung *nyúl* ‘hare’ < ?*ńaulV < ?*ńavolV < PU *ńoma(-la) ‘hare’. Also, one cannot entirely exclude the possibility that *úr* was borrowed from Turkic (cf. Old Turkish *urī* ‘male child, son’), even though this etymology is semantically somewhat less satisfying.
- *aŋmo- ‘yawn’ || Fi *ammotta-* ‘gape open’ | MariE *omešta-* ‘speak in one’s sleep’, W *omeštä-* ‘yawn’ | SlkKet *āmmu-* ‘yawn’ (< PSam *ammu-) (Aikio 2014a: 2–3). — Derived from *aŋa- ‘open, take off’.
- *kajšo ‘sickness’ || Fi *kaiho* ‘longing, yearning’ | MdE *kažo* ‘accident, misfortune’ | Komi *kjž* ‘stillborn child’, Udm *kjž* ‘sickness; evil spirit’ | MsP *kǎjt-*, *kʷǎjt-*, LL *kʷajt-* ‘be sick’ (< PMs *kajt-) | NenT *χædo* ‘epidemic’ (< PSam *kǎjto), Ngan *kočǎ* ‘sickness’ (< PSam *kǎjtǎ) (Aikio 2014a: 3–5).
- *pado ‘fishing weir’ || SaaN *buodđu* | Fi *pato* ‘dam, fishing weir’ | KhVVj *pāl* ‘fishing weir’ (< PKh *pǎl) | Hung *fal* ‘wall’ (UEW: 347; Sammallahti 1988: 548).
- *wajo- ‘sink’ || SaaN *vuodjut* | Fi *vajoa-* | MdE *vajams* | Komi *vej-*, Udm *vǎj-* | MsP *wuj-*, So *uj-* (< PMs *uj-) (UEW: 552; Sammallahti 1988: 551).

PU *i –i:

- *čiči ‘wild duck’ || Komi *čēž*, Udm *čēž* | VVj *čac* (< PKh *čāč) | MsP *šǎš*, So *sās* (< PMs *šǎš) (UEW: 58)
- *dʷimi ‘bird-cherry’ || SaaN *duopma* | Fi *tuomi* | MdE *lom*, M *lajmä* (!) | MariE *lombo*, W *lombǎ* | Komi, Udm *lēm* | KhVVj *jǎm* (< PKh *jǎm) | MsKU *lēm*, So *lām* (< PMs *lǎm) | SlkTaz *čēm* (< PSam *jēm) (UEW: 65; Sammallahti 1988: 536–537)
- *jdi ‘year’ || Fi *vuosi* | Komi *vo* ‘year’, Udm *wa-pum* ‘period, time’ | KhVVj *al* ‘year’ (< PKh *āl) | NenT *heŕo*, SlkTaz *ara* ‘autumn’ (< PSam *erö) (UEW: 335; Sammallahti 1988: 552; Aikio 2012: 233–234).
- *jppi ‘father-in-law’ || SaaN *vuohppa* | Fi *appi* | MariW *owǎ* | KhSur *op*, *up* (< PKh *ǎp) | MsSo *up* (< PMs *up) | Hung *ipa* (UEW: 14; Sammallahti 1988: 536).
- *jpti ‘hair on the head’ || SaaN *vuokta* | ? Fi *hapsi* | MariE, W *üp* | KhVVj *awǎt*, Sur *opǎt* (< PKh *ǎpǎt ~ *ǎpǎt) | MsT *āt*, So *āt* (< PMs *īt) | NenT *hebtʷ*, Ngan *hǎbtǎ*, SlkTaz *ǎptǎ* (< PSam *ǎptǎ) (UEW: 14–15; Sammallahti 1988: 536).

- *j̄isiw- ‘camp’ || Fi *asu-* ‘live (somewhere), dwell’ | Komi *už-*, Udm *iz̄j-*, *j̄z̄j-* ‘sleep, stay overnight’ | NenT *ηeso-* ‘camp, stop and put up a tent’ (< PSam **eso-*) (UEW 18–19; Aikio 2012: 241)
- *k̄j̄čci- ‘spoiled, bad-smelling’ || SaaN *guohca* : *guohccag-* ‘rotten’ | MdE *kačadoms* ‘smoke, smell’, *kačamo* ‘smoke’ | MariE *kočo*, W *kačô* ‘bitter’ | KhVVj *kj̄čjm* (< PKh **k̄j̄čjm*) | MsT *kq̄šχ*, So *χāssi* ‘mold’ (< PMs **k̄j̄šyā*) | SlkTaz *qēṭj̄* ‘bad smell, stench’ (< PSam **keçê-*) (UEW: 113; Sammallahti 1988: 552; Aikio 2014a: 5–8).
- *k̄j̄jiri ‘curved thing’ || SaaL *guoḡar* ‘boat rib’ | Fi *kaari* ‘curve; boat rib’ | KhO *χoḡkar* ‘anabranche, side channel of a river’ (< PKh **k̄j̄ḡkār*) | MsT *lajl-kāḡra*, KU *keḡar* ‘hollow of the knee’ (< PMs **k̄j̄ḡrā*) (UEW: 126). — The Ms item is a new addition to this cognate set.
- *lj̄k̄si- ‘carve’ || SaaN *luokča-* ‘cut or bore a hole’ | MdE *lakše-* ‘carve’ | MariE *lokšôñča-*, W *loksôñca-* ‘carve with an ax’ (UEW: 683).
- *lj̄mpi ‘pond, swamp’ || SaaN *luoppal* ‘lake-like widening of a river’ | Fi *lampi* ‘pond, small lake’ | NenT *limpəd^o* ‘bog’, Ngan *l̄ūḡhə*, SlkKet *lj̄mbj̄* ‘muddy place’ (< PSam **lj̄mpê*) (UEW: 235; Aikio 2014b: 86).
- *lj̄nti ‘lowland’ || Fi *lansi* ‘lowland’ | MariW *landaka* ‘small valley, depression’ | Komi, Udm *lud* ‘meadow’ | Ngan *lj̄ntə* ‘plain, valley’ (< PSam **lj̄ntê*) (UEW: 235; Sammallahti 1988: 552; Aikio 2014b: 86). — The Samoyed cognates given in UEW (NenT *l̄əmtə* ‘low’, etc. < PSam **l̄əmtə*) cannot belong here due to their irregular vocalism.
- *lj̄ps̄i ‘cradle’ || Fi *lapsi* ‘child’ | MdE *lavś* | MariE *lepš* | NenT *jebc^o*, Ngan *labsə*, SlkKet *t̄opsə* ‘cradle’ (< PSam **l̄eps̄ə* ~ **j̄eps̄ə*) (UEW: 260; SSA s.v. *lapsi*).
- *mj̄xi ‘earth’ || Fi *maa* | MariE *m̄i-* | Komi, Udm *mu* | KhVVj *m̄y* (< PKh **miy*) (!) | MsP *m̄ē*, So *mā* (< PMs **m̄j̄*) (UEW: 263; Sammallahti 1988: 546). — Ngan *mou* ‘earth’, given as cognate in UEW, does not belong here; it goes back to PSam **m̄j̄ā* < PU **muḏa* ‘earth, land’ (Abondolo 1996: 28–29; Aikio 2002: 22–23).
- *ñj̄čki ‘wet’ || SaaN *njuoskkas* | MdE *načko* | MariE *nočko*, W *načkô* | ? KhKaz *ñāšax*, O *ñāšax* ‘raw, uncooked; moist’ (? < PKh **ñj̄čāk* / **ñj̄čāk*) (UEW: 311). — The Khanty word, if it goes back to a back-vocalic form, could be included here by assuming a shortening of the first-syllable vowel caused by **ā* in the next syllable (Zhivlov 2014: 135).
- *ñj̄k̄cim ‘gill’ || SaaN *njuovčca* ‘tongue’ | MariE *nošmo*, W *našmô* ‘palate’ | Komi *ñokcim*, *ñekcim* | KhIrt *ñaxšəm* (< PKh **ñākčəm*) | MsKU *ñexšəm*, So *ñāχšam* ‘gill’ (< PMs **ñj̄k̄čəm*) (UEW 311–312; Sammallahti 1988: 546). — NenT *ñiñci?* ‘hard palate’ and Kam *nēni* ‘gums’ are cited as cognate in UEW, but they are in no regular sound correspondence to this cognate set.
- *ñj̄li ‘arrow’ || SaaN *njuolla* | Fi *nuoli* | MdE *nal* | MariE *nôlə* | Komi *ñev*, Udm *ñel* | KhVVj *ñal* (< PKh **ñāl*) | MsKU *ñēl*, So *ñāl* (< PMs **ñj̄l*) | Hung *nyil* | Mat *nej*, *ñej* ‘arrow’ (< PSam **ñej*) (UEW: 317; Sammallahti 1988: 539).
- *ñj̄ri, *ñj̄r-ka ‘cartilage’ || SaaN *njuorggis* | MdM *nar* | MariE *nöryö*, W *nöryə* | KhVVj *ñarəy* (< PKh **ñārəy*) | MsKU *ñērij*, So *ñārj̄y* (< PMs **ñj̄rəy*) | Hung *nyir* | NenT *ñer*, Ngan *ñir*, SlkTaz *ñir* (< PSam **ñer*) (UEW: 324; Sammallahti 1988: 546; Aikio 2006: 20–21; Zhivlov 2014: 135–136). — Probably related to **ñj̄ri* ‘weak, soft’.
- *ñj̄ri ‘weak, soft’ || SaaN *njuoras* ‘weak (e.g., an infant), soft’ | Fi *nuori* ‘young’ | MariE *nörö*, W *nörə* ‘flexible, pliable’ | Komi *ñer* ‘fragile (e.g., the blade of a knife)’ | Hung *nyrikos* ‘moist, damp, raw’ | NenT *ñer* ‘sap; white (of an egg)’, SlkKet *ñər* ‘semen’ (< PSam **ñer*) (UEW: 324; Sammallahti 1988: 546; Aikio 2006: 20–21; Zhivlov 2014: 135–136). — Probably related to **ñj̄ri*, **ñj̄r-ka* ‘cartilage’.

- *s̄j̄ni ‘sinew, vein’ || SaaN *suotna* | Fi *suoni* | MdE *san* | MariE *šün, šön, W šün* | Komi, Udm *sen* | KhVVj *lan, jan* (< PKh *lān) | MsP *tēn, So tān* (< PMs *t̄jn) | Hung *ín* | NenT *te?*, Ngan *taŋ, SlkTaz ten* (< PSam *ceŋ) (UEW: 441; Sammallahti 1988: 548).
- *s̄j̄nti- ‘clear (wood)’ || SaaN *suoddat* ‘cut up (meat or fish); make a clearing in wood’ | MdE *sañdams, sañdems* ‘root up; clear (forest)’ | MariE *šüda-*, W *šüä-* ‘clear (forest)’ (UEW: 751; Aikio 2014b: 89–90).
- *s̄j̄mi ‘scale’ || SaaN *čuopma* ‘fish skin’ | Fi *suomu* ‘scale’ | MdE *šav* ‘money’ | MariE *šüm, šöm, W šüm* | Komi, Udm *šem* | KhVVj *sam* (< PKh *sām) | KhP *sēm, So sām* ‘scale’ (< PMs *s̄jm) (UEW: 476; Sammallahti 1988: 549).
- *t̄j̄kti ‘black-throated loon’ || SaaN *dovtta* (!) | MariNw *toktä-lödo* | Komi *toktj* | KhVVj *täytatj* (!), Irt *taχtəŋ* (< PKh *tāytāŋ) | MsP *teχt, So tāχt* (< PMs *t̄j̄kt) (UEW: 530; Sammallahti 1988: 550)
- *w̄j̄lki- ‘light’ || SaaN *vielgat* (!) | Fi *valkea* ‘white’ | ? MdE *valdo* ‘white’ | MariE *wolyalte-*, W *walyalte-* ‘shine; break (of day)’ | Hung *világ* ‘world, light’, *villám* ‘lightning’ (UEW 554–555; Sammallahti 1988: 551).

PU *j̄ –a:

- *č̄j̄ppa- ‘cut, notch (wood)’ || SaaT *caχ̄pe-* ‘do timberwork, build’ | E *čapoms* ‘do timberwork’ | Komi *čup-*, Udm *čupi-* ‘make a cut or notch (in wood), make corner joints (in building logs)’ | KhVVj *čow* (< PKh *č̄šp) | MsP *šup, So sup* ‘half, piece, part’ (< PMs *š̄up) (Aikio 2013: 163–164; Aikio 2015: 5–6).
- *j̄kta- ‘hang’ || SaaS *voektenje* ‘beam (for drying nets on)’ | Fi *ahta-* ‘cram, stuff; spread or hang to dry’ | MdE *avtoms* | Komi *oktj-* ‘set a trap’ | KhVVj *j̄yət-* (< PKh *j̄yət-) | NenT *ñida-*, Ngan *ñiti-*, SlkTaz *ĩti-* ‘hang’ (< PSam *j̄tā-) (UEW: 5; Sammallahti 1988: 536).
- *j̄la- ‘under, below (relational noun)’ || SaaN *vuolle-* | Fi *ala-* | MdE *al-* | MariE, W *ül-* | Komi, Udm *ul-* | Kh VVj *j̄l-* (< PKh *j̄l-) | MsP *jal-*, So *jol-* (< PMs *jal-) (!) | Hung *al-* | NenT *ñilä-*, Ngan *ñilä-* (< PSam *j̄lā-) (UEW: 6; Sammallahti 1988: 536).
- *j̄na ‘tame’ || SaaL *vuodnje* ‘tame (of wild animals)’ | KhSur *añj* ‘not shy, allowing one to come into shooting range (of a bird)’ (< PKh *añj) | NenT *ñj^o* ‘tame’, SlkTaz *ĩñj* ‘quiet, calm’ (< PSam *j̄nā) (UEW: 340; Sammallahti 1988: 536).
- *k̄j̄ča- ‘understand’ || Komi *kuž-* | KhIrt *χoč-* (< PKh *kāč-) | MsKM *kēš-*, So *χās-* (< PMs *k̄j̄š-) (UEW: 114–115).
- *k̄j̄ntaw ‘log, fallen tree’ || SaaN *guottu* | Fi *kanto* ‘tree stump’ | MdE *kando* ‘fallen tree, windthrow’ | KhVVj *kant* (< PKh *kānt) | MsP *kēnt*, LU *χānta* ‘storehouse pillar’ (< PMs *k̄j̄ntā) (UEW: 123; Sammallahti 1988: 543).
- *m̄j̄rja ‘berry’ || SaaN *muorji* | Fi *marja* | MdE *-maí* ‘berry’ | MariE, W *mör* ‘strawberry’ (UEW: 264–265).
- *m̄j̄ksa ‘liver’ || SaaS *mueksie* | Fi *maksa* | MdE *makso* | MariE, W *mokš* | Komi, Udm *mus* | KhVVj *muyəl* (< PKh *m̄ȳəl) | MsKU *mēt, So majt* (< PMs *m̄j̄t : *majt-) | Hung *máj* | NenT *mid^o*, Ngan *mitə, SlkTaz m̄j̄tj* (< PSam *m̄j̄tā) (UEW: 264; Sammallahti 1988: 538).
- *m̄j̄tkā ‘passage’ || SaaN *muotki* ‘isthmus over which the boat must be hauled’ | Fi *matka* ‘trip, way, distance’ | KhVVj *muyət* ‘anabranche’ (< PKh *m̄ȳət) | SlkTaz *m̄j̄tj* ‘way, track’ (< PSam *m̄j̄tā) (Aikio 2015: 13–14).
- *p̄j̄kka- ‘burst’ || Fi *pakku-, pakahtu-* | KhVVj *pakən-, paγən-* (< PKh *pākən-) | Hung *fakad* (UEW: 349).
- *p̄j̄jka ‘psychedelic mushroom’ || MdE *pango* | MariE *poŋgo, W poŋgā* ‘mushroom’ | KhVVj *paŋk* (< PKh *pāŋk) | MsT *pāŋ, P pēŋk* ‘fly agaric’ (< PMs *p̄j̄j̄k) | Ngan *h^oaŋku-* ‘get drunk’ (< PSam *peŋkā-) (Sammallahti 1979: 33; 1988: 547; UEW: 355–356).

- *sjksa ‘Siberian pine’ || Komi *sus*, Udm *susj-pu* | KhVVj *lijäl, jyjäl* (< PKh **l̥j̥jäl*) | MsT *tät*, KU *tēt* (PL *tätät*) (< PMs **t̥jt* : **tajt-*) | NenT *tide?*, SlkTaz *tijij* (< PSam **tj̥t̥j̥j̥j̥*) (UEW 445–446; Sammallahti 1988: 540).
- *sjlkaw ‘pole, rod’ || SaaN *čuolggu* ‘rod for pushing nets under ice’ | Fi *salko* ‘long pole or rod’ | MdE *śalgo* ‘stick, thorn, stinger’ | Komi *śul*, Udm *deđi-śul* ‘sled runner’ | KhVVj *sayäl* (< PKh **sāyäl*) | T *śajla*, So *sāyla* ‘slat’ (< PMs **s̥j̥ylā*) | Hung *szál-fa* ‘timber, log, full-grown tree’ (UEW 460–461; Sammallahti 1988: 549; Reshetnikov & Zhivlov 2011: 106).
- *sjta ‘hundred’ || SaaN *čuodi* | Fi *sata* | Md *sado* | MariE *šüδö*, W *šüδə* | Komi *śo*, Udm *śu* | KhVVj *sat* (< PKh **sāt*) | MsP *šēt*, So *sāt* (< PMs **šj̥t*) | Hung *száz* (UEW: 467; Sammallahti 1988: 549).
- *tjrkra ‘crane’ || Komi, Udm *turi* | KhVVj *tarəy* (< PKh **tārəy*) | MsP *tērjy*, So *tārjy* (< PMs **tj̥rəy*) | Hung *daru* (UEW: 513).
- *wjlka- ‘come down’ || SaaN *vuolgit* ‘leave, go off’ | Fi *valkama* ‘landing place for boats’ | MdE *valgoms* | MariE *wole-*, W *wale-* | KhVVj *wayäl-*, *wjyäl-* (< PKh **wāyäl-* ~ **wj̥yäl-*) | MsT *wajl-*, So *wāyl-* ‘come down’ (< PMs **wj̥yl-*) | Hung *válik* ‘divorce; turn into’ (UEW: 554; Sammallahti 1988: 551).

PU *o–a:

- *kočka ‘eagle’ || SaaN *goaskin* | Fi *kotka* | MdE *kućkan* | E *kutkəž*, W *kučkəž* | Komi, Udm *kuč* (UEW: 668; Sammallahti 1988: 552).
- *kodwa ‘short time, while’ || SaaI *kuáđfi* ‘time between two checkings of a dragnet or long-line’ | Fi *kotva* ‘a short time, while’ | Komi *voj-kol užni*, Udm *keļj-* | KhVVj *kal-* (< PKh **kāl-*) | MsT *kōl-*, So *χūl-* (< PMs **kūl-*) | Hung *hál* ‘stay overnight’ (cf. UEW: 120–121, 669). — The Permic and Ugric words have traditionally been considered to reflect a separate etymon **kala-*. However, on the basis of the Ugric forms, one can equally well reconstruct **kodwa*; the Permic vowels remain irregular in any case, as pointed out by Zhivlov (2014: 126). As for the semantic connection between ‘short time, while’ and ‘stay overnight’, cf. English *while*, German *Weile* ‘while’, Gothic *weila* ‘period, while’ (< Proto-Germanic **hwīlō-*) ~ Old Norse *hvila* ‘rest, lie down’, Old High German *wīlōn* ‘stay, reside’ (< Proto-Germanic **hwīlē-*).
- *kod’ka ‘spirit’ || Komi *kuł* ‘evil spirit’, Udm *kijl* ‘severe fever, typhoid’ | MsP *kuł* ‘forest spirit’, So *χul* ‘sickness spirit’ (< PMs **kuł*) | ? Hung *hagymáz* ‘severe fever, typhoid’ | NenT *χæχʷ* ‘protecting spirit, idol’, Ngan *kojkə* ‘idol’ (< PSam **kâjkə*) (Aikio 2002: 13–15).
- *kojra ‘male animal’ || Fi *koira* ‘dog’, *koiras* ‘male’ | Komi *kjr-* ‘male’ | KhVVj *kar* (< PKh **kār*) | MsP *kēr*, So *χār* ‘male, reindeer bull’ (< PMs **kj̥r*) | Hung *here* ‘drone; testicle’ | NenT *χora*, Ngan *kuru*, SlkTaz *qorj* ‘reindeer bull’ (< PSam **korâ*) (UEW: 168–169).
- *kompa ‘wave’ || ? Fi *kumpua-* (!) | MdE *kumboldoms* ‘wave, rise in waves’ | MariE *wüt-kowə*, W *koe*, *ko* | KhVVj *kump* (< PKh **kūmp*) | MsP *kup*, So *χump* ‘wave’ (< PMs **kump*) | Hung *hab* ‘foam, surf’ | NenT *χampa*, Ngan *koñhu*, SlkTaz *qōmpj* (< PSam **kâmpâ*) (UEW: 203; Sammallahti 1988: 537; Aikio 2014b: 83).
- *kopa ‘skin’ || Est *kōba* ‘pine bark’ | MdE *kuvo* ‘crust; scab’ | MariE *kuwo* ‘husk’ | Komi, Udm *ku* | NenT *χoba*, Ngan *kuhu*, SlkTaz *qopj* ‘skin, hide’ (< PSam **kopâ*) (UEW: 180; Sammallahti 1988: 537).
- *koppala ‘wood grouse hen’ || SaaN *goahppil* | Fi *koppelo* | MariE *kuwâlčo* (UEW: 181).
- *korja- ‘gather’ || Fi *korjaa-* ‘gather; repair’ | Komi *kural-* ‘gather; rake together’, Udm *kurja-* ‘scrape’. — A new etymology.

- *koska ‘aunt / grandmother’ || SaaN *goaski* ‘mother’s older sister’ | NenT *χada* ‘grandmother’, Ngan *kotu* ‘mother’s or father’s older sister’ (< PSam *kâtâ) (UEW: 189; Sammallahti 1988: 537).
- *koška ‘common merganser’ || Fi *koskelo* | KhVVj *kas* (< PKh *kās). — Finnic *-elo can be interpreted as a suffix: cf. Fi *kotelo* ‘case, capsule’ ← *kota* ‘hut, teepee’. On the other hand, a folk-etymological contamination with Fi *koski* : *koske-* ‘river rapid’ may also have taken place.
- *kota ‘hut’ || SaaN *goahti* ‘teepee, sod hut’ | Fi *kota* ‘teepee’ | MdE *kudo* ‘house’ | MariE *kudo*, W *kuðə* ‘summer house’ | Komi *kola* ‘hunter’s cabin’, Udm *kwala* ‘sanctuary; summer kitchen’ | KhVVj *kat* (< PKh *kāt) | Hung *ház* ‘house’ (UEW: 190; Sammallahti 1988: 543).
- *ńoma, *ńomala ‘hare’ || SaaN *njoammil* | MdE *numolo* | Komi *ńimal* | Hung *nyúl* | NenT *ńawa*, Ngan *ńomu*, SlkTaz *ńoma* (< PSam *ńâmâ) (UEW: 322; Sammallahti 1988: 539).
- *od’a ‘raw, meat’ || Komi *ul’*, Udm *il’* ‘moist, wet, raw’; Komi *ul’is* ‘fat’, Udm *il’is* ‘big; moist; fat’ | NenT *ɣaja* ‘skin, body’, SlkTaz *węćj* ‘meat, body’ (< PSam *ąjâ), SlkTaz *węćjpił’* ‘raw’ (< PSam *ąjâpâjêj) (Aikio 2006: 11–12).
- *ojwa ‘head’ || SaaN *oaivi* ‘head’ | Fi *oiva* ‘good, splendid’ | ? MdM *uj* ‘brain’ | MariE, W *wuj* ‘head’ | NenT *ɣæwa*, Mat *ajba* ‘head’ (< PSam *ąjwâ) (UEW: 336–337; Sammallahti 1988: 536). — MdM *uj* has previously been derived from PU *ajni ‘brain’, but the vowel correspondence is not regular.
- *oksa ‘branch’ || SaaN *oaksi* | Fi *oksa* | MariE, W *uks* (UEW: 716; Sammallahti 1988: 552).
- *ola ‘jaw’ || SaaN *oalul* ‘lower jaw’ | MdE *ulo* ‘chin’ | MsT *olš*, So *ul’s* ‘lower jaw’ (< PMs *üləć) | Hung *áll* ‘chin’ (UEW: 337; Sammallahti 1988: 542).
- *ona ‘short’ || SaaN *oatni* | MsKL *ūny*, P *wūnk^wa* (< PMs *ünək^wā) (UEW: 339).
- *onša ‘meat, share’ || SaaN *oažži* ‘living flesh, muscles’ | Fi *osa* ‘part, share’, Liv *vözā* ‘part, share, meat’ | MariE *užas* ‘part, share’ | MsP *wuńś*, So *ūs* ‘buttocks, ass’ (< PMs *uńć) | Hung *ágyék* ‘loins’ (UEW: 333; Sammallahti 1988: 542).
- *ora ‘awl’ || SaaN *oarri* | Fi *ora* | MdE *uro* | Hung *ár* (UEW: 342; Sammallahti 1988: 542).
- *ora(-p/wa) ‘squirrel’ || SaaN *oar’ri* | Fi *orava* | MdE *ur* | MariE, W *ur* | Komi *ur* ‘squirrel’ | Mat *oroʔb* ‘Siberian chipmunk’ (< PSam *åröp) (UEW: 343; Sammallahti 1988: 552).
- *orja ‘slave’ || Fi *orja* | MdE *urē* | Udm *war*, *var* (UEW: 721).
- *orpa- ‘orphan’ || SaaN *oarbbis* | Fi *orpo* | MdE *uros* | KhVVj *jěŋk-urwĭ* (< PKh *-örpĭ) | Hung *árva* (UEW: 343; Sammallahti 1988: 542).
- *počaw ‘reindeer’ || SaaN *boazu* | MariE *püčö* (!), *pučo*, W *pučə* | Udm *pužej*, *pužej* (UEW: 387–388; Sammallahti 1988: 553).
- *šodka ‘common goldeneye’ || SaaN *čoadgi* | Fi *sotka* | MdE *šulgo* | E *ola-šue*, W *ala-šoe* | Komi *šuv-čęž*, Udm *pestro-šulĭ* | KhVVj *saj* (< PKh *sāj) | KhP *sēl’*, So *sāl’* (< PMs *sāl’) (UEW: 582; Sammallahti 1988: 549).
- *šoda ‘war’ || ? Saa (Schefferus 1673) <*tziäd*> | Fi *sota* ‘war’ | MdE *šudoms* | MariE, W *šudala-* ‘curse’ | Ngan *souru* ‘warrior’ (< PSam *sājārâ) (UEW: 777; Aikio 2002: 27–29; Aikio 2006: 30).
- *šojma ‘sound, noise’ || Fi *soimaa-* ‘scold, reproach’ | KhKaz *šiməl-* ‘be heard, be audible’ (< PKh *šiməl-) | MsP *suml-*, So *suməl-* ‘be heard, sound, ring’ (< PMs *suməl-) | Ngan *sojmü*, SlkTaz *sümĭ* ‘noise’ (< PSam *sājmä) (Aikio 2015: 16).
- *šoma- ‘get tired’ || MdE *šumordoms* ‘worry, grieve’ | MariE *šuma-*, W *šōma-* ‘get tired, languish’ | Komi *šumav-*, Udm *šuma-* ‘be hungry’ | Hung *szomjas* ‘thirsty’, *szomorú* ‘sad’ (Sammallahti 1988: 549; Aikio 2014b: 88–89).
- *šona ‘sled’ || SaaK *čuəŋŋ* ‘sled without runners’ | MsP *šun*, So *sun* ‘sled; cargo’ (< PMs *šun) (UEW 485–486).

- *šonta ‘dung’ || Fi *sonta* ‘dung’ | E *šondo* ‘urine’, W *šandā* ‘shit’ (UEW: 764–765). — Contrary to UEW, the word must be reconstructed with initial *š- and not *s-, because it has initial š- in the Malmyzh dialect of Mari (PU *s- is reflected as s- in Malmyzh).
- *šopa ‘clothing’ || Fi *sovat* PL ‘clothes’ (obsolete) | MsT *šop*, So *sup* ‘shirt’ (< PMs *šup) (UEW: 486).
- *tolwa ‘wedge’ || MdE *tulo* | Komi *tuv*, Udm *tul* ‘wedge, peg’ | EnF *tea*, Mat *täjbä* ‘nail, wedge’ (< PSam *tajwä) (UEW: 797–798; Sammallahti 1988: 554; Aikio 2002: 54).
- *tora ‘fight’ || SaaN *doarrut* ‘fight’ | Fi *tora* ‘quarrel’ | NenT *taro-*, Mat *toro-* ‘wrestle’ (< PSam *táro-) (UEW: 531; Sammallahti 1988: 540). — MdE *túrems*, M *túræms* ‘fight’ is problematic due to its irregular palatalized consonants, and it has also been compared to SaaN *doarjut* ‘support’, Fin *torju-* ‘ward off, tackle’, which would account for the palatalized *ř* (< *rj) but seems less appealing from a semantic perspective. As a side note, at least the Saami and Finnic verbs can be etymologized as borrowings from Proto-Indo-Iranian *d^hārāya- > Sanskrit *dhārāyati* ‘maintain, bear, support’; Komi *dorji-* ‘defend, protect’ seems to be a separate borrowing from the same Indo-Iranian verb.
- *toras, *toraksi ‘crosswise’ || SaaN *doaris* | E *troks*, *truks*, *turks*, M *tærks*, *turks* ‘via, through, across, over’ | MariE, W *toreš* ‘across, crosswise’ (UEW: 799). — A new etymology can be proposed: the word was borrowed from Proto-Iranian *taras (> Young Avestan *tarō* ‘sideways, to the side, through, over’; cognate with Sanskrit *tirás* ‘through, over, to the side’ and Old Irish *tar* ‘across’ < PIE *trh₂as).
- *woča ‘fence, fishing weir’ || SaaN *oahci* ‘obstacle, barrier (in terrain)’ | Fi *otava* ‘salmon net; Big Dipper’ | VVj *wač* ‘village, town’ (< PKh *wāč) | MsT *oš*, So *ūs* ‘town, fence’ (< PMs *uš) | NenT *waʔ*, Ngan *bəʔ* ‘fence’ (< PSam *wāc), SlkTym *kujež* ‘fishing weir; inlet’ (< PSam *wācu) (UEW: 577–578; Sammallahti 1988: 541).
- *woča- ‘wait’ || Saa (Lindahl & Öhring 1780) <*ådsotet*> | Fi *odotta-* | MdE *učoms* | MariE *wučē-*, W *wāčē-* (UEW: 334). — SlkTaz *atj-* ‘be visible’ and *ōttj-* ‘guard, watch’ are given as possible cognates in UEW, but neither of these matches phonologically.
- *wolka ‘shoulder’ || SaaN *oalgi* | Fi *olka* | Hung *váll* | SlkTaz *qeč* (< PSam *wajk) (UEW: 581; Sammallahti 1988: 551).
- *worka- ‘sew’ || MariE *wuryem*, W *wāryem* ‘clothes’ | Komi *vur-*, Udm *vurj-* | Hung *varr* ‘sew’ (UEW: 584–585; Sammallahti 1988: 551).
- *wosa ‘merchandise’ || SaaL *oases* ‘merchandise’ | Fi *osta-* ‘buy’ | MariE *užale-*, W *wāžale-* | Komi *vuzav-*, Udm *vuzav-* ‘sell’ | MsT *wētā*, So *wāta-χum* ‘trader’ (< PMs *wītā-) (UEW: 585; Sammallahti 1988: 551).

PU *ä–ä:

- *äjjä ‘old man’ || SaaN *áddjá* ‘grandfather, old man’ | Fi *äjjä* ‘old man’ | Komi *aj*, Udm *ajj* ‘father; male’ (UEW: 609; Sammallahti 1988: 552).
- *äjmä ‘needle’ || SaaN *áibmi* | Fi *äimä* | MariE *ime*, W *im* | Komi *jem* | NenT *níba*, Ngan *nejmi*, Mat *ime* (< PSam *äjmä) (UEW: 22; Sammallahti 1988: 536).
- *äktä- ‘cut’ || SaaSk *ä’hted* ‘slaughter, skin’ | Komi *ektj-*, Udm *oktj-* ‘reap, gather, collect’ | KhVVj *öyət-* (< PKh *äyət-) | MsKL *jäxt-*, So *jakt-* ‘cut’ (< PMs *jäkt-) (UEW: 23; Sammallahti 1988: 542–543).
- *älä ‘lap’ || MdE *e’le* ‘lap, hem’ | MariE *öltö*, *elte* ‘armful’ | Komi *ęleč*, Udm *al* ‘lap, knees’ | KhVVj *äl* ‘armful’ (< PKh *äl) | MsKL *öäl*, So *äl* ‘lap, hem’ (UEW: 23; Sammallahti 1988: 552).

- *ärä- ‘hinder’ || SaaN *árrit* ‘obstruct, hinder, detain’ | KhVVj *erəlt-* ‘hold back, not let go, block the way’ (< PKh *ärəlt-) | MsKL *öärt-*, So *arat-* ‘drive away, overtake’ (< PMs *ärät-) (Sammallahti 1988: 543).
- *čänäri ‘shin’ || Fi *sääri* | MdE *šejeř*, M *säjär* ‘shin’ | Komi *čer* ‘shinbone; bootleg’ (UEW: 612).
- *čäkä- ‘stick in’ || SaaN *cáhkkit* ‘stick in; put on (clothes)’ | MariE *čije-*, W *čie-* ‘put on (clothes)’ (Aikio 2013: 163).
- *jämä- ‘turn stiff, go numb’ || SaaN *jápmít* ‘die’ | Fi *jämakkä* ‘stiff, sturdy’ | MariE *jâme-* ‘go numb, go blind’, W *jəme-* ‘hide; ache (of teeth); go blind’ (Aikio 2014b: 81–82).
- *jänkä ‘bog’ || SaaN *jeaggi* ‘bog’ | Komi *jegjr, jegjr* ‘boggy forest’ | KhVVj *jöŋk* ‘open place in a bog’ (< PKh *jänk) | MsKL *jöänk* ‘treeless bog’ (< PMs *jänk) (UEW: 93; Sammallahti 1988: 543).
- *jäwrä ‘lake’ || SaaN *jávri* | Fi *järvi*, Liv *jōra* (< PFi *järvi ~ *jarvi) | MdE *erke*, M *järčkä* | MariE *jer*, W *jár* (UEW: 633).
- *kädwä ‘female animal’ || SaaN *gádfi* ‘female stoat’ | KhVVj *köjəŋ*, Sur *kəjəy* ‘female animal’ (< PKh *kəjəy) | MsKU *köäl*, So *käl* ‘female’ (< PMs *käl-) | ? Hung *hölgy* ‘lady, dame’ | Kam *šüjü* ‘female animal, capercaillie hen’, Mat *kejbe* ‘mare’ (< PSam *kəjwä) (UEW: 16; Sammallahti 1988: 545; Aikio 2002: 16–17).
- *kājä ‘moth’ || Fi *koi* | MdE *ki* | MariE *kije* | Komi *kej*, Udm *kej* | KhVVj *kej* (< PKh *kāj) | MsT *kij, kaj* (< PMs *kāj) (UEW: 167).
- *kälä- ‘wade’ || SaaN *gállit* ‘wade’ | Est *koole* ‘ford’ | MariE *kela-*, W *kelä-* ‘wade’ | Komi *kel-*, Udm *kolj-* ‘wade’ | KhVVj *kül-* ‘arise; go ashore’ (< PKh *kül-) | MsT *k^wäl-*, So *k^wäl-* (< PMs *k^wäl-) | Hung *kel* ‘rise, get up’ (UEW: 133–134; Sammallahti 1988: 545; Aikio 2012: 238).
- *kämä ‘shoe’ || SaaN *gáma* ‘shoe’ | MdE *keme*, M *kämä* | MariE, W *kem* ‘boot’ | Komi *kəm* ‘birch-bark shoe’ (UEW: 650; Sammallahti 1988: 552).
- *käsä ‘moisture’ || SaaS *gaasoe* ‘icy fog rising from a lake or a river’ | Fi *kasi* ‘moisture’ | Komi *kezdal-* ‘get damp (e.g., of matches)’ | KhVVj *kelə, kelä* (< PKh *kelä) | MsKU *köät’l* ‘dew’ (< PMs *kät’əl) | NenT *šed’a?* ‘frost, hoarfrost’, SlkKet *qattan* ‘rime’, Kam *kadaŋ* ‘newly fallen snow (in autumn)’ (< PSam *kätəŋ) (SSA s.v. *kasi*; Aikio 2009: 72–73).
- *lämä ‘scab’ || Fi *luomi* ‘birthmark; eyelid’ | MdE *leme* ‘rash, scab’ | MariE *limö*, W *lim* | Komi *ləm*, Udm *lom* ‘scab’ (UEW: 686; Aikio 2012: 238).
- *läšä- ‘cover, spread’ || SaaN *lähčit* ‘make (the bed)’ | NenT *ješe-*, SlkTaz *česj-* ‘cover (the tent with a tent cloth)’ (Helimski *apud* Aikio 2002: 49).
- *päjwä ‘sun, heat’ || SaaN *beaivi* | Fi *päivä* ‘day, sun’ | Ngan *hejbi* ‘heat’ (< PSam *päjwä) (Sammallahti 1988: 540).
- *pälä ‘side, half’ || SaaN *bealli* | Fi *puoli* | MdE *pele*, M *pälä* | MariE *pele*, W *pelə* | Komi *pəl*, Udm *pal* | KhVVj *pelək* (< PKh *pələk) | MsKL *pöäl*, So *päl* (< PMs *päl) | Hung *fél* | NenT *pəla*, Ngan *helj* (< PSam *pälä) (UEW 362–363; Sammallahti 1988: 540; Aikio 2012: 238).
- *pänä- ‘whet’ || Udm *penon* ‘whetstone’ | MsKM *pöänl-* (< PMs *pänəl-) | Hung *fen* (UEW: 365; Sammallahti 1988: 548).
- *pärtä ‘pole, board’ || Fi *parsi* ‘pole’ | KhVVj *pert* ‘board’ (< PKh *pärt) | MsKL *pöärt*, So *pärt* (< PMs *pärt) (UEW: 374; Sammallahti 1988: 548). — MariE *pärđəž*, Komi *berd-*, Udm *bord* ‘wall’ have also been included in this cognate set, but on the basis of their vocalism they must reflect a different root *pirtä- ‘wall’.
- *pätäri- ‘escape, hide’ || SaaN *báhtarit* ‘escape’ | MsKL *pöätr-*, So *pätər-* ‘disappear, hide’ (< PMs *pätər-) (Aikio 2013: 162–163).

- *säksä ‘dirt’ || SaaT *sāk̄še* ‘dirt’ | Kar *soaksi* ‘dirt (in hair or wool), dandruff’ | MdE *seks* ‘dirt’ | Komi *ses* ‘dirty, filthy’, Udm *ses* ‘uncleanliness’ (Sammallahti 1988: 553; Zhivlov 2014: 115).
- *sälä- ‘get in (a boat, a sled)’ || Fi *sälyttä-* ‘load, put a burden on’ | Komi *sel-* | KhVVj *lel-, jel-* (< PKh *Läl-) | MsKL *töäl-*, So *täl-* ‘get in (a boat, a sled), mount (a horse)’ (< PMs *täl-) | Hung *ellik* ‘mount (a horse)’ (UEW 434–435; Sammallahti 1988: 548). — The Samoyed forms mentioned by UEW reflect PSam *tij- or *tiä-, which is difficult to connect with PU *sälä-.
- *sänjšä- ‘sit down / stop’ || MariE *šinča-*, W *səncä-* | Komi *siž-* ‘sit down’ | NenT *tenčena-* ‘stop, calm down’ (< PSam *tänsä-). — The Mari and Permic forms have been traditionally connected with PU *saņša- ‘stand’, but Zhivlov (2014: 129) is certainly right in separating them from this connection, as they differ in both form and meaning. However, instead of the reconstruction *sinšä- suggested by Zhivlov, one can postulate PU *sänjšä- and include here also PSam *tänsä- ‘stop, calm down’, as discussed by Aikio (2002: 30–31).
- *säppä ‘bile’ || SaaN *sáhppi* | Fi *sappi* | MdE *sepe*, M *säpə* | Komi *sep*, Udm *sep* | MsT *täp*, KL *tööp* (< PMs *täp) | Hung *epe* (UEW: 435–436; Sammallahti 1988: 548).
- *särä ‘fibrous object’ || Liv *sūor* ‘tendon, fiber, vein’ (< PFi *sōri) | MariE *šer*, W *šär* | Udm *vir-ser* ‘blood vessel, vein’ | KhVVj *ler, jer* ‘root fiber, thin root, stripe’ (< PKh *Lär) | MsKL *töär*, So *tār* ‘root, fiber’ (< PMs *tār) | Hung *ér* ‘blood vessel, vein’ (UEW: 437; Sammallahti 1988: 548; Nikulin 2013).
- *särnä ‘ash, willow’ || Fi *saarni* ‘common ash’ | MariE *šertše, šartše*, W *šärtni* ‘a species of willow’ (UEW 752; Aikio 2014c: 137).
- *säčä ‘flood’ || SaaN *čähci* ‘water’ | KhVVj *seč* ‘flood in late summer’ (< PKh *säč) (UEW: 469; Sammallahti 1988: 549).
- *sälä- ‘cut open’ || SaaN *čällit* ‘write; slit, cut open’ | Fi *säle* ‘lath, large wood splinter’ | MariE *šela-*, W *šelä-* ‘split’ | KhVVj *sül-* ‘cut open’ (< PKh *sül-) | MsKL *šält-* ‘cut, cut off, split’ (< PMs *šilt-) | Hung *szel* ‘slices, cuts, carves’ | Ngan *šelj* ‘sharpness’ (< PSam *sälä) (UEW 35; Sammallahti 1988: 549; Aikio 2006: 25).
- *säsnä ‘woodpecker’ || SaaN *čáihni* | Fi *hähnä, häähnä* | MariE *šište*, W *šištə* | Komi, Udm *siž* (UEW: 772; Sammallahti 1988: 554).
- *täktä ‘remnant, bone’ || SaaN *dákti* ‘bone’ | Fi *tähteet* ‘leftovers’ | Hung *tetem* ‘corpse, dead body’ (UEW 515–516; Sammallahti 1988: 550).
- *tälwä ‘winter’ || SaaN *dálvi* | Fi *talvi* | MdE *t’el’e*, M *t’ala* (!) | MariE *tele*, W *tel* | Komi *təl*, Udm *tol* | VVj *těləy* (< PKh *tiləy) | MsKL *töäl*, So *täl* (< PMs *täl) | Hung *tél* (UEW: 516; Sammallahti 1988: 550).
- *tärä- ‘fit’ || Komi *ter-*, Udm *terj-* | Hung *tér* (UEW: 522; Sammallahti 1988: 550).

Ambiguous vowel correspondences:

- *ajta / *jta ‘fence’ || Fi *aita* | KhVVj *āṛ* (< PKh *āc) (Aikio 2014a: 1–2).
- *amta- / *jmta- ‘feed, give to drink’ || SaaN *vuovdi-* ‘sell’ | Fi *anta-* ‘give’ | MdE *andoms* ‘feed’ | MariE *omde-* ‘get filled with milk (of udder)’ | Komi *ud-*, Udm *udj-* ‘give to drink’ | Hung *ad* ‘gives’ (UEW: 8; Sammallahti 1988: 541).
- *jalka / *jjilka ‘foot, leg’ || SaaN *juolgi* | Fi *jalka* | MdE *jalgo* | MariE *jol*, W *jal* | ? Hung *gyalog* (UEW 88–89; Sammallahti 1988: 543).
- *para / *p̄ira ‘good’ || SaaN *buorre* ‘good’ | Fi *paras* ‘best’ | Md *paro* | MariE *poro*, W *purâ* | Komi, Udm *bur* ‘good’ (UEW: 724; Sammallahti 1988: 553).

- *parma / *p̄irma ‘gadfly’ || Fi *paarma* | MariE *pormo*, W *parmê* | KhKaz *p̄rəm*, O *purəm* (< PKh *p̄r̄əm ~ *p̄ūrəm) (cf. UEW 373, 724–725). — The Kh word has earlier been connected with Fi *permu* ‘gadfly larva’, which in terms of vowel correspondence is impossible, however.
- *rañši- / *r̄iñši- ‘tired’ || Fi *rasea* ‘tiresome’ | Komi *ružal-* ‘dry in the air; get exhausted’. — A new etymology.
- *salka- / *solka- / *salki- ‘stand’ || MariE *šoye-*, W *šalye-* | Komi *sulal-*, Udm *silj-* | Hung *áll* (UEW: 448; Sammallahti 1988: 553).
- *sarši / *sorsí ‘span’ || MariE *šorž*, *šor* (!) | KhVVj *sort*, Sur *sört* (!), O *sorəs* (< PKh *sart ~ *sarəs) | MsT *tāras* (< PMs *tārās) | Hung *arasz* (UEW: 431; Sammallahti 1988: 548).
- *šappa / *šjppa ‘sour’ || Fi *hapan* | Md *čapama* | E *šopo*, *šowo*, W *šapê* (UEW: 54; SSA s.v. *hapan*).
- *tañka / *t̄iñka ‘tangle’ || SaaN *duoggi* ‘tangle’ | Komi, Udm *tug* ‘tassel, plait’ (UEW: 791).
- *tarna / *t̄irna ‘grass’ || Fi *taarna* | Komi *turun*, Udm *turjn* (UEW: 792; Sammallahti 1988: 554).
- *wañkaw / *w̄iñkaw ‘handle’ || Fi *vanko* | Komi, Udm *vug* (UEW: 814; Sammallahti 1988: 554).

Contradictory vowel correspondences:

- *a/o(w)dimi ‘mosquito curtain’ || Fi *uudin* | MariE *omas̄*, W *amas̄* | Komi *von*, Udm *jn* | VVj *olaw*, Sur *ōlāp* (< PKh *alāp) | MsSo *ōmāl* (< PMd *āmāl) (UEW: 541; Sammallahti 1988: 542; Bereczki 2013 s.v. *omas̄*).
- *a/iñam, *a/iñVppi ‘mother-in-law or father-in-law’ || Fi *anoppi* | KhSur *ōntāp* (< PKh *antāp) | MsSo *ōnip* ‘mother-in-law’ (< PMs *āñip) | NenT *ñināb*², Ngan *ñinābā* ‘father-in-law’ (< PSam *iñāpā) (UEW: 9; Sammallahti 1988: 536).
- *aṅa/i ‘opening, mouth’ || Est *ava* | ? MariE *aṅ*, W *āṅ* ‘opening, hole’ | Komi *vom*, Udm *im* ‘mouth’ | KhVVj *ōṅ*, Sur *oṅ* ‘mouth (of an object)’ (< PKh *u/ōṅ) | Hung *aj* ‘groove’ | NenT *ñāz*², Ngan *ṅaṅ* ‘mouth’ (< PSam *aṅ) (UEW: 11–12; Sammallahti 1988: 542).
- *ja/iksa/i- ‘take off’ || Fi *jaksa-* | Mdm *juksəms* | Komi, Udm *juski-* (UEW: 630; Sammallahti 1988: 552).
- *ji/oṅsi ‘bow’ || SaaN *juoksa* | Fi *jousi* | Mde *jonks* | MariE *joṅež*, W *jangež* | KhVVj *joyəl*, Sur *jāy^wəl* (< PKh *jaṅəl) | MsT *jewt*, *jāwt*, So *jōwt* (< PMs *jawt) | Hung *ij* | NenT *ñin*², Ngan *d’intā* (< PSam *j̄intā ~ *iñtā) (UEW: 101–102; Sammallahti 1988: 537).
- *ji/uxi- ‘drink’ || SaaN *juhka-* | Fi *juo-* | MariE *jüa-*, W *jüä-* | Komi *ju-*, Udm *juj-* | Hung *iszik* | NenT *ñer-* (< PSam *e-r-), NenT *ñeχəl-* (< PSam *e-kāl-) (UEW: 85; Sammallahti 1988: 543; Aikio 2002: 38–40).
- *ka/o(j)ṅ/nV-ila ‘armpit’ || SaaS *gaejnjele* | Fi *kainalo* | Mde *kaval-alks* | MariE *koṅla*, W *koṅgəla* | Komi *kun-ū*, Udm *kun-ul* | KhVVj *kunəṅ-pētə*, Irt *χōnəṅ-pēt* (< PKh *kō/unəṅ-) | MsT *kalnā*, P *kanəl* (< PMs *kanlā) | Hung *hón-alj* | SlkTaz *qōl̄iñ*, *qōl̄ij* (< PSam *kalūṅ) (cf. UEW: 178, 645; Sammallahti 1988: 543).
- *k̄iñki/a- ‘crawl, climb’ || SaaS *goegkerdih* ‘crawl; climb’, SaaN *guokkardit* ‘crawl’ | Fi *kankea* ‘stiff, rigid’, *kangerta-* ‘crawl, move with difficulty’ | KhIrt *χoṅχ-* ‘climb; go upstream’ (< PKh *kōñk-) | MsP *keṅk-*, So *χāṅχ-* ‘climb’ (< PMs *k̄iñk-) | Hung *hág* ‘mount’. — The Ugric words are compared in UEW (127), but the comparison to Saami and Finnic has not been previously suggested.
- *ña/iñča- ‘stretch’ || SaaN *njuozzi-* ‘flatten’ | E *nñčək*, W *nñčək* ‘dough’ | Komi *ñužal-*, Udm *ñuža-* | KhVVj *ñiñč-* (< PKh *ñiñč-) | MsT *ñōñš-*, So *ñüns-* ‘stretch’ (< PMs *ñünš-) (UEW: 323; Sammallahti 1988: 546; Aikio 2014b: 84–85).

- *nä/elmä ‘mouth / tongue’ || SaaN *njálbmi* ‘mouth’ | MariE *jälme*, W *jälmə* | KhVVj *näləm* (< PKh *näləm) | MsT *níləm*, So *nēləm* (< PMs *nīlmə) | Hung *nyelv* (UEW: 313–314; Sammallahti 1988: 546).
- *njirma / *närmä ‘groin’ || SaaT *nāřme* | ? Fi *näärvä* | KhNi *ńórəm* (< PKh *nārəm) | MsSo *nārəm* (< PMs *nīrəm) (UEW: 312; Sammallahti 1988: 546).
- *nj/oxi- ‘pursue’ || ? SaaN *njáhka-* ‘sneak; stalk’ | Fi *nouta-* ‘fetch’ | KhVVj *ńuyəl-*, *ńoyəl-* (< PKh *nōyəl-) | MsP *ńiwl-*, LU *nāwl-* (< PMs *ńjwəl-) | SlkTaz *ńō-* ‘pursue’ (< PSam *ńo-) (UEW: 323; Sammallahti 1988: 539).
- *pa/ĭ/āni- ‘put’ || Fi *pane-* | Komi *pen-*, Udm *ponj-* | KhVVj *pān-* (< PKh *pjin-) | MsP *pun-*, So *pin-* (< PMs *pjin-) | NenT *pen-*, Ngan *h^uan-* (< PSam *pen-) (UEW: 353–354; Sammallahti 1988: 539).
- *pa/uwi ‘tree, wood’ || Fi *puu* | MariE, W *pu* | Komi, Udm *pu* | MsP *tīp-pa* ‘willow’ (< PMs *pā?) | Hung *fa* | NenT *pa*, Ngan *h^uaa* (< PSam *pa) (UEW: 410; Sammallahti 1988: 539).
- *sa/oŋi- ‘enter’ || SaaSk *suāŋgad* ‘go in, step in’ (< PSaa *soaŋō-), SaaL *suogŋat* ‘crawl in’ (< PSaa *suogē-) | E *sovams*, *suvams*, M *suvams*, *səvams* ‘enter, come in, go in’ | MariE *šoŋalam*, W *šəŋgalam* ‘put on (e.g., a shirt)’ | Komi *sun-*, Udm *zumj-*, *zjmj-* ‘dive’ | KhVVj *lāŋa-*, *jāŋa-* (< PKh *Ljŋā-) | MsT *tō-*, P *tū-* ‘enter’ (< PMs *tū-) | Hung *av* ‘penetrate, overgrow’ (UEW: 446–447; Sammallahti 1988: 548). — The Samoyed forms mentioned in UEW reflect PSam *tūj- ‘enter’, and due to the consonant *j and front vocalism, this verb cannot belong in the cognate set.
- *sapśa/i ‘sticklike object’ || SaaS *sueptjie* ‘forked stick’ | MariE *šopš*, W *šapš* ‘bobbin’ | KhSur *sāpəs* (< PKh *sapəs) | MsT *tās*, LL *tōs* ‘net needle’ (< PMs *tās) (UEW: 432; Sammallahti 1988: 548).
- *so/a/ĭja ‘sleeve’ || SaaN *soadjá*, *soadji* ‘wing, sleeve’ | MariE, W *šokš* ‘sleeve’ | Komi *soj*, Udm *suj* ‘arm’ | KhVVj *līt*, *jīt* (< PKh *Līt) | MsKU *tēt*, So *tājt* (< PMs *tīt : *tījta-) | ? Hung *ujj* ‘sleeve’ (UEW: 445; Sammallahti 1988: 548). — The front-vocalic Samoyed forms (NenT *tū*, Ngan *čiidə* ‘sleeve’ < PSam *tūj) can hardly belong here.
- *sä/ekä/i ‘catfish / burbot’ || Fi *säkä* | MdE *sije* | MariE *ši-kol* ‘Wels catfish’ | KhVVj *sěj* (< PKh *siy) | MsT *šiw*, So *siw* ‘burbot’ (< PMs *šiy) (UEW: 469).
- *sä/enä/i ‘bracket fungus’ || SaaN *čátná* ‘bracket fungus’ | Fi *sieni* ‘mushroom’ | MariE *šen*, W *šin* ‘tinder, bracket fungus’ | Udm *šenki*, *šenkj* | KhVVj *sāŋəy* (< PKh *sāŋəy) | MsT *šmü*, So *sēnjy* ‘bracket fungus’ (< PMs *šīnəy) (UEW 494–495; Sammallahti 1988: 548).
- *wa/ĭra/i- ‘crow’ || SaaN *vuoražas*, *vuorččis* | Fi *varis* | MdE *varaka* | KhVVj *urnj*, Irt *wärŋäj* (< PKh *wū/ĭrŋāj) | MsSo *ūrin-ēk^wa* (< PMs *ūrīn) | Hung *varjú* (UEW: 559).
- *wasa/i- ‘left’ || Fi *vasen*, Est *vasak* | EnF *bađi*, SlkKet *kwəđi* (< PSam *wāti) (Sammallahti 1988: 541).
- *woja/i ‘wild (animal)’ || MariW *wojər* | Komi *věj* | KhVVj *wajəy* (< PKh *wājəy) | MsSo *ūj* (< PMs *ūj) (UEW: 553). — The Mari word has not been previously been included in this cognate set.