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

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 *śorwa) 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.

1. 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’, *śilmä ‘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 *śorwa ‘antler’ > Fi sarvi : sarve- , SaaN čoarvi , MdE śuro
- PU *šola ‘gut’ > Fi suoli : suole- , SaaN čoalli , MdE šulo
- PU *tälwä ‘winter’ > Fi talvi : talve- , SaaN dälvi , MdE t'ele

No secondary e-stem:
- PU *kota ‘hut, tent’ > Fi kota , SaaN gohti , 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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1. This paper is largely based on the presentation Uralilaisen kantakielen vokaalistosta (‘On the vocalism of Proto-Uralic’) at the seminar Etymologia ja kielihistoria – Erkki Itkosen ja Aulis J. Joen 100-vuotisjuhlaseminaari, The Finno-Ugrian Society, Helsinki (19 April 2013).
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:

<table>
<thead>
<tr>
<th>PU</th>
<th>Pre-PFi</th>
<th>PFi</th>
<th>Fi</th>
</tr>
</thead>
<tbody>
<tr>
<td>*śorwa ‘antler’</td>
<td>*sarve-</td>
<td>*sarvi : *sarve-</td>
<td>*sarvi : sarve-</td>
</tr>
<tr>
<td>*śola ‘gut’</td>
<td>*sale-</td>
<td>*sōli : *sōle-</td>
<td>*suoli : suole-</td>
</tr>
<tr>
<td>*tālwä ‘winter’</td>
<td>*talve-</td>
<td>*talvi : talve-</td>
<td>*talvi : talve-</td>
</tr>
<tr>
<td>*kāsā ‘moisture’</td>
<td>*kase-</td>
<td>*kasi : *kase-</td>
<td>*kasi : kase-</td>
</tr>
<tr>
<td>*pālä ‘half, side’</td>
<td>*pale-</td>
<td>*pōli : *pōle-</td>
<td>*puoli : puole-</td>
</tr>
</tbody>
</table>

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 > Ppre-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’ (< *śoďa-j-) ← sota ‘war’ (< PU *śoďa), Fi sāliā ‘split wood shingles’ (< *śälā-j- ← PU *śālā- ‘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 *kôle- ‘die’
   PWU *kora > *kare- > PFi *kõri : *kõre- ‘crust, peel, skin’
   PWU *korta- > PFi *karci : *karte- ‘snuff; carbon deposit’
   PWU *nola- > *nale- > PFi *nôle- ‘lick’
   PWU *podwa > PFi *patvi : *patve- ‘outgrowth; compression wood’
   PWU *polma > PFi *palm-ikkoi ‘braid’
   PWU *pora(va) > PFi *parvi : *parve- ‘raft’
   PWU *sóla > *sále- > PFi *sõli : *sõle- ‘gut’
   PWU *sorwa > PFi *sarvi : *sarve- ‘horn’
   PWU *solma > PFi *salmi : *salme- ‘strait’
   PWU *tomma > PFi *tami : *tamme- ‘oak’
   PWU *torka- > PFi *tarke-ne- ‘stand the cold, feel just warm enough’
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):
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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 *i̮ whenever there is PKh *ā or *ī̮ in the second syllable. Consider the following examples:

**PWU *o–a ~ PKh *ā**
- PFi *kota, PSaa *koatē ‘teepee’, PMd *kudǝ ‘house’ ~ PKh *kāt ‘house’
- PFi *kotva, PSaa *koarvē ‘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 *čoaδkē, PMd *śulgǝ ~ PKh *sāj ‘goldeneye’
- PFi *koira ‘dog’, *koiras ‘male’ ~ PKh *kār ‘male, reindeer bull’
- PFi *kosk-elo ~ PKh *kās ‘merganser’

**PWU *?–? ~ PKh *a / *i̮**
- 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 *kulǝ- ‘die’ ~ PKh *ki̮lā- : *kal- ‘die’
- PFi *nōle-, PSaa *ńoal-ō-, PMd *śulǝ ~ PKh *ńi̮lā- : *ńal- ‘lick’
- PFi *parvi : *parve- ‘flock; raft’, PSaa *poarēvē ‘raft’ ~ PKh *pi̮rā ‘flock; raft’
- PFi *sōli : *sōle-, PSaa *čoalē, PMd *śulǝ ~ 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 *oađê-, PMd *uda- ~ PKh *jlâ- : *al- ‘sleep’
• PSaa *oaňē ‘brother’s wife’ ~ PKh *įńkį ‘wife of a male relative of an older generation’
• PSaa *loańčē- ‘abated wind; loose, slack’ ~ PKh *ḷańćV ‘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 *karǝɣ- ‘ache, burn’

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

• PSaa *toarkē-stē- ‘shiver, tremble’, PFi *tarke-ne- ‘stand the cold, feel just warm enough’ ~ PKh *ti̮rǝɣ- (> VVj tǝrǝɣ-, O târi-), *târǝɣ- (> Sur târǝɣ-, Irt toraj-, Ni tɔrij-, Kaz tɔri-) ‘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 *į is an expected correspondent of PFU *?–?. Hence, the variant *tārǝɣ- 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 *į, 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 *jlâ- : *al-, and suggests that because PKh *jlâ- : *kal- ‘die’ and PKh *ńlâ- : *ńal- ‘lick’ show the same vocalism, these PU verbs should be reconstructed as *kola- and *ńola-, 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 *į : *a. Second, it is impossible to derive the Samoyed cognates of the latter two verbs (PSam *kā̑- ‘die’, *ńā̑- ‘lick’) from the proto-forms *kola- and *ńola-, 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, *i̮).

According to Sammallahti (1988), PU *a and *i̮ merged into *a in Finno-Volgaic (i.e., West Uralic and Mari). As regards Mari, however, the claim of merger does not hold: PU *i̮ is frequently reflected as PMari *ū, 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 *i̮ and *a could have something to do with the anomalous vowel combination *ʔ–ʔ. The distinction between PU *i̮ 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 *i̮–a:

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

- PWU *aŋa- ‘open’ ~ PMs *īŋkʷ- (< *ūŋk-) ~ PSam *(ū)nəŋ- ‘take off’
- PWU *čača- ‘grow, yield crop’ ~ PSam *caci ‘family, tribe’
- PWU *čaŋa- ‘hit’ ~ PMs *šiŋkʷ- ‘kick, shove’ (< *šūŋk-) ~ PSam *šaŋ̩- ‘rub’
- PWU *kada- ~ PMs *kūl- ~ PSam *kajä- ‘leave’
- PWU *kaja- ‘dawn, shimmer’ ~ PSam *kajä ‘sun’
- PWU *kala ~ PMs *kūl ~ PSam *kälä ‘fish’
- PWU *kama-ra ‘crust, skin’ ~ PSam *kamä ‘scale’
- PWU *kanta- ~ PMs *kūnt- ~ PSam *kântä- ‘carry’
- PWU *nanča- ‘flatten’ ~ PMs *nūnš- ‘stretch’
- PWU *pala- ‘burn’ ~ PMs *pūl-, PSam *pälä- ‘devour, eat up’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *panča- ~ PMs *pūnš- ‘open’
- PWU *pata ~ PMs *pūt ‘pot, PSam *pat̪- ‘put in a pot, put in water’
- PWU *sala- ~ PMs *tūləm- ~ PSam *tālā- ‘steal’
- PWU *sanša- ~ PMs *tūńč- ‘stand’
- PWU *sarka ~ PSam *tārkä ‘branch’
- PWU *sāda- ~ PSam *sārä- ‘rain’
- PWU *taka- ~ PSam *tākä- ‘behind’
- PWU *talwa- ‘lead, bring’ ~ PMs *tūl- ‘bring’ ~ PSam *tājwä- ‘fetch, bring’
- PWU *wala ‘oath, word, song’ ~ PSam *wålä ‘song’
- PWU *wanša ~ PSam *wāntä ‘old’
- PWU *watka- ~ PSam *wät- ‘debark (a tree)’
- PU *i̮–a > PWU *a–a, PMs *i̮, PSam *i̮
• PWU *akta- ~ PSam *jitå- ‘hang’
• PWU *ala- ~ PMs *jal- (irregular) ~ PSam *jlo- ‘under’
• PWU *ańa ~ PSam *jínå ‘tame’
• PWU *kantaw ‘tree stump’ ~ PMs *kînt ‘storehouse pillar’
• PWU *maksâ ~ PMs *mîxt, *mîjst- ~ PSam *mîtō ‘liver’
• PWU *matka ‘isthmus, journey’ ~ PSam *mîtå ‘way, track’
• PWU *ńara ‘grass’ ~ PMs *ńîr ‘bog’
• PWU *pańka ‘mushroom’ ~ PMs *peńk ‘fly agaric’ ~ PSam *peńkå- (irregular) ‘get drunk’
• PWU *śalkaw ‘pole, rod’ ~ PMs *śîylâ ‘pointed stake’
• PWU *śata ~ PMs *śît ‘hundred’
• PWU *walka- ~ PMs *wîyel- ‘come down’

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

• PWU *śalama ‘lightning’ ~ PMs *śîl- ‘lighten’, PSam *sålå- ‘flash, lighten’
• PWU *anam, *anVppi ~ PMs *ānǝp ‘mother-in-law’ ~ PSam *ińǝpå ‘father-in-law’

Of these, only the latter case seems to be genuinely irregular, whereas the former may show a conditioned development *a > PMs *ī- (> PMs *ş-) (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 *i–i:

PU *i–i > PWU *a–i, PMs *ĭ, PSam *ë (*ĭ before a consonant cluster beginning with a nasal)
• PWU *adi ‘year’ ~ PSam * tér ‘autumn’
• PWU *apti ~ PMs *ĭt, PSam *ępî ‘hair on the head’
• PWU *aśiw- ‘dwell’ ~ PSam *ęso- ‘camp’
• PWU *dami ~ PMs *ľîm ~ PSam *Jennifer ‘bird-cherry’
• PWU *kańiri ‘curve, bend; boat rib’ ~ PMs *kîŋrâ ‘hollow of the knee’
• PWU *kačči- ‘rotten, smelly’ ~ PMs *kîşyâ ‘mold’ ~ PSam *kečsê- ‘stink’
• PWU *lampi ‘pond, small lake’ ~ PSam *łîmpô ‘bog, mud’
• PWU *lanti ‘lowland’ ~ PSam *łîntå ‘plain, valley’
• PWU *lapći ~ PSam *j/lepså ‘cradle’
• PWU *maxi ~ PMs *mî ‘earth’
• PWU *ńakšîmi ‘tongue’ ~ PMs *ńikcâm ‘gill’
• PWU *ńali ~ PMs *ńîl ~ PSam *ńêj ‘arrow’
• PWU *ńari- ~ PMs *ńîrây ~ PSam *ńîr ‘cartilage’
• PWU *sani ~ PMs *țîn ~ PSam *çeń ‘sinew’
• PWU *śami ~ PMs *śîm ‘scale’
According to Sammallahti (1988: 504), PU *a–i yielded PMs *ā. In Samoyed, the expected reflex appears to be PSam *â 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 *kāō ‘slender object’
- PWU *waji ~ PMs *wāj ‘grease’
- PWU *wajñi ~ PSam *wajñ ‘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 *manśi- ‘be depressed’ ~ PMs *mańć- ‘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 *i̮–i and which have cognates elsewhere in Uralic, including Mansi and Samoyed – namely the stems showing the PWU vowel combination *?–?. 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 *?–?. We can thus write PWU *a–i instead of *?–?, whereas PWU *a–i in the traditional reconstruction must be rewritten as PWU *i–i. However, no West Uralic language seems to have preserved a distinction between PU *a–a and *i–a, so it appears that a merger of PU *i̮, *a > PWU *a took place before second-syllable *a.

The remaining question is how to account for the words *kaji ‘sedge’, *manśi–‘be depressed’, *waji ‘grease’, *wajñi ‘breath’, *wali– ‘carve’ and *wari ‘hill’. The words *manśi- 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 unifying *kaji, *waji and *wajñi 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 > *i̮ /_j. This leaves us with PWU *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 uāllūd ‘scrape meat off bones with a knife’, SaaK voallgo ‘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 *ńôle- ‘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 *vôle- ‘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 *kulǝ-, PSam *kâš- ‘die’
- PU *ńali- > PFi *ńôle-, PSaa *ńoalō-, PMd *nola- (irregular), PSam *ńâš- ‘lick’

The development *l > 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 *kâš ‘fish’, PU *sala- > PSam *sâlə- ‘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 *ad-i- and *kali- respectively, the nouns *adma ‘sleep, dream’ (> Komi and Udm un, KhVVj alom, MsSo ülom, 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’ (< *sur-ma ← PU *šuri- ‘die’), SaaN jorbmi ‘deep place in water, whirlpool’ (< *jur-ma ← PU *juri- ‘spin’), MdE kérme ‘bunch, bundle’ (< *kär-mä ← PU *kär-mi- ‘wrap, bind’), and SaaN njálbmi ‘mouth’, Hung nyelv ‘tongue’ (< *ńäl-mä ← PU *ńäl-mi- ‘swallow’).

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

- PU ?*aški/āl ‘step’ > PFi *askel, PMd *aškəlda-, PMari *âškəl, PPerm *uškVl, PMs *tsyšal, PSam *asgəl- ‘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 *ajŋi (?) ‘brain’ > PSaa *vuojŋeš-, PFi *aivo-, ? PMd *uj, Hung aģy ‘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 *i̮ /_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 > *i̮ /_j. The change is, nevertheless, clearly visible in PMd *vaj ‘grease’ < PWU *wijj < 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 jaewajʔ ~ jæwejʔ ‘brain’ ← jæwa ‘head’ (< PU *ojwa).

• PU ??sa/oŋi- ‘enter’ > PSaa *soŋe̮ ‘creep in’ and/or *soaŋō- ‘enter’, PMd *savo- ‘enter’, PMari *šonala- *put on (e.g., a shirt); PPerm *sůŋ- ~ *zůŋ- ‘dive’, PKh *liŋâ-, 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 suogŋat, N suotnjat ‘crawl in or through’ (< PSaa *soŋe̮ -) and Sk suōŋŋad ‘enter’ (< PSaa *soaŋō-). The former suggests PU *soŋi- or *siŋi-, 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 vuogga ‘fishing hook’ (< PSaa *vuŋke̮ < Pre-PSaa *oŋki) ~ oaggut ‘fish (with a hook an line)’ (< PSaa *oŋkō- < Pre-PSaa *ŋk-o-). The Mari form is ambiguous between PU *a and *o, and the Mordvin and Mansi vowels seem irregular in any case. However, Permic *sůŋ- ~ *zůŋ- 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 ?*aďo ‘bed’ > PSaa *vuođō ‘bottom, foundation’, PPerm *wul ‘hide (for sleeping on)’, PMs *āl-āt, Hung āgy ‘bed’
• PU ??pado ‘fish weir’ > PSaa *puođō, PFi *pato ‘dam, fish weir’, PKh *pǐl ‘fish weir’, Hung fȁl ‘wall’
• PU ??kajšo ‘sickness’ > PFi *kaiho ‘longing, yearning’, PMd *kažǝ ‘accident, misfortune’, PPerm *kǐ̮ž ‘sickness, stillborn child’, PMs *kəjt, PSam *kâjtå, *kâjto ‘sickness’
• PU ?*asora ‘master’ > PMd *azəra ‘master, lord’, PPerm *uzjr ‘rich’, PMs *ātər ‘master, lord, hero’, ? Hung ûr ‘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 Finnish and Saami, but a second rounded vowel would be matched by the Indo-Iranian loan original *asura- (> Sanskrit āsuraḥ
‘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 *vij-, 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 *şiği ‘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 *ajgi ‘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 *soanjō- is the expected form, so even in this case there is no change in the number of assumed irregular forms.

The remaining five cases (*aďo ‘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 *-oj : *-uje- in Proto-Saami. This development
is found both in PU monomorphemic *w-stem nouns (e.g. SaaN gâloj-eatni (< PSaa *kâlôj) ~ Fi kâly ‘sister-in-law’, PSam *kâlû ‘brother-in-law’ < PU *kâliw) and in stat- 
tive or automotive passive verbs derived with the suffix *-w- (e.g., SaaN guddot ‘be left’, SaaSk kuâdd’djed ‘remain’ (< PSaa *kuoðュー-) ~ PFi *kato- ‘disappear’ ~ PSam 
*kâjo- ‘remain’ < PU *kaðâ-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 recon-
structional 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:

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<thead>
<tr>
<th>PU</th>
<th>PWU</th>
<th>Pre-PFi</th>
<th>PSaa</th>
<th>PMd</th>
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</thead>
<tbody>
<tr>
<td>*a–a</td>
<td>*a–a</td>
<td>*a–a</td>
<td>*uo–ē</td>
<td>*a</td>
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<tr>
<td>*a–i</td>
<td>1) *a–i</td>
<td>*a–e</td>
<td>*o–ē</td>
<td>*u</td>
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<td></td>
<td>2) *j–i /_j</td>
<td>*a–e</td>
<td>*uo–ē</td>
<td>*a</td>
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<tr>
<td>*o–a</td>
<td>*o–a</td>
<td>*o–a</td>
<td>*o–ē</td>
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<td>*o–i</td>
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<td>*o–e</td>
<td>*uo–ē</td>
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<td>*u–a</td>
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<td>*j–a</td>
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<td>*j–i</td>
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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 identi-
fied. Fortunately, though, this case is very revealing: Fi puoli : puole- ‘half, side’ (< 
Pre-PFi *pale-) ~ PSam *pälä (> NenT pela, Ngan heli ‘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 *kå- ‘die’ (> NenT ča-, Ngan kuo-), PSam *ńå- ‘lick’ (> SlkTaz ųu-, ųu-, Kam ųu-). 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 -ćä and Ngan -i. Also, PU intervocalic *-l- would not have been preserved unchanged in an *i-stem in Samoyed: cf. PU *pel- ‘be afraid’ > PSam *pej-, PU *käli ‘tongue’ > PSam *kå(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 *ä–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 *ä–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 *jäwrä ‘lake’ > Fi järvi : järve-; PU *šänä ‘bracket fungus’ > Pre-PFi *šäni > PFi *šēni : *šēne- > 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 jõra ‘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 *sāņā (> VVj sāņa, Trj sāņa, Irt sāna, Ni sana, Kaz sāņ, O sāņ ‘bracket fungus’), PMs *šīnā (> T śīnū, KL VN VS śēni, KM KU sēni, P śēni, LU S śēnī ‘bracket fungus’). The regular reflexes of PU *ä are PKh *ä and PMs *ā. 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:

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

- Est närb (gen närvä) ‘lacking appetite; feeble, languid’ < Finno-Saamic *ńärpä, cognate with SaaS njaerpie, SaaL njärbe ‘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 *śälä- (UEW: 470–471). Zhivlov (2014: 115) suggests that the absence of vowel lengthening and raising (*sälä- > *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 *ćäŋäri), which shows a contracted vowel. It is impossible to solve whether *ćäŋäri had changed to *ćäŋere- before the contraction or not, because the latter would also have produced Fi sääri (cf. Fi jää ‘ice’ < Pre-PFi *jāŋe- < PU *jänj). As a side note, the word is traditionally reconstructed as *ćajāri or *ćəjiri, but *ćäŋäri seems more probable because the sequences *-äjä- and *-äji- are not known to have produced the contracted vowel *-ää- in Finnic. A problematic example is Fi (obsolete) sääkä ‘Wels catfish’, which has been thought to reflect PU *śäkä (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 *šiɣ (> VVj sēɣ, Irt sēχ), PMs *šiɣ (> T šiw, KL šiɣ, 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 *śärkä (UEW: 436–437; Saarikivi 2010: 259). This, however, turns out to be a reconstructional error: MdE seŕge, MariE ši-kol ‘Wels catfish’, PKh *šiɣ (> VVj sēɣ, Irt sēχ), PMs *šiɣ (> T šiw, KL šiɣ, So siw ‘burbot’), which point to PU *šekä/i.

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 *äjä ‘old man’ > Fi äjä, 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 köi ‘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 *veajė-), even though the issue is somewhat complicated by the vocalism of the East Saami forms: cf. Saal vajjeđ, SaaSk vääjjeđ (< *vejė-), SaaK vaađjed, T viajjed (< *(v)ojė-). 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 viv ‘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 *wäśkä ‘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 *uškǝ), which together with PFi *vaksi could be seen to support a back-vocalic reconstruction *waśki; the development *a(–i) > PMd *u would be regular.

Regarding the Mordvin form, Häkkinen (2012: 18) has suggested that the variant viśkä in the Kazhlokda dialect represents an archaism. In his view, Kazhlokda vi-goes back to Pre-PMd *we-, and viśkä can be analyzed as the regular cognate of SaaN veaiki ‘copper’ (< Pre-PSaa *weśkä); the same interpretation could also be made of Kazhlokda and Koljajevo dialect vižir ‘ax’ (~ MdE užer, MdM užor) and SaaN veahčir ‘hammer’ < *wešärä (~ *wašara > Fi vasara ‘hammer’). Häkkinen attributes the front vocalism of these two words to a change *waś- >> *weś- that was supposedly shared between the predecessor of Saami and the Kazhlokda-Koljajevo dialects of Mordvin. This, however, seems to be an illusory parallel because the Kazhlokda and Koljajevo forms are better explained as results of a sound change PMd *u- > vi- before palatalized consonants: cf. Kazhlokda and Koljajevo vil’i- ‘be’ (~ MdE ul’e-, MdM ul’o- < 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 *uška ‘chain’ is a derivative of PMd *usko- ‘pull, draw’ (~ MdE uski-, MdM usko-), 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 *wäškä 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 ješa and Ngan basa ‘iron, metal’ shows that the root had the anomalous disharmonic shape *wäsa in Proto-Samoyed (Aikio 2006: 31); the expected reflex of PU *wäškä is PSam *wäsä, 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 *ä in Selkup and Kamas (cf. SlkJaz kēši ‘iron, metal’, Kam bāža ‘iron’). The pervasive irregularities in this lexical set indicate that we 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 *ä(–ä) 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 *päkšnä > *päšnä > Võro pähn ‘linden’
- PU *wäšä- ‘little’ > Fi vähä
- PU *šäšnä ‘woodpecker’ > Fi hähnä ~ häähnä
- PU *täštä ‘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 pista). On the partial analogy of PFi vehnä ‘wheat’ ~ MdE viš ~ MariE wiste, W wišto ‘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 tāšte ‘star’ (< PSaa *tāšt(s)); 2) SaaI tāsmi, SaaSk tāśmn ‘star, spot’ (< PSaa *tāsnē); 3) SaaL nāstte, SaaN nāsti ‘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 *tāšte-), but *sn in Fi tähne, Est tāhn ‘spot’ (< Pre-PFi *tāsn—). Furthermore, the stem vowel relationship between Fi tähti ‘star’ (< *tāšt-, tāhdtä ‘aim’ (< *tāšt-tä-) and Veps tähtaz ‘star’ (< *tāštäš) is irregular. The Mordvin form *tāšt’e can apparently reflect only *tāštV because *šn seems to have yielded PMd *š (cf. PMd viš ‘spelt’ ~ Fi vehnä ‘wheat’ mentioned above). What form PMari *tišt’a ‘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-final or in word-initial position. PSaa *čäšnē (> SaaN čáihnī, Saal čäšni), PMari *šištə (> MariE šište, MariW šišṭo) and PPerm *šiž ‘woodpecker’ (> Komi, Udm šiž) can be traced back to PU *šäšnä; 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 *aćnas (> Sanskrit áśna- ‘hungry’) > Pre-PFi *ašnas > Fi aðnas ‘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 baslỹs ‘pole, stake’) > Pre-PFi *pasla > Fi pahlça ‘fishing rod, pole, stake’ (SSA s.v. pahlça). A Uralic word that seems to show the same development is *pišlä (~ ? *pićlä, ? *pićrä) ‘rowan’ > PFi *pihlä > Veps pihľ: gen pihľän (the back harmony of Fi pihlaja is presumably a secondary development) (UEW: 376). Thus, the medial *-h- in PFi *hähnä ‘woodpecker’ is actually a regular reflex of PU *š, but the initial *h- remains unexpected. It could have developed either via assimilation (*sähnä >> *hähnä) or via dissimilation (Pre-PFi *säšnä >> *šäšnä > *hähnä).

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 ekšěr, jekšěr, jakšěr, MdM jäšťər ‘barren, sterile’ (< PMd *jäkštər). The word has formerly been reconstructed as back vocalic (*akštira; cf. UEW: 606), apparently on the basis of the MdE dialectal variant jakšěr. 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: *šiŋiri ‘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 onomatopoetic 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:
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
Aikio (*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 *śāśnä ‘woodpecker’ with its unique cluster *śn 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:

- *enäšän ~ *änäŋšV ‘raspberry’: MdE ińżej, MariE enäž, W øngøž, Komi emižj, Udm emež (UEW: 26)
- *jekäl ~ *jakälä ‘lichen’: SaaN jeagil, Fi jälälä, Komi jäl-, jala (UEW: 632)
- *kički- ~ *kička- ‘weed’: Fi kitke-, MdE kočkoms (UEW: 662)
- *lupsä- ~ *lupsa ~ *lū(p)š-tä- ‘milk’: Fi lypsä-, MdE lovco, MariE lūšte-, Komi lišti- (cf. UEW: 691, 695)
- *majaka ~ *mejä(kä) ‘beaver’: Fi majava, MdE mijav, Komi moj, Udm miji (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–ä. 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:

<table>
<thead>
<tr>
<th>Finnish</th>
<th>Proto-Samoyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>kuole- ‘die’</td>
<td>*kåǝ̑- ‘die’</td>
</tr>
<tr>
<td>nuole- ‘lick’</td>
<td>*ńåǝ̑- ‘lick’</td>
</tr>
<tr>
<td>puole- ‘side, half’</td>
<td>*pälä ‘half’</td>
</tr>
</tbody>
</table>

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 *ī̯ to be reconstructed into Proto-Uralic. Contrary to Janhunen and Sammallahti, however, PU *ī̯ 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
Est = Estonian
Fi = Finnish
Hung = Hungarian
Kam = Kamas
Kar = Karelian
KhIrt = Irtysh Khanty
KhKaz = Kazym Khanty
KhNi = Nizjam Khanty
KhO = Obdorsk Khanty
KhSur = Surgut Khanty
KhVVj = Vakh-Vasjugan Khanty
Liv = Livonian
MariE = East (Meadow) Mari
MariW = West (Hill) Mari
Mat = Mator
MdE = Erzya Mordvin
MdM = Moksha Mordvin
MsKL = Lower Konda Mansi
MsKM = Middle Konda Mansi
MsKU = Upper Konda Mansi
MsLL = Lower Lozva Mansi
MsLU = Upper Lozva Mansi
MsP = Pelymka Mansi
MsSo = Nosva Mansi
MsT = Tavda Mansi
NenT = Tundra Nenets
Ngan = Nganasan
PFi = Proto-Finnic
PKh = Proto-Khanty
PMari = Proto-Mari
PMd = Proto-Mordvin
PMs = Proto-Mansi
PPerm = Proto-Permic
PSaa = Proto-Saami
PSam = Proto-Samoyed
PU = Proto-Uralic
PWU = Proto-West-Uralic
SaaI = Inari Saami
SaaK = Kildin Saami
SaaL = Lule Saami
SaaN = North Saami
SaaS = South Saami
SaaSk = Skolt Saami

SaaT = Ter Saami
SlkKet = Ket Selkup
SlkTaz = Taz Selkup
SlkTym = Tym Selkup
Udm = Udmurt

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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 āla- (< PKh *iļā-) | MsT (obsolete) <ололанты>, <алалахъ> (< PMs *āl-) | Hung alszik (UEW: 334; Sammallahti 1988: 542).

*ajŋi ‘brain’ || SaaN vuoignašat | 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 imešša ‘last year’ cannot belong here due to its vowel i. Mat “umo”, “umu” is a ghost word falsely extracted from <hik-umo>, <hikʰ-umu> ‘early in the morning’, the correct reading of which is /hij kūmu(n)/ (Helimski 1997: 245).

*ańi ‘female in-law’ || SaaK vuśni | KiVj ānokj ‘wife of a male relative of an older generation’ (< PKh *iñkij) | MsT āńi ‘paternal uncle’s wife’, So āńyj ‘stepmother, older brother’s wife’ (< PMs *āńyγ) | Hung āngy ‘sister-in-law’ | SlkTaz ōńa ‘old brother’s wife’ (< PSam *ońV) (UEW: 10; Sammallahti 1988: 542). — Contrary to UEW, NenT nięa ‘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 ūha ‘older sister’ (< PSam *âña).
*ānti ‘spear / blade’ || KhVVj oŋtw, Sur ʔant+a (PKh *aŋtɒ) | MsT awtā, So owta ‘spear; iron tip of a goad’ (< PMs *awtā) | NenT iant ‘blade, point’; SlkTa šnti ‘blade’ (< PSam *aŋtā) (UEW: 342). — Mari E undo, umdo ‘thorn, stinger’ cannot belong here due to its consonant cluster.


*jādi- ‘ask’ || MariE jødam, W jødam ‘I ask’ | Komi jøav-, Udm jøl-, LU jølent- ‘talk into, persuade’ (< PMs *jølent-), KL jølace ‘ask for, talk into’ (< PMs *jølace-) (UEW: 622; Sammallahti 1988: 552). — The Mansi cognate is a new addition to this etymological set.

*jasi ‘chilly weather’ || SaaL joasso ‘chilly weather’ | Komi jøž, W jøž ‘cool air, cool wind’ | Udm juz ‘cool, fresh’; SlkTaz jāt ‘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 kuojâ ‘sedge’ | Komi, Udm ki̊ ‘awn’ | MsLL kā ‘hair (on the head)’ (< PMs *kā) | Hung haj ‘hair’ | SlkTaz qu ‘stalk, stem, oblong or slender object’ (< PSam *kå-). — 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 kař ‘birch-bark shoe’ is unlikely for both phonologial and semantic reasons; PU *kari would predictably yield MdE *kur (cf. SSA s.v. kuori).

*karki- ‘bitter’ || Fi karkea ‘coarse; bitter’ | KomE kurid, Udm kurit ‘bitter’ | KhVVj korv ‘burn (e.g., salt in a wound), ache’ (< PKh *karv>). — (UES: 128) gives Fi karas ‘bitter’ as the Finnic cognate, but this is an unrelated borrowing from Proto-Germanic *karwaz (> Old High German har, herbe, German herb, Dutch (dialect) haar ‘bitter’).

*laŋši- ‘soft, mild’ || SaaN loažži ‘abated wind’, loažžat ‘loose, slack’ | KhIr luq’ta (< PKh *lańcV) | MsIr lańč, Lo loqšy ‘lukewarm’ (< PMs *lańč) | Hung lágy ‘soft, gentle’ (UES: 250–251; Sammallahti 1988: 545). — In this case, one could theoretically also reconstruct PKh *ľońč, as the word is only attested in South and North Khanty, where PKh *a and *ę have merged. However, PKh *ę is not a regular correspondent of either PU *a–i or *o–a. Also the Mansi cognate clearly supports the reconstruction of PKh *a, because PMs *a ~ PKh *ę is a regular correspondence, whereas the correspondence PMs *a ~ PKh *ę is not attested at all (Honti 1982 passim).

*manši- ‘be tired?’ || Fi масэa ‘depressed, moody’ | KomE muš-, mjaž– ‘get tired’ | KhIr máńč (< PKh *mjańč-) | MsKL máńš-, LU maońš– ‘be in need, be in distress’ (< PMs *mańč-) (SSA s.v. masea).
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*ńali- ‘lick’ || SaaN njoallut | Fi nuole- | MdE nola- | MariE nule- | W nôle- | Komi ňuv-, Udm ňul|- | KhVv j nāla- (< PKh *unjā-) | MsKU nālœmt- (< PMs *nalāmt-) | SlkTaz ňu-, ňū- (< PSam *nās-) (UEW: 321; Sammallahti 1988: 539).
*påriwa/i ‘raft; flock’ || SaaN baorři ‘raft’ | Fi parvi ‘raft’ | Komi, Udm pur ‘raft’ | KhVv j pāra, pāřa ‘raft; flock’ | < PKh *pjāra | MsT pārā, So pārna ‘raft’ (< PMs *pārā) | NenT pā, pārē, Ngan horj ‘storage platform’, SlkTaz pōrij ‘rack for drying fish’ (< PSam *pārā) (UEW 356–357; Sammallahti 1988: 547). — The PSam stem-final *-ā 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 *ą–ä has regularly developed in PSam stems with intervocalic *l but not *r.

*pari ‘gut’ (< PKh *sal) (UEW: 483–484; Sammallahti 1988: 549).
*tåjwå- ~ *tåjwǝ̑- , which goes back to PU *talwa-.


*wari ‘hill’ || Fi wori | MdE vj | MariE üj, W ū | Komi vij, Udm vej | KhVv j waj (< PKh *waj) | MsT wāj, P wōj (< PMs *wāj) | Hung vaj (Sammallahti 1988: 551; UEW 578).

*wal- ‘carve’ || SaaN oalott ‘cut off (branches)’ | Fi vuole- ‘whittle’ | Komi velal-, Udm velj- ‘carve (with a knife), whittle’ | KhVv j wālt- ‘carve (with a chisel); plane’ (< PKh *wijl-) | MsKL wālt-, So wōlt- (< PMs *walt-) (UEW: 579–580; Sammallahti 1988: 554).
*wari ‘hill’ || Fi wori ‘rocky hill, mountain’ | Komi vēr ‘forest’, Udm vīr ‘hill, highland’ | KhVv j wōr ‘ridge, range of hills’ (< PKh *war) | MsT wōr, 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 | KhVv j ālom (< PKh ālām) | MsT ālom, So ālom (< PMs *ūlām) | Hung ālom (UEW: 335; Sammallahti 1988: 542). — A deverbal noun derived from *adi- ‘sleep’. UEW also gives MdE udomo ‘sleep (s)’ 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 amoľda- | KhVv j um- (< PKh *ūm-) | MsSo ūm- (< PMs *ūm-) (UEW: 7–8).

*adma- ‘sleep, dream’ || MariE omo, W om | Komi on, un, Udm um | KhVv j ālom (< PKh ālām) | MsT ālom, So ālom (< PMs *ūlām) | Hung ālom (UEW: 335; Sammallahti 1988: 542). — A deverbal noun derived from *adi- ‘sleep’. UEW also gives MdE udomo ‘sleep (s)’ 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 amoľda- | KhVv j um- (< PKh *ūm-) | MsSo ūm- (< PMs *ūm-) (UEW: 7–8).
čaŋa- 'hit' || MdE

kala- 'fish with a net' || Fi

aśka-, aśka/il 'step' || Fi

kaďa- 'leave' || SaaN

aŋta- 'open, untie' || MdE

kaća- 'give (as a gift)' || MdE

kačka- 'bite' || SaaN

aja- 'drive, flee' || SaaN

šaŋkw 'family, tribe' (< PSam *caci) (UEW: 52; Sammallahti 1988: 552; Aikio 2014a: 14–17).

kōl Pre-PSaa *-oCwo-, which is also found in *talwa- 'bring, take' > SaaN doalvut 1988: 552; Aikio 2002: 41–40).

čaŋa- 'grow' || Fi satas- 'yield crop', sato 'crops' || MdE čačoms || MariE, W šoča- || Komi čuž- 'be born, grow', Udm čiži-viži 'relative' || KhVVj čičim 'bear cub' (< PKh *čičim) || MsSo čūs-, čūns- 'grow, increase; have cubs (of a bear)' (< PKs *čū(n)s-) || SlkKet čāgi ‘family, tribe’ (< PSam *caci) (UEW: 52; Sammallahti 1988: 552; Aikio 2014a: 14–17).


kača- 'give (as a gift)' || MdE kačems 'give (as a gift)' || Komi kočin ‘dowry’, Udm kužim ‘gift’, Hung haszon 'advantage, profit, gain', NenT žaso ‘payment to a shaman’, SlkTaz gossi 'sacrifice; gift' (< PSam *kəso) (UEW: 111; Sammallahti 1988: 538). — Mari E kuzk, W kuzk ‘dowry’ has also been considered cognate, but it must be a Permic loanword because of its vocalism and irregular z (Berezckii 2013 s.v. kuzuk).


kala- ‘fish with a net’ || Fi kalin | Komi kulim | KhVVj kalow (< PKh *kůlap) || MsKu kulp, So čul (PSam *čulap) || Hung haló (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 **hámlik** ‘peel’ | NenT **šaw**̓, SlkTaz **qäm**̓ ‘scale’ (< PSam *kam̑) (UEW: 120; Sammallahti 1988: 544).

*kanta- ‘carry’ || SaaN **guoddit** | Fi **kanta-** ‘carry’ | MdE **kandoms** | MariE **konde-**, W **kande-** ‘carry, bring’ | KhVVj **kantöm-** ‘lift on one’s back’ (< PKh *kántom-) | MsP **kunt-**, LU **qūnt-** ‘carry (on one’s back)’ (< PMs *kūnt-) | NenT **χanu-**, Nga **nontu-** | SlkTaz **qentq-** ‘carry (away), take’ (< PSam *kánt-) (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 **ki̞r-** | Udm **ki̞rl-** | KhIrt **χer-** ‘dig, shovel’ (< PKh *kī̞r-) (cf. UEW: 221).

*lapa ‘shoulder-blade’ || SaaI **lyepi** | Fi **lapa** | MsKU **lup-lǝ̊** (< PMs *lūp-) (Aikio 2015: 13).

*mašta- ‘be able to’ || Fi **mahta-** | MdE **maštoms** | MariE **moštem** | W **må̟štem** (UEW: 265).

*nataw ‘in-law’ || SaaS **nååte** ‘younger female relative of one’s wife’ (< PSaa *nuotōj) | Fi **nato** ‘sister of one’s spouse; brother’s wife’ | MariE **nuδo** | W **nuδǝ̑** ‘younger sister of one’s spouse’ | NenT **nado** ‘younger brother of one’s spouse’ (< PSam *nåto) (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 **ńuɣǝl-**, MsSo **ńawl-** ‘pursue’.

*pala ‘piece (of food)’ || SaaT **pī̞l̜l̜e** (< PSaa *puolē) | Fi **pala** ‘piece, bit’ | MdE **pal** ‘piece (of food)’ | KhVVj **puḷ** ‘bit, mouthful, food chewed for the baby’ (< PKh *pūḷ) | MsT **pōl**, So **pūl** (*PMs *pūl) | Hung **falat** ‘mouthful, bit, bite’ (UEW: 350; Sammallahti 1988: 540).

*pala- ‘eat up’ || SaaN **buollit** | Fi **pala-** | MdE **paloms** ‘burn’ | KhVVj **puḷi̞-** ‘gobble’ (< PKh *pūḷi̞-) | MsSo **pūl-** ‘eat’ (< PMs *pūl-) | MsT **pōl**, So **pūl** ‘piece, portion’ (< PMs *pūl) | Hung **falat** ‘mouthful, bit, bite’ (UEW: 350; Sammallahti 1988: 540).

*panča- ‘open’ || SaaL **buottsos** ‘bare, naked’ | MdE **panžoms** | MariE **poča-**, W **pača-** ‘open’ | Komi **puǯ-** ‘roll up, fold back’, Udm **pužalti̞-** ‘roll up, wrap up’ | KhVVj **pūṇč-** (< PKh *pūṇč-) | MsT **pōnš-**, So **pūns-** ‘open’ (< PMs *pūnš-) (UEW: 350; Sammallahti 1988: 548; Abondolo 1996: 101).

*pata ‘pot’ || Fi **pata** ‘caldron’ | MariE **pot** | W **pat** | KhVVj **puḷ-** ‘gobble’ (< PKh *pūḷ-*) | MsSo **pūl-** ‘eat’ (< PMs *pūl-) | Hung **fal** ‘devours, eats ravenously’ | NenT **paľe-**, SlkTaz **pōli̞-** ‘swallow’ (< PSam *pålä-) (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 *paďi- ‘freeze’ (UEW: 352) is phonologically impossible.

*panča- ‘open’ || SaaL **buottsos** ‘bare, naked’ | MdE **panžoms** | MariE **poča-**, W **pača-** ‘open’ | Komi **puǯ-** ‘roll up, fold back’, Udm **pužalti̞-** ‘roll up, wrap up’ | KhVVj **pūṇč-** (< PKh *pūṇč-) | MsSo **pūl-** ‘eat’ (< PMs *pūl-) | MsT **pōt**, So **pūt** (< PMs *pūt) | Hung **falat** ‘mouthful, bit, bite’ (UEW: 350; Sammallahti 1988: 540).

*sala- ‘steal’ || SaaS **suolādit** ‘steal’ | Fi **salaa** ‘secretly’ | Md **salams** | MariE, W **šolštam** | KhVj **lalom-**, Vj **jalam-** | MsKL **tulmaχ**, So **tulmaχ** ‘thief’ (< PMs *tūlmāk) | NenT **talu-**, Nga **tol-** ‘steal’, SlkTaz **tē̞li̞-** ‘steal’ (< PSam **tālā-** ‘steal’) (UEW 430–431; Sammallahti 1988: 540).

*sarka 'branch' || SaaN suorgi ‘fork, branch’ (< PSaa *suorkē) | Fi sarka ‘patch, strip (of field)’ | MariE šor-wondo ‘take’ (wondo < pondo ‘shaft’) | NenT tarka ‘fork, branch’ (< PSam *tårkā) (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 sor- in the Malmyzh dialect, which points to PU *š-, not *s-. Moreover, Saami-Finnic *šara is a loan from Proto-Baltic *žarā- > Lithuanian žarā ‘fork, branch’ (Koivulehto apud Aikio 2009: 149).

*Sada- ‘rain’ || Fi sata- | NgaN soru-, SlkTaz šērj (< PSam *şarj-) (Sammallahti 1988: 540).

*Sala- ‘flash’ || Fi salama ‘lightning’ | Koivulehto (apud Aikio 2009: 149).


*Sāngka- ‘sting, stick’ || SaaN čuoggut | SlkTaz sënki (< PSam *såŋk̄-) (Aikio 2006: 24).


*tala- ‘bring, take’ || SaaN doalvut ‘take, transport (away)’ | Fi talu- ‘lead; allow to be lead’ (PFi *talu- < *talv-u, originally an automatic passive) | MsT źoł-, So źoł- ‘bring, lead, fetch’ (< PMs *źoł-) | NenT źew- ‘reach; catch up, overtake’, NgaN tojbusa ‘transport’ (< PSam *tjewwa- ~ *tjewwa-) (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).


*war ‘edge, ridge’ || SaaN várrа (!) ‘hill, mountain’ | KhVVj ur ‘sharp edge’, Irt ur ‘wooded ridge’ (< PKh *wûr) | MsT or, So or ‘hill, mountain, ridge’ (< PMs *or) | NgaN buru ‘mountain, cliff’ (< PSam *burā) (Sammallahti 1988: 551; Aikio 2006: 27–28).


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

PU *a–o:

*aďo ‘bed’ || SaaN vuoddu ‘bottom, foundation’ | Komi vol ‘reindeer or moose hide’ | MsT alát, So őlat (< PMs *ałát) | Hung ágy ‘bed’ (UEW: 4; Sammallahti 1988: 542; Aikio 2013: 171–172). — Fi vuode ‘bed’ can be related only if *aďo was derived from an underlying verb *aďi- (? > Udm waľi̮- ‘spread out; make the bed’); in this case Fi vuode word represents a parallel derivative *aďik. It can, however, also be a derivative of the Baltic loanword vuota ‘hide’.

*aľāt, So őľat (< PMs *āľāt) | Hung ágy ‘bed’ (UEW: 4; Sammallahti 1988: 542; Aikio 2013: 171–172). — 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 åres 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 χăpǝt- ‘tear or shake loose, knock over’ < PKh *k̮̊pǝt- and MsT kat-, So χat- ‘tear’ < PMs *kat-), Hung húz ‘pull, drag, haul’ < ?*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.

PU *i–i:

či̮ či̮ ’wild duck’ || Komi ćež, Udm čež | VVj cač (< PKh čäč) | MsP šēš, So sās (< PMs *šēš) (UEW: 58)

ďi̮ mi ‘bird-cherry’ || SaaN duopma | Fi tuomi | Māsī lohom, M lajmā (!) | MariE lombo, W lombō | Komi, Udm ĭm | KhVv jóm (< PKh jóm) | MsKu ĭm, So ĭm (< PMs *ľîm) | SlkTaz čěm (< PSam *čěm) (UEW: 65; Sammallahti 1988: 536–537)


*i̮ ppi ‘father-in-law’ || SaaN vuohppa | Fi appi | MariW owô | KhSur op, up (< PKh *şp) | MsSo up (< PMs *uş) | Hung ipa (UEW: 14; Sammallahti 1988: 536).

*śiw- ‘camp’ || Fi asu- ‘live (somewhere), dwell’ | Komi už-, Udm iž-, iž- ‘sleep, stay overnight’ | NenT neso- ‘camp, stop and put up a tent’ (< PSam *eso-) (UEW 18–19; Aikio 2012: 241)


*ńi̮ ri ‘weak, soft’ || SaaN(58) aikio

*ńi̮ r-ka ‘cartilage’ || SaaN

*ńi̮ njuɔ̃ ‘arrow’ || SaaN

*ńi̮ čki ‘wet’ || SaaN

*ńi̮ kćim ‘gill’ || SaaN

śiw- ‘camp’ || Fi

nti ‘lowland’ || Fi

kiš- ‘carve’ || SaaN

mpi ‘pond, swamp’ || SaaN

pśi ‘cradle’ || Fi

śiwa- ‘camp’ || Fi

κśi- ‘carve’ || SaaN

mpi ‘pond, swamp’ || SaaN

ńiri ‘curved thing’ || SaaL

čči- ‘spoiled, bad-smelling’ || SaaN

xi ‘earth’ || Fi

mā

ńarǝɣ ( < PKh *ńārǝɣ) | MsKU

ńal ( < PKh *ńāl) | MsKU

ńal nörö, SlkKet nörǝ | Komi

ńe̮ kćim ( < PKh *ńe̮ kćim) | MsKU

ńāχšam ( < PKh *ńāχšam) | MsKU

ńe̮ kćim ( < PKh *ńe̮ kćim) | MsKU

ńer ( < PKh *ńer) | MsKU


*šinī ‘clear (wood)’ || SaaN suoddat ‘cut up (meat or fish); make a clearing in wood’ | MdE saindams, saïndëms ‘root up; clear (forest)’ | MariE šuða-, W šūða- ‘clear (forest)’ (UEW: 751; Aikio 2014b: 89–90).

*šiṃi ‘scale’ || SaaN čɔwopma ‘fish skin’ | Fi suomu ‘scale’ | MdE šav ‘money’ | MariE šūm, šōm, W šūm | Komi, Udm śem | KhVvj sam (< PKh *sām) | KhP ēm, So sām ‘scale’ (< PMs *śejm) (UEW: 476; Sammallahti 1988: 549).

*tīkti ‘black-throated loon’ || SaaN dovita (!) | MariNw tokta-lōdō | Komi toktij | KhVvj täytāŋ (!), Irt tagtāŋ (< PKh *táytāŋ) | MsP āt, So ūt (< PMs *tįkt) (UEW: 530; Sammallahti 1988: 550).


**PU *č̈a-:**


*įkta- ‘hang’ || SaaN voektenje ‘beam (for drying nets on)’ | Fi ahta- ‘cram, stuff; spread or hang to dry’ | MdE avtoms | Komi oktij- ‘set a trap’ | KhVvj āyt (< PKh *āyat-) | NenT nīda-, Ngan niti-, SlkTaz ķit- ‘hang’ (< PSam *tiā-) (UEW: 5; Sammallahti 1988: 536).


*jnā ‘tame’ || SaaL vuolže ‘tame (of wild animals)’ | KhSur ānij ‘not shy, allowing one to come into shooting range of a bird’ (< PKh *ānaj) | NenT nīp ‘tame’, SlkTaz ķīp ‘quiet, calm’ (< PSam *nīj) (UEW: 340; Sammallahti 1988: 536).

*kīča- ‘understand’ || Komi kuž- | KhIrt čoč- (< PKh *kāč-) | MsKM kēš-, So čās- (< PMs *kēš-) (UEW: 114–115).


*mjksiš ‘liver’ || SaaS mueksie | Fi maksi | MdE makso | MariE, W mōš | Komi, Udm mus | KhVvj muyl (< PKh *mūyl) | MsKU mēt, So māt (< PMs *mēt : *māt-) | Hung máj | NenT midt, Ngan mītø, SlkTaz mītj (< PSam *mītā) (UEW: 264; Sammallahti 1988: 538).

*mjītkā ‘passage’ || SaaN muotki ‘isthmus over which the boat must be hauled’ | Fi matka ‘trip, way, distance’ | KhVvj muyāt ‘anabranch’ (< PKh *mūyāt) | SlkTaz mītj ‘way, track’ (< PSam *mītā) (Aikio 2015: 13–14).

*pijkā- ‘burst’ || Fi pakku-, pakahu- | KhVvj pākun-, payon- (< PKh *pākun-) | Hung fakad (UEW: 349).

*sıkka ‘Siberian pine’ || Komi sus, Udm susj-pu | KhVVj līya, jīya (< PKh *rīya) | MsT tāt, KU tēt (PL tāt-tet) (< PMs *tajt) | NeN tide, SlkTaz tijij (< PSam *tijāj) (UEW 445–446; Sammallahti 1988: 540).

*sılkkaw ‘pole, rod’ || SaaN čuolggu ‘rod for pushing nets under ice’ | Fi salko ‘long pole or rod’ | MdE šalqo ‘stick, thorn, stinger’ | Komi šul, Udm dešišul ‘sled runner’ | KhVVj sayol (< PKh *sāyol) | T sajja, So sāyl ‘slat’ (< PMs *sūlyl) | Hung sāl-fa ‘timber, log, full-grown tree’ (UEW 460–461; Sammallahti 1988: 549).

*sīta ‘hundred’ || SaaN čuodi | Fi sata | Md šado | MariE šūōo, W šūō | Komi šo, Udm šu | KhVVj sat (< PKh *sāt) | MsP šêt, So sät (< PMs *šēt) | Hung szāz (UEW: 467; Sammallahti 1988: 549).

*tīrka ‘crane’ || Komi, Udm turi | KhVVj tarəy (< PKh *tārəy) | MsP tērįy (< PMs *tīrįy) | Hung daru (UEW: 513).

*wīlka- ‘come down’ || SaaN vuolgit ‘leave, go off’ | Fi vakama ‘landing place for boats’ | MdE valgoms | MariE wole-, W wale- | KhVVj wayəl-, viyəl- (< PKh *wāyəl- ~ *wəyəl-) | MsT wajl- T so wəyl- ‘come down’ (< PMs *wəyl-) | Hung vālik ‘divorce; turn into’ (UEW: 554; Sammallahti 1988: 551).

**PU *o–a:**


*kodwa ‘short time, while’ || Saal kuādfi ‘time between two checkings of a dragnet or longline’ | Fi kotva ‘a short time, while’ | Koni voy-kol užnj, Udm keli- | KhVVj kal- (< PKh *kāl-) | MsT kōl-, So yūl (< PMs *kūl-) | Hung hāl ‘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 ĥeila ‘period, while’ (< Proto-Germanic *hwīlō-) ~ Old Norse hvila ‘rest, lie down’, Old High German wilōn ‘stay, reside’ (< Proto-Germanic *hwīlē-).


*kojar ‘male animal’ || Fi koira ‘dog’, koira ‘male’, Komi kijr- ‘male’ | KhVVj kar (< PKh *kār) | MsP kēr, So jār ‘male, reindeer bull’ (< PMs *kēr) | Hung here ‘drone; testicle’ | NeN gor, Ngaŋ kuru, SlkTaz gorj ‘reindeer bull’ (< PSam *kōrā) (UEW: 168–169).


*koppala ‘wood grouse hen’ || SaaN goahppil | Fi koppelo | MariE kuwāščo (UEW: 181).

*koska ‘aunt / grandmother’ || SaaN goaski ‘mother’s older sister’ || NenT *rada ‘grandmother’, Ngan *toto ‘mother’s or father’s older sister’ (< PSam *kát); | Hung ńaz ‘house’ (UEW: 189; Sammallahti 1988: 537).

*koska ‘common merganser’ || Fi koskelo | KhVvj kas (< PKh *kās). — Finnic *elo can be interpreted as a suffix: cf. Fi kotelo ‘case, capsule’ ← kotela ‘hot, tepee’. On the other hand, a folk-etymological contamination with Fi koski : koske- ‘river rapid’ may also have taken place.


*ojiwa ‘head’ || SaaN oaiivi ‘head’ || Fi oiva ‘good, splendid’ | ? MdM uj ‘brain’ | MariE, W ujuven ‘head’ || NenT ńewa, Mat ajba ‘head’ (< PSam *ńāw). — MdM uj has previously been derived from PU *ajgi ‘brain’, but the vowel correspondence is not regular.


*ola ‘jaw’ || SaaN oalul ‘lower jaw’ | MdE ulo ‘chin’ | MsT olš, So ŭš ‘lower jaw’ (< PMs *ušč) | Hung ńál ‘chin’ (UEW: 337; Sammallahti 1988: 542).

*ona ‘short’ || SaaN oamni | MsKL ńung, P wíng* (< PMs *ńuŋ*<ä) (UEW: 339).


*ora ‘awl’ || SaaN orai | Fi ora, MdE ur | Hung ěr (UEW: 342; Sammallahti 1988: 542).


*orja ‘slave’ || Fi orja | MdE uren | Udm war, var (UEW: 721).


*šoja ‘sound, noise’ || Fi soimaa ‘scold, reproach’ | KhKaz sîm ‘be heard, be audible’ (< PKh *sîmal)- | MsP suml- | So suml- ‘be heard, sound, ring’ (< PMs *suml)- | Ngan sojmi, SlkTaz sîm ‘noise’ (< PSam *sîmā) (Aikio 2015: 16).


*šona ‘sled’ || SaaK čuôn ‘sled without runners’ | MsP sun, So sun ‘sled; cargo’ (< PMs *sun) (UEW 485–486).
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*šonta ‘dung’ || Fi sonta ‘dung’ | E šondo ‘urine’, W šandš ‘shit’ (UEW: 764–765). — Contrary to UEW, the word must be reconstructed with initial *ś- and not *s-, because it has initial š- in the Malmyzh dialect of Mari (PU *ś- is reflected as s- in Malmyzh).

*šota ‘clothing’ || Fi sovat pl. ‘clothes’ (obsolete) | MsT šop, So sup ‘shirt’ (< PMs *šup) (UEW: 486).


tora ‘fight’ || SaaN doarrut ‘fight’ | Fi tora ‘quarrel’ | NenT taro-, Mat toro- ‘wrestle’ (< PSam *tåro-) (UEW: 531; Sammallahti 1988: 550). — MdE źúřem, M źúře ‘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 ź (< *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 *dâraya- > Sanskrit dhāráyati ‘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 tørks, 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 *tara- (> 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 wš, So wš ‘town, fence’ | NenT waʔ, Ngan bǝʔ ‘fence’ (< PMs *wāč), SlkTym wę)]‘fishing weir; inlet’ (< PSam *wācu) (UEW: 577–578; Sammallahti 1988: 541).

PU *ä–ä:

*äjjä ‘old man’ || SaaN äddjá ‘grandfather, old man’ | Fi äijä ‘old man’ | Komi aj, Udm aji ‘father; male’ (UEW: 609; Sammallahti 1988: 552).

*äjmä ‘needle’ || SaaN äibmi | Fi äimä | MariE ime, W im | Komi jem | NenT iibä, Ngan niejmi, Mat ime (< PSam *äjmä) (UEW: 797; Sammallahti 1988: 536).

*äktä- ‘cut’ || SaaSk ä́htted ‘slaughter, skin’ | Komi ekti-, Udm okti- ‘reap, gather, collect’ | KhVvj öygö (< PKh *äyö-) | MsKL jäft-, So jäft- ‘cut’ (< PMs *jękt-) (UEW: 22; Sammallahti 1988: 542–543).

*ärä- ‘hinder’ || SaaN ärrit ‘obstruct, hinder, detain’ | KhVVj erält- ‘hold back, not let go, block the way’ (< PKh *ärlt-) | MsKL öärt-, So ärat- ‘drive away, overtake’ (< PMs *ärât-) (Sammallahti 1988: 543).


*jäŋkä ‘bog’ || SaaN jeaggi ‘bog’ | Komi jegir, jegir ‘boggy forest’ | KhVVj jönk ‘open place in a bog’ (< PKh *jänk) | MsKL jöŋk ‘treeless bog’ (< PMs *jänk) (UEW: 133–134; Sammallahti 1988: 545; Aikio 2012: 238).


*käjä ‘moth’ || McE koil | McE kij | Komi kej, Udm kej | KhVVj kej (< PKh *käj) | McT kij, käj (< PMs *käj) (UEW: 167).

*kälä- ‘wade’ || SaaN gällit ‘wade’ | Est kool ‘ford’ | McE kela-, W kelä- ‘wade’ | Komi kel-, Udm kolj- ‘wade’ | KhVVj käl- arise; go ashore’ (< PKh *käl-) | McT k’äl- So k’äl (< PMs *k’äl-) | Hung kel ‘rise, get up’ (UEW: 133–134; Sammallahti 1988: 545; Aikio 2012: 238).


*kääsi ‘moisture’ || SaaS gasasoe ‘icy fog rising from a lake or a river’ | Fi kasi ‘moisture’ | Komi këzadal- ‘get damp (e.g., of matches)’ | KhVVj kela, kelä (< PKh *kela) | MsKL kōal ‘dew’ (< PMs *kål) | ? Hung kölgy ‘lady, dame’ | Kam šajj ‘female animal, capercaillie hen’, Mat kejbe ‘mare’ (< PSam *käjwā) (SSA s.v. kasi; Aikio 2009: 72–73).

*lämmä ‘scab’ || Fi luomu ‘birthmark; eyelid’ | McE leme ‘rash, scab’ | McE lümö, W lim | Komi lem, Udm lem ‘scab’ (UEW: 686; Aikio 2012: 238).

*lääsi- ‘cover, spread’ || SaaN lähëät ‘make (the bed)’ | ? NenT jëše-, SlkTâz ċëši- ‘cover (the tent with a tent cloth)’ (Helimski apud Aikio 2002: 49).

*päjwā ‘sun, heat’ || SaaN beävë ‘day, sun’ | Ngan hëjë ‘heat’ (< PSam *pähwā) (Sammallahti 1988: 540).


*pänä- ‘whet’ || Udm penon ‘whetstone’ | MsKM pōänl- (< PMs *pänl-) | Hung fen (UEW: 365; Sammallahti 1988: 548).

*pärtä ‘pole, board’ || Fi parsu ‘pole’ | KhVVj pert ‘board’ (< PKh *përt) | MsKL pōârt, So pârt (< PMs *pârt) (UEW: 374; Sammallahti 1988: 548). — McE pârö, 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 *pärt- ‘wall’.

Aikio


*sälä- ‘get in (a boat, a sled)’ || Fi sältytä- ‘load, put a burden on’ | Komi säl- | KhVVj ləl-, jel- (< PKh *ləl-) | MsKL tōl-, So täl- ‘get in (a boat, a sled), mount (a horse) (< PMs *täl-) | Hung ellipsis ‘mount (a horse)’ (UEW 434–435; Sammallahti 1988: 548). — The Samoyed forms mentioned by UEW reflect PSam *tij- or *tiǝ-, which is difficult to connect with PU *sälä-.

*säŋśä- ‘sit down / stop’ || MariE šińča-, W səncä- | Komi sį́- ‘sit down’ | NenT ténćena- ‘stop, calm down’ (< PSam *tänsä-). — The Mari and Permic forms have been traditionally connected with PU *sänša- ‘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 *sinśa- suggested by Zhivlov, one can postulate PU *säŋśä- and include here also PSam *tänša- ‘stop, calm down’, as discussed by Aikio (2002: 30–31).


*särńä ‘ash, willow’ || Fi saarni ‘common ash’ | MariE šertńe, šartńe, W šärtńi ‘a species of willow’ (UEW 752; Aikio 2014c: 137).


*śälä- ‘cut open’ || SaaN čállit ‘write; slit, cut open’ | Fi sâle ‘lath, large wood splinter’ | MariE šela-, W šelä- ‘split’ | KhVVj sůl- ‘cut open’ (< PKh *sůl-) | MsKL š словам- ‘cut, cut off, split’ (< PMs *słów-) | Hung szel ‘slices, cuts, carves’ | Ngan sēlı́ ‘sharpness’ (< PSam *sälä) (UEW 35; Sammallahti 1988: 549; Aikio 2006: 25).


Ambiguous vowel correspondences:

*ajta / *i̮ jta ‘fence’ || Fi aita | KhVVj ā́ (< PKh *āč) (Aikio 2014a: 1–2).


*parma / *pjirma ‘gadfly’ || Fi paarma | MariE pormo, W porm | KhKaz pirm, O purm (< PKh *pjirm ~ *pūrm) (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.


*sarši / *sorši ‘span’ || MariE

*jīja/i̮ ksa/i- ‘take off’ || Fi

*a/o(w)dimi ‘mosquito curtain’ || Fi uudin | MariE omaš, W amaš | Komi von, Udm ǰiŋ | VVj olôw, Sur ǰiŋ (PKh *alap) | MsSo ȯmôl (< PMd *améli) (UEW: 541; Sammallahti 1988: 542; Bereczki 2013 s.v. omaš).


*jai̱ıkša/i- ‘take off’ || Fi jaks- | MdM jûksôms | Komi, Udm jûski- (UEW: 630; Sammallahti 1988: 552).


*kįŋki/a- ‘crawl, climb’ || SaaS goegkerdidh ‘crawl; climb’, SaaN guokkardit ‘crawl’ | Fi kanka ‘stiff, rigid’, kangerta- ‘crawl, move with difficulty’ | KhIrt gōnj- ‘climb; go upstream’ (< PKh *kįŋk-) | MsP keŋk-, So ɣɑŋŋ- ‘climb’ (< PMs *kŋk-) | Hung hāg ‘mount’. — The Ugric words are compared in UEW (127), but the comparison to Saami and Finnic has not been previously suggested.


*ńjrama / *ńär̆mä ‘groin’ || SaaT njārm | Fi nār̆va | KhNi nārm (< PKh *ńār̆m) | MsSo njārm, So nārm (< PMs *ńi̮ rǝm) | Hung nyr̥v (UEW: 312; Sammallahti 1988: 546).

*ńi̮ /oxi- ‘pursue’ || ? SaaN njahka- ‘sneak; stalk’ | Fi nouta- ‘fetch’ | KhVVj nəɣl- (< PKh *ńɔ̄ ɣl-) | MsP n̆iwl-, LU náwl- (< PMs *ńiwl-) | SlkTaz nō- ‘pursue’ (< PSam *ńo-) (UEW: 323; Sammallahti 1988: 548). — The Samoyed forms mentioned in UEW reflect PSam *tüj- ‘enter’, and due to the consonant *j and front vocalism, this verb cannot belong in the cognate set.

*pa/i̮ /äni- ‘put’ || Fi pane-, Udm poni- | KhVVj păn- (< PKh *pi̮ n-) | MsP pun-, So pin- (< PMs *pi̮ n-) | NenT p̆a, Ngan h̆aa (< PSam *p̆a) (UEW: 410; Sammallahti 1988: 548). — The front-vocalic 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.

*pa/uwi ‘tree, wood’ || Fi puu | MariE, W pu | Komi, Udm pu | MsP tīp-pa ‘willow’ (< PMs *pā?) | Hung fa, NenT ūa (< PSam *p̆a) (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.

*śä/ekä/i ‘catfish / burbot’ || Fi sākā | MdE šihe | MariE ši-kol ‘Wels catfish’ | KhVVj sēj (< PKh *śi̮ gj) | MsT šiw, So siw ‘burbot’ (< PMs *śi̮ g) (UEW: 469).


*wa/i̮ ra/i- ‘crow’ || SaaN vuoražas, vuorččis | MariE ši-kol ‘Wels catfish’ | KhVVj uŋj (< PKh *uŋj) | MsT šiu, So siw ‘burbot’ (< PMs *ši̮ j) (UEW: 469).

*woja/i- ‘wild (animal)’ || MariW wojar | Komi vėj | KhVVj wajag (< PKh *wajag) | MsSo ūj (< PMs *ūj) (UEW: 553). — The Mari word has not been previously been included in this cognate set.