

Studies in Uralic vocalism III*

The paper discusses three issues in the history of Uralic vocalism: the change of Proto-Uralic vowel combination **ä-ä* to Proto-Finnic **a-e*, the fate of Proto-Uralic **i* before velar consonants in Finnic, Saami and Mordvin, and the possibility of reconstructing two distinct vowels in PU non-initial syllables instead of **a* of the traditional reconstruction. It is argued that the development of Uralic vocalism must be described in terms of strict sound laws, and not of “sporadic developments”.

Keywords: Uralic languages, Finno-Ugric languages, historical phonetics, proto-language reconstruction, Proto-Uralic vocalism.

“It was customary to vindicate this unpredictability of the PU reconstruction either by claiming that phonetic development is not governed by laws, but only follows certain trends of limited influence ... , or by stating that law-abiding development is accompanied by numerous changes of a sporadic nature. Lately, however, in Uralic studies (as well as in other branches of linguistics) the ideas of classical comparative linguistics — among them the Neo-grammarian-type notion of strict phonetic laws — have gained momentum again. This at once creates a dilemma: to find the lacking laws — or to reconsider the reconstruction itself” [Helimski 1984: 242].

0. Introduction

The present article is based on the following assumption: the historical development of the Uralic languages follows the same principles as the historical development of any other language family in the world. Therefore, we must apply in Uralic studies the same Neo-grammarian methodology that was successfully applied in the study of other language families, notably Indo-European, but also Algonquian, Austronesian, Bantu and many others. The basic tenet of this methodology is the principle of regularity of sound laws (“die Ausnahmslosigkeit der Lautgesetze”). Taking this principle seriously means that we cannot invoke “sporadic developments” as an explanation in historical phonology.

Unfortunately, only a few works in the field of Proto-Uralic reconstruction are written in the Neo-grammarian framework. The most important of these are the groundbreaking studies

* This paper was prepared as part of the research program “Traditional foundations of modern cultures and macroregions of the Orient” (School for Advanced Studies in the Humanities, RANEPa, Moscow). I am much obliged to Ante Aikio, Juho Pystynen and Kirill Reshetnikov for their comments that have helped to improve this paper. Any remaining mistakes are my own responsibility.

by J. Janhunen [Janhunen 1981] and P. Sammallahti [Sammallahti 1988], as well as a number of articles by Ante Aikio [Aikio 2002; Aikio 2006; Aikio 2012; Aikio 2014; SUE I; SUE II; SUE III]. The opposite tradition in the Uralic studies is represented by the most authoritative etymological dictionary of the Uralic languages, *Uralisches Etymologisches Wörterbuch* [UEW]. This work, fundamental as it is, is written in a pre-Neo-grammarians tradition: its authors view the sound change as essentially sporadic in nature. The reconstructions in UEW are actually “pre-reconstructions” in the sense of [Peiros 1997: 275], that is, they are not based on a proper set of phonological correspondences, but rather on the intuition of the authors.

Below we will try to show that at least some of the developments in the history of Uralic vocalism usually viewed as “sporadic” can be accounted for as a result of regular sound change.

1. The change $*\ddot{a}-\ddot{a} > *a-e$ in Proto-Finnic

It is a well-known fact that many etyma reconstructed for Proto-Uralic with the vowel combination¹ $*\ddot{a}-\ddot{a}$ have Proto-Finnic reflexes with the vowel combination $*a-e$ or $*\bar{o}-e$ (pre-Proto-Finnic $*a-e$ of whatever origin yields Proto-Finnic $*\bar{o}-e$, if the single intervocalic consonant is PU $*r, *l, *m, *n, *\delta, *\delta'$ or $*j$ [Aikio 2012: 232–241]). The shift $*\ddot{a}-\ddot{a} > *a-e$ was long thought to be an irregular development.² Recently, however, P. Kallio has noted that the shift in question “in fact occurred more often than not in the case of the earliest vocabulary” [Kallio 2012: 168]. Kallio goes on to remark that “diphthong $*\ddot{a}j$ perhaps blocked the development” in the words *päivä* ‘sun’ and *äimä* ‘needle’ [ibid.]. We think that Kallio’s conclusion can be restated in stronger terms: Proto-Uralic vowel combination $*\ddot{a}-\ddot{a}$ regularly yielded $*a-e$ in Finnic. The shift was blocked when $*\ddot{a}$ in the first syllable was followed by $*j$ or $*\check{s}$ ($> *h$ in Proto-Finnic). After $*j$ and $*\check{c}$ ³ (no cases with initial $*\check{n}$ are known to us) $*\ddot{a}-\ddot{a}$ apparently yielded $*\bar{a}-e$.

The following examples support our conclusions.

1) $*\ddot{a}-\ddot{a} > *a-e$ ($> *\bar{o}-e$):

PU $*k\ddot{a}l\ddot{a}$ - ‘to wade’ $>$ Est *koole* (gen. *koolme*) ‘ford’ [Aikio 2012: 238];

PU $*k\ddot{a}s\ddot{a}$ ‘dew, hoarfrost’ $>$ Fi *kasi* (: *kase-*) ‘cold mist, steam; smoke, coal gas’ [Aikio 2012: 238];

PU $*l\ddot{a}m\ddot{a}$ ‘rash, scab’ $>$ Fi *luomi* (: *luome-*) ‘birthmark; eyelid’ [Aikio 2012: 238];

PU $*p\ddot{a}l\ddot{a}$ ‘side, half’ $>$ Fi *puoli* (: *puole-*) [Aikio 2012: 238];

PU $*p\ddot{a}rt\ddot{a}$ ‘board’ $>$ Fi *parsi* (: *parte-*) ‘beam; stall’ [Sammallahti 1988: 548];

¹ By “vowel combination” we mean the vowels of the first and second syllables viewed together. This term is useful when we speak of Uralic languages, where second syllable vowels frequently affect the development of vowels in the first syllable.

² The only exception is [OCHЯ I: IX–X], where a separate Proto-Uralic vowel combination $*\bar{a}-a$ (distinct from $*\ddot{a}-\ddot{a}$) is set up in order to account for this correspondence.

³ Following [Sammallahti 1988], we reconstruct only one Proto-Uralic phoneme in the place of traditional $*\check{s}$ and $*\check{c}$. However, unlike Sammallahti, we prefer to interpret this phoneme as an affricate $*\check{c}$ for the following reasons. 1) The phoneme in question behaves like $*\check{c}$ and unlike $*s$ and $*\check{s}$: it forms clusters with a preceding homorganic nasal (clusters $*ns$ and $*n\check{s}$ either did not exist in Proto-Uralic, or were extremely rare, while cluster $*n\check{c}$ was rather frequent) and geminates (geminate $*ss$ and $*\check{s}\check{s}$ were definitely absent in Proto-Uralic). 2) The supposed unconditioned shift $*\check{s} > *c$ in Proto-Saami looks typologically quite strange. Unconditioned developments of the type “affricate $>$ fricative” are much more common than the reverse. One may object that the parallel independent development $*c > *s$ (except in clusters) in all branches save Saami also strains credibility, but here we have a perfect analogy in the history of Iranian languages, where Proto-Iranian $*c$ yielded *s* in all daughter languages except for South-Western Iranian where it yielded θ (see [Mayrhofer 1989: 4, 6]).

- PU **säksä* ‘dirt’ > Kar *soaksi* (: *soakse-*)⁴ ‘dirt (e.g. in hair or wool), dandruff’ [Ante Aikio, p.c.];
 PU **säppä* ‘bile’ > Fi *sappi* (: *sappe-*) [UEW: 435];
 PU **särä* ‘vein’ > Liv *sūoṛ* ~ *zūoṛ* ‘sinew, vein’ [Nikulin n.d.: 1];
 PU **särnä* ‘willow’ > Fi *saarni* (: *saarne-*) ‘ash’ [UEW: 752; Aikio 2014: 137];
 PU **tälwä* ‘winter’ > Fi *talvi* (: *talve-*) [UEW: 516];
 PU **wäčkä* ‘metal’ > Fi *vaski* (: *vaske-*) ‘copper’ [UEW: 560].

2) **ä-ä* > **ä-e* after palatal/palatalized consonants:

- PU **jäwrä* ‘lake’ > Fi *järvi* (: *järve-*) [UEW: 633];
 PU **ćänä* ‘shelf fungus’ > Fi *sieni* (: *siene-*)⁵ [UEW: 494].

3) **ä-ä* preserved before **j* and **š*:

- PU **äjjä* ‘old man’ > Fi *äijä* [UEW: 609];
 PU **äjmä* ‘needle’ > Fi *äimä* [UEW: 22];
 PU **päjwä* ‘heat; sun’ > Fi *päivä* ‘day’ [UEW: 360];
 PU **päkšnä* ‘lime tree’ > Est *pähn* (gen. *pähnä*) ‘old lime tree; elm’ [UEW: 726];
 PU **ćäšnä* ‘woodpecker’ > Fi *hähnä* [UEW: 772];
 PU **täštä* ‘star’ > Fi *tähti* (: *tähte-*)⁶ [UEW: 793];
 PU **wäšä* ‘small’ > Fi *vähä* [UEW: 818].

PU **räppänä* ‘smoke hole’ > Fi *räppänä* [UEW: 743] can be viewed as a conditioned exception if we assume that the shift in question did not operate in stems with more than two syllables.

The following three roots are preserved in Finnic only in derivatives. Apparently un-derived stems were absent in Finnic already at the time of the shift in question:

- PU **sälä-* ‘to load’ > Fi *sälyttää* ‘to load, burden’ [Sammallahti 1988: 548];
 PU **ćälä-* ‘to cut’ > Fi *säle* ‘lath’ [UEW: 470];
 PU **täktä* ‘remnant’ > Fi *tähde* ‘remnant, leftover’ [UEW: 515].

The absence of vowel lengthening in PU **ćälä-* > Fi *säle* is due to the fact that *-e-* here belongs to the suffix. As far as we know, lengthening operates only if *-e-* of the second syllable belongs to the root.

One more apparent exception was already explained as a loanword: Fi *jänkä* ~ *jänkkä* ‘bog’ is a substrate borrowing from PSaa **jeaŋkē* ‘bog’ < PU **jäŋkä* [Aikio 2009: 23].

We may conclude that the shift **ä-ä* > **ä-e* can be accounted for in the framework of the standard comparative method, without recourse to the notion of ‘sporadic change’.

2. PU **j* before velar consonants in Finnic, Saami and Mordvin

In a recent work, Ante Aikio has conclusively shown that the mysterious correspondence “Finnic **a-e* / **ō-e* — Saami **oa-ē* — Mordvin **u*” goes back to the Proto-Uralic vowel combination **a-i*, and that **j-i* developed differently from **a-i* in Saami and Mordvin [Aikio 2013]. Aikio’s conclusion can be supported by an additional case where the difference between

⁴ The lengthening of **a* to **ā* (> Kar *oa*) before *sk*, *ks*, and *rn* is common, if not completely regular, in Finnic.

⁵ With the regular lengthening **ä-e* > **ē-e* [Aikio 2012: 232–241].

⁶ This word, exceptionally, has an *e*-stem. Ante Aikio (p.c.) notes that the *ä*-stem is preserved in the obscure derivative *tähdätä* (: *tähtää-*) ‘to aim’.

**a* and **i* is relevant for the historical phonology of Western branches of Uralic.⁷ Consider the following examples:

PU **j̥ji*- ‘to drink’ > PFi **j̥ō-*, PSaa **juk̥e-*, PMari⁸ **j̥üa-*, PPerm⁹ **j̥o-*, Hung *i-*, *iv-*, *isz-*, PSam **ɛ-r-*, **ɛ-kəl-*;

PU **j̥iki* ‘river’¹⁰ > PFi **j̥oke-*, PSaa **j̥oke*, PMd **j̥ov* ‘Moksha river’, PPerm **j̥o*, PMs **j̥i̯*, PKh **j̥āγ*;

PU **t̥ikti* ‘diver’ > PSaa **tokt̥ek*, PMari **tokt̥a-*, PPerm **t̥ó/ókt̥i*, PMs **t̥ikt*, PKh **t̥ākt̥aŋ*.

Here Proto-Uralic **i* can be reconstructed on Ugric and Samoyed evidence. In Finnic the vowel of the first syllable coincided with PU **o*, in Saami and Mordvin — with PU **u*.

In all three examples Proto-Uralic **i* in the *i*-stem is followed by a velar obstruent. If we assume that the development of **i* in this particular position was regular, we can add the following example: PU **j̥kti* ‘bear’ > PFi **okte-*, PMd **ovt̥a*. We cannot reconstruct PU **o* in this word, because **o* in *i*-stems regularly yields **u* in Mordvin except before **ŋ* [SUE II: 9–10]. One more etymology probably also belongs here, as it shows the same vowel reflexes as PU **j̥iki*: PU **š̥iki-* ‘to say’ > PFi **hoke-* ‘to repeat’, PPerm **šo-*.

Two further examples show that the development in question did not occur before the cluster **-k̥c-*:

PU **lik̥ci-* ‘to adze’ > PSaa **luok̥c̥e-*, PMd **lak̥s̥a-*, PMari **lok̥š̥ánc̥a-*;

PU **nik̥c̥imi* ‘gills’ > PSaa **nuok̥c̥em*, PMari **n̥ásm̥a*, PPerm **n̥ó/ók̥cim*, PMs **n̥ik̥c̥ām*, PKh **n̥ākc̥am*.

What was the relative chronology of this change with respect to other changes affecting Proto-Uralic vowels? The following developments occurred in the prehistory of both Proto-Saami and Proto-Mordvin:

A. *i* > *u* / *_k/γ(C)i* (where *C* ≠ *č*)

This is the change described above.

B. *V* > *V̄* / *_γ*

This change is ascribed in [Sammallahti 1988: 523] to Proto-Finno-Volgaic, but the real evidence for it comes only from Saami and Mordvin: before **γ* PU **a* > PSaa **ā*, PMd **a*, PU **e* > PSaa **ie*, PMd **i*, PU **u* > PSaa **u*, PMd ?, PU **i* > PSaa **i*, PMd **i*.

C. *a* > *i* / *_j*

This change was postulated in [Aikio 2013: 6] in order to explain the non-application of the following change to the PU stems **kaji*, **waji* and **waj̥ji*.

D. *a-i* > *o-a*

This change accounts for the correspondence “Finnic **a-e* / **ō-e* — Saami **oa-ē* — Mordvin **u*” [Aikio 2013].

⁷ In the light of both Aikio’s results and our own recent research (summarized in Appendices 2 and 3 to this paper) we regard the main thesis of [Reshetnikov & Zhivlov 2011] — the supposed complementary distribution between PU **a* and **i* — as erroneous. However, the distribution of Permic reflexes of PU **a* and **i* in *a*-stems that was established in that paper remains valid.

⁸ We use Ante Aikio’s reconstruction of Proto-Mari vocalism [Aikio 2014].

⁹ Our reconstruction of Proto-Permic vocalism is outlined in Appendix 1 to this paper.

¹⁰ This etymology must be distinguished from PU **juka* ‘small river’ > PFi **juka*, PKh **joyəŋ*, PSam **jək̥ā*. At least Finnic and Khanty have reflexes of *both* roots.

E. *e-i > i-i*

Later **i-i > PSaa *e-e, PMd *e.*

F. *j > a*

The result of this change is realized as PMd **a* and PSaa **uo*. The evidence of early Germanic loanwords in Saami shows that PSaa **uo* goes back to earlier **a*.

The relative chronology of A and B is unclear: either A preceded B (**iγi > *uγi > *ūγi > PSaa *uke*), or the other way round (**iγi > *īγi > *ūγi > PSaa *uke*). C obviously preceded D. B also preceded D, which is clear from the fact that the vowel lengthening blocked the application of D to PU **sayi-* ‘to arrive, to get’ > PSaa **sāke-*, PMd **say-*. B preceded E: PU **eyi* yielded PSaa **ieke*. A obviously preceded F. D also preceded F: otherwise Proto-Uralic vowel combinations **a-i* and **j-i* would yield identical results in Saami and Mordvin.

The resulting relative chronology is: B, C > D > F; B > E; A > F.

The highly idiosyncratic nature of these sound laws, especially of the development **a-i > *o-a*, makes it unlikely that the set of changes listed above occurred independently in two different languages. There are two possibilities: 1) this set was transferred through language contact from one closely related dialect to another, 2) the changes in question occurred in the common Saami-Mordvin proto-language or, rather, proto-dialect in the Finno-Volgaic dialect continuum. Note that although the change **j > a* also occurred in Finnic, in Saami and Mordvin it was preceded by four other changes not shared with Finnic.

3. Proto-Uralic **a*-stems

The Khanty reflexes of PU **a* and **j* in *a*-stems show an apparently unconditioned split: **a-a* yields either PKh **ā* or **ī / *ū* (**ū* word-initially and after labials, **ī* otherwise); **j-a* also yields either PKh **ā* or **ī / *ū* (this time **ū* after labials, **ī* otherwise, including word-initial position). Now one might think that the split in question is due to the Khanty ablaut. Proto-Khanty had a productive morphophonological alternation between low, mid and high vowels, whereby some inflectional and derivational suffixes condition the shift “low vowel > mid vowel” or “low vowel > high vowel” in the root [Helimski 2001]. It may be supposed that unexpected high vowels either (1) result from generalization of high ablaut grade in inflection or (2) are triggered by lost derivational suffixes. Regarding (1), while verbs show in their paradigm both mid and high ablaut grade, high grade is absent in the inflection of nouns (except for a limited number of terms of relationship). As for (2), Khanty derivation does indeed include zero suffixes that trigger high grade of ablaut. The most common of these is the zero suffix of deverbal nouns. Cf. the following examples:

PKh **k̄γal-* ‘to run’ — PKh (attested only in KhTrj) **kūγal* ‘run’ [DEWOS: 457];

PKh **kāntəm-* ‘to carry on the back’ — PKh **k̄jnt* ‘basket for carrying on the back’ [DEWOS: 516–517];

PKh **katəl-* ‘to dawn’ — PKh **k̄jətəl* ‘day, sun’ [DEWOS: 571–574];

PKh **lāləm-* ‘to breathe in, to sigh’, PKh **lāl̄t-* ‘to breathe’ — PKh **l̄l* ‘breath, soul’ [DEWOS: 749–751].

More rare is the zero suffix of denominal nouns, also triggering high ablaut grade:

PKh **j̄j̄ŋk* ‘ice’ [DEWOS: 391–392] — PKh **j̄j̄ŋk* ‘water’ [DEWOS: 387–390];

PKh **L̄j* ‘finger’ — PKh **L̄j* ‘thimble; finger-ring’ [DEWOS: 719–720].

Neither of these suffixes, however, can explain cases of inherited nouns that preserved their Proto-Uralic meaning, such as PU **kala* ‘fish’ > PKh **kūl* ‘fish’, PU **pata* ‘pot’ > PKh **pūt* ‘pot’, PU **miksa* ‘liver’ > PKh **mūγal* ‘liver’, PU **siksa* ‘Siberian pine’ > PKh **Līγal* ‘Siberian pine’. Moreover, we do not know of any ablaut-triggering zero verbal suffixes.

More important, however, is the fact that both hypotheses have a common weak point: if analogical redistribution of ablaut grades and/or addition of semantically opaque ablaut-triggering zero suffixes operated in Khanty on such a scale that half of reflexes of **a-a* and **i-a* were affected by it, this process must have left traces in the reflexes of other Proto-Uralic vowel combinations as well. Apart from **a-a* and **i-a*, there are two other Proto-Uralic vowel combinations that can have Proto-Khanty **ā* as their reflex: PU **i-i* and **o-a*.

A quick look at the Khanty reflexes of **i* in *i*-stems shows that ablaut played no role here:

PU **ćimi* ‘fish scales’ > PKh **sām*;
 PU **ćiči* ‘duck’ > PKh **čāč*;
 PU **đimi* ‘bird cherry’ > PKh **jōm*;
 PU **iđi* ‘year’ > PKh **āl*;
 PU **jini* ‘tame’ > PKh **ānī*;
 PU **jppi* ‘father-in-law’ > PKh **ōp*;
 PU **jpti* ‘hair of the head’ > PKh **ōpət*;
 PU **jiki* ‘river’ > PKh **jāγ*;
 PU **lički-* ‘to let go’ > PKh **lās-*;
 PU **ńikćimi* ‘gills’ > PKh **ńākcəm*;
 PU **ńili* ‘arrow’ > PKh **ńāl*;
 PU **ńiri* ‘tender; cartilage’ > PKh **ńārəγ*;
 PU **pići* ‘mittens’ > PKh **pās*;
 PU **sini* ‘sinew, vein’ > PKh **Lān*;
 PU **tikti* ‘diver’ > PKh **tāktəŋ*.

It is striking that not a single case of PKh **ī* or **ū* is attested in this row of correspondences. The Khanty reflexes of PU **o-a* are less numerous, but the picture is essentially the same: five non-suffixal items show PKh **ā*, while only one word (with a suffix **-ī*) has **ō* or **ū*:

PU **čoδka* ‘a kind of duck’ > PKh **sāj*;
 PU **kočka* ‘a kind of duck’ > PKh **kās*;
 PU **kojra* ‘male animal’ > PKh **kār*;
 PU **kota* ‘house’ > PKh **kāt*;
 PU **orpas* ‘orphan’ > PKh **ō/ūrpi*;
 PU **woča* ‘fence’ > PKh **wāč*.

If the duality of the Khanty reflexes of PU **a-a* and **i-a* is not due to analogy or zero ablaut-triggering suffixes, and no complementary distribution between the two types of reflexes can be established within Khanty, we may look for external correspondences for this phenomenon. The following cases of seemingly unconditioned splits in other branches of Uralic are worth considering:

- 1) Mari reflects Proto-Uralic nouns of the shape **CVCa* (where intervocalic *-C-* is a single consonant) either as *CVCə*, or as *CVC*.¹¹ The distribution between the two types of reflexes is unknown;

¹¹ Mordvin also reflects PU **CVCa* nouns as either *CVCə* or *CVC*. But here most cases of *CVC* nouns result from the specifically Mordvin process *Calə* > *Cal* [Понарядов 2013: 115], cf. such cases as PU **kala* ‘fish’ > MdM *kal*, MdE *kal*, PU **pala* ‘bit’ > MdM *pal* ‘meat’, MdE *pal* ‘bit’, PU **wala* ‘word, song’ > MdM *val* ‘word’, MdE *val* ‘word’,

- 2) Hungarian has both *á* and *a* as reflexes of Proto-Uralic **a* and **j* in *a*-stems. Again, conditions for the split are not known;
- 3) Proto-Samoyed reflects Proto-Uralic second syllable **a* as either **ǎ* or **ə* with no apparent distribution.

We suppose that all these phenomena are connected. The following correspondences can be established:

- 1) PU **a-a₁*, **j-a₁* > Mari CVCə nouns — Proto-Khanty low vowels¹² — Hungarian *á* — Proto-Samoyed second syllable **ǎ* (except **al/ða* > **ǎjä*)
- 2) PU **a-a₂*, **j-a₂* > Mari CVC nouns — Proto-Khanty high vowels — Hungarian *a* — Proto-Samoyed second syllable **ə* (except **al/ða* > **ǎjä*)

Consider the following examples:¹³

PU **a-a₁*:

- PU **adma₁* ‘sleep, dream’ > PMari **omə*, PPerm **onm-*, PMs **üləm*, PKh **āləm*, **ōləm*, Hung *áлом*;
 PU **čara₁₋* ‘dry’ > PPerm **šorm-*, PMs **sūrā*, PKh **sār-*, Hung *száraz*;
 PU **čaŋa₁₋* ‘to hit’ > PMd **čav-*, PMari **čāŋe-*, PMs **šīŋ.k_o-*, PKh **čōŋk-*, PSam **cāŋǎ-*;
 PU **kala₁₋* ‘to fish’ > PFi **kalime-*, PPerm **kolām*, PMs **kūlap*, PKh **kālap*, Hung *háló*;
 PU **kala₁₋* ‘to spend a night’ > PPerm **kwel-*, PMs **kūl-*, PKh **kāl-*, Hung *hál-*;
 PU **kana₁₋* ‘to dig’ > PPerm **kon-*, PMs **kūn-*, PKh **kāŋ- ~ *kīŋ-*, Hung *hány-*;
 PU **kanta₁₋* ‘to carry’ > PFi **kanta-*, PSaa **kuontē-*, PMd **kand-*, PMari **kānde-*, PMs **kūnt-*,
 PKh **kāntəm-*, PSam **kántǎ-*;
 PU **lapta₁* ‘flat, thin’ > PFi **latt-eta*, PMd **lavtəv*, PMari **laptəra*, PKh **lāptək*, PSam **jāptǎ*;
 PU **sala₁₋* ‘to steal’ > PFi **salata-*, PSaa **suolē-*, PMd **sala-*, PMari **solə*, PMs **tūlmānt-*, PKh
**Laləm-*, PSam **tālǎ-*;
 PU **s/šara₁* ‘flood’ > PMs **tūr*, PKh **Lār*, Hung *ár*.

PU **j-a₁*:

- PU **čilka₁* ‘lath’ > PFi **salko*, PSaa **čuolkōj*, PMd **śalgə*, PPerm **śol*, PMs **sīylā*, PKh **sāγəl*,
 Hung *szálfa*;
 PU **čjta₁* ‘hundred’ > Fi *sata*, PSaa **čuotē*, PMd **śadə*, PMari **šüδə*, PPerm **śó*, PMs **šj̄t*, PKh
**sāt*, Hung *száz*;
 PU **pīŋka₁* ‘mushroom’ > PMd **paŋgə*, PMari **poŋgə*, PMs **pīŋk*, PKh **pāŋk*, PSam **peŋkǎ-*;
 PU **wīlka₁₋* ‘to go down’ > Fi *valkama* ‘haven’, PMd **valg-*, PMari **wāle-*, PMs **wīyl-*, PKh
**wāγəl- ~ *wīγəl-*, Hung *vál-*.

PU **a-a₂*:

- PU **aŋa₂₋* ‘to open’ > PFi **avata-*, PMd **avt-*, PMs **īŋ.k_o-*, PKh **īŋk-*, PSam **(ń)aŋə-*;
 PU **kaða₂₋* ‘to leave’ > PFi **katota-*, PSaa **kuoδē-*, PMd **kad-*, PMari **koδe-*, PPerm **kól-*, PMs
**kūl-*, PKh **kīj-*, Hung *hagy-*, PSam **kājǎ-*;
 PU **kala₂* ‘fish’ > PFi **kala*, PSaa **kuolē*, PMd **kal*, PMari **kol*, PMs **kūl*, PKh **kūl*, Hung *hal*,
 PSam **kālǎ*;

PU **jla* ‘under, below’ > MdM *al*, MdE *al-*. This process was rather late, as in Nicolaes Witsen’s Moksha wordlist, collected in 17th century, the following forms are attested: *kala* ‘Visch’, *aksikala* ‘Groote witte Visch’, *kalavaj* ‘Vet van Visch’ [Witsen 1705: 626], cf. also *sala* ‘Een schelm’ [Witsen 1705: 625] (this word, related to MdM *sala-* ‘to steal’, is not attested in modern Moksha, presumably because after the sound change in question it coincided phonetically with MdM *sal* ‘salt’, attested in Witsen’s wordlist as *sal* ‘Zout’ [Witsen 1705: 626]). I am grateful to Juho Pystynen for directing my attention to Witsen’s wordlist.

¹² In the rare instances where both low and high vowels are attested, we take the form with the low vowel as basic and consider the form with the high vowel to be derived from it by ablaut.

¹³ Only forms attested in more than one diagnostic language are given here. See the full material in Appendix 3.

PU **kama₂* ‘rind, crust’ > PFi **kamara*, PMari **kom*, PSam **kamə* ‘scale’;
 PU **pala₂* ‘bit’, **pala-* ‘to gobble’ > PFi **pala*, PMd **pal*, PMs **pūl*, **pūl-*, PKh **pūl*, Hung *falat*,
fal-, PSam **pālā-*;
 PU **palka₂* ‘village’ > PMs **pīwəl*, PKh **pūγəl*, Hung *falú*;
 PU **pata₂* ‘pot’ > PFi **pata*, PMari **pât*, PMs **pūt*, PKh **pūt*, Hung *fazék*, PSam **pata-*;
 PU **wara₂* ‘edge’ > PMs **ur*, PKh **ūr*, PSam **wārə*

PU **j-a₂*:

PU **jla₂* ‘under, below’ > PFi **ala-*, PSaa **vuolē*, PMd **al*, PMari **iil-*, PPerm **ol*, PMs **jal*,
 PKh **jīl*, Hung *al-*, PSam **jīl-*;
 PU **miksa₂* ‘liver’ > PFi **maksa*, PSaa **muoksē*, PMd **maksə*, PMari **moks*, PPerm **mos*, PMs
**mīt*, **majt-*, PKh **mūγəl*, Hung *máj*,¹⁴ PSam **mijtə*.

Exceptions:

PU **jka-* ‘to hang up’ > PFi **akta-*, PSaa **vuokteńe*, PMd **avt-*, PMari **ā/oktāš*, PPerm **ōkt-*,
 PKh **jγət-*, PSam **jīā-*;
 PU **kađma* ‘ashes’ > PMs **kūləm*, PKh **kājəm*, Hung *hamu*;
 PU **pal/jkka-* ‘to burst’ > PFi **pakku-*, PKh **pāγ-*, Hung *fakad-*.

According to Ante Aikio (p.c.), **kađma* ‘ashes’ is derived from the verb **kađa-* ‘to leave’ (**kađa₂-* in our reconstruction). The semantic development was ‘leftovers’ > ‘ashes (= that which is left over when the fire has burned)’. Thus, **kađma* contains the same suffix of deverbal nouns **-ma* (**-ma₁* in our reconstruction) as PU **ađma* ‘sleep, dream’, derived from PU **ađi* ‘to sleep’. Aikio argues that since Hungarian reflexes of these words have different initial syllable vowels (PU **kađma* > Hung *hamu*, PU **ađma* > Hung *álom*), this can be taken as an indication that the distribution of Hungarian *a* vs. *á* in the initial syllable could not be conditioned by an opposition **a₁ : *a₂* in the non-initial syllable. We think that instead of invalidating our hypothesis, Aikio’s etymology of the word for ‘ashes’ actually strengthens it, since the irregular (in our formulation of sound correspondences) short *a* in Hung *hamu* can now be explained as a result of leveling of this deverbal noun’s vocalism on the model of the deriving verb (PU **kađa₂-* > Hung *hagy-*). The fact that no such leveling occurred in the case of PU **ađi* ‘to sleep’ > Hung *al-* vs. PU **ađma* ‘sleep, dream’ > Hung *áalom* does not contradict our explanation, since analogical processes are by definition “irregular” (i.e. applied to individual lexical items).

One more potential exception would arise if we compare MsSo *ur* ‘mountain, mountain ridge’ (PMs **ur*), KhV *ur* ‘sharp edge’, KhKaz *wūr* ‘sharp edge; mountain ridge covered with forest’ (PKh **ūr*) with PSam **wārə* ‘mountain’. However, since the Ob-Ugric words in question also have the meaning ‘edge’, it is possible to compare them with PSam **wārə* ‘edge’ instead. Actually we think that three phonetically similar and semantically overlapping etymologies must be distinguished:

- 1) PU **wara₁* ~ **wārä* ‘mountain’ > Fi *vuori* (: *vuore-*) ‘mountain’, SaaN *várri* ‘mountain’ (PSaa **vārē*), PSam **wārä* ‘mountain’ (Finnic and Saami words reflect the variant **wārä*);
- 2) PU **wara₂* ‘edge’ > MsSo *ur* ‘mountain, mountain ridge’ (PMs **ur*), KhV *ur* ‘sharp edge’, KhKaz *wūr* ‘sharp edge; mountain ridge covered with forest’ (PKh **ūr*), PSam **wārə* ‘edge’;
- 3) PU **wori* ‘forest’ > Komi *ver* ‘forest, wood’, KomiJ *vur* ‘forest’, Udm *vijr* ‘hummock, hill’ (PKomi **ver*, PUdm **vijr* < PPerm **vur*), MsSo *w̄r* ‘forest’ (PMs **wār*), KhV *w̄r* ‘ridge near a river bank’ (PKh **war*).

¹⁴ The long vowel in Hung *máj* is apparently the result of contraction after the regular shift PU **-ks-* > Hungarian zero. Hungarian *j* probably appeared after this contraction as a hiatus-filler before vocalic affixes.

The Proto-Uralic words for ‘mountain’ and ‘edge’ may be eventually related, but the derivational pattern is unclear, and it would be more safe on the present level of our knowledge to treat them as two distinct roots.

We have no explanation for the two remaining counterexamples (PU **ikta-* > PKh **īγat-*, PSam **itã-*; PU **paljkk-* > PKh **pāγ-*, Hung *fakad-*), but the very fact that there are only two of them compared to 24 regular cases (only words attested in more than one diagnostic language were counted) suggests that the correspondences formulated above reflect some real feature of Proto-Uralic, and are not just an artifact of our approach to reconstruction.

In the above discussion we provisionally marked the Proto-Uralic vowel combinations in question as **a-a₁*, **i-a₁* vs. **a-a₂*, **i-a₂*. How this opposition was realized phonetically is a complex question, but the most obvious solution would be to reconstruct two different second syllable vowels instead of traditional **a*, perhaps **a* vs. **o*.

Another important question is whether the opposition between second syllable **a₁* and **a₂* can be reconstructed for words with first syllable vowels other than **a* and **i*. Samoyed data suggest that **a₁* and **a₂* were opposed after **u* as well, cf. such cases as PU **kura* ‘crooked’ > PSam **kərã*, PU **muna* ‘egg’ > PSam **mãã*, PU **muδa* ‘earth’ > PSam **møjã* vs. PU **kuδa* ‘morning’ > PSam **kərø*, PU **kuma-* ‘to fall over’ > PSam **kãmø-*, PU **muja-* ‘to smile’ > PSam **møjø-*. Khanty here also seems to agree with Samoyed, but a detailed analysis of Ob-Ugric reflexes of Proto-Uralic **u* must be conducted before Khanty data can be successfully compared with Samoyed. We hope to deal with the vowel combinations **u-a₁* and **u-a₂* in a future publication.

Proto-Uralic roots with the first syllable vowel **o*, on the other hand, reveal no obvious traces of the opposition in question. The vowel combination **o-a* is regularly reflected as **ã* in Proto-Khanty (see above). Samoyed generally reflects **o-a* as **ã-ã* (in one case¹⁵ **o-ã*):

- PU **čoδa* ‘war’ > PSam **sãjã-* ‘to wage war’;
- PU **kopa* ‘bark’ > PSam **kopã* ‘skin’;
- PU **koska* ‘older female relative’ > PSam **kãtã* ‘grandmother’;
- PU **noma* ‘hare’ > PSam **nãmã*;
- PU **ojwa* ‘head’ > PSam **ãjwã*;
- PU **ora* ‘squirrel’ > PSam **ãrop*;
- PU **tolwa* ‘wedge’ > PSam **tajwã* ‘nail; wedge’.

Two words with the Proto-Uralic vowel combination **o-a* have consonantal stems in Proto-Samoyed:

- PU **woča* ‘fence’ > PSam **wãc* ‘fence’;
- PU **wolka* ‘shoulder’ > PSam **wãjk*.

Only one word shows the development of PU **o-a* to PSam **ã-ø*:

- PU **kočka* ‘dry’ > PSam **kãsø-*.

This is certainly insufficient evidence to reconstruct two distinct vowel combinations instead of traditional **o-a*. It seems that after Proto-Uralic **o* in the first syllable only the vowel symbolized here as **a₁* was allowed. If **a₁* was **a* and **a₂* was **o*, we could say that the vowel combination **o-o* was prohibited in Proto-Uralic.

¹⁵ PSam **korã* ‘male animal’ apparently goes back not to **kojra*, but to the more archaic variant **kojira* without syncope of the medial **i* (the word is ultimately derived from PU **koi* ‘male’).

Appendix 1. Proto-Permic vocalism

We reconstruct the following vocalic system for Proto-Permic:¹⁶

	front	central		back
	non-labialized	labialized	non-labialized	labialized
high	i	ú		u
mid	e	ò	ɛ	o
low	ä	ɔ	a	ɔ

The reconstruction is based on the following correspondences for initial syllables:

Vocalic correspondences between Komi dialects

Proto-Komi	*i	*j	*u	*e	*ɛ	*wɛ	*kwɛ	*o	*wo	*ɛ	*ɛ	*wɛ	*ɔ	*a
Literary Komi	i	j	u	e	ɛ	vo	ko	o	vo	e	ɛ	vo	o	a
Upper Sysola	i	j	u	e	ɛ	ɔ	kɔ	ɔ	ɔ	e	ɛ	ɛ	o	a
Literary Komi-Permyak	i	j	u	e	ɛ	ɛ	kɛ	o	o	e	ɛ	ɛ	o	a
Jažva	i	ə	u	í	ú	ú	kuú	ú	ú	e	ò	ò	o	a

Vocalic correspondences between Udmurt dialects

Proto-Udmurt	*i	*ú	*j	*u	*e	*ɛ	*o	*a
Literary Udmurt	i	u	j	u	e	ɛ	o	a
Malmyž-Uržum, Jelabuga (peripheral Southern)	i	ú	j	u	e	ò	o	a
Besermyan	i	ə	ə	u	e	e	o	a

In stems of the CV type Proto-Udmurt **u* yields *ú* in peripheral Southern dialects, but *u* in Besermyan (**ú* is not reconstructed in CV-type stems).

The opposition between **u* and **ú* is practically non-reconstructible before palatalized consonants. In this position we reconstruct only **u*.

Vocalic correspondences between Proto-Komi and Proto-Udmurt

Proto-Permic	*i	*ú	*u	*o	*e	*ò	*wò	*ɛ	*wɛ	*ɔ	*ä	*a	*ɔ
Proto-Komi	*i	*j	*(w)ɛ ¹	*u	*e/ɛ ²	*o	*wo ³	*ɛ	*wɛ	*ɔ	*ɛ	*a	*a
Proto-Udmurt	*i	*j	*j	*u ⁴	*e/o ⁵	*ú/u ⁶	*wa ⁷	*ɛ	*ɛ	*u	*e/o/a ⁸	*a	*u

1. **wɛ* word-initially and after **k-*, **ɛ* otherwise.

2. **e* before voiced obstruents (but not adjacent to *b* and *m*) and before a lost **j* or **l*; **ɛ* otherwise.

¹⁶ For non-initial syllables, we reconstruct **j* as an allophone of **ú*.

3. **wo*- word-initially, but **o* after **k*-.
4. **ü* in stems of the type *CVCj*. Proto-Permic **o* can also be reflected as Proto-Udmurt **j* under unclear conditions.
5. **e* before palatalized consonants and *m*; **o* before *n*, *ŋ*, *l*, non-palatalized sibilants and affricates; **e* ~ **o* before non-palatalized stops and *r*.
6. **ü* in stems of the type *CVC* and *CVCj*; **u* in stems of the type *CV* and *CVCVC*. Proto-Permic **o* can also be reflected as Proto-Udmurt **j* under unclear conditions.
7. But PPerm **wój*- > PUdm **uj*-.
8. **e* before palatalized consonants and *s*; **o* before non-palatalized sibilants and affricates (except *s*) and before *l* after a dental stop; **a* before *l* (except after a dental stop), **e* ~ **o* before non-palatalized nasals, non-palatalized stops and *r*.

The following table summarizes the differences between the present Proto-Permic reconstruction and the reconstructions in [Zhivlov 2010], [Sammallahti 1988], [KЭCK] (= Lytkin 1970), [Harms 1967] and [Itkonen 1954].

PKomi	PUdm	present work	Zhivlov 2010	Sammallahti 1988	Lytkin 1970	Harms 1967	Itkonen 1954
* <i>u</i>	* <i>u</i>	* <i>o</i>	* <i>u</i>	* <i>ü</i>	* <i>u</i>	* <i>u</i>	* <i>u</i>
* <i>u</i>	* <i>ü</i>	* <i>o</i>	* <i>ü</i>	* <i>ü</i>	* <i>ü</i>	* <i>ü</i>	* <i>u</i>
* <i>j</i>	* <i>j</i>	* <i>ü</i>	* <i>j</i>	* <i>ï</i>	* <i>ü</i>	* <i>j</i>	* <i>j</i>
* <i>i</i>	* <i>i</i>	* <i>i</i>	* <i>i</i>	* <i>ï</i>	* <i>i</i>	* <i>i</i>	* <i>i</i>
* <i>o</i>	* <i>u</i>	* <i>ö</i>	* <i>ö</i>	* <i>u</i>	* <i>ᵛ</i>	* <i>ō</i>	* <i>ᵛ</i>
* <i>o</i>	* <i>ü</i>	* <i>ö</i>	* <i>ö</i>	* <i>ü</i>	* <i>ᵛ</i>	* <i>ū</i>	* <i>ᵛ</i>
* <i>(w)ε</i>	* <i>j</i>	* <i>u</i>	* <i>ε</i>	* <i>i</i>	* <i>ᵛ</i>	* <i>ī</i>	* <i>ᵛ</i>
* <i>ε</i>	* <i>ε</i>	* <i>ε</i>	* <i>ᵛ</i>	* <i>ü</i>	* <i>ᵛ</i>	* <i>ō</i>	* <i>ᵛ</i>
* <i>e</i>	* <i>e/o</i>	* <i>e</i>	* <i>e</i>	* <i>i</i>	* <i>ε</i>	* <i>ī</i>	* <i>ε</i>
* <i>ᵛ</i>	* <i>u</i>	* <i>ᵛ</i>	* <i>o</i>	* <i>o</i>	* <i>ᵛ</i>	* <i>o</i>	* <i>o</i>
* <i>ε</i>	* <i>e/o</i>	* <i>e</i>	* <i>e</i>	* <i>e</i>	* <i>ε</i>	* <i>e</i>	* <i>e</i>
* <i>ε</i>	* <i>e</i>	* <i>ä</i>	* <i>ä</i>	* <i>ë</i>	* <i>ε</i>	* <i>ē</i>	* <i>ε</i>
* <i>ε</i>	* <i>o/a</i>	* <i>ä</i>	* <i>ä</i>	* <i>ö</i>	* <i>ö</i>	* <i>ö</i>	* <i>ö</i>
* <i>a</i>	* <i>a</i>	* <i>a</i>	* <i>a</i>	* <i>a</i>	* <i>a</i>	* <i>a</i>	* <i>a</i>
* <i>a</i>	* <i>u</i>	* <i>ᵛ</i>	* <i>ᵛ</i>	* <i>ā</i>	* <i>ā</i>	* <i>ā</i>	* <i>a</i>

The reconstruction outlined above is a somewhat modified version of Proto-Permic reconstruction in [Zhivlov 2010]. Although we cannot give here a detailed justification of our current understanding of Proto-Permic vocalism, we will briefly comment on the differences between it and the reconstruction in [Zhivlov 2010].

1) Proto-Permic **o* (= **u* and **ü* in [Zhivlov 2010]). Here we reconstruct one phoneme instead of two in [Zhivlov 2010]. Proto-Udmurt **u* and **ü* in this row of correspondences (i.e. when they correspond to Proto-Komi **u*) are in complementary distribution: **ü* is regularly found in stems of the type *CVCj*, **u* in other cases. Before palatalized consonants, the opposition between **u* and **ü* was neutralized in Proto-Udmurt. The remaining cases of the corre-

spondence “Proto-Komi **u* – Proto-Udmurt **ü*” are too few to warrant the reconstruction of a separate Proto-Permic phoneme.

The phoneme in question is reconstructed as Proto-Permic **o* because PPerm **u* is needed for another correspondence (cf. below) and because there are Permic loanwords in Mari that reflect this vowel as PMari **o*: PPerm **ož* ‘stallion’ > PMari **ožə* ‘id.’ [KƏCK: 296], PPerm **poš* ‘fish-trap’ > PMari **poš* ‘id.’ [KƏCK: 234]. Note that the development of Proto-Permic **o* to Komi and Udmurt **u* can be viewed as part of a general trend in the Volga-Kama linguistic area: the shift *o* > *u* has also occurred in the history of Mari, Anatri Chuvash and Tatar.

2) Proto-Permic **u* (= **ę* in [Zhivlov 2010]). The correspondence “Proto-Komi **ę* – Proto-Udmurt **j*” must reflect a labialized vowel, since word-initially and after **k* we always find a prothetic **w* in Komi. Cf. also two Permic loanwords in Mari: PPerm **vurt* ‘heddle string’ > PMari **würt* ‘id.’ [KƏCK: 68], PPerm **um* ‘mouth’ > PMari **ümša* ‘id.’ [KƏCK: 62].

3) Proto-Permic **j* (= **o* in [Zhivlov 2010]). This vowel is reflected as PMari **ü* in Permic loanwords (Proto-Mari lacked **ö* and **j*): PPerm **jrd* ‘side, ribs’ > PMari **ürδəž* ‘id.’ [KƏCK: 206], PPerm **läl* ‘alder’ > PMari **lül* ‘id.’ [KƏCK: 160].

4) Proto-Permic **ü* (= **j* in [Zhivlov 2010]). This vowel is also reflected as PMari **ü* in Permic loanwords: PPerm **gürk* ‘hollow, cavity’ > PMari **kürγə* ‘id.’ [KƏCK: 85–86]. The interpretation of this phoneme as **j* is also incompatible with the development PPerm **u* > Pre-PKomi **j* > PKomi **ę*, required by our reconstruction.

5) Proto-Permic **ę* (= **j* in [Zhivlov 2010]). This reconstruction is rather self-evident, given that both Komi and Udmurt reflect this phoneme as **ę*.

Appendix 2. Reflexes of Proto-Uralic **a*, **j* and **o* in daughter languages

PU	Pfi	PSaa	PMd	PMari	PPerm	PMs	PKh	Hung	PSam
*a-a ₁	*a-a	*uo-ē ¹	*a	*ā/o ²	*o/ō ³	*ū ⁴	*ā ⁵	á	*ā-ā ⁶
*a-a ₂	*a-a	*uo-ē ¹	*a	*ā/o ²	*o/ō ³	*ū ⁴	*j/ū ⁷	a	*a-ə ⁶
*a-i	*a-e ⁸	*oa-ē ⁹	*u ⁹	*ā/o ¹⁰	*o/ō ³	*ā	*a ¹¹	a ¹²	*a-(ə) ¹³
*j-a ₁	*a-a	*uo-ē	*a	*ü ¹⁴	*o/ō ¹⁵	*j	*ā ¹⁶	á	*j/ę-ā ¹⁷
*j-a ₂	*a-a	*uo-ē	*a	*ü ¹⁴	*o/ō ¹⁵	*j	*j/ū ¹⁸	a	*j/ę-ə ¹⁷
*j-i	*a-e ¹⁹	*uo-ę ²⁰	*a ²⁰	*ü ¹⁴	*ę ²¹	*j	*ā ¹⁶	i/f ²²	*j/ę-(ə) ¹⁷
*o-a	*o-a	*oa-ē	*u	*u ²³	*o/ō ²⁴	*j/ū ²⁵	*ā ¹⁶	á	*ā-ā ²⁶
*o-i	*o-e	*uo-ę	*u ²⁷	*ā/o ²⁸	*u ²⁹	*ā ³⁰	*a ³¹	a/o ³²	*ā-(ə) ³³

1. PU **kajwa₁*- ‘to dig’ > PSaa **koajwō-* and PU **talwa₁*- ‘to lead, to bring’ > PSaa **toalvō-* show that PU **a* > PSaa **oa* regularly at least before **-jw-* and **-lw-*. In a number of words, most of which contain PU **č*, PU **a-a* > PSaa **ā-ē*.

2. PMari **o* before labials, velars, **š*, **š* and intervocalic **l*; **ā* otherwise (this is a tentative formulation with a number of exceptions, to be improved in the future).

3. PPerm **ō* (**wō-* word-initially) before palatalized consonants and **-rj-*, PU **aji* > PPerm **ü*; **o* otherwise.

4. PMs **u* after PU **w-*; before velar consonants, PMs **ū* > **j* with the shift of labialization on the following velar.

5. PKh **j* before velars.

6. PU **ala*_{1/2}, **aδa*_{1/2} > PSam **ājä*. The distribution between PSam **ā* and **a* (< PU **a*) depends on Proto-Samoyed vowel of the second syllable, not on the Proto-Uralic one: **ā* before **ā*, **o* and **ū*; **a* before **ə*; monosyllabic stems have both **ā* and **a* without evident complementary distribution.
7. PKh **ū* word-initially and after labials, **ĩ* otherwise.
8. Pre-PFi **a-e* of whatever origin is lengthened to PFi **ō-e*, if the intervocalic consonant is PU **r*, **l*, **m*, **n*, **δ*, **δ'* or **j* [Aikio 2012: 232–241].
9. In pre-PSaa and pre-PMd, PU **aji* > **iji* with later development to PSaa **uo-ē* and PMd **a* [Aikio 2013: 6]; PU **a* before **γ* > PSaa **ā*, PMd **a*.
10. PMari **ā* or **o* as in the note 2 above; PMari **u* in PU **ćarwi* ‘horn’ > PMari **šur* and PU **tammi* ‘oak’ > PMari **tumə* is probably regular before clusters with the labial second component.
11. PKh **ĩ* before affixes requiring the high grade of Khanty ablaut, e.g. before (verbal and nominal) **-ā-*.
12. Hung *á* before PU **δ* and **ń*.
13. PSam **ā* before (apparently suffixal) second syllable **o* and **ū* (see Note 6); PU **ali*, **aji* > PSam **āa*.
14. PMari **o* before **k* and **ŋ* (but not before **γ*). There are also unexpected occurrences of PMari **ā* or **o* in other positions.
15. PPerm **ō* (**wō-* word-initially) before palatalized consonants, **-rj-* and intervocalic **-t-* and **-δ-*; PPerm **ō* before PU clusters beginning with **-k-*, PPerm **o* otherwise.
16. PKh **ō* ~ **ā* before labials.
17. Originally **ĩ* in PSam (not PU!) open syllable, **ē* in PSam closed syllable (but not before **-mp-*, **-nt-*) and in stems of the shape CV; but when CVC-stems add a vocalic suffix, **ē* is preserved: PU **jci-* ‘to camp’ > pre-PSam **es-* > PSam **eso-*, PU **jdi* ‘year’ > pre-PSam **er* > PSam **erö*.
18. PKh **ū* after labials, **ĩ* otherwise.
19. PFi **o* before velar obstruents; Pre-PFi **a-e* of whatever origin is lengthened to PFi **ō-e*, if the intervocalic consonant is PU **r*, **l*, **m*, **n*, **δ*, **δ'* or **j* [Aikio 2012: 232–241].
20. Coincides with PU **u* before velar obstruents (but not before cluster **-kć-*): PSaa **o* (**u* before PU **γ*), PMd **o*.
21. PPerm **o* before PU intervocalic **-k-* and **-γ-*; PPerm **ō* before PU clusters beginning with **-k-*; PPerm **ō* (**wō-* word-initially) before intervocalic **-t-* and **-δ-*.
22. Hung *i* alternating with *í* according to the rules of Hungarian morphophonology.
23. PMari **ū* before labials and after **w-*, **m-* (but not after **p-*), **u* otherwise [Aikio 2014: 157].
24. PPerm **ō* (**wō-* word-initially and after **k*) before palatalized consonants, **-rj-* and intervocalic **-t-* and **-δ-*; PPerm **wē* before PU clusters beginning with **-k-*; PU **ojC* > PPerm **ū*; **o* otherwise.
25. PMs **ū* word-initially, **ĩ* word-medially.
26. PSam **a* before PU syllable-final **l* > PSam **j*.
27. PMd **o* before **ŋ* [SUE II: 9–10].
28. PMari **ū* before labials and after **w-*, **m-* (but not after **p-*), **ā* or **o* (distributed according to rules in Note 2) otherwise [Aikio 2014: 157].
29. PPerm **ū* after **m-*, PU **oji* > PPerm **ū*; PPerm **u* otherwise.
30. PMs **a* before PMs **-γ-*, **-kt-* [SUE II: 11]; PU **oji* > PMs **uj* [SUE I: 167].
31. PKh **ĩ* before affixes requiring the high grade of Khanty ablaut, e.g. before (verbal and nominal) **-ā-*; PU **oji* > PKh **ō*.
32. Hung *o* before PU clusters (except **-nt-*, **-nč-*, **-tk-*, i.e. clusters beginning with **-n-* and **-t-*), *a* otherwise.
33. PSam **u* before PSam second syllable (suffixal?) **u*; PSam **o* before a single PU consonant.

Appendix 3. Etymological material

PU **a-a*₁

PU **aδma*₁ ‘sleep, dream’ > MariM *omo*, MariW *om* (PMari **omə*), Komi *un* (*unm-*), KomiUS *on*, KomiJ *un*, Udm *um*, UdmMU *um* (PKomi **unm-* ~ **onm-*, PUdm **um* < PPerm **onm-*), MsSo *ūlām* (PMs **ūlām*), KhV *alām* ‘sleep’, KhKaz *alām* ‘sleep’ (PKh **ālām*), KhV *ulām* ‘dream’, KhKaz *wolām* ‘dream’ (PKh **ōlām*), Hung *álom* [UEW: 335]

Deverbal noun of PU **aδi-* ‘to sleep’.

PU **apta*₁- ‘to bark’ > MariM *optem*, MariW *opte-* (PMari **opte-*), Komi *uvtñi*, KomiJ *utñó*, Udm *utñi*, UdmMU *uwtñi* (PKomi **ut-*, PUdm **ut-* < PPerm **ot-*), MsSo *ūt-* (PMs **ūt-*), KhKaz *ɔpət-* ‘to bark at game’ (PKh **āpət-*) [UEW: 14]

Komi and UdmMU forms were affected by onomatopoeia.

PU **cada*₁- ‘to rain’ > Fin *sataa*, PSam **sārā-* [Janhunen 1981: 3 (221)]

PU **čara*₁- ‘dry’ > KomiUd *šurmēm* ‘stale, dried up’, Udm *šurmñi* ‘to harden (of callosity)’ (PKomi **šurm-*, PUdm **šulürm-* < PPerm **šorm-*), MsSo *sūra* ‘dry’ (PMs **sūrā*), KhJ *sār-* ‘to get dry’ (PKh **sār-*), Hung *száraz* ‘dry’ [UEW: 466]

PU **čana*₁- ‘to hit’ > MdM *šav-*,¹⁷ MdE *čav-*, MariM *čonēm* ‘to make corner joints (in building logs)’, MariW *čanēm* ‘to make corner joints (in building logs)’ (PMari **čāñe-*), MsLU *šęñk-* ‘to kick (of a horse)’, MsLO *sāñk-* ‘to kick (of a horse)’ (PMs **šñk-*), KhJ *čok-* ‘to kick (of a horse)’, KhKaz *šonχ-* ‘to kick (of a horse)’ (PKh **čōñk-*), PSam **cāñā-* ‘to rub, wear out’ [UEW: 53–54; Aikio 2002: 11–12]

PU **kaδma*₁ ‘ashes’ > MsSo *χūlām* (PMs **kūlām*), KhJ *kājām* (PKh **kājām*), Hung *hamu* [UEW: 194–195]

According to Ante Aikio (p.c.), this word is derived from the verb **kaδa-* ‘to leave’ (**kaδa*₂- in our reconstruction). The semantic development was ‘leftovers’ > ‘ashes (= that which is left over when the fire has burned)’. The unexpected short *a* in Hung *hamu* can be explained by the influence of the deriving verb *hagy-*.

PU **kaja*₁- ‘to appear, come in sight’ > Fi *kajastaa* ‘to dawn’, SaaN *guojihit* ‘to dawn; to appear (in a wood, in a mist)’ (PSaa **kuojē-*), MariM *kojam*, MariW *kajam* (PMari **kāja-*), PSam **kājā* ‘sun’ [UEW: 642–643; Janhunen 1981: 3 (221)]

PU **kajwa*₁- ‘to dig’ > Fi *kaivaa* ‘to dig’, SaaN *goaivut* ‘to dig’ (PSaa **koajwō-*), MdM *kaja-* ‘to pour’, MdE *kaja-* ‘to throw’, MariM *kuem* ‘to shovel’, MariW *koem* ‘to shovel’ (PMari **koe-*), Komi *kojnñi* ‘to scoop out’, KomiJ *kújalno* ‘to throw about’, Udm *kujanñi* ‘to throw’ (PKomi **koj-*, PUdm **kuj-* < PPerm **kój-*), PSam **kajwā* ‘spade’ [UEW: 170–171]

PU **kala*₁- ‘to fish’ > Fi *kalin* (: *kalime-*) ‘a part of net’, Komi *kulēm* ‘set net’ (PKomi **kulēm* < PPerm **kolām*), MsSo *χūlāp* ‘net’ (PMs **kūlāp*), KhV *kalaw* ‘net’ (PKh **kālāp*), Hung *háló* ‘net’ [UEW: 120]

All these words are *nomina instrumenti* derived from an unattested verb with the meaning ‘to fish’.

PU **kala*₁- ‘to spend a night’ > Komi *voj-kov* ‘24 hours’, KomiP *oj-keṽ* ‘all night long’, Udm *keļñi* ‘to sleep; to spend a night’ (PKomi **woj-kweļ*, PUdm **keļ-* < PPerm **kwel-*), MsSo *χūl-* (PMs **kūl-*), KhV *kal-* (PKh **kāl-*), Hung *hál-* ‘to sleep; to spend a night’ [UEW: 120–121]

Vowel reflexes in Permic are highly irregular; the reconstruction is based on Ugric forms only.

¹⁷ Mordvin languages have an opposition between consonantal verbal stems (e.g., MdE *kad-oms* ‘to leave’, 3 sg. pret. *kad-ś*) and verbal stems ending in the Proto-Mordvin reduced vowel (e.g., MdE *udo-ms* ‘to sleep’, 3 sg. pret. *udo-ś*). Although this opposition is consistently marked in major Erzya-Russian and Moksha-Russian dictionaries, it is traditionally ignored in comparative Uralic studies: for example, in UEW the Erzya verbs mentioned above are cited as *kado-* and *udo-*. We hope that this regrettable tradition will no longer be maintained by Uralic scholars.

- PU **kana*₁- ‘to dig’ > Komi *kundīnj* ‘to bury’ (PKomi **kun-d-* < PPerm **kon-*), MsSo *χūn-* ‘to scoop’ (PMs **kūn-*), KhV *kij-* ‘to dig’, KhKaz *χəŋ-* ‘to scoop’ (PKh **kāŋ-*, **kīŋ-*), Hung *hány-* ‘to throw’ [UEW: 125]
- PU **kanta*₁- ‘to carry’ > Fi *kantaa*, SaaN *guoddit* (PSaa **kuontē-*), MdM *kand-*, MdE *kand-*, MariM *kondem* ‘to bring’, MariW *kandem* ‘to bring’ (PMari **kānde-*), MsLO *χūnt-* ‘to carry on the back’ (PMs **kūnt-*), KhV *kantəm-* ‘to carry on the back’ (PKh **kāntəm-*), PSam **kāntā-* [UEW: 124]
- PU **kanta*₁- ‘to carry’ is a causative from PU **kani-* ‘to go’, preserved only in PSam **kân-* ‘to go’.
- PU **lapta*₁ ‘flat’ > Fi *lattea* ‘flat’, MdM *laftu* (pl. *laftuft*) ‘shoulder’, MdE *lavtov* ‘shoulder’, MariM *laptâra* ‘flat’, MariW *laptâra* ‘flat’ (PMari **laptâra*), KhV *lawtək* ‘even’, KhKaz *лэптэх* ‘flat’ (PKh **lāptək*), PSam **jāptā* ‘thin’ [UEW: 238]
- As far as we know, comparison with the Mordvin word for ‘shoulder’ was not suggested previously. The semantic development ‘flat piece’ > ‘shoulder blade’ > ‘shoulder’ is attested in a number of Indo-European languages, see [Buck 1949: 235–236]. Fi *lattea* ‘flat’ may alternatively be viewed as a loan from Proto-Germanic **flata-* ‘flat’.
- PU **para*₁ ‘good’ > Fi *paras* ‘best’, SaaN *buorre* (PSaa **puorē*), MdM *para*, MdE *paro*, MariM *poro*, MariW *purâ* (PMari **porâ* ~ **purâ*), Komi *bur*, Udm *bur*, UdmMU *bur* (PKomi **bur*, PUdm **bur* < PPerm **bor*) [UEW: 724]
- PU **sala*₁- ‘to steal’ > Fi *salata* ‘to hide’, SaaN *suollit* ‘secretly’ (PSaa **suolē-*), MdM *sala-*, MdE *sala-*, MariW *šolâ* ‘thief’ (PMari **solâ*), MsSo *tūlmant-* (PMs **tūlmānt-*), KhV *laləm-*, KhVj *jaləm-* (PKh **Laləm-*), PSam **tālā-* [UEW: 430–431]
- PU **s/šara*₁ ‘flood’ > MsSo *tūr* ‘lake’ (PMs **tūr*), KhV *lar* ‘flood plain’, KhVj *jar* ‘flood plain’ (PKh **Lār*), Hung *ár* ‘flow; flood water’ [UEW: 843–844]
- PU **sarka*₁ ‘fork’ > Fi *sarka* ‘strip (of field)’, SaaN *suorgi* (PSaa **suorkē*), PSam **tårkå* [Janhunen 1981: 3 (221)]
- PU **talwa*₁- ‘to lead, to bring’ > SaaN *doalvut* ‘to lead, to take (somewhere)’ (PSaa **toalvō-*), MariM *tolam* ‘to come’, MariW *tolam* ‘to come’ (PMari **tola-*), MsSo *tūl-* ‘to bring, to lead, to drive’ (PMs **tūl-*), PSam **tājwå-* ‘to arrive, reach; to bring’ [Aikio 2002: 29–30]
- PU **wara*₁ ~ **wārä* ‘mountain’ > Fi *vuori* (: *vuore-*), SaaN *várri* (PSaa **vārē*), PSam **wārä* [Sammallahti 1988 551; Aikio 2006: 27–28]
- Finnic and Saami words go back to PU **wārä*, Samoyed one – to PU **wara*₁. See PU **wara*₂ ‘edge’ and PU **wori* ‘forest’ for other forms usually compared with reflexes of PU **wara*₁ ~ **wārä*.

PU **a-a*₂

- PU **amma*₂- ‘to scoop’ > Fi *ammentaa*, MdM *amōla-*, MdE *amolā-*, MsN *ūm-* (PMs **ūm-*), KhV *um-*, KhKaz *ūm-* (PKh **ūm-*) [UEW: 7–8]
- PU **aŋča*₂ ‘nelma’ > Komi *už*, (PKomi **už* < PPerm **ož*), MsSo *ūs* (*ūns-*) (PMs **ūnš*), KhJ *unč*, KhKaz *wüş* (PKh **ūŋč*), PSam **aŋčV* [UEW: 339]
- PU **aŋa*₂- ‘to open’ > Fi *avata* ‘to open’, MdE *avf-* ‘to open (e.g. mouth)’, MsKM *ēŋ.k_o-* ‘to take off clothes’, MsSo *āŋ.k_o-* ‘to take off clothes’ (PMs **ŋ.k_o-*), KhKaz *εŋχ-* ‘to unbind; to take off clothes’ (PKh **ŋk-*), PSam **(ŋ)aŋə-* ‘to take off clothes’ [UEW: 11; Aikio 2002: 50]
- PU **čača*₂- ‘to be born’ > Fi *sataa* ‘to yield harvest’, MdM *šáč-*, MdE *čáč-*, MariM *šočam*, MariW *šačam* (PMari **šāča-*), Komi *čužni*, Udm *čiči-viči* ‘kin’ (PKomi **čuž-*, PUdm **čič-* < PPerm **čož-*), MsN *sūns-* ~ *sūs-* ‘to grow, to increase (intr.); to have cubs (of a bear)’ (PMs **šū(n)š-*), KhV *čičim* ‘one-year old bear cub’ (PKh **čičVm*), PSam **caci* ‘family, tribe’ [UEW: 52; SUE II: 14–17]
- PU **jalka*₂ ‘foot’ > Fi *jalka*, SaaN *juolgi* (PSaa **juolkē*), MdM *jalga* ‘on foot’, MdE *jalgo* ‘on foot’, MariM *jol*, MariW *jal* (PMari **jål*), Hung *gyalog* ‘on foot’ [UEW: 88–89]

PU **kaća*₂ ‘to present’ > MdM *kaž-*, MdE *kaž-*, Komi *kožin* ‘(wedding) present’, KomiJ *kuúžin* ‘a present’, Udm *kužim* ‘a present’ (PKomi **kožin*, PUdm **kužim* < PPerm **kóž-*), Hung *haszon* ‘profit’, PSam **kãso* ‘payment, gift’ [UEW: 111]

MariM *kuzâk* ‘dowry’, MariW *kuzâk* ‘dowry’ (PMari **kućak*) are certainly borrowed from some other branch of Uralic, most probably from Permic.

PU **kačka*₂ ‘to bite’ > Fi *katkera* ‘bitter’, SaaN *gáskit* (PSaa **käckē-*), MariM *kočkam* ‘to eat’, MariW *kačkam* ‘to eat’ (PMari **kãčka-*), MsSo *χūs-* ‘to sting (of nettle)’ (PMs **kūs-*), KhV *kjč-* ‘to ache’, KhJ *kjč* ‘nettle’ (PKh **kjč-*, **kjč*) [UEW: 641; SUE II: 5–8]

PU **kađa*₂ ‘to leave’ > Fi *kadota*, SaaN *guođđit* (PSaa **kuođē-*), MdM *kad-*, MdE *kad-*, MariM *kođem*, MariW *kođem* (PMari **kođe-*), Komi *kolni*, KomiJ *kúlno*, Udm *kilñni* ‘to fall behind; to stay’ (PKomi **kol-*, PUdm **kjł-* < PPerm **kól-*), MsSo *χül-* (PMs **kül-*), KhJ *kij-* (PKh **kj̄j-*), Hung *hagy-*, PSam **kãjä-* [UEW: 115–116]

PU **kala*₂ ‘fish’ > Fi *kala*, SaaN *guolli* (PSaa **kuolē*), MdM *kal*, MdE *kal*, MariM *kol*, MariW *kol* (PMari **kol*), MsSo *χül* (PMs **kül*), KhV *kul*, KhKaz *χül* (PKh **kül*), Hung *hal*, PSam **kälä* [UEW: 119]

Khanty **ū* instead of the expected **̄j* is unclear. Still, the word has a PKh high vowel.

PU **kama*₂ ‘rind, crust’ > Fi *kamara* ‘rind’, MariM *kom* ‘crust’, MariW *kom* ‘crust’ (PMari **kom*), PSam **kamã* ‘scale’ [UEW: 121–122]

PU **kara*₂ ‘to dig’ > MdM *kara-* ‘to dig’, MdE *kara-* ‘to hollow out, to dig’, MariM *korem* ‘to hollow out, to dig’, MariW *karem* ‘to dig’ (PMari **kãre-*), KhKaz *χir-* ‘to dig; to shovel’ (PKh **kj̄r-*) [UEW: 221–222]

PU **ňanča*₂ ‘to stretch’ > SaaN *njuozzit* ‘to hammer, beat smth. so that it becomes flat and thin’ (PSaa **ňuoncē-*), ? MariM *nönčâk* ‘dough’, ? MariW *nünžak* ‘dough’ (PMari **nünčak*), Komi *ňužavni*, Udm *ňužani* (PKomi **ňuž-*, PUdm **ňu/ůž-* < PPerm **ňož-*), MsSo *ňüns-* (PMs **ňünš-*), KhV *ňjñč-* (PKh **ňjñč-*) [UEW: 323; SUE III: 84–85]

Comparison with Mari is uncertain (Mari word reflects first syllable **j*).

PU **pala*₂ ‘bit’, **pala*₂ ‘to gobble’ > Fi *pala* ‘bit’, MdM *pal* ‘meat’, MdE *pal* ‘bit’, MsSo *pül* ‘bit’ (PMs **pül*), MsSo *pül-* ‘to eat, to gobble’ (PMs **pül-*), KhV *puł* ‘bit’, KhKaz *pül* ‘bit’ (PKh **pül*), Hung *falat* ‘bit’, *fal-* ‘to gobble’, PSam **pälã-* ‘to swallow’ [UEW: 350]

PU **palka*₂ ‘village’ > MsP *pēl* ~ *pēwl*, MsSo *pāwl* (PMs **pj̄wəl*), KhV *puγal*, KhIrt *puχæt* (PKh **pūγal*), Hung *falu* [UEW: 351; Sammallahti 1988: 548]

PU **panča*₂ ‘to open’ > SaaL *puottsō* ‘naked’ (PSaa **puoncō*), MdM *panž-*, MdE *panž-*, MariM *počam*, MariW *pačam* (PMari **pãča-*), Komi *pužni* ‘to roll up (e.g. sleeves)’, Udm *pužaltjini* ‘to roll up (e.g. sleeves)’, UdmMU *pužawtjini* ‘to turn inside out’ (PKomi **puž-*, PUdm **puž-* < PPerm **pož-*), MsSo *püns-* (PMs **pünš-*), KhV *puñč-*, KhKaz *pññš-* (PKh **pünñč-*) [UEW: 352]

PU **pata*₂ ‘pot’ > Fi *pata*, MariM *pot*, MariW *pat* (PMari **pât*), MsSo *püt* (PMs **püt*), KhV *put*, KhKaz *püt* (PKh **püt*), Hung *fazék*, PSam **patã-* ‘to pot’ [UEW: 358; Aikio 2002: 50]

PU **taka*₂ ‘behind’ > Fi *taka-*, SaaN *duohki* (PSaa **tuokē*), PSam **takã-* [UEW: 506–507]

PU **wanča*₂ ‘to step over’ > SaaN *vázzit* ‘to go (on foot)’ (PSaa **vāncē-*), MariM *wońcem*, MariW *wanžem* (PMari **wãnce-*), Komi *vužni* ‘to cross over’, Udm *vižjini* ‘to cross over’ (PKomi **vuž-*, PUdm **viž-* < PPerm **vož-*), MsSo *uns-* (PMs **unš-*), KhV *uñč-* ‘to cross (a river)’, KhKaz *wññš-* ‘to cross (a river)’ (PKh **uñč-*), PSam **wãncV-* ‘to sneak’ [UEW: 557; Aikio 2002: 36–38]

PU **wara*₂ ‘edge’ > MsSo *ur* ‘mountain, mountain ridge’ (PMs **ur*), KhV *ur* ‘sharp edge’, KhKaz *wür* ‘sharp edge; mountain ridge covered with forest’ (PKh **ür*), PSam **wãra* ‘edge’ [Aikio 2006: 27–28]

Samoyed has **ã* instead of the expected **a*. See PU **wara*₁ ~ **wärã* ‘mountain’ and PU **wori* ‘forest’ for other forms usually compared with reflexes of PU **wara*₂.

PU **a-a*₁ or **a-a*₂

PU **ačka-* ‘to step’ > Fi *askel* ‘step’, MdM *áskała-*, MdE *éskeła-*, MariM *oškeđem*, MariW *aškeđem* (PMari **áškeđe-*), Komi *voškov* ‘step’, KomiJ *úšköl* ‘step’, ? Udm *učkil* ‘step’ (PKomi **woškeł*, ? PUdm **učkil* < PPerm **woškäl*), MsN *ūs-* (PMs **uš-*), PSam **asəl-* ‘to step over’ [UEW: 19]

The Udmurt form is a hapax, attested only in Wiedemann’s dictionary [Wiedemann 1880: 549], and thus highly unreliable (Wiedemann’s dictionary contains a number of otherwise unattested Komi and Udmurt forms). The usual Udmurt word for ‘step’ is *vaniš*.

PU **aja-* ‘to drive’ > Fi *ajaa*, SaaN *vuodjit* (PSaa **vuojē-*), Komi *vojni* ‘to bolt downhill (of horse)’, Udm *ujini* ‘to run after, to pursue’ (PKomi **wo/ɔj-*, PUdm **uj-* < PPerm **wò/ɔj-*), MsK *jit-wujt-* ‘to hunt, to pursue’ (PMs **ū/ujt-*) [UEW: 4–5]

PU **carta* ‘elk’ > MdM *šarda* (pl. *šartt*) ‘deer’, MdE *šardo* (pl. *šartt*) ‘elk’, MariM *šorđo* ‘elk’, MariW *šarđā* ‘elk’ (PMari **šārđa*) [UEW: 464]

PU **kakta* ‘two’ > Fi *kaksi* (: *kahte-*), SaaN *guokte* (PSaa **kuoktē*), MdM *kafta*, MdE *kavto*, MariM *kok*, MariW *kok* (PMari **kok*) [UEW: 118–119]

This reconstruction is valid only for the Proto-Finno-Volgaic level.

PU **kaswa-* ‘to grow’ > Fi *kasvaa*, MdM *kas-*, MdE *kas-* [UEW: 129–130]

PU **mara-* ‘to dive’ > MSo *mürs-* ‘to dive’ (PMs **mūr-*), KhVj *māra-* (1 sg. perf. *mōram*) ‘to get wet’ (PKh **mīrā-* ~ **mar-*), Hung *márt-* ‘to dip’ [UEW: 868]

Shortness of the vowel in Khanty can be explained by suffixation: Khanty verbs with the suffix **-ā-* always have short PKh vowels in the root.

PU **mašta-* ‘to be able’ > Fi *mahtaa*, MdM *mašt-*, MdE *mašt-*, MariM *moštem*, MariW *māštem* (PMari **mošte-*) [UEW: 265]

PU **nataw* ‘sister-in-law’ > Fi *nato* ‘husband’s sister’, SaaS *nāate* ‘wife’s sister’ (PSaa **nuotōj*), MariM *nuđo* ‘younger sister-in-law’, MariW *nuđā* ‘younger sister-in-law’ (PMari **nuđa*), PSam **nāto* ‘spouse’s brother’ [UEW: 299–300]

Mari **u* can be explained by the influence of the second syllable **-aw*.

PU **sańća-* ‘to stand’ > Fi *seisoa*, EstS *saisa-*, SaaN *čuožžut* (PSaa **čuońćō-*), MdM *šta-* ‘to stand up’, MdE *šta-* ‘to stand up’, MsTJ *tōńć-* (PMs **tūńć-*), KhVj *jjńć-* ‘to set up’, KhKaz *лońś-* ‘to set up’ (PKh **Lāńć-* ~ **Ljńć-*) [UEW: 431–432]

Mari and Komi words, usually included in this etymology, go back to a different root: PU **sińćV-* ‘to sit’ > MariM *šińćem* ‘to sit; to be situated’, MariW *sənzem* ‘to sit; to be situated’ (PMari **šińće-*), KomiJ *sińji* ‘to settle down (somewhere)’ (PKomi **siɟ* < PPerm **siɟ-*).

PU **šappa* ‘sour’ > Fi *hapan* (: *happame-*), MdM *šapama*, MdE *čapamo*, MariM *šopo*, MariW *šapā* (PMari **šāpā*) [UEW: 54–55]

PU **šara* ‘fork, branch’ > Fi *hara* ‘harrow’, Est *haru* ‘branch’, SaaN *suorri* ‘fork, branch’ (PSaa **suorē*), MariM *šor-wondo* ‘rake’ (PMari **šā/or*) [UEW: 783; Aikio 2009: 149]

PU **tappa-* ‘to entangle’ > MdM *tapańa-*, MdE *tapa-*, MariM *towo* ‘tangle’, MariW *tawā* ‘dag lock’ (PMari **tāwā*), Komi *tupil* ‘clew’ (PKomi **tupil* < PPerm **top-*) [KЭCK: 287]

PU **wačka-* ‘to hit’ > Fi *vatkata* ‘to whisk (in cooking)’, MdM *vačkad-*, MdE *vačkod-* [UEW: 548]

PU **waja-* ‘to sink’ > Fi *vajota*, SaaN *vuodjut* (PSaa **vuojō-*), MdM *vaja-*, MdE *vaja-*, Komi *vejni*, KomiJ *vújnə*, Udm *vijini* (PKomi **vej-*, PUdm **vij-* < PPerm **vuj-*), MsSo *uj-* (PMs **uj-*) [UEW: 551]

Permic reflexes are irregular.

PU **wala* ‘word, song’ > Fi *vala* ‘oath’, SaaL *vuollē* ‘yoik (traditional Saami song)’ (PSaa **vuolē*), MdM *val* ‘word’, MdE *val* ‘word’, PSam **wālā* ‘song’ [UEW: 812; Aikio 2006: 26–27]

PU **wala* ‘word, song’ may be a correlative derivative of PU **wali-* ‘to speak’, reflected only in PSam **wāā-* ‘to speak’ (see [Aikio 2002: 54–55] on this archaic derivation pattern).

PU **vatka-* ‘to bark (a tree)’ > SaaI *vyetkiđ* ‘to bark (a pine tree)’ (PSaa **vuotkē-*), MdM *vatka-* ‘to peel, skin, bark’, MdE *vatka-* ‘to scratch; to peel, skin, bark’, MariM *woktam* ‘to bark (a tree)’, MariS *wotkem* ‘to bark (a tree)’, MariW *waktam* ‘to bark (a tree)’ (PMari **wátke-* ~ **wákta-*), PSam **wât-* ‘to bark (a birch tree)’ [UEW: 561]

PU **a-i*

PU **ađi-* ‘to sleep’ > SaaN *oađđit* (PSaa **oađē-*), MdM *uđa-*, MdE *udo-*, Old South Mansi *алалахъ*, KhV *āla-* ‘to lie; to sleep’ (PKh **īlā-*), Hung *alud-* [UEW: 334]

PU **ađi* ‘bed’ > Fi *vuode*, SaaN *vuodđu* ‘bottom; layer (under something), foundation; sole (of a shoe)’ (PSaa **vuodō-*), Komi *vol’* (*voll’-*) ‘hide (of deer or elk)’, KomiJ *úl-pas* ‘bed’, Udm *val’ini* ‘to make the bed’, UdmMU *wal’ini* ‘to make the bed’ (PKomi **wol’-*, PUdm **wal’-* < PPerm **wól’-*), MsSo *ālāt* ‘bed’ (PMs **ālāt*), Hung *ágy* ‘bed’ [UEW: 4; SUE I: 171–172]

In Saami the early affixation of **o* < **aw* prevented the expected shift **a-i* > **oa-ē*.

PU **ajji* ‘brain’ > Fi *aivot*, SaaN *vuoigijašat* (PSaa **vuoijje-*), Hung *agy* [UEW: 5]

PU **ammi* ‘previous’ > Fi *ammoin* ‘long ago, in ancient times’, SaaN *oamis* ‘old (of things)’ (PSaa **oamē-*), MdE *umoń* ‘ancient, bygone; old (of things)’, Hung *ó* ‘ancient; old (of things)’, *avul-* ‘to become obsolete’ [UEW: 337–338; Ante Aikio (p.c.)]

PU **ani* ‘big, many’ > Komi *una* ‘many’, Udm *uno* ‘many’, UdmMU *uno* ‘many’ (PKomi **una*, PUdm **uno* < PPerm **ona*), KhNi *unə* ‘big’, KhKaz *wəŋ* ‘big’ (PKh **a/ōnV*) [UEW: 9]

PU **ańi* ‘elder brother’s wife’ > SaaK *vueńń* (PSaa **oańē-*), MsSo *āńiγ* (PMs **āńāγ*), KhVj *āńki* (PKh **jńkī*), Hung *ányg* ‘spouse’s sister; brother’s wife’ [UEW: 10–11]

According to Ante Aikio (p.c.), *-ngy* in Hungarian word is from **-ńg* < **-ńVγ/k* (cf. Ob-Ugric forms with a suffixed velar).

PU **ćali* ‘intestine’ > Fi *suoli* (: *suole-*), SaaN *čoalli* (PSaa **ćoalē-*), MdM *śula* (pl. *śulət*), MdE *śulo* (pl. *śulot*), MariM *šolo*, MariW *šol* (PMari **šola*), Komi *śuv* (*śuvj-*), Udm *śul*, UdmMU *śuw* (PKomi **śul*, PUdm **śul* < PPerm **śol*), KhV *sqł*, KhKaz *sqł* (PKh **sal*) [UEW: 483–484]

PU **ćalmi* ‘strait’ > Fi *salmi* (: *salme-*), SaaN *čoalbmi* (PSaa **ćoalmē-*), Udm *śum* ‘bay, inlet; small oblong lake near a river’, UdmU *śum* ‘small lake near a river’ (PUdm **śum* < PPerm **śo/ō/ōm*) [UEW: 775]

PU **ćarwi* ‘horn’ > Fi *sarvi* (: *sarve-*), SaaN *čoarvi* (PSaa **ćoarvē-*), MdM *śura* (pl. *śurət*), MdE *śuro* (pl. *śurot*), MariM *šur*, MariW *šur* (PMari **šur*), Komi *śur*, Udm *śur*, UdmMU *śur* (PKomi **śur*, PUdm **śur* < PPerm **śor*), MsSo *sōrp* ‘male elk’ (PMs **šārəp*), Hung *szarv* [UEW: 486–487]

PU **ćaši* ‘barley’ > MdM *šuž*, MdE *šuž*, MariM *šož*, MariW *šož* (PMari **šož*), Komi *ćuž* (*ćužj-*) ‘malt’, Udm *čužjem* ‘malt’, UdmMU *čužjem* ‘malt’ (PKomi **čuž*, PUdm **čužjem* < PPerm **čož*) [UEW: 622]

PU **kaćmi* ‘onion’ > KomiP *komiž* ‘spring onion’, KomiJ *kúmić* ‘spring onion’, Udm *kumijž* ‘garlic’ (PKomi **komiž*, PUdm **kul’umijž* < PPerm **komiž*), MsP *koššam* ‘onion’, MsLO *χōsman* ‘onion’ (PMs **kāćam*), Hung *hagyma* ‘onion’ [UEW: 164–165]

PU **kaćmi* > pre-PPerm **kōžim* > PPerm **komiž*.

PU **kaji* ‘stalk’ > SaaN *guodja* ‘flower stalk or seed shell of a sedge’ (PSaa **kuoje*), Komi *kj* ‘awn’, Udm *kj* ‘awn’ (PKomi **kj*, PUdm **kj* < PPerm **kú*), MsLU *kōj* ‘head hair’ (PMs **kāj*), Hung *haj* ‘hair’, PSam **kâa* ‘stalk, stem, slender object’ [SUE I: 166–167]

PU **kali-* ‘to die’ > Fi *kuolla*, MdM *kulə-*, MdE *kulo-*, MariM *kolem*, MariW *kolem* (PMari **kole-*), Komi *kuvni*, Udm *kul’ini*, UdmMU *kuw’ini* (PKomi **kul-*, PUdm **kul-* < PPerm **kol-*), MsSo *χōl-* (PMs **kāl-*), KhV *kāla-* (PKh **kīlā-*), Hung *hal-*, PSam **kâa-* [UEW: 173]

An early derivative of this root is PU **kalma* ‘death, grave’ > Fi *kalma* ‘death’, MdM *kalma* (pl. *kalmət*) ‘grave’, MdE *kalmo* (pl. *kalmot*) ‘grave’ [UEW: 119–120]

PU **kamti* ‘lid’ > Fi *kansi* (*kante-*), SaaN *goavdi* ‘shed, awning’ (PSaa **koamtē*), MdE *kundo* (pl. *kuntt*), MariM *komδāš*, MariW *komδāš* (PMari **komδās*), Komi *kud* (*kudj-*) ‘bast basket’, *ji kud ulin* ‘under the ice’, Udm *kudj* ‘bast basket’, UdmJ *kudj* (PKomi **kud*, PUdm **kūdj* < PPerm **kodj*) [UEW: 671]

For the meaning of the Permic word cf. Negidal *komtaxan* ‘birch-bark box’ < Proto-Tungus-Manchu **komta-n* ‘lid’, itself possibly borrowed from Uralic. The usual idea that the Permic word is borrowed from Chuvash *kuntä* ‘bast basket’ does not hold water: the Chuvash word itself is borrowed from Tatar *qumta* ‘box’, and Permic denasalization would be impossible in such a late loan.

PU **kari* ‘skin, bark’ > Fi *kuori* (: *kuore-*) ‘crust, bark’, PSam **kar* ‘skin, surface’ [Aikio 2002: 50]

PU **karki* ‘bitter’ > Fi *karkea* ‘rough, coarse’, Kar *karkie* ‘bitter’, Komi *kurid* ‘bitter’, Udm *kurit* ‘bitter’, UdmMU *kurit* ‘bitter’ (PKomi **kurid*, PUdm **kurit* < PPerm **korid*), KhV *korəγ-* ‘to sting, burn (in mouth from bitter or sour food); to turn sour’ (PKh **karəγ-*) [UEW: 128–129; Aikio 2013: 8]

PU **karti-* ‘to roast, to burn’ > Fi *karsi* (: *karte-*) ‘snuff; crust, dirt, carbon deposit’, SaaN *goardit* ‘to roast; to burn (of the sun)’ (PSaa **koartē-*), MariE *kordem* ‘to fumigate’ (PMari **kå/orde-*) [UEW: 186–187; Aikio 2013: 8]

The intervocalic clusters in MdM *kəRta-* ‘to singe; to burn (tr.)’, MdE *kirta-* ‘to singe’ reflect PU **-rtt-*. The unusual three-consonant cluster can be explained if we assume that this verb is a causative from the root of MdM *kərväz-* ‘to catch fire’, MdE *kirva-* ‘to blaze’ < PU **korp-*, caus. **korp-ta-*.

PU **lañci* ‘soft’ > SaaN *loažži* ‘abated wind’ (PSaa **loañcé*), MsTJ *lañčəŋ* ‘warm’, MsSo *loñšəŋ* ‘warm’ (PMs **lañčəŋ*), KhKaz *loñsi* ‘lukewarm’, KhO *loñsi* ‘lukewarm’ (PKh **la/ṽñčəŋ*), Hung *lággy* ‘soft, gentle’ [UEW: 250–251]

The vowel in Mansi is irregular.

PU **ñali-* ‘to lick’ > Fi *nuolla*, SaaN *njoallut* (PSaa **ñoalō-*), MdM *nola-*, MdE *nola-*, MariM *nulem*, MariW *nālem* (PMari **nūle-*), Komi *ñuvni*, Udm *ñulini*, UdmMU *ñuwini* (PKomi **ñul-*, PUdm **ñul-* < PPerm **ñol-*), MsTJ *ñalānt-*, MsSo *ñolant-* (PMs **ñal-*), KhV *ñāla-* (PKh **ñilā-*), Hung *nyal-*, PSam **ñā-* [UEW: 321]

PU **paði* ‘dam’ > Fi *pato*, SaaN *buođđu* (PSaa **puoδō*), KhV *pāl* ‘fish weir’ (PKh **pjl*), Hung *fal* ‘wall’ [UEW: 347]

In Saami the early affixation of **o* < **aw* prevented the expected shift **a-i* > **oa-ē*.

PU **pari(ma)* ‘gadfly’ > Fi *paarma*, SaaN *boaru* (PSaa **poarō*), MdM *purəm*, MdE *promo*, MariM *pormo*, MariW *parmā* (PMari **pārmə*) [UEW: 724–725]

PU **pariwali* ‘raft’ > Fi *parvi* (: *parve-*) ‘flock, shoal, swarm; loft, hayloft’, SaaN *boar’ri* ‘raft’ (PSaa **poarēvē*), Komi *pur* (*purj-*) ‘raft’, Udm *pur* ‘raft’, UdmMU *pur* ‘raft’ (PKomi **pur*, PUdm **pur* < PPerm **por*), MsSo *pōra* ‘raft’ (PMs **pārā*), KhVj *pāra* ‘flock (of birds); raft’ (PKh **pjrā*), PSam **pārū* ‘storage hut’ [UEW: 356–357, 395–396]

Final **-ä* in Samoyed is a result of contraction of the sequence **-iwa*.

For semantics cf. one of the meanings of English *raft* according to Oxford English Dictionary: ‘A large floating mass or accumulation of some material, or collection of materials, as fallen trees, logs, vegetation, ice, etc. Also, a dense flock of swimming birds, esp. ducks; similarly, a group of other aquatic animals.’

The Samoyed form is considered by Aikio to be an Ob-Ugric loan [Aikio 2013: 8]. I do not see any compelling reason for this: the meanings of Ob-Ugric and Samoyed forms are different, and the second syllable **-ä* in Samoyed also cannot be derived from Ob-Ugric form: unlike Samoyed, Ob-Ugric does not tolerate disharmonic stems.

PU **sayi-* ‘to arrive, to get’ > Fi *saada* ‘to get’, SaaK *soagke* ‘to catch; to get’ (PSaa **sāke-*), MdM *sa-* ‘to come’, *šav-* ‘to take’, MdE *sa-* ‘to come’, *saj-* ‘to take’, MariM *šuum* ‘to ar-

rive, reach', MariW *šoam* 'to arrive, reach' (PMari **šo-a-*), Komi *sunj* 'to catch, to catch up with', Udm *sutinj* 'to catch up with', UdmMU *sutinj* 'to catch up with' (PKomi **su-*, PUdm **sü-t-* < PPerm **so-*) [UEW: 429–430]

PSaa **ā* is a result of vowel lengthening before **γ*.

PU **sani-* 'to enter' > SaaK *suanjje* 'to enter' (PSaa **soanjō-*), MdM *suva-* 'to enter', MdE *sova-* 'to enter', MariE *šoŋalam* 'to put on (clothes)', MariW *šəŋgalam* 'to put on (clothes)' (PMari **s/šoŋala-*), Komi *sunavni* 'to dive', Udm *zimjini* 'to dive', UdmS *zumjini* 'to dive' (PKomi **sun-*, PUdm **zum-* ~ **zim-* < PPerm **soŋ-*), MsKM *tū-* 'to enter' (PMs **tū-*), KhV *lāŋa-* 'to enter', KhVj *jāŋa-* 'to enter' (PKh **Lijā-*), Hung *av-* 'to penetrate; to soak in' [UEW: 446–447; Aikio (forthcoming): 61–62]

PU **šariwa* 'thin, rare' > Fi *harva* 'few; thin', MdM *šura* 'rare', MdE *čuro* 'rare', KhVj *joṛaw* 'rare (of net etc.)', KhIrt *turəp* 'rare (of net etc.)' (PKh **Larəp*) [UEW: 502]

PU **tammi* 'oak' > Fi *tammi* (: *tamme-*), MdM *tuma* (pl. *tumat*), MdE *tumo* (pl. *tumot*), MariM *tumo*, MariW *tum* (PMari **tumə*) [UEW: 798]

PU **tari-ksV* 'across' > SaaN *doaris* 'across, athwart' (PSaa **toarēs*), MdM *turks* 'across, athwart', MdE *troks* 'across, athwart', MariM *toreš* 'across', MariW *toreš* 'across' (PMari **toreš*) [UEW: 799]

PU **waji* 'fat' > Fi *voi* 'butter', SaaN *vuodja* 'butter; (liquid) fat' (PSaa **vuojje*), MdM *vaj* 'oil, butter', MdE *oj* 'oil, butter; fat', MariM *üj* 'oil, butter', MariW *ü* 'oil, butter' (PMari **ü*), Komi *vij* 'oil, butter', Udm *vej* 'oil, butter' (PKomi **vij*, PUdm **vej* < PPerm **vVj*), MsLO *wōj* 'fat' (PMs **wāj*), KhV *wōj* 'fat' (PKh **waj*), Hung *vaj* 'butter' [UEW: 578–579]

The Finnic word has undergone a complex, but regular development: **waje* > **ōje* > **wōje* > *voi*. Mari and Permic reflexes are aberrant.

PU **wajni* 'breath' > SaaN *vuoiŋa* 'spirit' (PSaa **vuojje*), PSam **wajŋ-* [UEW: 552–553]

PU **wakštira* 'maple' > Fi *vaahtera*, MdM *uštər*, MdE *ukštər*, MariM *waštar*, MariW *waštar* (PMari **waštar*) [UEW: 812]

PU **wanči* 'root' > MariM *wož*, MariW *waž* (PMari **wāž*), Komi *vuž* (*vužj-*), Udm *vižj* (PKomi **vuž*, PUdm **vižj* < PPerm **vožj*), KhKaz *wōš* 'butt of a tree', KhO *wās* 'up-rooted stump' (PKh **wič(ā)*), PSam **wāncō* [UEW 548–549]

PU **warti* 'stalk, stem; handle' > Fi *varsi* (: *varte-*), MariM *wurdo*, MariW *wurδə*, MariV *wūrdo* (PMari **wūrδə*) [UEW: 814]

The vowel in Mari is irregular.

PU **j-a*₁

PU **čilka*₁ 'lath' > Fi *salko* 'pole', SaaN *čuolggu* 'crowbar' (PSaa **čuolkōj*), MdM *šalga* (pl. *šalkt*) 'awn', MdE *šalgo* (pl. *šalkt*) 'sting (of a bee); thorn', Komi *šuv* (*šuvj-*) 'sledge runner', Udm *šul* 'sledge runner', UdmMU *šuw* 'sledge runner' (PKomi **šul*, PUdm **šul* < PPerm **šol*), MsP *sajla* 'lath', MsSo *sāyla* 'lath' (PMs **sājylā*), KhV *sayəl* 'lath', KhKaz *soχəλ* 'board' (PKh **sāyəl*), Hung *szálfa* 'lumber wood; long log' [UEW: 460–461; Reshetnikov & Zhivlov 2011: 106]

PU **čita*₁ 'hundred' > Fi *sata*, SaaN *čuohiti* (PSaa **čuotē*), MdM *šada*, MdE *šado*, MariM *šüδö*, MariW *šüδə* (PMari **šüδə*), Komi *šo*, KomiUS *šə*, Udm *šu*, UdmMU *šü*, UdmB *šü* (PKomi **šo*, PUdm **šu* < PPerm **só*), MsP *šēt*, MsSo *sāt* (PMs **šīt*), KhV *sat* (PKh **sāt*), Hung *száz* [UEW: 467]

PU **kjinta*₁ 'stump of tree' > Fi *kanta* 'heel, base', *kanto* 'stump of tree', SaaN *guottu* 'stump of tree' (PSaa **kuontōj*), MdM *kanda* (pl. *kantt*) 'block, log', MdE *kando* (pl. *kantt*) 'block, log', MsLO *χānta* 'horizontal beam in the floor of a stilt storage hut; stilt of a stilt storage hut' (PMs **kjintā*), KhTrj *kānt* 'stilt of a stilt storage hut' (PKh **kānt*) [UEW: 123]

PU **nĭkra*₁ ‘Siberian pine nut’ > Fi *nauris* ‘turnip’, MsP *nēr* (PMs **nĭr*), KhV *naγar*, KhKaz *noχar* (PKh **nāγar*) [UEW: 298]

PU **pĭŋka*₁ ‘mushroom’ > MdM *panga* (pl. *pankt*), MdE *pango* (pl. *pankt*), MariM *poŋgo*, MariW *poŋgə* (PMari **poŋgə*), MsP *pēŋk* ‘fly agaric’ (PMs **pĭŋk*), KhV *paŋk* ‘fly agaric’ (PKh **pāŋk*), PSam **peŋkå*- ‘to get drunk’ [UEW: 355–356; Aikio 2013: 11]

The Samoyed verb (preserved only in Nganasan) can hardly be an Ob-Ugric loan: Ob-Ugric verbs with the meaning ‘to get intoxicated’ (PMs **pĭŋkal*-, PKh **pāŋkal*-) are derived from the noun ‘fly agaric’ with the suffix *-l*-. There is no reason to suppose either the loss of the suffix on Samoyed soil, or the borrowing of Ob-Ugric noun as a Samoyed verb.

PU **šĭra*₁- ‘to dry (intr.)’ > Komi *šuravni* ‘to dry (intr.)’ (PKomi **šur*- < PPerm **šor*-), PSam **tĭrā*- ‘to dry (intr.)’ [UEW: 502–503]

The Permic verb can be compared either to the Samoyed one, or to SaaN *soarvi* ‘dead pine tree’ (PSaa **soarvē*). We prefer the former comparison as it seems more straightforward semantically.

PU **wĭlka*₁- ‘to go down’ > Fi *valkama* ‘haven’, MdM *valg-*, MdE *valg-*, MariM *wolem*, MariW *walem* (PMari **wāle*-), MsLU *wajl-*, MsSo *wāyl-* (PMs **wĭyl*-), KhV *wayal*-, KhVj *wĭyal*-, KhNi *wəχət*- (PKh **wāyal*-, **wĭyal*-), Hung *vál*- ‘to turn into; to divorce’ [UEW: 554]

PU **j*-*a*₂

PU **ĭla*₂ ‘under, below’ > Fi *ala*-, SaaN *vuolle*- (PSaa **vuolē*), MdM *al*, MdE *al*-, MariM *ül*-, MariW *ül*- (PMari **ül*-), Komi *uv*, Udm *ul*, UdmJ *ul*- (PKomi **ul*, PUdm **ul* < PPerm **ol*), MsTJ *jal*, MsSo *jol* (PMs **jal*), KhV *il* (PKh **ĭl*), Hung *al*-, PSam **ĭlā*- [UEW: 6]

The Mansi form is irregular.

PU **kĭčča*₂ ‘smelly’ > SaaN *guohca* ‘rotten’ (PSaa **kuocček*), MdM *kačam* ‘smoke’, MdE *kačamo* ‘smoke’, MariM *kočō*, MariW *kačā* ‘bitter’ (PMari **kāčā*), MsSo *χāssi* ‘mould’ (PMs **kĭšγV*), KhV *kĭč* ‘mould’ (PKh **kĭč*) [SUE II: 5–8]

PU **mĭksa*₂ ‘liver’ > Fi *maksa*, SaaS *mueksie* (PSaa **muokse*), MdM *maksa* (pl. *maksət*), MdE *makso* (pl. *maksot*), MariM *mokš*, MariW *mokš* (PMari **moks*), Komi *mus* (*musk*-), Udm *mus*, UdmKUf *muš* (PKomi **mus*, PUdm **mus* < PPerm **mos*), MsLU *mēt* (pl. *majtət*) (PMs **mĭt*-, **majt*-), KhV *muγal*, KhKaz *mōχal* (PKh **mūyal*), Hung *máj*, PSam **mĭtə* [UEW: 264]

The long vowel in Hung *máj* is apparently a result of contraction after the regular shift PU **-ks*- > Hungarian zero. Hungarian *j* probably appeared after this contraction as a hiatus-filler before vocalic affixes.

PU **sĭksa*₂ ‘Siberian pine’ > Komi *sus* ‘Siberian pine’, Udm *susĭ-pu* ‘juniper’, UdmMU *sūsĭ-pu* ‘juniper’ (PKomi **sus*, PUdm **sūsĭ* < PPerm **sosi*), MsKM *tēt* (pl. *tajtət*) (PMs **tĭt*-, **tajt*-), KhV *jĭγal*, KhIrt *teχət* (PKh **Lĭγal*), PSam **tĭtəŋ* [UEW: 445–446]

PU **j*-*a*₁ or **j*-*a*₂

PU **čĭla*- ‘to flash (of lightning)’ > Fi *salama* ‘lightning’, MsKO *sēl*- ‘to flash (of lightning)’, MsSo *sāl*- ‘to flash (of lightning)’ (PMs **sĭl*-), KhV *sāla*- ‘to flash (of lightning)’ (PKh **sĭlā*-), ? PSam **sālā*- ‘to flash, lighten’ [UEW: 459; Aikio 2002: 27–29]

Shortness of the vowel in Khanty can be explained by suffixation: Khanty verbs with the suffix **-ā*- always have short PKh vowels in the root. The Samoyed form is entirely irregular and possibly does not belong here at all.

PU **ĭna* ‘mother-in-law’ > Fi *anoppi*, SaaN *vuoni* (PSaa **vuonēm*), MsSo *ōnip* (PMs **ānəp*), KhJ *ōntəp*, KhKaz *wəntəp* (PKh **antəp*), Hung *napa*, PSam **ĭnəpə* ‘father-in-law’ [UEW: 9–10]

All the languages except Saami reflect the compound **ĭnajppi* < ***ĭna-ĭppi*.

PU **mĭya* ‘earth’ > Fi *maa*, ? MdM *mastər*, ? MdE *mastor*, MariM *mlande*, MariW *müländə* (PMari **mü*-), Komi *mu*, Udm *mu*, UdmMU *mü* (PKomi **mu*, PUdm **mu* < PPerm **mo*), MsP *mē*, MsSo *mā* (PMs **mĭ*), KhV *məγ*, KhNi *mĭγ* (PKh **mĭγ*) [UEW: 263–264]

The vowel in Khanty is irregular.

PU **m̄irja* ‘berry’ > Fi *marja*, SaaN *muorji* (PSaa **muorjē*), MariM *mör*, *mörə*, MariW *mör* (PMari **mürə*) [UEW: 264–265]

Exception

PU **ikta*₁- ~ **ikta*₂- ‘to hang up’ > Fi *ahtaa* ‘to cram, stuff; (dial.) to hang up (a net), to set up (a trap)’, SaaS *voektenje* ‘pole for hanging up nets’ (PSaa **vuokteñe*), Mdm *aft-* ‘to set up (a net, a trap)’, MariE *oktāš* ‘trap; noose’ (PMari **ā/oktāš*), Komi *okt̄inj* ‘to set up (a trap)’, KomiUS *okt̄inj* ‘to set up (a trap)’ (PKomi **okt-* < PPerm **okt-*), KhV *iyat-* ‘to hang up’, KhKaz *ixat-* ‘to hang up’ (PKh **iyat-*), PSam **jtā-* ‘to hang up’ [UEW: 506; Sammallahti 1988: 536]

PU **j-i*

PU **čili-* ‘to split’ > SaaN *čuollat* ‘to chop, cut’ (PSaa **čuole-*), Hung *szil-* ‘to split’ [UEW: 459–460]

PU **čimi* ‘fish scale’ > Fi *suomu*, SaaN *čuopma* ‘fish-skin’ (PSaa **čuome*), MariM *šüm* ‘bark, shell, peel’, *kol-šüm* ‘fish scale’ MariW *süm* ‘bark, peel, scale’ (PMari **šüm*), Komi *šem*, KomiJ *šum*, Udm *šem* (PKomi **šem*, PUdm **šem* < PPerm **šem*), MsKM *sēm*, MsSo *sām* (PMs **sīm*), KhV *sam* (PKh **sām*) [UEW: 476]

PU **čiči* ‘duck’ > Komi *čěž* ‘duck’, Udm *čěž* ‘duck’ (PKomi **čel/ěž*, PUdm **čěž* < PPerm **čěž*), MsP *šēš* ‘mallard’, MsSo *sās* ‘mallard’ (PMs **šiš*), KhV *čač* ‘mallard’ (PKh **čāč*) [UEW: 58]

PU **šimi* ‘bird cherry’ > Fi *tuomi* (: *tuome-*), SaaN *duopma* (PSaa **duome*), Mdm *lajmä* (pl. *lajmät*), Mde *lom* (pl. *lomt*), MariM *lombo*, MariW *lombâ* (PMari **lombâ*), Komi *lēm* (*lēmj-*), KomiJ *lum* (*lúmiš*), Udm *lēm* (PKomi **lēm*, PUdm **lēm* < PPerm **lēm*), MsKM *lēm*, MsSo *lām* (PMs **līm*), KhV *jōm* (PKh **jōm*), PSam **jēm* [UEW: 65–66]

The development of Mordvin forms is unclear.

PU **iči-* ‘to stay’ > Fi *asea* (dial.) ‘to put, place’, *asua* ‘to live, to dwell’, *asema* ‘station’, Mdm *aščä-* ‘to be situated; to stay (for a short time); to consist of’, Mde *ašte-* ‘to stand; to sit; to be situated; to consist of’, Mdm *äzəm* ‘bench’, Mde *ežem* ‘bench’, PSam **ęso-* ‘to camp’ [UEW: 18–19; Helimski 2001b: 82]

According to Helimski, *-*tä-* in the Mordvin verb is a reflexive suffix. There are no counterexamples for the development PU *-*čt-* > PMd *-*št-* (-*št-*). See [Helimski 2001b] for other possible reflexes of this Uralic verb.

PU **idi* ‘year’ > Fi *vuosi* (: *vuote-*), Komi *vo*, KomiJ *u*, Udm *va-pum* ‘time; century’, UdmMU *wa-pun* ‘time; century’ (PKomi **wō*, PUdm **wā* < PPerm **wō*), KhV *al* (PKh **āl*), PSam **erō* ‘autumn’ [UEW: 335–336; Aikio 2012: 233–234]

PU **ikti* ‘bear’ > Fi (poet.) *ohto*, Liv *ōkš*, Mdm *ofta* (pl. *oftt*), Mde *ovto* (pl. *ovtt*) [SSA II: 260]

PU **jini* ‘tame’ > SaaN *vuonjas* (PSaa **vuonjes*), KhTrj *āñi* ‘not timid (of wild birds)’ (PKh **āñi*), PSam **jina* [UEW: 340]

PU **ippi* ‘father-in-law’ > Fi *appi* (: *appe-*), SaaN *vuohppa* (PSaa **vuoppē*), MariNW *owö*, MariW *owâ* (PMari **owâ*), KhTrj *op* (PKh **ōp*), Hung *ipa* [UEW: 14]

PU **jpti* ‘hair of the head’ > SaaN *vuokta* (PSaa **vuoptē*), MariM *üp*, MariW *üp* (PMari **üp*), MsTJ *āt* ‘plait’, MsSo *āt* (PMs **īt*), KhJ *opat* (PKh **ōpat*), PSam **ępta* [UEW: 14–15]

PU **jyi-* ‘to drink’ > Fi *juoda*, SaaN *juhkat* (PSaa **juke-*), MariM *jüam*, MariW *jüäm* (PMari **jüä-*), Komi *juni*, Udm *juiñi*, UdmMU *düñi*, UdmB *juono* (PKomi **ju-*, PUdm **ju-* < PPerm **jo-*), Hung *i-*, *iv-*, *isz-*, PSam **ę-r-*, **ę-käl-* [UEW: 103; Aikio 2002: 38–40]

PU **jiki* ‘river’ > Fi *joki* (: *joke-*), SaaN *johka* (PSaa **joke*), Mde *jov* ‘Moksha river’, Komi *ju*, UdmG *ju-šur* (PKomi **ju*, PUdm **ju* < PPerm **jo*), MsKM *jē*, MsSo *jā* (PMs **jī*), KhV *-jay* ‘small river’ (only in compounds) (PKh **jāγ*) [UEW: 99–100]

- PU **j̄j̄ni* ‘path’ > Fi *juoni* (: *juone-*) ‘plot; row’, SaaS *joene* ‘way’ (PSaa **juone*), MdM *jan* ‘path’, MdE *jan* ‘path’ [SSA I: 250]
- PU **k̄ilki* ‘(single) hair’ > Fi *kalki* (: *kalke-*) ‘(single) hair; stalk’, SaaN *guolga* ‘hair (not on the head of a human being)’ (PSaa **kuolke*), MdM *kalga* (pl. *kalkt*) ‘awnchaff’, MdE *kalgo* (pl. *kalkt*) ‘awnchaff’ [UEW: 644]
- PU **k̄ijiri* ‘curved, concave’ > Fi *kaari* (: *kaare-*) ‘arc, curve’, SaaN *guotnjar* ‘rib nearest to the bow or stern of a river boat’ (PSaa **kuoŋer*), MsKU *kēŋər* ‘hollow of the knee’ (PMs **k̄iŋrā*), KhNi *χuŋχarə* ‘hollow of the hand’, KhO *χoŋkareŋ* ‘concave’ (PKh **ka/ə/ōŋkārV*) [UEW: 126; Aikio 2013: 10]
- PU **k̄irki* ~ **kurki* ‘crane’ > Fi *kurki* (: *kurke-*), SaaN *guorga* (PSaa **kuorke*), MdM *karga* (pl. *karkt*), MdE *kargo* (pl. *kargot*), PSam **kərō* [UEW: 128]
- Finnic and Samoyed forms reflect the variant with **u*, Saami and Mordvin ones – the variant with **i*.
- PU **l̄ički-* ‘to let go’ > Fi *laskea* ‘to lower, drop’, SaaN *luoitit* ‘to let go’ (PSaa **luoštē-*), MdM *laš̄k-* ‘to run’, KhNi *l̄əχij-* ‘unharness (a horse)’ (PKh **l̄ās-*) [UEW: 233–234]
- PU **l̄iči-* ‘to become wet’ > SaaN *luohcat* ‘get soaked through (of wood etc.)’ (PSaa **luoče-*), MariM *löčem*, MariW *löčem* ‘to swell (due to moisture)’ (PMari **lüče-*) [UEW: 682]
- PU **l̄ik̄ci-* ‘to adze’ > SaaN *luokčat* ‘to chisel’ (PSaa **luokče-*), MdM *lakšə-*, MdE *lakše-*, MariM *lokš̄inčam*, MariW *loks̄anzam* (PMari **lokš̄āńca-*) [UEW: 683]
- PU **l̄impi* ‘small lake’ > Fi *lampi* (: *lampe-*) ‘pond; small lake’, SaaN *luoppal* ‘small lake through which a river runs’ (PSaa **luompel*), PSam **l̄impə* ‘mud’ [UEW: 235]
- PU **l̄ip̄ci* ‘cradle’ > Fi *lapsi* (: *lapse-*) ‘child’, MdE *lav̄s*, MariM *lep̄š*, MariU *l̄ip̄še* (PMari **l̄ip̄š*), PSam **j̄epsə* ~ **l̄epsə* [UEW: 260; SSA II: 48–49]
- PU **m̄ij̄ni* ‘clear weather’ > SaaS *moenje* ‘clear (sky, weather)’ (PSaa **muońe*), MdM *mańi* ‘clear’, MdE *mańej* ‘sunny, clear’ [UEW: 698–699]
- PU **ń̄ički* ‘wet, raw’ > Fi *nahkea* ‘wet’, SaaN *njuoskkas* ‘wet; raw’ (PSaa **ń̄uoocke*), MdM *načka* ‘wet’, MdE *načko* ‘wet’, MariM *nočko* ‘wet’, MariW *načk̄ə* ‘wet’ (PMari **n̄āčkə*), KhKaz *ń̄āšaχ* ‘raw’, KhO *ń̄āsaχ* ‘raw’ (PKh **ń̄ičāk*) [UEW: 311]
- PU **-čk-* is regularly reflected as **-č-* in Khanty (see PU **kačka₂₋* ‘to bite’), so *-k* in PKh **ń̄ičāk* is suffixal. Shortness of the vowel in Khanty is due to second syllable **ā* (cf. PU **ćila-* ‘to flash (of lightning)’ > PKh **silā-*).
- PU **ń̄īk̄imi* ‘gills’ > SaaN *njuovčča* ‘tongue’ (PSaa **ń̄uokčem*), MariM *nošmo* ‘palate’, MariW *našm̄ə* ‘gills’ (PMari **n̄āšmə*), Komi *ń̄ok̄im* ‘gills’ (PKomi **ń̄o/ə̄k̄im* < PPerm **ń̄o/ə̄k̄im*), MsKO *ń̄eχš̄əm*, MsSo *ń̄āχš̄am* (PMs **ń̄īk̄ām*), KhKaz *ń̄oχš̄əm* (PKh **ń̄āk̄ām*) [UEW: 311–312]
- PU **ń̄ili* ‘arrow’ > Fi *nuoli* (: *nuole-*), SaaN *njuolla* (PSaa **ń̄uolē*), MdM *nal*, MdE *nal*, MariM *nölö pikš* ‘arrow with a bone head’ (PMari **n̄üla*), Komi *ń̄ev* (*ń̄evj-*), KomiJ *gəm-ń̄uul* ‘thunder arrow’, Udm *ń̄el* (PKomi **ń̄el*, PUdm **ń̄el* < PPerm **ń̄el*), MsKM *ń̄ēl*, MsSo *ń̄āl* (PMs **ń̄īl*), KhV *ń̄al* (PKh **ń̄āl*), Hung *nyil* (*nyil-*), PSam **ń̄ej* [UEW: 317]
- PU **ń̄jri* ‘tender, flexible, not yet hardened or dried’ > Fi *nuori* (: *nuore-*) ‘young’, SaaN *njuoras* ‘soft, not yet hardened’ (PSaa **ń̄uore-*), SaaN *njuorggis* ‘gristle’ (PSaa **ń̄uorkēs*), MdM *nar* ‘gristle; grass’, MdE *nar* ‘grass, meadow’, MariM *nörö* ‘flexible; moist’, MariW *nörə* ‘flexible’ (PMari **n̄üra*), MariM *nör̄yö* ‘young, fresh, tender, not yet hardened or dried; gristle’, MariW *nör̄yə* ‘young, fresh, tender, not yet hardened; gristle’ (PMari **n̄ür̄yə*), Komi *ń̄er* (*ń̄erj-*) ‘rod, switch; shoots, young growth’, KomiJ *ń̄uur* (*ń̄úuren*) ‘rod’, Udm *ń̄er* ‘rod, twig, switch’ (PKomi **ń̄er*, PUdm **ń̄er* < PPerm **ń̄er*), MsKM *ń̄ērii* ‘gristle’, MsSo *ń̄āriy* ‘gristle’ (PMs **ń̄īr̄y*), KhV *ń̄arəy* ‘gristle’, KhJ *ń̄ārəy* ‘gristle; embryo’, KhO *ń̄ar* ‘gristle; white of the egg’ (PKh **ń̄ārəy*), Hung *nyír* ‘frog (in

horse hoof), *nyirkos* ‘moist, damp’, PSam **ńer* ‘gristle; sap, white of the egg, sperm’ [UEW: 317; Aikio 2013: 10]

As an adjective, PU **ńiri* must have meant ‘tender, flexible, not yet hardened or dried’. As a noun, it was used to denote things possessing these qualities, basically ‘shoot, sprout, (young) grass’ and ‘gristle’ (as opposed to bone). Cf. the English expression *in the gristle* ‘in an initiatory, unformed, or embryonic stage of existence’. The meaning ‘moist’ developed from ‘not yet dried’.

PU **pići* ‘mittens’ > Komi *ke-piś*, KomiJ *ki-piś* ~ *ki-piś*, Udm *pež* (PKomi **ke-piś*, PUdm **pež* < PPerm **pež*), MsKM *pēsγa*, MsSo *pāssa* (PMs **pīsγā*), KhV *pas* (PKh **pās*) [UEW: 376]

PU **sini* ‘sinew, vein’ > Fi *suoni* (: *suone-*), SaaN *suotna* (PSaa **suone*), MdM *san*, MdE *san*, MariM *šön*, MariW *šün* (PMari **sün*), Komi *sen*, Udm *sen* (PKomi **se/εn*, PUdm **sen* < PPerm **sen*), MsKM *tēn*, MsSo *tān* (PMs **tīn*), KhV *lan*, KhVj *jan* (PKh **Lān*), Hung *ín* (*in-*), PSam **cen* [UEW: 441]

PU **sinti-* ‘to root out (trees)’ > SaaN *suoddat* ‘to cut up (meat, fish), to make a clearing in a wood’ (PSaa **suonte-*), MdM *sańd-* ‘to root out (trees)’, MdE *sańda-* ‘to root out (trees)’, MariM *šüdam* ‘to root out (trees)’, MariW *šüdam* ‘to root out (trees)’ (PMari **süda-*) [UEW: 751; SUE III: 89–90]

PU **šiki-* ‘to say’ > Fi *hokea* ‘to repeat’, Komi *šuni* ‘to say’, Udm *šuińi* ‘to say’ (PKomi **šu-*, PUdm **šu-* < PPerm **šo-*) [UEW: 786–787]

PU **tįkti* ‘diver’ > SaaN *dovtta* ‘black-throated diver (*Gavia arctica*)’ (PSaa **toktek*), MariNW *toktā-löđö* ‘black-throated diver’ (PMari **toktā-*), Komi *tokti* ‘diver’ (PKomi **to/okti* < PPerm **tó/okti*), MsKO *teχt* ‘black-throated diver’, MsSo *tāχt* ‘black-throated diver’ (PMs **tįkt*), KhKaz *tχtəŋ* ‘black-throated diver’ (PKh **tāktəŋ*) [UEW: 530]

PU **wili-* ‘to whittle, to plane’ > Fi *vuolla*, SaaN *vuollat* (PSaa **vuole-*), Komi *velawni*, KomiJ *vólalno*, Udm *velini* (PKomi **ve/εl-*, PUdm **vel-* < PPerm **vel-*), MsSo *wolt-* (PMs **wa/olt-*), KhV *wält-* (PKh **wilt-*) [UEW: 579–580]

Permic reflexes unambiguously point to **i-i*, while Ob-Ugric vowels cannot regularly reflect either **i-i*, or **a-i*.

PU **wilki* ‘light’ > Fi *valkea* ‘white’, SaaN *vielgat* (attr. *vilges*) ‘white’ (PSaa **vielkV-*), MariM *wolyādo* ‘light (adj. and noun)’, MariNW *walyāđā* ‘light (adj. and noun)’ (PMari **wālyāđā*), Hung *világ* ‘world; light’ [UEW: 554–555]

Saami and Mari vowels are irregular.

PU **o-a*

PU **čođka* ‘a kind of duck’ > Fi *sotka* ‘diving duck (*Aythya*)’, SaaN *čoadgi* ‘goldeneye (*Bucephala clangula*)’ (PSaa **čoadkē*), MdM *śulga* ‘diver’, MdE *śulgo* ‘diver’, MariM *ola šue* ‘a kind of duck’, MariW *ala šoe* ‘a kind of duck’ (PMari **šoe*), Komi *śuv-čęž* ‘goldeneye’, Udm *śuli-čęž* ‘mallard’ (PKomi **śul*, PUdm **śu/ülj* < PPerm **śolj*), MsKM *sēl* ‘goldeneye’, MsSo *sāl* ‘goldeneye’ (PMs **śil*), KhV *saj* ‘goldeneye’ (PKh **śāj*) [UEW: 482]

There is no need to reconstruct the variation **čođka* ~ **čođka*, because the dissimilative development **é...đ* > **ś...l* is perfectly regular in Permic. Moreover, PU **đ* regularly yields Permic zero, not **l*.

PU **čođa* ‘war’ > Fi *sota* ‘war’, MdM *śudā-* ‘to curse’, MdE *śudo-* ‘to curse’, MariM *śudalam* ‘to curse’, MariW *śudalam* ‘to curse’ (PMari **śudala-*), PSam **sāja-* ‘to wage war’ [UEW: 777]

PU **kočka* ‘a kind of duck’ > Fi *koskelo* ‘merganser (*Mergus*)’, Komi *kosjś* ‘gadwall’, KomiJ *kuisis* ‘merganser’, Udm *kwaši* ‘drake’ (PKomi **kosjś*, PUdm **kwaši* < ? PPerm **kwoś-*), KhV *kas* ‘merganser’ (PKh **kās*) [UEW: 111, 673–674]

The comparison with Komi is possible, if we assume a dissimilation **kosjś* > *kosjś*.

PU **kočka* ‘dry’ > SaaN *goikkis* (PSaa **koškē*), MdM *koškä*, MdE *koške*, MariM *koškem* ‘to dry (intr.)’, MariW *koškem* ‘to dry (intr.)’ (PMari **koške-*), Komi *kośmįni* ‘to dry (intr.)’,

KomiJ *kústinö* ‘to dry (tr.)’, Udm *kwašm̄inj* ‘to dry (intr.)’ (PKomi **koś-*, PUdm **kwaś-* < PPerm **kwós-*), PSam **kāsə-* ‘to dry (intr.)’ [UEW: 223–224]

Saami and Mordvin reflect a protoform **kučka*.

PU **kočka* ‘eagle’ > Fi *kotka*, SaaN *goaskin* ‘golden eagle (*Aquila chrysaetos*)’ (PSaa **koackēmē*), MdM *kućkan*, MdE *kućkan*, MariM *kutkâž*, MariW *kučkâž* (PMari **kučkâž*), Komi *kuč*, UdmM *kuč* ‘a bird, similar to golden eagle, but smaller’ (PKomi **kuč*, PUdm **ku/üč* < PPerm **koč*) [UEW: 668]

PU **koδ/δwa* ‘a period of time’ > Fi *kotva* ‘moment, a short while’, SaaI *koadžfi* ‘period of time between two checks of a fishing net’ (PSaa **koadvē*) [UEW: 669]

Despite the etymological tradition reflected in [UEW], MariM *γoδ-* (stem of postpositions with the temporal meaning) and MariW *γoδ* ‘year’, *γoδ-* (stem of postpositions with the temporal meaning) are evidently borrowed from Russian *god* ‘year; (dial.) a favourable period of time’.

PU **koja* ‘fat’ > MdM *kuja*, MdE *kuja*, MariM *koja*, MariW *kaja* (PMari **kâja*), Udm *kwajinj* ‘to grow fat’ (PUdm **kwaj-* < PPerm **kwój-*), Hung *háj* ‘(interior) fat’ [UEW: 195–196]

PU **kojra* ‘male animal’ > Fi *koira* ‘dog’, Komi *kijr* ‘male (animal)’ (PKomi **kijr* < PPerm **kür*), MsKM *kēr* ‘male animal, stallion, male reindeer’, MsSo *χār* ‘male animal, stallion, male reindeer’ (PMs **kīr*), KhJ *kār* ‘male animal’ (PKh **kār*), Hung *here* ‘drone; testicle’, PSam **korā* ‘male animal’ [UEW: 168–169]

This word is derived from PU **koji* ‘male’. Samoyed apparently reflects the archaic variant **kojira* without syncope of the medial **i* (otherwise we would expect PSam ***kājirā*).

PU **koksa* ‘dry’ > MariM *kukšo*, MariW *kukšâ* (PMari **kukšâ*), Komi *kos*, KomiP *keš*, KomiJ *kuus*, Udm *keš* (PKomi **kwes*, PUdm **keš* < PPerm **kwes*) [UEW: 670]

PU **kopa* ‘bark’ > Est *kõba* (gen. *kõba*) ‘pine bark’, MdM *kuva* (pl. *kuvæt*) ‘crust’, MdE *kuvo* (pl. *kuvot*) ‘crust; rind’, MariM *kuwo* ‘husk’, MariV *kũwo* ‘id.’ (PMari **kũwâ*), Komi *ku* ‘hide; skin’, Udm *ku* ‘hide; skin’ (PKomi **ku*, PUdm **ku* < PPerm **ko*), PSam **kopâ* ‘skin’ [UEW: 180–181]

PU **koppala* ‘female capercaillie’ > Fi *koppelo* (dial. *koppala*), SaaN *goahppil* (PSaa **koappēlē*), MariM *kuwâlčö*, MariU *kũwũlzö* (PMari **kũwâlčä*) [UEW: 181]

PU **koska* ‘older female relative’ > SaaN *goaski* ‘mother’s older sister’ (PSaa **koaskē*), PSam **kâtâ* ‘grandmother’ [UEW: 189]

PU **kota* ‘house’ > Fi *kota* ‘hut’, SaaN *goahti* ‘tent, Lapp hut’ (PSaa **koatē*), MdM *kud*, MdE *kudo* (pl. *kudot*), MariM *kuđo* ‘summer hut’, MariW *kuđâ* ‘id.’ (PMari **kuđâ*), Komi *vićko* ‘church’, KomiJ *vić-kú* ‘church’, Udm *kwa* ‘summer hut’ (PKomi **ko*, PUdm **kwa* < PPerm **kwò*), KhV *kat* ‘house’ (PKh **kāt*), Hung *ház* ‘house’ [UEW: 190]

PU **lowna* ‘midday’ > Fi *lounas* (dial. *louna*) ‘southwest’, Komi *lun* ‘day; south’, Udm *nunal* ‘day’, UdmMU *n̄naw* ‘day’ (PKomi **lun*, PUdm **nunal* < PPerm **lon*) [UEW: 693]

PU **močča* ‘tussock, hummock’ > MariM *mučö-wuj* ‘tussock, hummock’, MariW *măččâ-wuj* ‘tussock, hummock’ (PMari **mũčă*), Udm *muč* ‘tussock, hummock’, UdmMU *muč* ‘tussock, hummock’ (PUdm **muč* < PPerm **mo/öč*) [UEW: 704]

A loan between Udmurt and Mari is possible.

PU **nočka* ‘bend’ > Fi *notkea* (dial. *notka*) ‘flexible’, SaaN *njoaski* ‘(mountain) saddle, col’ (PSaa **ñoackē*), MdM *nučka* (pl. *nučkt*) ‘bend; waist’ [UEW: 714]

PU **nojta* ‘shaman’ > Fi *noita* ‘witch’, SaaN *noaidi* ‘sorcerer’ (PS **noajtē*), MdE *nudñe-* ‘to tell fortunes’, MsKM *ńöäjt* ‘shaman’, MsP *näjt* ‘divination’, MsSo *ńäjt* ‘shaman’ (PMs **näj*t) [UEW: 307–308]

PMs **ä* is irregular, but the etymology is quite certain. To the best of our knowledge, comparison with Mordvin was not suggested before.

PU **ńoma(la)* ‘hare’ > SaaN *njoammil* (PSaa **ñoamēlē*), MdM *numal*, MdE *numolo*, KomiJ *ńimól* (PKomi **ńimil* < PPerm **ńimil*), Hung *nyúl* (*nyul-*), PSam **ńámâ* [UEW: 322]

- PU **ojwa* ‘head’ > Fi *oiva* ‘excellent’, SaaN *oaiwi* (PSaa **oajvē*), MdM *uj* ‘brain’, MariM *wuj*, MariW *wuj* (PMari **wuj*), PSam **ājwā* [UEW: 336–337]
- PU **oksa* ‘branch’ > Fi *oksa*, SaaN *oaksi* (PSaa **oaksē*), MariM *ukš*, MariW *ukš* (PMari **uks*) [UEW: 716]
- PU **oksa-* ‘to vomit’ > Fi *oksentaa*, SaaN *vuoksit* (PSaa **vuoksē-*), MdM *uksənd-*, MdE *uksno-*, MariM *ukšínčam*, MariW *ukšənzam* (PMari **ukšəńca-*), Komi *vosni*, KomiP *esni*, KomiJ *úsetno*, Udm *ęskini* (PKomi **węs-*, PUdm **ęs-* < PPerm **węs-*) [UEW: 716–717]
- PU **ola* ‘lower jaw’ > SaaN *oalul* ‘lower jaw’ (PSaa **oalōl*), MdM *ula* (pl. *ulət*) ‘chin’, MdE *ulo* (pl. *ulot*) ‘chin’, MsP *wūlś* ‘lower jaw’, MsSo *ūlś* ‘lower jaw’ (PMs **ūlc*), Hung *áll* ‘chin’ [UEW: 337]
- PU **ona* ‘short’ > SaaN *oatni* (PSaa **oanē*), MsKM *ūnχ* ‘short’ (PMs **ūn-*) [UEW: 339]
- PU **ońca* ‘part’ > Fi *osa*, SaaN *oažžut* ‘get, obtain’ (PSaa **oańcō-*), MariM *užaš* (PMari **u/ūžaš*) [UEW: 333]
- PU **ońcca* ‘front’ > Fi *otsa* ‘forehead’, MariM *ońčəl*, MariW *anzəl* (PMari **áńcəl*), Komi *vož*, KomiP *ož*, KomiJ *už*, Udm *až* (PKomi **wož*, PUdm **až* < PPerm **wōž*) [UEW: 339–340]
- PU **ora* ‘squirrel’ > Fi *orava*, SaaN *oar’ri* ‘squirrel’ (PSaa **oarēvē*), MdM *ur*, MdE *ur*, MariM *ur*, MariW *ur* (PMari **ur*), Komi *ur* (PKomi **ur* < PPerm **or*), PSam **ārop* [UEW: 343]
- PU **ora* ‘awl’ > Fi *ora*, SaaK *vuerę* (PSaa **oarē*), MdM *ura* (pl. *urət*), MdE *uro* (pl. *urot*), Hung *ár* [UEW: 342]
- PU **orja* ‘slave’ > Fi *orja* ‘slave’, SaaN *oarji* ‘west’, (dial.) ‘south’ (PSaa **oarjē*), MdM *urü* ‘slave’, MdE *urē* (pl. *urēt*) ‘slave’, Udm *war* ‘servant; slave’ (PUdm **war* < PPerm **wōr*) [UEW: 721]
- PU **orpana* ‘relative’ > Fi *orpana* ‘cousin’, SaaK *vuerępenę* ‘sister’ (PSaa **oarpēnē*) [UEW: 722]
- PU **orpas* ‘orphan’ > Fi *orpo*, SaaN *oarbbis* (PSaa **oarpēs*), MdM *uraz*, MdE *uroz*, KhV *jəŋk-urwı* (PKh **ō/ūrpi*), Hung *árova* [UEW: 343]
- PU **poča* ‘deer’ > SaaN *boazu* ‘tame reindeer’ (PSaa **poacōj*), MariM *puččō* ‘deer’, MariW *pučə* ‘deer’ (PMari **pučə*), Udm *pužej* ‘deer’, UdmMU *pužej* ‘deer’ (PUdm **pužej* < PPerm **puž-*) [UEW: 387–388]
- PU **počka* ‘thigh’ > Fi *potka* ‘hind leg (of cattle)’, SaaN *boaski* ‘ankle’ (PSaa **poackē*) [UEW: 389]
- PU **poltta-* ‘to burn (tr.)’ > Fi *polttaa*, SaaN *boaldit* (PSaa **poaltē-*), MdM *pəLta-*, MdE *pulta-* [UEW: 352]
- PU **sonta* ‘dung’ > Fi *sonta* ‘dung’, MariM *šondo* ‘urine’, MariW *šandə* ‘excrements’ (PMari **šāndə*) [UEW: 764–765]
- PU **tolwa* ‘wedge’ > MdM *tula* (pl. *tulət*), MdE *tulo* (pl. *tulot*), Komi *tuv* (*tuvj-*) ‘nail; dowel, wedge’, Udm *tul* ‘wedge’, UdmJ *tul* ‘wedge’ (PKomi **tul*, PUdm **tul* < PPerm **tol*), PSam **tajwā* ‘nail; wedge’ [UEW: 797–798; Aikio 2013: 13]
- PU **tora* ‘fight’ > Fi *tora* ‘quarrel’, SaaN *doarru* ‘fight’ (PSaa **toarō*), MdM *túr-* ‘to fight’, MdE *túr-* ‘to fight’, PSam **táro-* ‘to wrestle’ [UEW: 531]
- Hill Mari *torle-* ‘dorgální, szidalmazni; rügen, schelten’, compared with this root in UEW, is probably a ghost-word. It is absent from all dictionaries of Mari, save Budenz’s 1866 dictionary. From this dictionary [Budenz 1866: 56] we learn that the Hill Mari verb *torlem* ‘dorgální, szidalmazni | increpare’ is attested only once, in the Hill Mari translation of the New Testament, specifically in the 1st Epistle to Timothy, chapter 3, verse 7, in the form *ини́жторлэ́бь* (i.e. *anež torlep*, 3 pl. neg. pres. opt. ‘lest they reproach (him)’) [Mari NT: 587] (cf. the English translation of this verse: “Moreover he must have a good report of them which are without; lest he *fall into reproach* and the snare of the devil.”). Instead of being a unique attestation of an otherwise unknown verb, the form may be a misprint / incorrect transcription of the verb *törlem* ‘to reproach / verurteilen, Gericht halten’ [Moisio & Saarinen 2008: 811] (the main meaning of this verb is ‘to even, to level’; it is a denominal verb from a Chuvash loanword *tör* ‘even; right, correct’).

PU **woča* ‘fence’ > Fi *otava* ‘Big Dipper’, SaaN *oahci* ‘natural obstacle’ (PSaa **oacē*), MsSo *ūs* ‘fence; yard; town’ (PMs **ūš*), KhV *wač* ‘town’ (PKh **wāč*), PSam **wāc* ‘fence’ [UEW: 577–578]

The Mansi word has irregularly lost initial **w-*, hence the vowel is reflected as if it were in word-initial position (cf. **wolka* and **wosa*, where no such development occurred).

PU **woča-* ‘to wait’ > Fi *odottaa*, SaaSw *ådsotet* (PSaa **oacōttē-*), MdM *uč-*, MdE *učo-*, MariM *wučēm*, MariW *wāčem* (PMari **wūče-*) [UEW: 334]

PU **wolka* ‘shoulder’ > Fi *olka*, SaaN *oalgi* (PSaa **oalkē*), MsKU *wojlap* ‘shoulder strap’, MsLO *wāylap* ‘shoulder strap’ (PMs **wīylāp*), Hung *váll*, PSam **wajk* [UEW: 581; Aikio 2002: 54]

PU **worači* ‘pig’ > Fi *oraisa*, *orasa* ‘(castrated) boar’, MdM *urāzi* (pl. *urāziŋt*) ‘boar’ [UEW: 720]

PU **worka-* ‘to sew’ > MariM *uryem*, MariW *āryem* (PMari **ūrye-*), Komi *vurnj*, Udm *vurinj*, UdmMU *vurinj* (PKomi **our-*, PUdm **our-* < PPerm **vor-*), Hung *varr-* [UEW: 584–585]

Short *a* in Hungarian is irregular. If the Mari word is an early loan from Permic, PU **warka₂₋*, **wirka₂₋* or **warki-* can be reconstructed.

PU **wosa* ‘ware’ > Fi *ostaa* ‘to buy’, SaaN *oastit* ‘to buy’ (PSaa **oastē-*), MariM *užalem* ‘to sell’, MariW *wāžalem* ‘to sell’ (PMari **wūzale-*), Komi *vuzavnj* ‘to sell’, Udm *vuz* ‘ware’, UdmMU *vuz* ‘ware’ (PKomi **vuz*, PUdm **vuz* < PPerm **voz*), MsKM *wētāl-* ‘to trade’, MsSo *wātāl-* ‘to trade’ (PMs **wītāl-*) [UEW: 585]

PU **wotta-* ‘to gather’ > Fi *ottaa* ‘to take’, MsKM *wēt-* ‘to pluck, to gather’, MsSo *wāt-* ‘to pluck, to gather’ (PMs **wīt-*) [UEW: 586]

PU **o-i*

PU **čoji* ‘sound’ > Fi *soida* ‘to sound; to ring’, SaaN *čuodjat* ‘to sound, to ring’ (PSaa **čuoje-*), MariM *šoktem* ‘to play (a musical instrument)’, MariW *šaktem* ‘to play (a musical instrument)’ (PMari **šakte-*), MsSo *suj* ‘voice, sound’ (PMs **suj*), KhV *sōj* ‘voice, sound’ (PKh **sūj*), Hung *zaj* ‘noise’ [UEW: 482–483]

PU **colki* ‘buckle’ > Fi *solki* (: *solke-*), MdM *šulgam* ‘brooch’, MdE *šulgamo* (pl. *šulgamot*) ‘a kind of brooch’ [UEW: 774–775]

PU **colmi* ‘knot’ > Fi *solmu*, SaaN *čuolbma* (PSaa **čuolme*), MdM *šulma* (pl. *šulmät*), MdE *šulmo* (pl. *šulmot*), Hung *csomó* [UEW: 38–39]

PU **joŋsi* ~ **jīŋsi* ‘bow’ > Fi *jousi* (: *jouse-*), SaaN *juoksa* (PSaa **juokse*), MdM *jonks*, MdE *jonks*, MariM *joŋež*, MariW *janžež* (PMari **jāŋež*), MsTČ *jāwt*, MsP *jäyt*, MsLO *jowt* (PMs **jayt*), KhV *joŋal*, KhKaz *joχal* (PKh **jayal*), Hung *íj*, PSam *(*j*)*intä* [UEW: 101–102]

The protoform **jīŋsi* is reflected in Samoyed and Hungarian.

PU **koysi* ‘spruce’ > Fi *kuusi* (: *kuuse-*), SaaN *guossa* (PSaa **kuose*), MdM *kuz*, MdE *kuz*, MariM *kož*, MariW *kož* (PMari **koz*), Komi *koz* (*kozj-*), KomiP *kež*, KomiJ *kuuz*, Udm *kiz* (PKomi **kwež*, PUdm **kiz* < PPerm **kuz*), MsLU *kayt*, MsSo *χowt* (PMs **kayt*), KhV *kəl*, KhKaz *χoŋ* (PKh **kal*), PSam **kā(ə)t* [UEW: 222–223]

PU **koji* ‘male’ > SaaK *kūjj* ‘husband’ (PSaa **kuoje*), MsP *kuj* ‘male of animals’, MsSo *χuj* ‘male of animals’ (PMs **kuj*), KhV *ku* (pl. *kujät*) ‘man; husband’, KhKaz *χo* (*χoŋ-*) ‘man; husband’ (PKh **kō*) [UEW: 166–167]

Despite [Moisio 2013: 270], the Mansi word is not a Khanty loan.

PU **koji* ‘dawn’ > Fi *koi*, Komi *kja* (PKomi *kja* < PPerm **kua*), MsLU *kuj* (PMs **kuj*), KhJ *kuñt’á*, KhNi *χuñt’al* (PKh **kōñčal*), Hung *hajnal* [UEW: 167]

- PU **kolmis* ‘tree bark’ > SaaN *guolmmas* ‘inner bark of conifers’ (PSaa **kuolmes*), MariM *kumâž* ‘birch bark’, MariW *kâmâž* ‘birch bark’ (PMari **kŭmâž*) [SUE I: 168–169]
- PU **konti-* ‘to hunt; to murder’ > MdM *kunda-* ‘to catch’, MdE *kunda-* ‘to catch’, MsSo *χōnt-* ‘to find’ (PMs **kānt-*), MsSo *χōnt* ‘war; army’ (PMs **kānt*), Hung *had* ‘army’, PSam **kāntā* ‘sacrificial animal’, **kāntos-* ‘to murder’ [UEW: 206, 207; Aikio 2006: 15–17]
- PU **koppi* ‘mould’ > SaaN *guohpa* (pl. *guohppagat*) ‘mould’ (PSaa **kuoppək*), MariM *kupem* ‘get mouldy’, MariW *kâpa* (1sg) ‘get mouldy’ (PMari **kŭpe-*) [UEW: 680]
- PU **korpi* ‘woods’ > Fi *korpi* (: *korpe-*) ‘dense forest, wildwood’, MsLO *χōrp* ‘grove, forest’ (PMs **kārəp*) [UEW: 217; SUE II: 8–10]
- PU **korpi-* ‘to burn’ > Fi *korventaa* ‘to scorch, parch’, SaaN *guorbat* ‘be scorched’ (PSaa **kuorpe-*), MdM *kər̥vāž-* ‘to catch fire’, MdE *kirva-* ‘to blaze’ [UEW: 186]
- PU **močki-* ‘to wash’ > Est (dial.) *mōske-*, MdM *mušk-* ‘to launder’, MdE *mušk-* ‘to launder’, MariM *muškam*, MariW *māškam* (PMari **mŭška-*), Komi *miškini*, Udm *miškini* (PKomi **mišk-*, PUdm **mišk* < PPerm **mišk-*), Hung *mos-*, PSam **māsa-* [UEW: 289]
- PU **moni* ‘many’ > Fi *moni* (: *mone-*), Komi *mįnda* ‘as many as’ (postposition), Udm *mįnda* ‘as many as’ (postposition) (PKomi **mįnda*, PUdm **mįnda* < PPerm **mũnda*) [UEW: 279–280]
- PU **ńolki* ‘slime’ > Kar *ńolki* ‘saliva’, SaaN *snuolga* ‘snot’ (PSaa *(s)*nuolke*), MdM *nolga* (pl. *nolkt*) ‘snot’, MdE *nolgo* (pl. *nolkt*) ‘snot’, Hung *nyál* ‘saliva’ [UEW: 322]
- Mordvin **o* and Hungarian *á* are irregular.
- PU **omti* ‘abdominal cavity’ > SaaN *vuovda* ‘abdominal cavity’ (PSaa **vuomtę*), MsKM *ōntər* ‘stomach’, MsLO *ōntər* ‘uterus’ (PMs **āntər*), KhV *qnt* ‘inside; belly’, KhIrt *unt* ‘inside’ (PKh **ant*) [UEW: 338]
- PU **oŋi* ‘mouth (of an animal)’ > SaaN *vuonjas* ‘muzzle of a dog’ (PSaa **vuonjes*), MdM *ovəst* (pl.) ‘bit (in bridle)’, MdE *onkšt* ‘bit (in bridle)’, Komi *vom* ‘mouth’, KomiP *em* ‘mouth’, KomiJ *um* (*úmon*) ‘mouth’, Udm *im* ‘mouth’ (PKomi **wem*, PUdm **im* < PPerm **um*) [UEW: 11–12; SUE II: 10]
- Saami and Mordvin forms go back to a derivate: **oŋis* ‘muzzle, bit’. MariM *umša* ‘mouth’, MariW *āšma* ‘mouth’ (PMari **ŭmša*) is a Permic loanword (note PMari **ŭ* as a substitution of PPerm **u*).
- PU **oŋki* ‘fish-hook’ > Fi *onki* (: *onke-*) ‘fishing rod’, SaaN *vuogga* ‘fish-hook’ (PSaa **vuonke*), MariM *oŋgo* ‘loop’, MariW *oŋgā* ‘loop’ (PMari **oŋgā*) [UEW: 719–720]
- PU **oŋti* ‘hollow (in a tree)’ > Fi *onsi* (: *onte-*) ‘hollow, cavity’, SaaN *vuovda* ‘nest box for waterfowl’ (PSaa **vuovtę*), MdM *unda* (pl. *untt*) ‘hollow (in a tree)’, MdE *undo* (pl. *untt*) ‘hollow (in a tree)’, KhV *qŋət* ‘hollow (in a tree)’, KhKaz *qŋət* ‘hollow (in a tree)’ (PKh **aŋət*), Hung *odú* ‘hollow (in a tree)’ [UEW: 341–342]
- PU **poči* ‘penis’ > SaaN *buohča* ‘penis’ (PSaa **puočę*), Hung *fasz* [UEW: 345]
- PU **polwi* ‘knee’ > Fi *polvi* (: *polve-*), SaaN *buolva* ‘generation’ (PSaa **puolvę*), MdM *pāl-manža*, MariM *pul-wuj*, MariW *pāl-wuj* ~ *pul-wuj* (PMari **pŭ/ul-*) [UEW: 393]
- PU **ponči* ‘tail’ > MariM *poč*, MariW *pač* (PMari **páč*), Komi *bež*, KomiJ *buwž*, Udm *biž* (PKomi **bež*, PUdm **biž* < PPerm **buž*), MsKU *ponš* ‘bird’s tail’, MsN *pōnsi* ‘bird’s tail’ (PMs **pānšī*), KhV *pōč* ‘occiput’ (PKh **pač*), Hung *far* ‘rump’, *farok* ‘tail’, PSam **pāncə* ‘hem’ [UEW: 353; Aikio 2006: 23–24]
- PU **ponji* ‘bosom’ > Fi *povi* (: *pove-*) ‘bust, bosom’, SaaN *buokŋa* ‘breast of a bird’ (PSaa **puonę*), MdM *pov* ‘bosom’, MdE *pongo* (pl. *pongot*) ‘bosom’, MariM *pomāš*, MariW *pongāš* ‘bosom’ (PMari **ponāš*), Komi *pičęg* ‘bosom’, KomiP *pi* ‘bosom’, Udm *pi* ‘bosom’ (PKomi **pi*, PUdm **pi* < PPerm **pi*), MsKM *pūt* ‘bosom’ (PMs **pūt*), KhV *puyal* ‘bosom’, KhNi *puχət* ‘bosom’ (PKh **pŭyal*) [UEW: 395]
- Permic and Ob-Ugric reflexes are highly irregular.

PU **poski* ‘cheek’ > Fi *poski* (: *poske-*), MsLU *pēt* (pl. *pajtat*), MsSo *pājt* (PMs **pīt*, **pajt-*), KhV *puylam*, KhNi *puχtām* (PKh **pūylām*), PSam **pāt-* [UEW: 396]

Ob-Ugric vowels are irregular.

PU **soksi* ‘worm’ > SaaN *suoksa* ‘larva, maggot’ (PSaa **suokse*), MdM *suks* ‘worm’, MdE *suks* ‘worm’, MariM *šukš* ‘worm’, MariW *šukš* ‘worm’ (PMari **suks*) [UEW: 764]

PU **soŋi-* ‘to wish’ > Fi *suoda* ‘to give, allow, permit, grant; to wish’, MsTJ *taŋk-* ‘to want’, MsSo *taŋχ-* ‘to want’ (PMs **taŋk-*), KhV *lāŋka-* ‘to want; to love’, KhVj *jāŋka-* ‘to love’ (PKh **Ljŋkā-*) [UEW: 447]

PMs **a* is irregular.

PU **sori* ‘finger, span’ > Fi *sormi* (: *sorme-*) ‘finger’, SaaN *suorbma* ‘finger, toe’ (PSaa **suorme*), MdM *sur* ‘finger’, MdE *sur* ‘finger’, MariE *šorž* ‘span’ (PMari **sā/orž*), MariU *šor* ‘span’ (PMari **sā/or*), MsSo *t̄ras* ‘span’ (PMs **tārās*), KhO *sorəs* ‘span’ (PKh **sarəs*) [UEW: 448, 765]

The root without suffixation is preserved in Mordvin.

PU **soski-* ‘to chew’ > SaaN *suoskat* (PSaa **suoske-*), MdM *susk-* ‘to bite’, MdE *susk-* ‘to bite off’, KomiP *seŋkini*, Udm *sjskini* (PKomi **se/εsk-*, PUdm **sjsk-* < PPerm **susk-*), MsTJ *tawt-*, MsVS *tayt-* (PMs **tayt-*), KhVj *jɔɣəl-*, KhKaz *ɒɣəl-* (PKh **Laɣəl-*), PSam **tutu-* [UEW: 448–449]

PU **šodi-* (~ -*δ-*) ‘to leak’ > SaaN *suoddat* ‘to leak (of air)’ (PSaa **suodε-*), MdM *šudā-* ‘to flow’, MdE *čud-* ‘to flow; to leak’ [UEW: 786]

PU **šoji* ‘prick’ > Liv *vɔi* ‘net needle’, SaaS *soeje* ‘net needle’ (PSaa **suoje*), Komi *ši* ‘spear; bayonet’, Udm *ši* ‘sting; bayonet’, UdmMU *ši* ‘sting’ (PKomi **ši*, PUdm **ši* < PPerm **šü*) [UEW: 787–788]

PU **šoji* ‘foam’ > MdM *šov*, MdE *čov* (dial. *čoj*), MariM *šoj*, MariW *šojg* (PMari **šoj*) [UEW: 621]

PU **toyi-* ‘to give’ > Fi *tuoda* ‘to bring’, SaaS *doekedh* ‘to sell’ (PSaa **tuoke-*), MdM *tu(j)-* ‘to bring’, MdE *tu(j)-* ‘to bring’, KhV *tu-* ‘to bring’, KhKaz *tɔ-* ‘to bring’ (PKh **tō-*) [UEW: 529–530]

PU **tošti-* ‘to dare’ > Fi *tohtia*, SaaN *duostat* (PSaa **tuoste-*), MariM *toštam*, MariNW *toštam* (PMari **tošta-*) [UEW: 799]

PU **totki* ‘tench’ > Est *tōtkes*, MdM *tutka* (pl. *tutkt*), MdE *tutko* (pl. *tutkot*), MariM *toto*, MariW *tatâ* (PMari **tâtâ*), MsTJ *taχt-kōl* (PMs **takt*), Hung *tat hal*, PSam **tutu* ‘crucian carp’ [UEW: 532]

PU **wokši* ‘thin’ > Fi *ohut* ‘thin’, MsVS *wayta*, MsSo *wowta* (PMs **waytā*), KhJ *woɣəl* ‘thin (of flat objects)’, KhKaz *oɣəl* ‘thin (of flat objects)’ (PKh **wayəl*) [Решетников 2011: 110]

PU **woli-* ‘to be’ > Fi *olla*, MdM *ul-*, MdE *ul-*, MariM *ulam*, MariW *ɔlam* (PMari **ūla-*), Komi *ovni-vjvni* ‘to live’ (folklore), Udm *uljini-viljini* ‘to live’ (folklore) (PKomi **vjl-*, PUdm **vjl-* < PPerm **vül-*), MsSo *ɔl-* ‘to be, to live, to have’ (PMs **āl-*), KhV *wäl-* ‘to be, to live’, KhKaz *wɔl-* ‘to be, to live’ (PKh **wal-*, **wjl-*), Hung *vol-*, *val-*, *vagy-* [UEW: 580–581]

PU **wonki* ‘hole’ > Fi *onkalo* ‘hole, cavity’, SaaK *vuenjnk* ‘hole, burrow’ (PSaa **vuoŋkō*), MsSo *wōŋχa* ‘pit’ (PMs **wāŋkā*), KhLikr *wāŋk* ‘burrow’, KhIrt *wonχ* ‘pit’ (PKh **wanχk*), PSam **wāŋkə* ‘hole, cave, den’ [UEW: 583]

PU **wori* ‘forest’ > Komi *ver* ‘forest, wood’, KomiJ *vuur* ‘forest’, Udm *vjr* ‘hummock, hill’ (PKomi **ver*, PUdm **vjr* < PPerm **vur*), MsSo *wɔr* ‘forest’ (PMs **wār*), KhV *wɔr* ‘ridge near a river bank’ (PKh **war*) [UEW: 571]

See PU **wara*₁ ~ **wärä* ‘mountain’ and PU **wara*₂ ‘edge’ for other forms usually compared with reflexes of PU **wori*.

PU *a-a₁ or *j-a₁

PU **a/ijta₁* ‘fence’ > Fi *aita*, KhV *ať* (PKh **āč*) [SUE II: 1–2]

PU **a/jrwa₁* ‘price’ > Fi *arvo* ‘value’, MdM *ařśa-* ‘to think’, MdE *ařše-* ‘to think’, Hung *ár* ‘price’ [UEW: 16–17]

PU *a-a₂ or *j-a₂

PU **a/jmta₂₋* ‘to give’ > Fi *antaa*, SaaN *vuovdit* ‘to sell’ (PSaa **vuomtē-*), MdM *and-* ‘to feed’, MdE *and-* ‘to feed’, Komi *udni* ‘to give to drink’, Udm *udini* ‘to give to drink’, UdmMU *udini* ‘to give to drink’ (PKomi **ud-*, PUdm **ud-* < PPerm **od-*), Hung *ad-* ‘to give’ [UEW: 8]

PU *a-a or *j-a

PU **čalirja* ‘beam’ > Fi *sarja* ‘row’, Komi *śor* ‘crossbar for hanging drying cloth’, KomiJ *śur* ‘crossbar for hanging drying cloth’, Udm *śuri* ‘crossbar for hanging drying cloth; perch’, UdmMU *śuri* ‘crossbar’ (PKomi **śor*, PUdm **śuri* < PPerm **śori*) [UEW: 770–771]

PU **čalippa-* ‘to make a notch’ > SaaT *cāχped* ‘to make corner joints (in building logs)’ (PSaa **cāppē-*), MdM *šap-* ‘to make corner joints (in building logs)’, MdE *čap-* ‘to make corner joints (in building logs); to make a notch (in wood)’, Komi *čupni* ‘to make corner joints (in building logs); to make a notch (in wood)’, Udm *čupini* ‘to make corner joints (in building logs); to make a notch (in wood)’, UdmMU *čupini* ‘to hew’ (PKomi **čup-*, PUdm **čup-* < PPerm **čop-*) [UEW: 618–619; SUE I: 163–164]

PU **jalik(k)a-* ‘to divide’ > Fi *jakaa*, SaaN *juohkit* (PSaa **juokē-*), MdM *jav-*, MdE *jav-*, Komi *jukni*, Udm *lukini*, UdmMU *lukini* (PKomi **juk-*, PUdm **juk-* < PPerm **jok-*) [UEW: 87]

PU **jalijša-* ‘to grind’ > Fi *jauhaa*, MdM *jaža-* ‘to break; to grind’, MdE *jaža-* ‘to break; to grind’, MariM *jonğžem* ‘to chew the cud’, MariW *janğğžem* ‘to chew the cud’ (PMari **jāğğže-*) [UEW: 631–632]

PU **laljwča* ‘mild’ > Fi *lauha*, MdM *lafča* (pl. *lafčt*) ‘weak’, MdE *lavšo* ‘weak; old (of things)’ [UEW: 685]

PU **maljksa-* ‘to give’ > Fi *maksaa* ‘to pay’, MdM *maks-* ‘to give’, MdE *maks-* ‘to give’ [UEW: 698]

PU **maljksša* ‘piece of rotten wood’ > Fi (dial.) *mahea* ‘rotten’, MdM *makša* (pl. *makšət*), MdE *makšo* (pl. *makšot*), MariM *mekš*, MariW *mäkš* (PMari **mäkš*) [UEW: 698]

PU **malirta* ‘farrow’ > Fi *marto* ‘barren, sterile’, KomiUd *mur* ‘farrow (cow)’, Udm *murj* ‘farrow’, UdmMU *mürü* ‘farrow’ (PKomi **mur*, PUdm **mürj* < PPerm **mori*) [UEW: 699]

PU **maljta-* ‘to crawl’ > Fi *mataa* ‘to crawl’, *matala* ‘low’, MdM *mad-* ‘to lie down’, MdE *mad-* ‘to lie down’

A new comparison.

PU **paljla-* ‘to burn’ > Fi *palaa* ‘to burn (intr.)’, SaaN *buollit* ‘to burn (intr.)’ (PSaa **puolē-*), MdM *pal-* ‘to burn (intr.)’, MdE *pal-* ‘to burn (intr.)’ [UEW: 352]

PU **saljikka*, **saljik-ita* ‘thick’ > Fi *sakka* ‘dregs, lees’, *sakea* ‘thick (of liquids, fog etc.); thick, dense (of forest)’, SaaN *suohkat* ‘thick (of liquids); thick, dense (of forest etc.)’ (PSaa **suoketē*), Komi *suk* ‘thick (of liquids); thick, dense (of forest etc.)’ (PKomi **suk* < PPerm **sok*) [UEW: 750]

The shortening of the geminate **-kk-* in the form **saljik-ita* is as of yet unexplained, but the etymological relationship between **saljikka* and **saljik-ita* is quite certain.

- PU **tal̥inta* ‘to balk’ > MdM *tandad-* ‘to balk’, MdE *tandad-* ‘to become frightened’, Komi *dudni* ‘to balk (of horse, cattle)’ (PKomi **dud-* < PPerm **dod-*) [KЭCK: 97]
- PU **tal̥iŋka* ‘tassel’ > SaaN *duoggi* ‘lump of hair, wool’ (PSaa **tuon̄kē*), Komi *tug* (*tugj-*) ‘tassel’, Udm *tug* ‘tassel; fringe’, UdmU *tug* ‘tassel; fringe’ (PKomi **tug*, PUdm **tug* < PPerm **tog*) [UEW: 791]
- PU **tal̥ippa-* ‘to beat’ > Fi *tappaa* ‘to kill’, MdM *tapa-* ‘to trample; to break’, MdE *tapa-* ‘to trample; to break’ [UEW: 509–510]
- PU **tal̥irna* ‘grass’ > Fi *taarna* ‘sedge (*Cladium mariscus*)’, Komi *turun* ‘grass; hay’, Udm *tur̥in* ‘grass; hay’, UdmMU *tur̥im* ‘grass; hay’ (PKomi **tur̥in*, PUdm **tur̥in* < PPerm **tor̥in*) [UEW: 792]
- PU **wal̥iksa* ‘span’ > Fi *vaaksa*, SaaN *vuoksi* (PSaa **vuopsē*), MdM *vaks*, MdE *vaks* [UEW: 811–812]
- PU **wal̥ila-* ‘to pour’ > Fi *valaa*, MdM *val-*, MdE *val-* [UEW: 812]
- PU **wal̥iŋka* ‘handle’ > Fi *vanko* ‘long pole with hook at one end, used in slash-and-burn agriculture’, Komi *vug* (*vugj-*) ‘bail (e.g., of a bucket)’, Udm *vugi* ‘bail (e.g., of a bucket); felloe’ (PKomi **vug*, PUdm **vu/ugi* < PPerm **vogi*) [UEW: 814]
- PU **wal̥isa* ‘calf’ > Fi *vasa* ‘fawn’, SaaK *vūšš* ‘reindeer calf’ (PSaa **vuosē*), MdM *vaz* ‘calf’, MdE *vaz* ‘calf’ [UEW: 814–815]

Exception

- PU **pal̥ikka₁₋* ~ **pal̥ikka₂₋* ‘to burst’ > Fi (dial.) *pakkua* ‘to burst’, KhTrj *pāγ-* ‘to crackle’, KhKaz *pɔχ-* ‘to burst’ (PKh **pāγ-*), Hung *fakad-* ‘to spring (of water); to blossom out’ [UEW: 349–350]

Either the Khanty or the Hungarian vowel is irregular. Khanty **-γ-* is also unexpected.

PU **a-a* or **j-a* or **a-i*

- PU **paka-/pika-/paki-* ‘to run away’ > Fi *paeta* (: *pakene-*) ‘to flee, to run away’, *pako* ‘flight, escape’, MariM *poktem* ‘to drive; to pursue’, MariW *poktem* ‘to drive; to pursue’ (PMari **pokte-*) [OCHЯ I: 181]
- Mari **pokte-* is derived from this PU root with the causative suffix *-te-*.
- PU **sama/sjma/sami* ‘muddy, murky’ > Fi *samea* ‘muddy, murky’, Komi *zum̥iš* ‘gloomy; cloudy’, UdmU *zum̥it* ‘muddy’ (PKomi **zum-*, PUdm **zum-* < PPerm **zom-*) [SSA III: 151]

PU **o-a* or **j-a₁*

- PU **ko/jča₁₋* ‘to be able’ > Komi *kužni* ‘to be able’, Udm *kužim* ‘strength, power’, UdmJ *kužim* ‘strength, power’ (PKomi **kuž-*, PUdm **kužim* < PPerm **kož-*), MsSo *χās-* ‘to understand, to be able’ (PMs **k̄jš-*), KhKaz *χǰš-* ‘to understand, to be able’ (PKh **kāč-*) [UEW: 114–115]
- PU **no/jra₁* ‘swamp’ > Komi *ńur* ‘swamp’, Udm *ńur* ‘swamp; moisture’, UdmJ *ńur* ‘swamp; moisture’ (PKomi **ńur*, PUdm **ńur* < PPerm **ńor*), MsKM *ńēr* ‘swamp’, MsSo *ńār* ‘swamp’ (PMs **ńj̄r*), Hung *nyárfa* ‘poplar’ [UEW: 324–325]
- PU **to/jrka₁* ‘crane’ > Komi *turi*, Udm *turi*, UdmMU *turi* (PKomi **turig*, PUdm **turi* < PPerm **torig*), MsKM *tērii*, MsSo *tārəγ* (PMs **tj̄rəγ*), KhV *tarəγ* (PKh **tārəγ*), Hung *daru* [UEW: 513]

Hungarian *a* is irregular.

PU **a-a₁* or **o-a*

- PU **a/ońca₁* ‘back’ > MsLO *ūńś* ‘buttocks’ (PMs **ūńć*), Hung *ágyék* ‘groin’ [UEW: 832]

PU *a-i or *o-a

PU **anti/*onta* ‘root’ > SaaK *vüentęş* ‘root’ (PSaa **oantē*), MdM *unks* ‘root’, MdE *undoks* ‘root’ [UEW: 719]

PU **sampi/*sompā* ‘stick’ > SaaN *soabbi* ‘stick’ (PSaa **soampē*), MariE *šomba* ‘pole for driving fish into the net’ (PMari **sâ/omba*) [UEW: 764]

PU *a-i or *o-i

PU **kal/oni* ‘on one’s back’ > MdM *kunf* ‘on one’s back’, MdE *kunst* ‘on one’s back’, MsSo *χῶni* ‘on one’s back’ (PMs **kânəy*), Hung *hanyatt* ‘on one’s back’ [UEW: 179]

Unclear cases

PU ? **aŋa* ~ **aŋi* ‘opening’ > Est *ava* ‘opening’, MariM *aŋ* ‘opening’, MariW *äŋg* ‘opening’ (PMari **äŋ*), KhJ *oŋ* ‘opening’ (PKh **ῶŋ*), Hung *ajak* ‘lip’, PSam **aŋ* ‘mouth’ [UEW: 11–12]

This is a correlative derivative of PU **aŋa₂* ‘to open’.

PU ? **kaŋajla* < ***kaŋa-ila₂* ‘armpit’ > Fi *kainalo*, SaaS *gaejnjele* (PSaa **kājŋēl*), MdM *kavlal*, MdE *kavalalks*, MariM *koŋla*, MariW *koŋgāla* (PMari **koŋla*), Komi *kunleş* ‘gusset’, KomiI *kun-ū* ‘armpit’, Udm *kunul* ‘armpit; gusset’, UdmKUf *kunul* ‘armpit’ (PKomi **kun-ul*, PUdm **kun-ul* < PPerm **koŋ-ol*), MsKO *kân jalpöäl*, MsKO *kânal*, MsLO *χanl* (PMs **kan*, **kanal*), KhV *kunəŋ-pətɜ*, KhKaz *χoŋəŋ-päti* (PKh **kōŋəŋ-*, **kōŋəŋ-*), Hung *hón*, PSam **kalüŋ* [UEW: 178]

PU ? **lanti-* ~ **lįnti-* ‘lowland’ > Fi *lansi* (: *lante-*) ‘lowland’, MariW *landaka* ‘small valley, depression (esp. in a forest)’ (PMari **lā/andaka*), Komi *lud* ‘glade; pasture’, Udm *lud* ‘field’, UdmMU *lud* ‘field’ (PKomi **lud*, PUdm **lud* < PPerm **lod*), PSam **lįntə* ‘plain, valley’ [UEW: 235–236; SUE II: 86]

Possibly more than one root here.

PU ? **pali* ‘berry’ > Fi *puola* ‘cowberry’, Komi *puv* (*puvj-*) ‘cowberry’ (PKomi **pul* < PPerm **pol*), MsP *pul* ‘berry’, MsSo *pil* ‘berry’ (PMs **pīl*) [UEW: 392]

PU ? **lįkti* ~ **lakti* ‘bay’ > Fi *lahti* (: *lahte-*), SaaN *luokta* (PSaa **luokte*), MsSo *lῶχ* (PMs **lāk*) [UEW: 234]

PU ? **soja* ‘arm’ > SaaK *suejj* ‘wing; sleeve’ (PSaa **soajē*), MariM *šokš* ‘sleeve’, MariW *šokš* ‘sleeve’ (PMari **soks*), Komi *soj* ‘arm’, KomiI *kí-suj* ‘arm’, Udm *suj* ‘arm’ (PKomi **soj*, PUdm **suj* < PPerm **sój*), MsKM *tēt* (pl. *tajtət*) ‘sleeve’, MsSo *tajt* ‘sleeve’ (PMs **tjət*, **tajt-*), KhV *līt* ‘sleeve’, KhVj *jit* ‘sleeve’ (PKh **Līt*), Hung *ujj* ‘sleeve’ [UEW: 445]

PU ? **pįni-* ‘to put’ > Fi *panna*, Komi *penni* ‘to copulate with a woman’, Udm *ponįni* ‘to put’ (PKomi **pe/εn-*, PUdm **pon-* < PPerm **pän-*), MsP *pun-*, MsSo *pin-* (PMs **pįn-*), KhV *pän-* (PKh **pįn-*), PSam **pen-* [UEW: 353–354]

Abbreviations for languages and dialects

Est — Estonian
EstS — South Estonian
Fi — Finnish
Hung — Hungarian
Kar — Karelian
KhIrt — Irtysh Khanty
KhJ — Jugan Khanty
KhKaz — Kazym Khanty

KhLikr — Likrisovskoje Khanty
KhNi — Nizjam Khanty
KhO — Obdorsk Khanty
KhTrj — Tremjugan Khanty
KhV — Vakh Khanty
KhVj — Vasjugan Khanty
KomiI — Ižma Komi
KomiJ — Jažva Komi

KomiP — Komi-Permyak
KomiUd — Udora Komi
KomiUS — Upper Sysola Komi
Liv — Livonian
MariE — East Mari
MariM — Meadow Mari
MariNW — Northwest Mari
MariS — Sernur Mari

MariU — Upša Mari	MstJ — Tavda Mansi, village Janyčkova	SaaL — Lule Saami
MariV — Volga Mari		SaaN — North Saami
MariW — West (Hill) Mari	MsVS — South Vagilsk Mansi	SaaS — South Saami
MdE — Erzya	PFi — Proto-Finnic	SaaSw — Swedish Saami [Lindah & Öhrling 1780]
MdM — Moksha	PKh — Proto-Khanty	SaaT — Ter Saami
MsK — Konda Mansi	PKomi — Proto-Komi	Udm — Udmurt
MsKM — Middle Konda Mansi	PMari — Proto-Mari	UdmB — Besermyan Udmurt
MsKO — Upper Konda Mansi	PMd — Proto-Mordvin	UdmG — Glazov Udmurt
MsKU — Lower Konda Mansi	PMs — Proto-Mansi	UdmJ — Jelabuga Udmurt
MsLO — Upper Lozva Mansi	PPerm — Proto-Permic	UdmKUf — Krasnoufinsk district Udmurt
MsLU — Lower Lozva Mansi	PSaa — Proto-Saami	
MsN — North Mansi	PSam — Proto-Samoyed	UdmM — Malmyž Udmurt
MsP — Pelymka Mansi	PU — Proto-Uralic	UdmMU — Malmyž-Uržum Udmurt
MsSo — Sosva Mansi	PUdm — Proto-Udmurt	UdmS — Sarapul Udmurt
MsTČ — Tavda Mansi, village Čandyri	SaaI — Inari Saami	UdmU — Ufa Udmurt
	SaaK — Kildin Saami	

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М. А. Живлов. Исследования по уральскому вокализму III.

В статье рассматриваются три проблемы из истории уральского вокализма: переход прауральского сочетания гласных **ä-ä* в праприбалтийско-финское **a-e*, судьба прауральского **j* перед веллярными согласными в прибалтийско-финских, саамских и мордовских языках, а также возможность реконструировать две различные прауральские гласные непервых слогов вместо **i* традиционной реконструкции. Цель статьи — показать, что развитие уральского вокализма должно описываться с помощью строгих фонетических законов, а не «спорадических изменений».

Ключевые слова: уральские языки, финно-угорские языки, историческая фонетика, лингвистическая реконструкция, прауральский вокализм.