Historical phonology of Proto-Northern Jê*

This is the first paper in a planned series on the historical phonology of Macro-Jê languages. The Jê languages constitute the largest and the most diverse family within the Macro-Jê stock; for this reason, all comparative Macro-Jê studies depend heavily on Jê data. However, the only attempt at a systematic reconstruction of Proto-Jê phonology and lexicon (Davis 1966) has been severely criticized in subsequent works (Ribeiro and Voort 2010, Nikulin 2015b). In this paper, I propose a reconstruction of the proto-language of Northern Jê, the largest branch of the family.

Keywords: Jê languages, Macro-Jê languages, language reconstruction, comparative method.

1. Jê family

The Jê family\(^1\) comprises ten extant languages, all of which are spoken in Brazil, and approximately four extinct, poorly attested languages (one of which was spoken in the Misiones province of Argentina and in the extreme east of Paraguay). Preliminary lexicostatistical calculations and the distribution of sound changes, lexical and morphological innovations point to the following phylogenetic structure of the family:

Cerrado\(^2\)

Northern Jê

Panará\(^3\) (PAN)

Core Northern Jê

AMT: Apinajé (Apinajé, API), Kayapó (Mébêngôkre, KAY), Timbira (TIM)

Tapayúna (TAP), Suyá (Kisêdjê, SUY)

Central Jê: Xavante (XAV), Xerente (XER), Acroà (†), Xakriabá (†)

Southern Jê

Ingain (†)

Kaingáng (KGG), Xokléng (XOK)

(?) Jeikó (†)

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1 Traditionally the term ‘family’ is used in South American linguistics to refer to low-level phyla (roughly equivalent to the term ‘group’ in European linguistics), while deeper phyla are commonly referred to as ‘stocks’ (roughly equivalent to ‘families’ in European linguistics).

2 This phylum has been previously called Amazonian Jê (Ribeiro and Voort 2010: 549) and Northern Jê (Ramírez, Vegini and França 2015: 261); the latter source inappropriately treats what we call Northern Jê as if it were a dialect continuum of a sole language (“Proper Jê”). The choice of the term Amazonian Jê is infelicitous, since the geographical distribution of these languages corresponds much better to the region of Cerrado than to the Amazon.

3 Called Southern Kayapó in older sources.
Of these, Timbira is actually a dialect continuum with at least six divergent dialects: Pypkobjê, Ramkokamekrá, Krahô, Apâniêkrá, Pará Gavião (Parkatêjê), Krikati. Kaingáng is subdivided into five dialects: Paraná, Central, South-Western, South-Eastern and São Paulo (the latter is considered an independent language in some sources). Minor dialectal differences have also been described for Kayapô as spoken by the Kayapô and Xikrín ethnic groups.

A comprehensive overview of the state of affairs in comparative and synchronic studies in Jê is offered by Rodrigues (2012).

All data are cited using UTS (Unified Transcription System), based on the IPA with minor differences and currently used as the default standard for the Global Lexicostatistical Database (http://starling.rinet.ru/new100). Broad phonetic transcription is preferred over phonemic representation or practical orthography with the exception of Timbira, for which a normalized supradialectal phonemic representation (Nikulin 2016b) is used. The data used in this paper are extracted from the following sources:

Apinayé: Oliveira 2005, Ham et al. 1979
Pypkobjê: Sá 1999, Amado 2004
Ramkokamekrá: Popjes and Popjes 1971
Krahô: Miranda 2014
Apâniêkrá: Alves 2004
Parkatêjê: Araújo 2016, Ferreira 2003
Tapayúna: Camargo 2010, Rodrigues and Ferreira-Silva 2011

Old (late XVIII–early XX century) sources cover some Southern Kayapô, Kayapô, Timbira and Xavánte dialects which are now extinct. The most remarkable of them are:

a) the dialect of Southern Kayapô once spoken in Paranaíba and Triângulo Mineiro, unique in that it retained *r (*r > y before back vowels in the dialect of Vila Boa, which apparently evolved into Panará) (Vasconcelos 2014);
b) the variety of Xavánte recorded by Ehrenreich (1895), peculiar in that it had undergone the sound changes *c > θ, *-kw- > -ŋw- and *r > y, w, ɨ, r (Nikulin 2015a: 27–29);
c) Timbira varieties called “Menren” and “Krao” and the Kayapô variety called “Gorotirê” by Loukotka (1963), where r is found in place of earlier *t (in modern Timbira h is found, whereas in Kayapô it yielded ? or disappeared) (Nikulin 2015a: 25–27).

Akroá-Mirim, Xakriabá, Ingain and Jeikó data are limited to low-quality wordlists. They might eventually turn out to be important for further comparative Jê studies (at least Xarkiabá and Ingain show some interesting phonological retentions); however, their data are not taken into account in the present series.

Since back and central unrounded vowels do not contrast in any Jê language, back unrounded vowels ∙a, ∙e, ∙o, are written here as 3, 9, ɨ in order to facilitate the reading.
2. Overview

The first and only work dedicated to the reconstruction of Proto-Jê phonology is (Davis 1966). Davis considers data from five languages (Apinayé, Timbira, Suyá, Xavánte and Kaingáng) and proposes a reconstruction of the Proto-Jê phonological system. Even though he recognizes that Kaingáng and Xokléng are the most divergent members of the family, he does not attempt to postulate any phonological differences between Proto-Jê, Proto-Cerrado and Proto-Northern Jê. He reconstructs a system of 11 consonant phonemes, 9 oral and 6 nasal vowel phonemes. He also reconstructs 112 lexical items, whose distribution varies from Northern Jê to Jê (in my terminology). Davis’ reconstruction relies on false cognates, especially when it comes to Kaingáng (cf. 35, 55, 59, 86, 100) and fails to account for many sound correspondences, treating many developments as unexplained splits. Other shortcomings in Davis’ work include listing multiple unrelated roots under one etymology (cf. 49) and absence of systematic treatment of Jê morphophonology (e.g. relational prefixes, long verb forms, utterance-internal allomorphs in Xavánte). The correspondences postulated by Davis are presented below as Tab. 1–2 (the notation is modified for Apinayé, Timbira, Xavánte and Kaingáng to match UTS).

Table 1. Proto-Jê consonants according to Davis (1966).

<table>
<thead>
<tr>
<th>PJ</th>
<th>API</th>
<th>TIM</th>
<th>SUY</th>
<th>XAV</th>
<th>KGG</th>
</tr>
</thead>
<tbody>
<tr>
<td>*p</td>
<td>p</td>
<td>p</td>
<td>w - hw - p, h before r</td>
<td>p - b / m - w</td>
<td>p</td>
</tr>
<tr>
<td>*t</td>
<td>t</td>
<td>t</td>
<td>t, tʰ, r, n</td>
<td>t - d / n, θ before w</td>
<td>t, “d / n, r</td>
</tr>
<tr>
<td>*c</td>
<td>č, θ before w</td>
<td>t, y, n</td>
<td>η - y, η before w</td>
<td>y, ə” in coda</td>
<td></td>
</tr>
<tr>
<td>*k</td>
<td>k</td>
<td>k - kʰ</td>
<td>η, h (₃ₕ), sometimes u, w (₃ₕ), θ (Cₕ)</td>
<td>k, “g, θ word-finally</td>
<td></td>
</tr>
<tr>
<td>*m</td>
<td>m / ʰb</td>
<td>m / p</td>
<td>m</td>
<td>p - b / m</td>
<td>“b / m, p, “g” / -y, -d”</td>
</tr>
<tr>
<td>*n</td>
<td>n / ʰd</td>
<td>n / t</td>
<td>n</td>
<td>t - d / n</td>
<td>“d / n, t</td>
</tr>
<tr>
<td>*ŋ</td>
<td>ŋ / ʰg</td>
<td>ŋ / k</td>
<td>ŋ</td>
<td>ŋ / “g, k</td>
<td></td>
</tr>
<tr>
<td>*w</td>
<td>w</td>
<td>w</td>
<td>w</td>
<td>w, θ</td>
<td>θ, -η</td>
</tr>
<tr>
<td>*r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r, θ (Cₕ)</td>
<td>r, -n</td>
</tr>
<tr>
<td>*z</td>
<td>ź, y, 率领</td>
<td>h, y</td>
<td>s, y</td>
<td>c, ʒ / h, θ word-finally</td>
<td>φ, y, h, θ (Cₕ), n (Cₕ)</td>
</tr>
</tbody>
</table>

Table 2. Proto-Jê vowels according to Davis (1966).

<table>
<thead>
<tr>
<th>PJ</th>
<th>API</th>
<th>TIM</th>
<th>SUY</th>
<th>XAV</th>
<th>KGG</th>
</tr>
</thead>
<tbody>
<tr>
<td>*a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a, ē</td>
</tr>
<tr>
<td>*ə</td>
<td>ə, a, ə</td>
<td>ə, o</td>
<td>i, a, e, ə, a</td>
<td>a, ə, ē</td>
<td></td>
</tr>
<tr>
<td>*i</td>
<td>i</td>
<td>i</td>
<td>a</td>
<td>i, i, e</td>
<td></td>
</tr>
<tr>
<td>*ɔ</td>
<td>ɔ</td>
<td>ɔ</td>
<td>ɔ</td>
<td>ɔ, ē</td>
<td></td>
</tr>
<tr>
<td>*o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>?</td>
</tr>
<tr>
<td>*u</td>
<td>u</td>
<td>u</td>
<td>u</td>
<td>u</td>
<td>u</td>
</tr>
<tr>
<td>*e</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>*ɛ</td>
<td>e, ɛ</td>
<td>e, e</td>
<td>e, e, e, i, e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
</tr>
</tbody>
</table>
The reconstruction by Davis has been heavily criticized, notably by Ribeiro and Voort (2010) and Nikulin (2016a). However, an alternative detailed description of Proto-Jê phonology has never been proposed to date.

Many stems in Cerrado languages have two allomorphs: one is used when the word immediately follows its syntactic dependant, another is found in non-contiguous position. The difference between these allomorphs usually affects the initial consonant or the initial syllable. In synchronic descriptions it is practically useful to treat these alternating segments as independent morphemes (‘relational prefixes’, as described by Rodrigues (1952, 1953, 2010 [1981]). In comparative work, however, it is more appropriate to consider entire stems for the following reasons: (a) bare (prefix-less) roots do not occur; (b) the shape of the prefixes is very diverse in individual languages and this diversity can be traced back to PNJ and further; (c) in some instances the prefixes are fossilized and no longer segmentable. Henceforth the stems containing relational prefixes will be notated as follows: “non-contiguous allomorph / = contiguous allomorph”.

All verbs in Jê languages can be nominalized (so-called ‘long form’). Since the allomorphy of the nominalization suffix is lexically determined, I systematically provide both the finite (‘short’) and the nominalized forms of the verbs when this information is available. This is notated as follows: “short form(-nominalization suffix)”. Whenever the addition of the suffix causes alternations to the stem, both forms are written separately: “short form / long form”.

Finally, in most Jê languages words may surface differently in utterance-final position. In Northern Jê languages the differences are restricted to the presence of echo vowels and are not written out. In Central Jê the differences are sometimes very noticeable (cf. xav tu // nɔmɔ ‘belly’) and not entirely predictable; both allomorphs will be systematically written out separated by a double slash. In Southern Jê languages the vowels of certain roots are affected. I have shown that this phenomenon was present in PSJ and involved lowering of oral close-mid and open-mid vowels in final open syllables with an optional continuant coda (Nikulin 2015b). In the daughter languages (Kaingá and Xokleng) this process was obscured by a number of sound changes. PSJ syllables containing low, high or nasal vowels, as well as syllables with a nasal coda, were not affected. For roots that match said conditions, I systematically mark whether they were subject (#) or prone (?) to this phenomenon.

3. Proto-Northern Jê

3.1. Syllable structure and echo vowels.

The maximal syllable structure of most Northern Jê languages is CRVC, where R is a liquid or a glide. An interesting phenomenon found to a varying extent in all Core Northern Jê languages is the existence of so-called echo vowels. Echo vowels (EV) occur after the coda consonants of final (stressed) closed syllables, mostly in utterance-final position. Their quality depends on the vowel in the syllable nucleus (V₁) and on the syllable coda:

<table>
<thead>
<tr>
<th>Language</th>
<th>Condition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apinayé</td>
<td>EV = V₁ (i after palatal -č; i in finite verb forms only after -ar; suppressed in non-finite verb forms)</td>
<td>Oliveira 2005: 78–79: 191</td>
</tr>
<tr>
<td>Kayapó</td>
<td>EV = V₁ (i if V₁ = e; o ~ u if V₁ = o; i after dⁿ, dⁿ; i if V₁ = a; i after -č if V₁ is not rounded)</td>
<td>Stout and Thomson 1974</td>
</tr>
</tbody>
</table>

Salanova 2001
Echo vowels are sometimes manifested as a final i in Panará, but Core Northern Jê languages appear to be much more conservative in this respect. Apparently word-final echo vowels were present in all PNJ stems ending in a consonant, except for non-finite verb forms (hence different outcomes in Apinayé and Kayapó and a different correspondence in Central Jê, see below). Thus the presence of echo-vowels was marginally phonemic or quasi-phonemic in PNJ. It should be noted that they may have been suppressed in utterance-internal position for prosodic reasons. In most cases, its quality must have been identical to the quality of the syllable nucleus vowel. The dissimilation with a was apparently operative already in PNJ and persisted in Apinayé, Kayapó, Ramkokamekrá and Suyá; i must have surfaced after palatals and voiced post-nasalized codas.

Several rhymes may be optionally analyzed as a sequence of a vowel and a glide (followed by an echo vowel) or a sequence of two vowels. These will be treated in the Vowels section.

Syllable-initial clusters involving a liquid (CR) always have a labial or a velar onset in all Northern Jê languages (except for Tapayúna and Suyá, where hɾ, hɺ < *pɾ). It is practically useful to treat them as independent onsets for our purposes.

Syllable-initial clusters involving a glide (Cw, Cy; in some languages y yielded a fricative) have a much more restricted distribution: Cw sequences occur mostly before a or o (Pykobjê i, Suyá o, Panará o, i), whereas Cy sequences are relatively frequent only before e (Pykobjê i). For this reason, the glides are better analyzed as parts of raising diphthongs (like Chinese medials). Note that the glides still do interact with the syllable onsets in some cases (while plain vowels do not).

In Core Northern Jê languages final syllables are stressed, except certain suffixes (which might be better nalyzed as clitics for this reason). This stress pattern can be securely traced back to PNJ.

3.2. Onset.

Many voiced consonant phonemes had two allophonic realizations: one surfaced in oral syllables, another in nasal syllables (the syllable nasality was, and still is, governed by the nucleus vowel). This system is maintained in Apinayé and Kayapó, Tapayúna and Suyá with minimal changes. The following pairs of PNJ consonants occurred in complementary distribution: *m ~ */nsuperb, *n ~ */nsuperd, *ŋ ~ */nsuperg. In addition, *ɲ did not contrast with any other voiced palatal (*y, */nsuperȡ and *ȡ). Since the allophony in question undeniably existed in PNJ (it is paralleled by very similar phenomena in other Jê languages as well as in related Maxakalian, Krenák and Jabutí language families), I chose to represent these allophones in my reconstructions. See Tab. 3 for the summary.

Major differences between Davis’ reconstruction of PJ onsets and my reconstruction of PNJ onsets include the reconstruction of a voiced stop series and of a richer set of palatal consonants (four phonemes, five allophones).

5 Except for one very specific environment (namely, before a secondarily nasalized vowel), in which a minimal pair involving *ȡ and *ɲ is attested, see 3.3.
Table 3. Onset consonants in Northern Jê languages.

<table>
<thead>
<tr>
<th>PNJ</th>
<th>PNR</th>
<th>API</th>
<th>KAY</th>
<th>TIM</th>
<th>TAP</th>
<th>SUY</th>
</tr>
</thead>
<tbody>
<tr>
<td>*p</td>
<td>p</td>
<td>p</td>
<td>p</td>
<td>p</td>
<td>hʷ, hʰ</td>
<td>hʷ, hʰ</td>
</tr>
<tr>
<td>*pr</td>
<td>py, pr⁺</td>
<td>pr⁺</td>
<td>pr⁺</td>
<td>pr⁺</td>
<td>hʳ</td>
<td>h₁</td>
</tr>
<tr>
<td>*t</td>
<td>t</td>
<td>t (*ty &gt; č)</td>
<td>t (*ty &gt; č)</td>
<td>t (*ty &gt; č)</td>
<td>tʰ (*ti &gt; či, *ty &gt; č)</td>
<td>tʰ (*ti &gt; či, *ty &gt; č)</td>
</tr>
<tr>
<td>*k</td>
<td>k</td>
<td>k</td>
<td>k</td>
<td>k</td>
<td>k *k *k</td>
<td>k *k</td>
</tr>
<tr>
<td>*kr</td>
<td>ky, kr⁺</td>
<td>kr⁺</td>
<td>kr⁺</td>
<td>kr⁺</td>
<td>kχ</td>
<td>k⁺, k</td>
</tr>
<tr>
<td>*b</td>
<td>p</td>
<td>p</td>
<td>b</td>
<td>p</td>
<td>w (oral), m (nasal)</td>
<td>p, w §</td>
</tr>
<tr>
<td>*s</td>
<td>s</td>
<td>č</td>
<td>ʃ</td>
<td>c</td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>*m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
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<tr>
<td>*mr</td>
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<td>mr</td>
<td>mr</td>
<td>r</td>
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<tr>
<td>*n</td>
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<td>n</td>
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<tr>
<td>*n-</td>
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<td>=n-</td>
<td>=n-</td>
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<tr>
<td>*ŋ</td>
<td>y</td>
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<tr>
<td>*ŋr</td>
<td>k</td>
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<tr>
<td>*ŋh</td>
<td>y</td>
<td>y</td>
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<tr>
<td>*ŋbr</td>
<td>*p</td>
<td>μp</td>
<td>m</td>
<td>[m]p</td>
<td>μb - m</td>
<td>μb - m</td>
</tr>
<tr>
<td>*ŋdr</td>
<td>*d</td>
<td>*d</td>
<td>*d</td>
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<td>*ŋv</td>
<td>*ŋv</td>
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<td>*ŋy</td>
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<td>*ŋw</td>
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<td>*ŋw</td>
</tr>
</tbody>
</table>

Notes: † Before rounded vowels. ‡ Before front vowels. § In unstressed syllables.

Major differences between Davis’ reconstruction of PJ onsets and my reconstruction of PNJ onsets include the reconstruction of a voiced stop series and of a richer set of palatal consonants (four phonemes, five allophones).

3.2.1. Panará. Non-trivial developments in Panará include:

- *r > y before back vowels (did not affect the southernmost dialects of Southern Kayapó):
  PNJ *ka=*gco ‘warm’ > PNR =rʒ=ky spyOn:
  PNJ *rʒ ‘flower’ > PNR iyʃ;
  PNJ *krʒ ‘head’ > PNR ikyʃ;
  PNJ *cŋp=kca / *ŋp=kca ‘hand’ > PNR si=kyaj / ʃi=kyaj;
  PNJ *kri ‘cold’ > PNR kyij;
  PNJ *cara / *yara ‘wing, feather’ > PNR saya ‘flight feather’;
  PNJ *ka’bro ‘blood’ > PNR =rʒpyu;
PNJ *kukɾiṭi ‘tapir’ > PNR kyiti;
PNJ *ɾɔ ‘anacoonda’ > PNR yɔ-ti;
PNJ *ɾɔ(ɾ) ‘to cover’ > PNR pyo-ɾi;
PNJ *’bro-ti ‘Genipa americana’ > PNR pyu-ti, etc.

This change did not take place before front vowels:
PNJ *kɾ /ec̃ (¬ɾ) ‘to eat’ > PNR kɾ /ec̃;
PNJ *=kɾ /ec ‘house’ > PNR ku=kɾ /ec;
PNJ *kɾĩ ‘short (of height), child’ > PNR ku=kɾĩ, etc.

There are reasons to suspect that PNJ (and Proto-Cerrado) *k in unstressed syllables was phonetically voiced, at least before *a (this is still the situation in Apinayé and Tapayúna; the reflexes are distinct in Central Jê). Panará seems to corroborate this hypothesis:

- *ka [ga] > nʒ in unstressed syllables before prenasalized consonants with subsequent flapping of n in intervocalic position:
  PNJ *ka=”gɾ /warm’ > PNR nʒ=” kyɾ / =ɾʒ=” kyɾ;
  PNJ *ka”bro ‘blood’ > PNR nʒ=”pyu / =ɾʒ”pyu;
  PNJ *kanʒ ‘blood’ > *ka”gʃ > PNR nʃkʃ;
  PNJ *u=ka”ga ‘lazy’ > PNR s=w”ka, etc.;

- *ka [ga] > a in unstressed syllables before voiceless consonants:
  PNJ *kaɔtʃ ‘cotton’ > PNR asaʃ ‘cord’;
  PNJ *kaɔwɔ ~ *kaɔwa ‘mortar’ > PNR asuɔ ‘pestle’;
  PNJ *kapɾi’sad’ > PNR aprí-pe;
  PNJ *kapɾiʃ ‘turtle’ > PNR apʃi, etc.;

- *ku > i in unstressed syllables before voiceless consonants:
  PNJ *kutʃi ‘fire’ > PNR isi;
  PNJ *kukɾit ‘tapir’ > PNR ikyiti;
  PNJ *kubè ‘barbarian’ > PNR ipè;
  PNJ *kumtiʃ ‘capybara’ > PNR intʃi, etc.

- Voiced stops (both plain and prenasalized) underwent devoicing. Intervocalic prenasalized stops seem to have nasalized preceding vowels. In case of monosyllabic roots ũ was added word-initially (probably for prosodic reasons, as proposed by Lapierre et al. 2016b):
  PNJ *ba ‘liver’ > PNR iʔpa;
  PNJ *biˈti ‘sun’ > PNR iʔpit;
  PNJ *do ‘eye’ > PNR iʔtʃ, etc.

- Since CCC onsets are not allowed in Panará, such PNJ clusters were simplified:
  PNJ *grwɔ ~ *gɾuwa ‘moriche palm’ > PNR iʔkwa ~ kwa–.

- A sole example of PNJ *ŋɾ is available, in which ŋ disappears:

It is unclear whether the phonemes g and w existed in Proto-Northern Jê or whether they emerged in Proto-Core Jê after the split of Panará.
3.2.2. Apinayé, Kayapó and Timbira. These languages are relatively conservative phonologically.

- PNJ *t yielded ʔ or disappeared in Apinayé and Kayapó (the distribution is not clear); the Timbira reflex is h (Ø before w):
  PNJ *tʃ ‘seed’ > API i ~ ʔi, KAY ʔi, TIM hi;
  PNJ *tʃ ‘leaf, bodily hair’ > API o, KAY ʔo, TIM ho;
  PNJ *kutʃ ‘fire’ > API kuvi, KAY kuwi, TIM kuhi;
  PNJ *tʃa / *tʃa ‘tooth’ > API wa / =čwa, KAY wa / =čwa, TIM wa / =cwa;
  PNJ *kətʃa ~ *kətʃa ‘mortar’ > API kauv ~ kaʔu ~ kauɾu, KAY kawa, TIM kahuwá, etc.

- Another development that affected all these languages is the affricatization of PNJ *ty (API, KAY č, TIM c), though only one example is currently known:
  PNJ *tyetĕ ‘to burn’ > API četĕ, KAY čet / čeɾĕ, TIM cet.

- The voiced stop series remains unchanged in Kayapó; in Apinayé and Timbira all of them were devoiced (which is probably why Davis does not reconstruct it for PJ):
  PNJ *biʃi ‘only’ > API pič, KAY bit, TIM pit;
  PNJ *boʃi ‘to arrive’ > API poy, KAY boyč, TIM poy;
  PNJ *kaʃtʃ ‘cotton’ > API kašti, KAY kaʃt, TIM kacsı;
  PNJ *tʃa / *=tʃa ‘tooth’ > API wa / =čwa, KAY wa / =čwa, TIM wa / =cwa;
  PNJ *ga ‘thou’ > API ka, KAY ga, TIM ka;
  PNJ *ga / *=tʃa ‘to fry’ > API ka / =šə ~ =ør, KAY =ga / =ʒə-ɾ / =ʃə-ɾ, TIM ka / hə-ɾ / cə-ɾ.

- In Kayapó voiced prenasalized consonants became fully nasal. This has no consequences for the phonologic representation, since nasal and prenasalized consonants were allophones already in PNJ (as well as in PJ and probably in PMJ). However, in some exceptional cases the nasality propagated to the following vowel:
  PNJ *bra(-ɾ) ‘to walk’ > KAY mɾã (~-yɲ);
  PNJ *kábru ‘blood’ > KAY kamɾo ‘blood’, kamɾo ‘spleen’;
  PNJ *da(-ɾ) ‘to bite’ > KAY pã (~-yɲ).

One case of nasality assimilation is attested:
PNJ *yuʃi ‘hummingbird’ > KAY myuɗ (instead of expected *yuyɗ).

- After prefixes ending in -m (< *m, *p) in Kayapó *")d > y:
  PNJ *am=ʃo ‘rat’ > KAY am=yo;
  PNJ *am=ʃi ‘bumblebee’ > KAY am=yi;
  PNJ *=m="də(-ɾ) ‘to chew, to gnaw’ > KAY =m=yã / =m=yã-m, etc.
  PNJ *=*də sometimes yield my through analogy:
  PNJ *dɔp”dɔp’ itchiness’ > KAY myomyp (analogy with the next syllable);
  Proto-Core Jê *pi=ɗawã / *pi="daws-ɾ ‘to put vertically.PL’ > KAY pi=myuwã / pi=myɾ-ɾ (analogy with ʔu=m=yuwã / ʔu=m=yeɾ-ɾ < *tu=m=ɗawã / *tu=m="daw-ɾ).

- All instances of *ɾw were subject to metathesis in Apinayé and Timbira; interconsonantal w was removed in Timbira. In some cases the metathesis was blocked in Timbira via vowel epenthesis:
Table 4. Velar k and kʰ in Timbira lects. Cases with variation or unexpected reflexes are shadowed.

<table>
<thead>
<tr>
<th>PNJ</th>
<th>Common TIM</th>
<th>Krahô</th>
<th>Ramkokamekrá</th>
<th>Pykobjê</th>
</tr>
</thead>
<tbody>
<tr>
<td>*ŋɡo ‘water’</td>
<td>/ko/</td>
<td>ko</td>
<td>ko</td>
<td>ku</td>
</tr>
<tr>
<td>*ŋɡa ‘paca’</td>
<td>/kra/</td>
<td>kra</td>
<td>kla</td>
<td>kra:</td>
</tr>
<tr>
<td>*ŋɡva – *ŋɡwɑ ‘moriche log’</td>
<td>/kwɑ/</td>
<td>krove – kʰrove</td>
<td>klowɑ</td>
<td>krow</td>
</tr>
<tr>
<td>*ŋɡ3 ‘yard’</td>
<td>/k3/</td>
<td>ke</td>
<td>k3</td>
<td>kʰo: (irreg.)</td>
</tr>
<tr>
<td>*ŋɡ ‘dry’</td>
<td>/k3/</td>
<td>kɛɛ - kʰɛɛ</td>
<td>kʰɛɛ (irreg.)</td>
<td>kɔo</td>
</tr>
<tr>
<td>*kɑ’ɡɔ ‘warm’</td>
<td>/kɔɡ/</td>
<td>kɑɡo</td>
<td>kɺa</td>
<td>kɾaː</td>
</tr>
<tr>
<td>*ŋɡo ‘pig’</td>
<td>/kro/</td>
<td>kro</td>
<td>k³lo (irreg.)</td>
<td>kruː – kʰruː</td>
</tr>
<tr>
<td>*ŋɡoŋ (PAMT) ‘squash’</td>
<td>/kɔʔkʰɔn/</td>
<td>kuʔkʰɔn – kuʔkɔn</td>
<td>–</td>
<td>kuʔkʰɔn</td>
</tr>
<tr>
<td>*ɡa ‘thou’</td>
<td>/ka/</td>
<td>ka</td>
<td>ka</td>
<td>ka</td>
</tr>
<tr>
<td>*k3 ‘skin’</td>
<td>/k3/</td>
<td>kɛɛ</td>
<td>k3</td>
<td>kʰo</td>
</tr>
<tr>
<td>*kəa ‘offspring’</td>
<td>/kʰɛa/</td>
<td>kʰɛa – kɛa</td>
<td>kʰɛa</td>
<td>kʰɛa</td>
</tr>
<tr>
<td>*kɛɛ ‘hole’</td>
<td>/kʰɛɛ/</td>
<td>kʰɛɛ – kɛɛ</td>
<td>kʰɛɛ</td>
<td>kʰɛɛ</td>
</tr>
<tr>
<td>*kɛi ‘stone’</td>
<td>/kʰɛn/</td>
<td>kʰɛɛn</td>
<td>kʰɛɛn</td>
<td>kʰɛɛ</td>
</tr>
</tbody>
</table>

PNJ *ɾuwɑ / *ɾo̱k ‘to descend’ > API vɾ / vɾi, TIM wɾ / wɾ-k;
PNJ *ŋɡɔwɑ ~ *ŋɡwɑ ‘moriche palm’ > API ‘ɡora, TIM kɛwɑ ‘moriche log’;
PNJ *kɾɔtʰ ‘beak’ > API kɔɾtʰ, TIM kʰɔt;
PNJ *ɾo̱k-ɭ ‘rib’ > API vɾ-ɭi, TIM wɾ-ɭi.

Voiced prenasalized stops were devoiced in Timbira; the prenasalization was lost except at morpheme boundaries. Lapierre et al. (2016b) took this as evidence to group Timbira and Panará against other Northern Jê languages; however, the innovations shared by Core Northern Jê and not shared by Panará clearly outnumber the number of features common to Timbira and Panará.

In most Timbira varieties there are two contrasting voiceless velars: k and kʰ (Sá 1999: 52–53, Popjes and Popjes 1971: 9, Miranda 2014: 30). This opposition is not rendered consistently in the transcriptions, which points to a considerable degree of variation already in Proto-Timbira. Apparently this opposition survives mainly in Pykobjê and Ramkokamekrá, whereas it is obsolescent in Krahô and non-existent in Apâniêkrá and Parkatêjê. Timbira kʰ goes back to PNJ *k in stressed syllables, while Timbira k goes back to PNJ *ŋg, *ɡ and *k in unstressed syllables. A non-exhaustive list of Timbira etymologies illustrating this situation is provided in Tab. 4.

3.2.3. Tapayúna and Suyá. These two share some important innovations that suggest that these languages are very closely related (Rodrigues and Ferreira-Silva 2011):
In one case, one can suspect Kayapó or Suyá influence in Tapayúna:

Individual straightforward developments in Tapayúna and Suyá include:

- **PNJ *t* > TAP ť, SUY th**:  
  - **PNJ *tep* ‘fish’ > TAP ťew̌, SUY ťew̌;**  
  - **PNJ *katɔ̌ / *katɔ-r ‘to leave / to be born’ > TAP ǩaʔɔ̌, SUY ǩaʔɔ̌ / ǩaʔɔ-ʔɔ̌-łɔ̌;**  
  - **PNJ *tiki* ‘belly’ > SUY ťiǩi, etc.**

In one case, one can suspect Kayapó or Suyá influence in Tapayúna:

PNJ *tiki* ‘black’ > TAP ťi:ǩi, SUY ťi:ǩi.

- **PNJ *t* > TAP ť, SUY s**:  
  - **PNJ *ti* ‘seed’ > TAP ti, SUY si;**  
  - **PNJ *twakɔ̌ ‘coati’ > TAP toakɔ̌, SUY swakɔ̌;**  
  - **PNJ *kutì ‘fire’ > TAP kutì, SUY kwisi;**  
  - **PNJ *tɔ̌:ǩi ‘hawk, bird’ > TAP tɔ̌:ǧ, SUY sɔ̌:ǩ, etc.**

- **PNJ *b* > TAP w/m (per nasality), SUY p, w (in unstressed syllables?):**  
  - **PNJ *bu ‘grass’ > TAP m̌o, SUY p̌;**  
  - **Proto-Core Jê *bɔ̌ ‘forest’ > TAP wɔ̌, SUY pɔ̌ ‘grass, bush’;**  
  - **PNJ *bɔ̌:ťi ~ *b̌ɔ̌-ťi ‘corn’ > TAP wɔ̌:ťi ~ m̌o-ťi, SUY wɔ̌-si;**  
  - **PNJ *bo:ťi ‘to arrive’ > SUY pɔw̌i / pɔɐ̌;**

* Note that Guedes (1993) systematically writes *γ* and *γw* where other authors write *hγ* and *hw.*
The suggested distribution is violated in PNJ *bití ‘only’ > SUY wirí ‘always’, if the comparison is correct. In isolated cases TAP, SUY wí is found as an irregular reflex of other PNJ stops:

- PNJ *mr > TAP r; PNJ *br > TAP nr, SUY *bl; PNJ *kr > TAP kʰ, SUY k(ˈ)l; PNJ *γr > TAP g reconciliating; PNJ *mrúmúnu ‘ant’ > TAP rúwú / rúm-;
- Proto-Core Jê *brí ‘animal, game’ > TAP nri, SUY *blí;
- PNJ *bró-ti ‘Genipa americana’ > TAP nro-či;
- PNJ *ka’brí ‘heron’ > TAP kanri;
- PNJ *ka’a ‘offspring’ > TAP kʰa, SUY kʰa;
- PNJ *κρúkri ‘tapir’ > TAP kukʰiɾí, SUY kuk(ˈ)iɾí;
- PNJ *κρί Generating ‘green’ > TAP ʰeŋeŋe ~ ʰeŋe ‘blue, green, yellow’, SUY *gआgआ-मि ‘yellow’;
- PNJ *γe ‘egg’ > TAP “γe, SUY “γe;
- PNJ *γρό ‘Pleiades’ > SUY “γρο;
- PNJ *γρό ‘to warm up’ > TAP ka=“γρό ‘warm’, SUY “γά, etc.

- PNJ *b > TAP *b ~ m, PNJ *d > TAP *d ~ n:
  - PNJ *ba ‘liver’ > TAP *ba ~ ma;
  - PNJ *bití ‘sun’ > TAP *biri ~ miɾí;
  - PNJ *de ‘giant otter’ > TAP *de ~ ne;
  - PNJ *da ‘rain’ > TAP *da ~ na;
  - PNJ *do ‘eye’ > TAP “dā ~ n3, etc.

- PNJ Cω > TAP Cω:
  - PNJ *καδwaw ‘salt’ > TAP katwaw;
  - PNJ *κιwɾ ‘manioc’ > TAP kʷoɾ;
  - PNJ *tawa ‘sour’ > TAP tʷa-či, etc.

- PNJ *ky > TAP č, PNJ *ty > TAP č, SUY s, PNJ *by > TAP y ~ ž ~ ž, SUY mʒ:
  - PNJ *kye ‘thigh’ > TAP če;
  - PNJ *tyeɾé ‘to burn’ > TAP čeɾé, SUY seré;
  - PNJ *byed’i ‘husband’ > TAP ēɾé ~ ɾé ~ ɾé, SUY mžené, etc.

In two words PNJ *k disappears in Tapayúna; in both cases, the root is preceded by the same prefix (TAP tu- < PNJ *tu):
- PNJ *tu=ka’də ‘medicine’ > TAP tu=ane, SUY su=ka”de;
- PNJ *tu=ka’ga ‘lazy’ > TAP tu=éenga.
According to Nonato (2014), \( t^h \) and \( k^h \) contrast with \( t \) and \( k \) in Suyá. This contrast is not recognized by Santos (1997) and Guedes (1993). Even throughout Nonato’s recordings the contrast is inconsistent (e.g. \( i=t^h\text{-}m\tilde{e} \sim i=t\text{-}m\tilde{e} \) ‘my going’). As demonstrated above, SUY \( t^h \) more often goes back to PNJ *\( t \), whereas SUY \( t \) usually goes back to PNJ *\( \tilde{t} \). I was not able to find any similar correlations for SUY \( k^h \) and \( k \):

- PNJ *\( k\text{-}\text{u}k\text{-}\text{e} \) ‘agouti’ > SUY *\( k\text{-}\text{u}k\text{-}\text{e} \);
- PNJ *\( t\text{-}\text{u}k\text{-}\text{e} \) ‘coati’ > SUY *\( s\text{-}\text{w}a\text{-}\text{e} \), etc.

Note that TAP \( k \) is realized as [g] in unstressed syllables (this is reflected in my transcription) and is aspirated before back vowels (this is not reflected in my transcription). This is likely to be a retention from PNJ. However, this does not seem to be related to the aspiration contrast in Suyá. Further studies are needed to determine the status of the contrast in question in Suyá as well as its origins.

- PNJ *\( g \rangle SUY \( k \) (might have also happened in Tapayúna but the words in question are not attested in available sources on that language):
  - PNJ *\( g\text{-}a \) ‘2SG.NOM’ > SUY *\( k\text{-}a \);
  - PNJ *\( g\text{-}a / *\( i\text{-}k\text{-}r \) / *\( i\text{-}k\text{-}r \) ‘to fry’ > SUY *\( k\text{-}a \);
  - PNJ *\( g\text{-}u \) ‘1INCL.NOM’ > SUY *\( k\text{-}u \), etc.

- In several isolated words, PNJ *\( k\text{-}r \) > TAP, SUY *\( k \) (Guedes: ĉ) before front vowels:
  - PNJ *\( k\text{-}r\text{-}i \) ‘village’ > SUY *\( k\text{-}i \) (Guedes: ĉi);
  - PNJ *\( k\text{-}r\text{-}i \) ‘pet’ > TAP, SUY *\( k\text{-}i\text{-}i \);
  - PNJ *\( k\text{-}r\text{-}e \) ‘parakeet’ > TAP k\( \chi\text{-}i\text{-}e \), SUY k\( \tilde{e} \) (Guedes: ĉē);
  - PNJ *\( k\text{-}r\text{-}i \) ‘grasshopper, cricket’ > TAP k\( \chi\text{-}i\text{-}i\text{-}i \) ~ k\( \text{-}i\text{-}i\).

Given that this irregular process affected different words in Tapayúna and Suyá, it must have taken place after their split. Note that in other words satisfying these conditions PNJ *\( k\text{-}r \) developed normally:

- PNJ *\( k\text{-}r\text{-}e \) ‘hole’ > TAP k\( \chi\text{-}e \), SUY k\( \epsilon \);
- PNJ *\( k\text{-}r\text{-}i (\text{'}*\( k\text{-}r\text{-}i \text{'} ?) \) ‘to sit.PL’ > SUY *\( k\text{-}i \), etc.

- Apparently rw-like clusters are not tolerated in Tapayúna:
  - PNJ *\( k\text{-}r\text{-}u\text{-}w \) ‘moriche palm’ > TAP *\( g\text{-}u\text{-}w \);
  - PNJ *\( k\text{-}r\text{-}w\text{-}y\text{-}s\text{-}h \) ‘Amazon parrot’ > TAP k\( \chi\text{-}s\text{-}k\( \chi\text{-}s \);
  - PNJ *\( a\text{-}k\text{-}r\text{-}w\text{-}u\text{-}l\text{-}o \) ‘cashew’ > TAP ak\( \chi\text{-}y\text{-}\text{-}H\text{-}H\text{-}H\text{-}H\).

### 3.3. Nucleus.

Northern Jê languages typically have large vowel inventories and little to no vowel allophony. I assume that PNJ vowels have been most faithfully preserved in Kayapó and Common Timbira. The correspondences are summarized in Tab. 5. Of these, *\( u \) and *\( a \) were not phonemic, and *\( a \) and *\( i \) were very rare. *\( ye \) and *\( iy\̄ \), as well as *\( wa \) and *\( uw\̄ \), were frequently in variation, whose nature is yet to be discovered.

- *\( u \) (\( *\text{-i} \)) and *\( a \) were allophones of PNJ *\( u \), *\( i \) and *\( a \) before nasal codas:  
  - PNJ *\( i\text{-}t\text{-}m\tilde{u} \) ‘father (vocative)’ > PNR *\( s\text{-}i \), KAY *\( s\text{-}\tilde{u} \), TIM *\( c\text{-}i\text{-}m \) ~ *\( c\text{-i} \), TAP *\( t\text{-}\text{-}u\text{-}re \);
  - PNJ *\( t\text{-}u\text{-}m\tilde{u} \) ‘old’ > PNR *\( t\text{-}\text{-}u \), API *\( t\text{-}u\text{-}m\tilde{u} \), KAY *\( t\text{-}u\text{-}m \), TIM *\( t\text{-}u\text{-}m \), TAP *\( t\text{-}u\text{-}m\tilde{u} \), SUY *\( t\text{-}u\text{-}m\tilde{u} \);

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7 The marginal status of these phonemes in Kayapó has already been noted by Salanova (2001: 24).
### Table 5. Vowels in Northern Jê languages.

<table>
<thead>
<tr>
<th>PNJ</th>
<th>PNR</th>
<th>API</th>
<th>KAY</th>
<th>TIM</th>
<th>TAP</th>
<th>SUY</th>
</tr>
</thead>
<tbody>
<tr>
<td>*a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>*ə</td>
<td>ə</td>
<td>ə</td>
<td>ə</td>
<td>ə</td>
<td>ə</td>
<td>ə</td>
</tr>
<tr>
<td>*e</td>
<td>e</td>
<td>e</td>
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<td>e</td>
</tr>
<tr>
<td>*ɛ</td>
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<td>ɛ</td>
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<tr>
<td>*ɔ</td>
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<td>ɔ</td>
<td>ɔ</td>
<td>ɔ</td>
<td>ɔ</td>
<td>ɔ</td>
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<tr>
<td>*u</td>
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<td>u</td>
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<td>u</td>
<td>u</td>
</tr>
<tr>
<td>*i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
</tr>
<tr>
<td>*ɪ</td>
<td>ɪ</td>
<td>ɪ</td>
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<td>ɪ</td>
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<tr>
<td>*a</td>
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</tr>
<tr>
<td>*a</td>
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<tr>
<td>*a</td>
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</tr>
<tr>
<td>*a</td>
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<td>a</td>
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<tr>
<td>*a</td>
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<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>*a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

**Notes:** † The onset becomes labialized. ‡ The onset becomes palatalized (see 3.2.).

PNJ *kũmtům ũ ~ *kũmtôm “capybara” > PNR intĩŋ, KAY kũnûm, TIM kũmtûm, TAP kaṭũn ũ ~ koʃũwũ, SUY kʊ̃ũm;

PNJ *kũmû’ ‘smoke’ > API kũmû, KAY kũm, TIM kûm, SUY kus=kũm;

PNJ *mrûmû ‘ant’ > API mrûmû, KAY mrûm, TIM prûm, TAP rûwû;

PNJ *ŋũmû ~ *nûmî ‘who’ > API ɲũmô (older speakers), ɲámã (younger speakers) ‘another’, KAY nûm (Xikrín), nîb” (Kayapô), TIM yûm, TAP ɲûmã, SUY ɲûmû;

PNJ *bâmû ‘other person’s father’ > API põmû, KAY bûmû, TIM a=pam, TAP mêmù, SUY pûmû;

PNJ *=dã / *dã-m / *tã-m ‘to stand’ > PNR sã ~ saŋ, API ʃa / ʃã-m ~ ʃa-r, KAY ʃa / ʃã-m / ʃã-m, TIM ca / ca-m / ha-m, SUY =ta / tã-m / sã-m;

PNJ *tâmû / *tâmã ‘chin’ > API ɲûmô, KAY ama, TIM hama;

PNJ *tâmã-to / *tâmã-ţo ‘beard’ > API ɲûmô, KAY ama-ţo, TIM hama-ho, TAP tam-ţo.

- Examples of PNJ *ə (outside the diphthong *we):
  - PNJ *tsû ‘hard’ > PNR lûtû, API tsûʃ / tsytû, KAY tsûʃ, TIM tsuy, SUY turû (tsrû ?);
  - PNJ *tʃə / *tʃa ‘bitter’ > API ʃə / ʃa ŋu / ʃa ŋa, KAY ʃə, TIM hɔ / ɔ, TAP ʃu;
  - PNJ **bûwũ / **bû-ř ‘to cry’ > API ʃu-ř ~ ʃu-ɒ / ʃɒ-ř, KAY müs / mɔ-ř, SUY ʃo-ţu;
  - PNJ *kuʃə ‘bad smell’ > KAY kuʃs, TIM kušs, TAP kušs;
  - PNJ *kûs ‘smooth’ > API, TIM kʊs.
The same correspondence is attested in a number of roots whose distribution is limited to Apinaye, Kayapó and Timbira:

PAMT *ṭb9 / *ṭb9-‘ to carry’ > API "b9 / "b9-yd" ~ "b9-ɾ, KAY =m9 / m9-ya=" ‘to grab’, TIM ≈ p9-‘ (may be related to PNR ṭpi-‘ id.');
PAMT *ṭapɾ / *ṭapɾ-‘ to insult, to dishonor’ > API apɾ9 / yapɾ9, KAY apɾ9 / yapɾ9, TIM apɾ9 / yapɾ9 ‘to name’;
PAMT "p9 ‘corn husk’ > API pɾ9 ‘feather’, KAY pɾ9, TIM pɾ9 ‘corn husk / feather’;
PAMT *ṭubɔ̌b⁹-‘ deep’ > API ʁapɔ̌m9, KAY ʁubɔ̌;
PAMT *k9 ‘bad smell, fish smell’ > API, TIM k9, KAY k9, etc.

In one case the daughter languages disagree on the exact quality of Proto-Core Jê vowel: KAY yət, TIM yət, SUY yər³ ~ "yər³ ~ "nər³ ‘sweet potato’ point to Proto-Core Jê *yət, whereas API ẑət and TAP yər³ ~ "nər³ ‘id.’ reflect PNJ *yət.

- The sole reliable example of PNJ *ɾ is:
  PNJ *ṭi / *ṭi-‘ to sit.SG’ > PNR s依照 / s依照 / AP M T, KAY p依照 / p依照, TIM h依照 / h依照 / y依照 / y依照, SUY =依照 / s依照 / p依照.

- The alternation between *ye and *iyá can be exemplified by the following etymologies (note that the sequence *ɾy is regularly simplified to *y):
  PNJ *kyiːyá / *kye-‘ to raise’ > PNR kəye- (?), KAY kɾiːyá / kye-ɾ;
  PNJ *kukíyá / *kukye-‘ to ask’ > PNR k索赔- (?), API kukoː / kkoː- ‘to search’, SUY kukkíyá;
  PNJ *kokiːyá / *koke-‘ to split’ > PNR kye- ‘to cut’ (?), KAY koke- ‘to pick, to lift’ (?), KAY kokye ~ kokoː / kokoː- (Xikrin: -?), TIM kokoː / kokoː- ‘to search’;
  Proto-Core Jê *a=kkiyá / *a=kye-‘ to yell, to argue’ > API a=kki / ẑa=kki-ɾ, KAY a=kkiyá ~ a=kya / ʒ3=kki-ɾ, TIM a=kkoː / a=kkoː- ‘angry’, SUY a=kkoː;
  Proto-Core Jê *giiyá / *gye-‘ to enter.PL’ > PNR k索赔- (?), KAY k索赔 / k索赔- (KAY), TIM k索赔 / k索赔- (TIM) ‘to enter.PL’;
  Proto-Core Jê *riːyá ~ *yeté / *yet ‘to hang.PL’ > API a=yeté / yet, KAY a=riːyá, SUY =yeré / a=yet, sariːyá / yariːyá.

In some other cases no such alternation is attested:
  PNJ *kvey / *kvey- ‘to drag’ > PNR kɾ3- ( (?, API kve / kve-‘, KAY kve / kve-‘, TIM kʃv / kʃv-‘;
  Proto-Core Jê *kake / *kakye-‘ to scratch’ > API kakake, TIM kʃv / kʃv-‘, SUY kʃv (e)-ri;
  PAMT *takye / *takye-‘ to look for water’ > API ʁakaxe / ʁakaxe / ʁakaxe ‘to open a hole’, TIM kʃv / yakaxe / yakaxe ‘to fetch water’;
  Proto-Core Jê *kiyá ‘fire pit’ > API kiri ~ kiː, TIM kʃv;
  PNJ *kye ‘thigh’ > API kʃe, KAY kʃe, TIM kʃe, TAP ṭe;
  PNJ *byedí ‘husband’ > API bʒeŋ, KAY myed, TIM pyed, TAP *ʃeɾ, SUY mʃení;
  PNJ *yeté ‘to burn’ > PNR tití, API četé, KAY čet / čeɾ, TIM čet, TAP čeɾ, SUY seré.

The distribution, if it ever existed, must have been obscured by numerous paradigmatic analogies (which seem to have operated to a lesser extent in Kayapó). *iyá is restricted to open syllables, *ye is found both in open and closed syllables. It is possible that originally *ye was found exclusively in closed syllables.
The alternation between *wa, *wə and *uwə can be illustrated with the following examples:

Proto-Core Jê *krəwə ~ *krəwa ‘arrow’ > API kruʉ, KAY kruwɔ, TIM kruwə, SUY kwa;
PNJ *gəwə ~ *gəwə ‘moriche palm’ > PNR _AMD əwə ~ əwə-, API *gəra, KAY əwə, TIM kruwə
‘moriche log’, TAP _AMD əwə, SUY əwə;
PNJ *kaɬuə ~ *kaɬəwa ‘mortar’ > PNR asuə ‘pestle’, API kruəv ~ kətə ~ kaurə, KAY kwa,
TIM kahuə;

Proto-Core Jê *ruəvə / *ruə-k ‘to descend’ > API əvə / əvi, KAY rəuəv ~ rəəv / rəə-k, TIM wrə / wrə-k;

PNJ *dəwə / *təwə-ɾ ‘to bathe’ > PNR swə-ɾ, API čwa / wa-ɾ, KAY įuəv / əvə-ɾ / įvər-
TIM įwa / wə-ɾ / cwə-ɾ, SUY təwə ~ təwə, etc.

Once again, the original distribution of these nuclei is obscure. *uwə and *wa are restricted to open syllables, whereas *wə is found both in open and closed syllable. I assume that originally *wə was restricted to closed syllables; in open syllable, *uwə and *wa would have occurred in free variation. This is corroborated by other cases of alternation in individual languages, such as TIM kwa / kəwə-ɾ ‘to take.PL’.

Since Proto-Northern Jê vowel inventory was very rich (no less than 15 monophthongs and 2 diphthongs were phonemic), there was little space for allophony. That is why in most cases the reflexes of PNJ vowels in modern languages are quite straightforward (many shifts have occurred in some Timbira varieties after the split of Proto-Timbira, see (Nikulin 2016b)). However, several poorly understood splits have taken place in individual languages, notably PNJ *ʒ > API ʒ, ɬ (Nikulin 2015a: 13):

PNJ *gəbədəi ‘piranha’ > API ɬəbənəi;
PNJ *=tə ‘basker’ > API kə=əvə;
PNJ *kə ‘skin; breast’ > API ka;
PNJ *kəɬə ‘to whistle’ > API kəɾə / kəɾ;
PNJ *pətə ‘southern tamandua’ > API pətə, pəɾ-ɾ, pəɾ-ɬi, etc.

Their phonemic status is demonstrated by Oliveira (2005: 66–67). In most cases, ə is found in phonetically open syllables, while ʒ is usually found in phonetically closed syllables (including long verb forms, in which echo vowels are typically absent). The issue is further complicated by the fact that Apinayé ə may be realized as any of these in free variation: [ʒ, ə, ə].

Irregular nasalization in Kayapó has been treated in 3.2.2.

The reflexes of PNJ *wə in Panará are uncertain. ə is found in verbs (e.g. PNJ *twə-ɾ / *dəwə-ɾ ‘to bathe’.NMLZ’ > PNR swə-ɾ) but is not attested in nouns:

PNJ *kwəɾə ‘manioc’ > PNR kwə;
PNJ *dəwədəi ‘snail’ > PNR pari=ɬə;
PNJ *twəbəi ‘fat’ > PNR təmuə, etc.
3.4. Coda.

Except for syllables whose rhymes go back to PNJ *iyă or *uwă in PNJ, the codas of modern Northern Jê languages reflect PNJ codas. The reflexes sometimes differ phonetically depending on whether the coda was followed by an echo vowel (in utterance-internal position) or not (in utterance-final position, long verb forms in any position). These differences are noted here for Tapayuna and Suyá, where they are absolutely regular and systematic. For other languages they are written out as long as they are phonemic. See Tab. 6–7.

Basic correspondences can be illustrated with the following examples:

PNJ *t ken / eopenrevbrevecomb'fish' > PNR tepi, API tepē, KAY, TIM tep, TAP tew, SUY t̪ew;
PNJ *b ili / eopenrevsun' > PNR t̪iti, API bītī, KAY mit, TIM pi, TAP bīri / mīri, SUY "birī;
PNJ *t s̪i / eopenrevhard' > PNR t̪i, API t̪iȳ / t̪ii, KAY t̪ȳ, TIM tȳ, SUY turu (169 ?);
PNJ *b ēt i / eopenrevgood' > PNR t̪pe, API bēc, KAY mēc, TIM pē, TAP "be-\-mey-, SUY "beři;
PNJ *t k̪i / eopenrevhawk, bird' > PNR sa, API tk̪i, KAY 3k, TIM h3k, TAP t̪3g̪3, SUY s3k3;
PNJ *tob / eopenrevflour, powder' > API "cōb" // čomō, KAY ob / "cōb", TIM hōb / "cōb";
PNJ *t sb / eopenrevraw' > API t̪sb // t̪smi, TIM t̪sb, SUY t̪̄smi;
PNJ *byed l / eopenrevhusband' > API b̄ēȳa, KAY mȳa, TIM pȳed, TAP "jer̲, SUY m̃en̄;
Proto-Core Jê *tod / eopenrevarmadillo' > API tōd // tonō, KAY, TIM tōd, TAP porō, SUY ṁen̄;
PNJ *bed r / eopenrevhoney' > PNR n̄=pēny, API "bēȳa, KAY mēȳa, TIM pēd, TAP wey, "be-y-ti 'bee', SUY "beni;
PNJ *kukoy / eopenrevmonkey' > PNR kkōy, API kukoy, KAY kukōi, TIM kukōy, TAP kukōy, SUY kukūyi;
PNJ *pur u / eopenrevfield' > PNR pū, API pūr, KAY purū, TIM purū, TAP hurū, SUY hūlū;
PNJ *d i w i / eopenrevfield’ > PNR d̄ui, API "d̄ī, KAY ni, TIM [nu]w̄a, TAP, SUY "d̄īwī.

Cf. also PNJ, Proto-Core Jê or PAMT *kopō 'fly (insect)', *t̪=k̪op / *p̄=k̪op 'claw, nail', *tepē 'bat', *c̪opō 'jaguar', *tyetē 'to burn', *k̪otō 'cicada', *kukrite 'taipir', *kubiti 'howler monkey', *b uti / eopenrevneck', *k̪etē / eopenrevnot', 'k̪ad̄īt̄ / eopenrev3 cotton', *wetē / eopenrevlizard', *p̄tī / eopenrevt̪ōther southern tamandua', *ȳt̪ī / eopenrevsweet potato', *t̪ut̪ū / eopenrevpigeon', 'kāb̄īt̄ī / eopenrevnight', *t̪̄=kotō / *p̄=kotō 'chest', *grotō 'Pleidades', *boti / eopenrevto arrive', *boti / eopenrevcourbaril', *tētē / eopenrevto deceive', *pētē 'to make', *kakī 'cough', *tiki 'black', *kud̄ek̄ē 'vein', *tikī 'stomach', *kābrēk̄ē 'red', *poko 'to ignite', *koko 'wind', *ātī 'forest surrounding the village', *pe-k 'to fart', *ti-k 'to die', *t̪āba-k / *ȳa=ba-k 'to listen', *w̄ā-k 'to descend', *bāki / eopenrevscorpion', *tw̄b̄ī / eopenrevfat', *b̄d̄ī / eopenrevmacaw', *āb̄d̄ī / eopenrevpiranha', *t̪̄d̄ī / *d̄̄d̄ī / *d̄̄ / *d̄̄ī / eopenrev'sweet', *yūd̄ī / eopenrevhummingbird', *kwēd̄ī 'bird, feather', *kuked̄ī 'agouti', *r̄d̄ī / *r̄d̄ī / eopenrevgrugru palm', *bh̄ȳ / eopenrevsnake sp.', *āȳī / eopenrevwoodpecker', *rōrō 'termite', *b̄r̄d̄ 'tree', *kawr̄ / eopenrevmanioc', *puri / eopenrevfoot', *terē / eopenrevEnterpe sp.', *at̄r̄ī / eopenrevtinamou', *kāb̄erē 'Turu palm', etc.
The most reliable etymologies are: not very numerous. No secure etymologies with a nasal nucleus followed by

**Notes:** † Internal = in the middle of an intonational phrase, final = immediately preceding a pause. ‡ After i. # In long verb forms. ¶ After a. § After a, in long verb forms also after a or ə.

### Table 6. Coda consonants in Northern Jê languages after non-nasal vowels.

<table>
<thead>
<tr>
<th>PNJ</th>
<th>PNR</th>
<th>API</th>
<th>KAY</th>
<th>TIM</th>
<th>TAP (internal†)</th>
<th>TAP (final†)</th>
<th>SUY (internal†)</th>
<th>SUY (final†)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*p</td>
<td>pl</td>
<td>p</td>
<td>p</td>
<td>p</td>
<td>p</td>
<td>wV</td>
<td>p</td>
<td>wV</td>
</tr>
<tr>
<td>*t</td>
<td>t̡</td>
<td>t̢, ỵť§</td>
<td>ṭ, ỵ §</td>
<td>ṭ</td>
<td>ṭ</td>
<td>rV</td>
<td>ṭ</td>
<td>rV, ri†</td>
</tr>
<tr>
<td>*ḳ</td>
<td>ṭ</td>
<td>ỵ ṭ</td>
<td>ę̣</td>
<td>ỵ</td>
<td>ỵ</td>
<td>ỵ, ṭ</td>
<td>ỵ</td>
<td>rV§</td>
</tr>
<tr>
<td>*ḥ</td>
<td>ę̣</td>
<td>ḅ</td>
<td>ḅ</td>
<td>ḅ</td>
<td>m</td>
<td>ṃ</td>
<td>m</td>
<td>ṃ</td>
</tr>
<tr>
<td>*ḍ</td>
<td>ḍ, ỵḍ̣</td>
<td>ḍ</td>
<td>ḍ</td>
<td>rV</td>
<td>n</td>
<td>ṇ</td>
<td>ṇ</td>
<td>ṇ</td>
</tr>
<tr>
<td>*d̡</td>
<td>j̡</td>
<td>ỵd̡</td>
<td>j̡</td>
<td>d̡</td>
<td>ỵ</td>
<td>ỵ</td>
<td>n</td>
<td>ṇ</td>
</tr>
<tr>
<td>*ỵ</td>
<td>:</td>
<td>p̣</td>
<td>p̣</td>
<td>ỵ</td>
<td>ỵ</td>
<td>ỵ</td>
<td>ỵ</td>
<td>ỵ</td>
</tr>
<tr>
<td>*ṛ</td>
<td>:</td>
<td>ri#¶</td>
<td>ṛ</td>
<td>ṛ</td>
<td>ṛ</td>
<td>ṛ</td>
<td>ṛ</td>
<td>ṛ</td>
</tr>
<tr>
<td>*ẉ</td>
<td>i</td>
<td>w</td>
<td>ɺ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
</tr>
</tbody>
</table>

**Notes:** † Internal = in the middle of an intonational phrase, final = immediately preceding a pause. ‡ After i. # In long verb forms. ¶ After a. § After a, in long verb forms also after a or ə.

### Table 7. Coda consonants in Northern Jê languages after nasal vowels.

<table>
<thead>
<tr>
<th>PNJ</th>
<th>PNR</th>
<th>API</th>
<th>KAY</th>
<th>TIM</th>
<th>TAP (internal†)</th>
<th>TAP (final†)</th>
<th>SUY (internal†)</th>
<th>SUY (final†)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*ṭ</td>
<td>*ṭ</td>
<td>*ṭ</td>
<td>ṭ</td>
<td>n</td>
<td>nV</td>
<td>nV</td>
<td>nV</td>
<td>nV</td>
</tr>
<tr>
<td>*ḳ</td>
<td>*ḳ</td>
<td>*ḳ</td>
<td>ỵ</td>
<td>n</td>
<td>nV</td>
<td>nV</td>
<td>nV</td>
<td>nV</td>
</tr>
<tr>
<td>*ṃ</td>
<td>ṃ</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>mV, wV</td>
<td>m</td>
<td>mV</td>
<td>mV</td>
</tr>
<tr>
<td>*ṇ</td>
<td>ṇ</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>nV, rV</td>
<td>n</td>
<td>nV</td>
<td>nV</td>
</tr>
<tr>
<td>*ṇ</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>*ỵ</td>
<td>ỵ</td>
<td>ɺ</td>
<td>ɺ</td>
<td>ỵ</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>y</td>
</tr>
<tr>
<td>*ṛ</td>
<td>r</td>
<td>r, n†</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
</tr>
<tr>
<td>*ẉ</td>
<td>i</td>
<td>w</td>
<td>ɺ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
<td>ẉ</td>
</tr>
</tbody>
</table>

**Notes:** † Internal = in the middle of an intonational phrase, final = immediately preceding a pause. ‡ After i.  † After ə.

Except in long verb forms, where much variation with *ŋ and *r is attested, the examples are not very numerous. No secure etymologies with a nasal nucleus followed by *p are known, though this syllable pattern might have existed, cf. KAY ðŋ / ðŋŋ `elbow’ of unknown origin. The most reliable etymologies are:

- Proto-Core Jê *pṛtí `to run’ > API pṛtíŋt̥, KAY pṛtí, SUY hɟṇ;  
- Proto-Core Jê *ṭti `sister’ > API ṭtíŋt̥, KAY ṭtíŋt̥ `brother’, TIM ṭţi, SUY ṭţiŋ̣;  
- PNJ *kaṭḳ `firearm’ > PNR aṭj, API kaṭḳ, KAY kaṭḳ, TIM kaṭḳ;  
- Proto-Core Jê *kɔ̣ḳ `lizard’ > API kɔ̣ḳt̥, KAY kɔ̣ḳt̥, TIM kɔ̣ḳt̥, TAP kɔ̣ḳ-c̣;  
- PNJ *kɛ̣ṇẹ `stone’ > PNR kịy (?), API kɛ̣ṇẹ, KAY kɛ̣ṇ, TIM kɛ̣ṇ, TAP kɛ̣ṇẹ, TAP kɛ̣ṇẹ;  
- PNJ *ṭiṇị / *ṭịṇị `faeces’ > PNR ṣị / ỵị, API ṭịṇị / ṭịṇị, KAY ịṇ / j̣ịṇ, TIM ḥịṇ / ỵịṇ, TAP ṭịṛ;  
- Proto-Core Jê *kɔ̣ṇị `articulation, knee’ > API kɔ̣ṇị, KAY kɔ̣ṇ, TIM kɔ̣ṇ, TAP kɔ̣ṛ, SUY kɔ̣ṇị;  
- PNJ *kapṛṇị `turtle’ > PNR apỵṇ, API kapṛṇị, KAY kapṛṇ, TIM kapṛṇ, TAP kahṛṃ-c̣, SUY kahlịɔ̣-c̣;  
- PNJ *kuṭɔ̣y `worm, blind snake’ > API kuṭɔ̣y, KAY kuṭɔ̣, TIM kuṭɔ̣, TAP kuṭɔ̣y;  
- PNJ *ṛɔ̣ ̣ɔ̣ `Attalea speciosa coconut’ > API ṛɔ̣ ̣ɔ̣, KAY ṛɔ̣ṇ, TIM ṛɔ̣;  
- Proto-Core Jê *tịɾ̣ị `alive’ > API tịɾ̣ị, KAY tịɾ̣, TIM tịɾ̣, SUY ṭịɾ̣.  

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3.4.1. Notes on echo vowels.

1. The syllables containing the nucleus *a must have contained a high unrounded echo vowel. This is still the case in some Kayapó and Timbira varieties as well as in and Suyá (Stout and Thomson 1974, Popjes and Popjes 1971, Nonato 2014: 129). This vowel must have triggered palatalization of *t (in Apinayé and Kayapó) and of *ɾ (in Tapayuna and Suyá):

- PNJ *krai ‘base, stem, lower part of the body’ > API kṛata ‘waist, leg, beginning, medial part of a long object’ ~ krayć ‘wall, stem, stalk’, KAY krayć ‘trunk, stump, pelvis’ (cf. SUY kɾarī);
- PNJ *pari ‘foot’ > TAP h”ay, SUY hwaj (cf. KAY parī);
- PNJ *ba / *beɾ ‘to know’ > *ba / *beɾi > SUY *ba / *ba-ɾi (cf. KAY ma-ɾi);
- PNJ *kapa / *kapa-ɾ ‘to pull out’ > *kapa / *kapa-ɾi > SUY kapa-ɾi.

Note that the same echo vowel must have existed in syllables with the vowel *i, but in this case it triggered palatalization only in Apinayé:

- PNJ *biti ‘only’ > API pič, but KAY bit (cf. TIM pit, maybe SUY wiɾ ‘always’);
- PNJ *kriti ‘pet’ > API kriči ~ krič, but KAY krit (cf. TAP, SUY kiri);
- PNJ *=tzi / *ti-ɾi / *tzi-ɾi ‘to put’ > SUY =tζi / si-li / ti-li (cf. KAY =tζi / חי-ɾi), etc.

This does not necessarily suggest that the echo vowels of these two groups of words were phonetically distinct: it is common for palatalization to be blocked when the consonant is both preceded and followed by palatalizing vowels (this is precisely what happens in languages like Paresí (Brandão 2014: 46)).

2. There are numerous reasons to believe that PNJ long verb forms did not contain echo vowels, as it happens today in Apinayé (Oliveira 2005: 191). They are listed below.

- Although echo vowels are present in Kayapó long verb forms, they are chosen in a special way for syllables whose underlying rhyme is ər or ər. While in nouns with these rhyme the echo vowel is [i] (b/eopenrevɾi ‘tree, horn’), in long verb forms it copies the nucleus (ak3-ɾ3 / yak3-ɾ3 ‘to cut’). This suggests that these words did not rhyme at an earlier stage.

- The correspondences in Central Jê languages are different for nouns and long verb forms ending in PNJ *r. Compare the following pairs:
  - PNJ *pa / *pa-ɾ ‘to finish, to kill’, Xavante pa / pa-ɾi ‘to finish, to erase’;
  - PNJ *pari ‘foot’, Xavante paca ‘id.’.

What matters here is not the quality of PNJ echo vowel but its presence or absence. The Proto-Cerrado forms of these words would have been *pa / *pa-ɾ ‘to finish’ and *pacā ‘foot’ (the dissimilation seems to have occurred in the independent history of PNJ).

- Some Suyá alternations are explainable if we assume that the echo vowels were suppressed in PNJ long verb forms:
  - SUY paryi / pot ‘to arrive’ < *bɔtʃi / *bət < *bɔt / *bɔt;
  - SUY =yere / a=yet ‘to hang.PL’ < *=yetʃ / *yet, etc.

The depalatalization of PNJ *t through suppression of an echo vowel is attested in API tayć / layt ‘hard’.
It is uncertain whether this phenomenon affected PNJ long verb form suffixes other than *r. As a preliminary solution, I reconstruct forms like PNJ *tɛ-m ‘to go.SG’, *kɔ-m ‘to drink’, *pe-k ‘to fart’, *ti-k ‘to die’, *tɑ’ba-k / *ya=ba-k ‘to listen’, *rəw-k ‘to descend’ (with the unproductive suffixes *-m and *-k also found in a handful of other verbs). However, it has not been proven conclusively that these particular suffixes occurred without an echo vowel. The same applies to the productive suffix *-ɲ.

4. Conclusion

For the first time, a phonological reconstruction of Proto-Northern Jê has been proposed. Some issues still remain to be clarified, including:

— the emergence of long vowels in Timbira;
— the status and sources of syllable-final glottal stops in Timbira and preaspiration in Apinayé (Oliveira 2005: 78);
— the status and sources of the k / kʰ opposition in Suyá;
— the status of stem-initial alternations of palatal consonants and *g (*ŋ in nasal syllables), first observed by A. P. Salanova (p.c.);
— the status and sources of word-initial unstressed syllables without an onset.

Now that a reconstruction of PNJ is available, we are in position to proceed to the reconstruction of Proto-Cerrado and, subsequently, Proto-Jê and Proto-Macro-Jê. The importance of such intermediate-level reconstructions as demonstrated, e.g., by S. Starostin (1999), cannot be underestimated; ignoring this stage has led to absence of reliable reconstructions of Proto-Jê, which in turn makes further comparative studies in Macro-Jê impossible.

I am planning to propose a reconstruction of Proto-Jê in a forthcoming article.

References


А. В. Никулин. Историческая фонетика северной ветви семьи же.

Статья является первой в планируемой автором серии публикаций по исторической фонологии языков южноамериканской макросемьи макро-же. Поскольку в рамках этой макросемьи самой большой и разнообразной семьей являются собственно языки же, сравнительные исследования по макро-же в первую очередь зависят от степени исторической обработанности данных по семье же; при этом единственная известная на сегодня попытка системной реконструкции фонологической системы и лексического инвентаря пра-же (Davis 1966) подверглась обстоятельной критике в целом ряде работ (Ribeiro and Voort 2010, Nikulin 2015b). В настоящей статье предлагается промежуточная реконструкция для прасеверного же, представляющего крупнейшую из ветвей семьи же.

Ключевые слова: языки же, языки макро-же, языковая реконструкция, сравнительно-исторический метод.