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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: **Apinayé** (Apinajé, API), **Kayapó** (Mẽbêngôkre, KAY), **Timbira** (TIM)
    - **Tapayúna** (TAP), **Suyá** (Kĩsêdjê, SUY)
- Central Jê: **Xavánte** (XAV), **Xerénte** (XER), Acroá (†), 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* (Ramirez, 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: **Pykobjê**, **Ramkokamekrá**, **Krahô**, **Apãniêkrá**, **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 Kayapó as spoken by the Kayapó 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)[4]. 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:

Panará:	Dourado 2001, Bardagil-Mas et al. 2016, Lapierre et al. 2016a
Apinayé:	Oliveira 2005, Ham et al. 1979
Kayapó:	Costa 2015, Jefferson 1989, Stout and Thomson 1974, Salanova 2001, Salanova p.c.
Pykobjê:	Sá 1999, Amado 2004
Ramkokamekrá:	Popjes and Popjes 1971
Krahô:	Miranda 2014
Apãniêkrá:	Alves 2004
Parkatêjê:	Araújo 2016, Ferreira 2003
Tapayúna:	Camargo 2010, Rodrigues and Ferreira-Silva 2011
Suyá:	Santos 1997, Nonato 2014, Guedes 1993

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

a) the dialect of Southern Kayapó once spoken in Paranaíba and Triângulo Mineiro, unique in that it retained **ɾ* (**ɾ* > *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 **ɾ* > *y*, *w*, *∅*, *ɾ* (Nikulin 2015a: 27–29);
c) Timbira varieties called “Menren” and “Krao” and the Kayapó variety called “Gorotiré” by Loukotka (1963), where *r* is found in place of earlier **ɬ* (in modern Timbira *h* is found, whereas in Kayapó it yielded *ʔ* 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.

[4] Since back and central unrounded vowels do not contrast in any Jê language, back unrounded vowels *ʌ*, *ɤ*, *ɯ*, are written here as *ɜ*, *ɘ*, *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).

PJ	API	TIM	SUY	XAV	KGG
*p	p	p	w ~ hw ~ p, h before ɾ	p ~ b / m ~ w	p
*t	t	t	t, t^h, ɾ, n	t ~ d / n, ∅ before w	t, ^{n}d / n, ɾ
*c	č, ∅ before w	c-, -y	t, y, n	c ~ ʒ ~ y, ʔ before w	y, $ɖ_ɸ^n$ in coda
*k	k	k ~ k^h	k ~ k^h	ʔ, h (_ə), sometimes u, w (#_a), ∅ (C_C)	k, ^{n}g, ∅ word-finally
*m	m / ^{m}b	m / p	m	p ~ b / m	^{m}b / m, p, -g^n / -ŋ, -d^n
*n	n / ^{n}d	n / t	n	t ~ d / n	^{n}d / n, t
*ɲ	ɲ / $^n ɖ_ɸ$	c, h, -n	n, ɲ	c, ʒ / ɲ, -y	y, n, -ŋ
*ŋ	ŋ / ^{n}g	ŋ / k	ŋ	ʔ	ŋ / ^{n}g, k
*w	w	w	w	w, ∅	∅, -ŋ
*ɾ	ɾ	ɾ, n	ɾ	ɾ, ∅ (C_ə)	ɾ, -n
*z	ʔ, y, ɲ	h, y	s, y	c, ʒ / ɲ, h, ∅ word-finally	ɸ, y, h, ∅ (C_), n (_C)

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

PJ	API	TIM	SUY	XAV	KGG
*a	a	a	a	a	a, ɛ̃
*ə	ɜ, e, a	ə, o	ɨ, a, ə	ɛ, ə, a	a, ã
*ɨ	ɨ	ɨ	ɨ	ə	ɨ, ĩ, i, e
*ɔ	ɔ	ɔ	ɔ	ɔ	ɛ̃
*o	o	o	o	u	ʔ
*u	u	u	u	u	u
*ɛ	ɛ	ɛ	ɛ	e	ɛ
*e	e, ɛ	e	e, ɛ	e, ɛ, i	e
*i	i	i	i	i	i

PJ	API	TIM	SUY	XAV	KGG
*ã	ə̃	ɛ̃	ẽ	ã	ɛ̃
*ɨ̃	ɨ̃	ə̃		ã	ĩ
*õ	ɔ̃	ɔ̃	õ	õ	ũ, ã
*ũ	ũ	ũ	ũ	ũ	ũ
*ẽ	ɛ̃	ɛ̃	ẽ, e, ɛ	ẽ	ɛ̃
*ĩ	ĩ	ĩ	ĩ	ĩ	ĩ

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* // *nɔ̃mɔ̃* '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 (Kaingáng and Xokléng) 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 (ʔ) 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 (V_1) and on the syllable coda:

Apinayé:	EV = V_1 (*i* after palatal *-č*; *i* in finite verb forms only after *-ar*; suppressed in non-finite verb forms)	Oliveira 2005: 78–79: 191
Kayapó:	EV = V_1 (*i* if V_1 = *e*; *o* ~ *u* if V_1 = *o*; *i* after *d*^{n}, *ɖ*^{n}; *ɨ* if V_1 = *a*; *i* after *-č* if V_1 is not rounded)	Stout and Thomson 1974
	EV = V_1 (*i* if V_1 = *a*, *ɜ*, *ɔ* in non-finite verb forms, *a* in nouns), only if the coda is *ɾ*	Salanova 2001

Ramkokamekrá:	EV = V_1 (*i* if V_1 = *a*)	Popjes and Popjes 1971
Krahô:	EV = V_1, only if the coda is *ɾ*	Miranda 2014
Tapayúna:	EV = V_1	Camargo 2010: 100–101
Suyá:	EV = V_1 (*i*/*ɨ* if V_1 = *a* or after *m, n, y* if V_1 is oral; *ĩ* in some words following *ɛ̃n*; *i* occurs after coronals and *ɨ* elsewhere)	Nonato 2014: 129

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, hl* < **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 *ɘ* (Pykobjê *ɨ*, Suyá *ə*, Panará *ə, ɨ*), 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* ~ **ᵐb*, **n* ~ **ⁿd*, **ŋ* ~ **ⁿg*. In addition, **ɲ* did not contrast with any other voiced palatal (**y*, **ⁿʤ* and **ʤ*[5]). 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 Maxakalían, 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 **ʤ* and **ɲ* is attested, see 3.3.

Table 3. Onset consonants in Northern Jê languages.

PNJ	PNR	API	KAY	TIM	TAP	SUY
**p*	*p*	*p*	*p*	*p*	*h^{w}, h*†	*hw, h*†
**pɾ*	*py, pɾ*‡	*pɾ*	*pɾ*	*pɾ*	*hɾ*	*hɻ*
**t*	*t*	*t* (**ty > č*)	*t* (**ty > č*)	*t* (**ty > c*)	*ţ* (**ti > či, *ty > č*)	*t^{h}* (**ti > či, *ty > s*)
**ţ*	*s*	*ʔ, ∅*	*ʔ, ∅*	*h* (**ţw > w*)	*t*	*s*
**k*	*k* (**ka > nɜ̃, =ɾɜ̃ ~ a, *ku > i*§)	*k*	*k*	*k^{h}, k*§	*k* (**ky > č, *uka > *ua*)	*k(^{h})*
**kɾ*	*ky, kɾ*‡	*kɾ*	*kɾ*	*k^{h}ɾ, kɾ*§	*kχ*	*k(^{h})ɹ, k*‡
**b*	*p*	*p*	*b*	*p*	*w* (oral), *m* (nasal)	*p, w*§
**dʱ*	*s* (**dʱi > ti*)	*č*	*ǯ*	*c*	*t*	*t*
**g*			*g*	*k*		*k*
**m*	*m*	*m*	*m*	*m*	*m*	*m*
**mɾ*		*mɾ*	*mɾ*	*mɾ*	*ɾ*	
**n*	*n-, =ɾ-*	*n*	*n*	*n*	*n*	*n*
**ɲ*	*y*	*ɲ*	*ɲ*	*y*	*ɲ*	*ɲ*
**ŋ*	*k*	*ŋ*	*ŋ*	*ŋ ~ ^{n}g*	*ŋ*	*ŋ*
**ŋɾ*	*y*	*ŋɾ*	*ŋɾ*	*ɾ*	*ŋχ*	*^{n}gɹ*
**^{n}b*	*^{n}p*	*^{n}b*	*m*	*[m]p*	*^{n}b ~ m* (**^{n}by > ^{n}ǯ ~ y*)	*^{n}b* (**^{n}by > my ~ mǯ*)
**^{n}bɾ*	*^{n}py, ^{n}pɾ*‡	*^{n}bɾ*	*mɾ*	*[m]pɾ*	*nɾ*	*^{n}bɻ*
**^{n}d*	*^{n}t*	*^{n}d*	*n*	*[n]t*	*^{n}d ~ n*	*^{n}d*
**^{n}dʱ*	*^{n}s*	*^{n}ǯ*	*ɲ*	*[n]c*	*^{n}t* (*~ ^{n}d*)	*^{n}t* (*~ ^{n}d*)
**^{n}g*	*^{n}k*	*^{n}g*	*ŋ*	*[ŋ]k*	*^{n}g*	*^{n}g*
**^{n}gɾ*	*^{n}ky, ^{n}kɾ*‡	*^{n}gɾ*	*ŋɾ*	*[ŋ]kɾ*	*^{n}gʁ*	*^{n}gɹ*
**y*	*y*	*ž*	*y*	*y*	*^{n}ǯ ~ y*	*^{n}y ~ y ~ ǯ*
**ɾ*	*y, ɾ*†	*ɾ*	*ɾ*	*ɾ*	*ɾ*	*ɾ*
**w*		*v*	*w*	*w*	*w*	*w*

N o t e s: † 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:

- **ɾ > y* before back vowels (did not affect the southernmost dialects of Southern Kayapó):
  PNJ **ka=^{n}gɾɔ* 'warm' > PNR *=ɾɜ̃=kyɔ*;
  PNJ **ɾɜ̃* 'flower' > PNR *iyɜ̃*;
  PNJ **kɾɜ̃* 'head' > PNR *ikyɜ̃*;
  PNJ **cĩp=kɾa* / **ɲĩp=kɾa* 'hand' > PNR *si=kya* / *yĩ=kya*;
  PNJ **kɾɨ* 'cold' > PNR *kyɨ*;
  PNJ **caɾa* / **yaɾa* 'wing, feather' > PNR *saya* 'flight feather';
  PNJ **ka^{n}bɾo* 'blood' > PNR *=ɾɜ̃pyu*;

PNJ **kukɾɨtɨ̃* 'tapir' > PNR *kyɨti*;
PNJ **ɾɔ* 'anaconda' > PNR *yɔ-ti*;
PNJ **pɾɔ(-ɾ)* 'to cover' > PNR *pyo-ɾĩ*;
PNJ **ⁿbɾo-ti* '*Genipa americana*' > PNR *pyu-ti*, etc.

This change did not take place before front vowels:
PNJ **kɾɛ̃(-ɾ)* 'to eat' > PNR *kɾɛ̃*;
PNJ **=kɾɛ* 'house' > PNR *ku=kɾɛ*;
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*] > *nɜ̃* in unstressed syllables before prenasalized consonants with subsequent flapping of *n* in intervocalic position:
    PNJ **ka=ⁿgɾɔ* 'warm' > PNR *nɜ̃=ⁿkyɔ / =ɾɜ̃=ⁿkyɔ*;
    PNJ **kaⁿbɾo* 'blood' > PNR *nɜ̃=ⁿpyu / =ɾɜ̃ⁿpyu*;
    PNJ **kaŋɜ̃* 'blood' > **kaⁿgɜ̃* > PNR *nɜ̃kɜ̃*;
    PNJ **ɬu=kaⁿga* 'lazy' > PNR *s=waⁿka*, etc.;

  - **ka* [*ga*] > *a* in unstressed syllables before voiceless consonants:
    PNJ **kadʑɜtʃ̃* 'cotton' > PNR *asətĩ* 'cord';
    PNJ **kaɬuwã ~ *kaɬwa* 'mortar' > PNR *asuã* 'pestle';
    PNJ **kapɾĩ* 'sad' > PNR *apɾĩ-pɛ*;
    PNJ **kapɾɜ̃tɜ̃̌* 'turtle' > PNR *apyɜ̃n*, etc.;

  - **ku* > *i* in unstressed syllables before voiceless consonants:
    PNJ **kuɬɨ* 'fire' > PNR *isɨ*;
    PNJ **kukɾɨtɨ̃* 'tapir' > PNR *ikyɨtĩ*;
    PNJ **kubɛ̃* 'barbarian' > PNR *ipɛ̃*;
    PNJ **kũmtɨ̃mɨ̃̌* 'capybara' > PNR *intɨŋ*, etc.

- Voiced stops (both plain and prenasalized) underwent devoicing. Intervocalic prenasalized stops seem to have nasalized preceding vowels. In case of monosyllabic roots *ĩ* was added word-initially (probably for prosodic reasons, as proposed by Lapierre et al. 2016b):
  PNJ **ⁿba* 'liver' > PNR *ĩⁿpa*;
  PNJ **ⁿbɨtɨ̃* 'sun' > PNR *ĩⁿpɨtĩ*;
  PNJ **ⁿdɔ* 'eye' > PNR *ĩⁿtɔ*, etc.

- Since CCC onsets are not allowed in Panará, such PNJ clusters were simplified:
  PNJ **ⁿgɾwã ~ *ⁿgɾuwa* 'moriche palm' > PNR *ĩⁿkwa ~ kwa-*.

- A sole example of PNJ **ŋɾ* is available, in which *ŋ* disappears:
  PNJ **ŋɾɔ̃Cʃ̃̌* 'toucan' > PNR *yɔ̃-kwekwe, yɔ̃-sə*.

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 **ʈ* yielded *ʔ* or disappeared in Apinayé and Kayapó (the distribution is not clear); the Timbira reflex is *h* (*∅* before *w*):
  PNJ **ʈɨ* 'seed' > API *ɨ ~ ʔɨ*, KAY *ʔɨ*, TIM *hɨ*;
  PNJ **ʈo* 'leaf, bodily hair' > API *o*, KAY *ʔo*, TIM *ho*;
  PNJ **kuʈɨ* 'fire' > API *kuvɨ*, KAY *kuwɨ*, TIM *kuhɨ*;
  PNJ **ʈwa / *=ɖwa* 'tooth' > API *wa / =čwa*, KAY *wa / =ǯwa*, TIM *wa / =cwa*;
  PNJ **kaʈuwă ~ *kaʈwa* 'mortar' > API *kauvə̆ ~ kaʔu ~ kauɾŭ*, KAY *kawa*, TIM *kahuwă*, 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 **bitĭ* 'only' > API *pič*, KAY *bit*, TIM *pit*;
  PNJ **bɜ* 'forest' > API *pə*, KAY *bɜ*;
  PNJ **boʈĭ* 'to arrive' > API *poy*, KAY *boyč*, TIM *poy*;
  PNJ **kaɖɜtǯ* 'cotton' > API *kačətə̆*, KAY *kaǯɜt*, TIM *kacɜt*;
  PNJ **ʈwa / *=ɖwa* 'tooth' > API *wa / =čwa*, KAY *wa / =ǯwa*, TIM *wa / =cwa*;
  PNJ **ga* 'thou' > API *ka*, KAY *ga*, TIM *ka*;
  PNJ **ga / *ʈɜ-ɾ / *ɖɜ-ɾ* 'to fry' > API *=ka / =ɜɾ ~ =əɾ*, KAY *=ga / ǯɜ-ɾǯ*, TIM *ka / hɜ-ɾǯ / cɜ-ɾǯ*.

- 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 **ᵐbɾa(-ɾ)* 'to walk' > KAY *mɾã(-yɲ)*;
  PNJ **kaᵐbɾo* 'blood' > KAY *kamɾõ* 'blood', *kamɾo* 'spleen';
  PNJ **ⁿɖa(-ɾ)* 'to bite' > KAY *ɲã(-yɲ)*.

  One case of nasality assimilation is attested:
  PNJ **yuɖⁿĭ* 'hummingbird' > KAY *ɲuyɖⁿ* (instead of expected **yuyɖⁿ*).

- After prefixes ending in *-m* (< **m, *p*) in Kayapó **(ⁿ)ɖ > y*:
  PNJ **am=ɖo* 'rat' > KAY *am=yo*;
  PNJ **am=ɖɨ* 'bumblebee' > KAY *am=yɨ*;
  PNJ **=m=ⁿɖa(-ɾ)* 'to chew, to gnaw' > KAY *=m=yã / =m=yã-ɲ*, etc.
  PNJ **ⁿɖ* sometimes yield *my* through analogy:
  PNJ **ⁿɖopⁿɖopŏ* 'itchiness' > KAY *myomyop* (analogy with the next syllable);
  Proto-Core Jê **pɨ=ⁿɖuwă / *pɨ=ⁿɖwɘ-ɾ* 'to put vertically.PL' > KAY *pɨ=myuwə̆ / pɨ=myɘ-ɾə̆* (analogy with *ʔu=m=yuwə̆ / ʔu=m=yɘ-ɾə̆* < **ʈu=m=ⁿɖuwă / *ʈu=m=ⁿɖwɘ-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 *k*^{h} in Timbira lects. Cases with variation or unexpected reflexes are shadowed.

PNJ	Common TIM	Krahô	Ramkokamekrá	Pykobjê
*^{n}*go* ‘water’	/ko/	ko	ko	ku
*^{n}*gɾa* ‘paca’	/kɾa/	kɾa	kl̥a	kɾa:
*^{n}*gɾwa ~ *^{n}*gɾuwă* ‘moriche log’	/kɾɔwă/	kɾɔw ~ k^{h}ɾɔw	kl̥owă	kɾow
*^{n}*gɜ* ‘yard’	/kɜ/	kɐ	kɜ	k^{h}ə: (irreg.)
*^{n}*gɾɜ* ‘dry’	/kɾɜ/	kɾɐ ~ k^{h}ɾɐ	k^{h}l̥ɜ (irreg.)	kɾə
*ka^{n}*gɾɔ* ‘warm’	/kakɾɔ/	kakɾɔ ~ kak^{h}ɾɔ	—	kakɾo
*^{n}*gɾɛ* ‘sing’	/kɾɛ/	kɾɛ ~ k^{h}ɾɛ	kl̥ɛ	kɾe
*^{n}*gɾo* ‘pig’	/kɾo/	kɾo	k^{h}l̥o (irreg.)	kɾu: ~ k^{h}ɾu:
*^{n}*gokõn* (PAMT) ‘squash’	/koʔk^{h}ɔ̃n/	kuʔk^{h}õn ~ kuʔkõn	—	kuʔk^{h}õn
**ga* ‘thou’	/ka/	ka	ka	ka
**kɜ* ‘skin’	/k^{h}ɜ/	k^{h}ɐ	k^{h}ɜ	k^{h}ə
**kɾa* ‘offspring’	/k^{h}ɾa/	k^{h}ɾa ~ kɾa	k^{h}l̥a	k^{h}ɾa
**kɾɛ* ‘hole’	/k^{h}ɾɛ/	k^{h}ɾɛ ~ kɾɛ	k^{h}l̥ɛ	k^{h}ɾe
**kɛ̃nɛ̃̌* ‘stone’	/k^{h}ɛ̃n/	k^{h}ɛ̃n	k^{h}ɛ̃n	k^{h}en

PNJ **ɾuwă* / **ɾwə-k* ‘to descend’ > API *vɾə* / *vɾɨ*, TIM *wɾə* / *wɾə-k*;
PNJ *^{n}*gɾwă ~ *^{n}*gɾuwa* ‘moriche palm’ > API *^{n}gvɾa*, TIM *kɾɔwă* ‘moriche log’;
PNJ **kɾwətə̃* ‘beak’ > API *kvɾətə̃*, TIM *k^{h}ɾət*;
PNJ **ɾwə-ɬi* ‘rib’ > API *vɾɨ-ʔi*, TIM *wɾəʔ-hi*.

- PNJ **ŋɾ* is preserved in Apinayé and Timbira; for Timbira, only two examples are available, in which *ŋ* disappears (note that no cognates outside Core Jê have been identified for any other words containing **ŋɾ* in Proto-Core Jê):
  PNJ **ŋɾɔ̃Cɔ̃̌* ‘toucan’ > API *ŋɾɔ̃yŋ*, KAY *ŋɾɔ̃t*, TIM *ɾɔ̃*;
  PAMT **ɬiŋɾɔ̃tɔ̃̌* ‘sprout’ > API *iŋɾɔ̃tɔ̃̌*, TIM *hiɾɔ̃t*.

- 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 *k*^{h} (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 Apãniêkrá and Parkatêjê. Timbira *k*^{h} goes back to PNJ **k* in stressed syllables, while Timbira *k* goes back to PNJ *^{n}*g*, **g* 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):

- debuccalization of **p* (TAP *h^w*, SUY *hw*) and further delabialization in complex onsets:
  PNJ **pa* 'arm' > TAP *h^wa*, SUY *hwa*[6];
  PNJ **puɾ̆* 'field' > TAP, SUY *huɻ̆*;
  PNJ **pɾ̃* 'wife' > TAP *hɾ̃*, SUY *hɻ̃*;
  PNJ **pɾɨ* 'road' > TAP *hɾɨ*, SUY *hɻɨ*, etc.

- affrication and optional prenasalization of PNJ **y* (non-phonemic):
  Proto-Core Jê **yɘtɘ̆ ~ *y$_3$t$_3$̆* 'sweet potato' > TAP *yərə̆ ~ ǰərə̆ ~ ^{n}ǰərə̆*, SUY *y$_3$ɾ$_3$̆ ~ ^{n}y$_3$ɾ$_3$̆ ~ ǰ$_3$ɾ$_3$̆*, etc.

- alveolarization of PNJ **ɖ* and **^{n}ɖ* (TAP *t* and *^{n}t ~ ^{n}d*, SUY *t* and *^{n}t ~ ^{n}d*):
  Proto-Core Jê **ʈudɖe / *=ɖudɖe* 'bow' > TAP *tute*, SUY *sute / =tute*;
  PNJ **a=ɖ$_3$ / *ɖ$_3$-ɾ$_3$ / *ʈ$_3$-ɾ$_3$* 'to enter' > SUY *a=t$_3$ / t$_3$-ɻ$_3$ / s$_3$-ɻ$_3$*;
  PNJ **=ɖa / *ɖã-m / *ʈã-m* 'to stand' > SUY *=ta / tã-m / sã-m*;
  PNJ **kaɖwa* 'salt' > TAP *kat^{w}a*, SUY *k^{h}atwa*;
  PNJ **=ɖwa / *ʈwɘ-ɾ / *ɖwɘ-ɾ* 'to bathe' > SUY *t^{h}wɘ ~ twɘ*;
  PNJ **ka^{n}ɖe* 'star' > TAP *ka^{n}te-či ~ ka^{n}de-či*, SUY *kãte-či*;
  PNJ **^{n}ɖi* 'mother' > TAP *^{n}ti-ɾe*;
  PNJ **^{n}ɖa / *^{n}ɖa-ɾ* 'to bite' > TAP *kũ=ta*, SUY *^{n}ta*;
  PNJ **^{n}ɖo / *^{n}ɖo-ɾ* 'to hang' > SUY *^{n}to / ^{n}to-ɻ̆*;
  PNJ **^{n}ɖepĕ* 'bat' > TAP *^{n}tewĕ*, SUY *^{n}dewĕ*;
  PNJ **^{n}ɖomɖopŏ* 'itchiness' > TAP *^{n}do^{n}dowŏ*, etc.

- affrication of PNJ **t* before **t* (TAP *či*, SUY *či*):
  PNJ **akati* 'day' > TAP *agači*, SUY *akači*;
  PNJ **=ti* 'augmentative' > TAP *=či*, SUY *=či*, etc.

Individual straightforward developments in Tapayúna and Suyá include:
- PNJ **t* > TAP *ʈ*, SUY *t^h*:
  PNJ **tɛpĕ* 'fish' > TAP *ʈɛwĕ*, SUY *t^{h}ɛwĕ*;
  PNJ **katɔ / *katɔ-ɾ* 'to leave / to be born' > TAP *kaʈɔ*, SUY *kat^{h}ɔ / kat^{h}ɔ-ɻ̃*;
  PNJ **tikĭ* 'belly' > SUY *t^{h}ikĭ*, etc.

In one case, one can suspect Kayapó or Suyá influence in Tapayúna:
  PNJ **tɨkɨ̆* 'black' > TAP *tɨgɨ̆*, SUY *t^{h}ɨkɨ̆*.

- PNJ **ʈ* > TAP *t*, SUY *s*:
  PNJ **ʈɨ* 'seed' > TAP *tɨ*, SUY *sɨ*;
  PNJ **ʈwakɔ̃* 'coati' > TAP *toakɔ̃*, SUY *swakɔ̃*;
  PNJ **kuʈɨ* 'fire' > TAP *kutɨ*, SUY *kwisɨ*;
  PNJ **ʈ$_3$k$_3$̆* 'hawk, bird' > TAP *t$_3$g$_3$̆*, SUY *s$_3$k$_3$̆*, etc.

- PNJ **b* > TAP *w/m* (per nasality), SUY *p*, *w* (in unstressed syllables?):
  PNJ **bɔ̃* 'grass' > TAP *mõ*, SUY *pɔ̃*;
  Proto-Core Jê **b$_3$* 'forest' > TAP *w$_3$*, SUY *p$_3$* 'grass, bush';
  PNJ **b$_3$-ʈɨ ~ *bɔ̃-ʈɨ* 'corn' > TAP *w$_3$-tɨ ~ mõ-tɨ*, SUY *w$_3$-sɨ*;
  PNJ **boʈɨ̆* 'to arrive' > SUY *pɘyɨ̆ / poɾŏ*;

[6] Note that Guedes (1993) systematically writes *ɣ* and *ɣw* where other authors write *hɾ* and *hw*.

PNJ *=*bĩ* / **bĩ-ɾ* ‘to kill’ > SUY *pĩ* / *pĩ-ɻĩ̌*;
PNJ **ba* ‘1SG.NOM, 1INCL.ABS’ > TAP *wa*, SUY *pa ~ wa*;
PNJ **bɜɾ-ʈɨ* ‘pepper (tree-seed)’ > TAP *wɜy-tɨ*;
PNJ **bi* / *bi-ɾ* ‘to ascend’ > SUY *pi*;
PNJ **bɨ* / *bɨ-ɾ* ‘to take’ > TAP *wɨ*, SUY *pɨ*;
PNJ **bãmɜ̃* ‘father’ > TAP *mɜ̃mɜ̃̌*, SUY *pə̃mə̃*, etc.

The suggested distribution is violated in PNJ **bitĭ* ‘only’ > SUY *wiɾĭ* ‘always’, if the comparison is correct. In isolated cases TAP, SUY *w* is found as an irregular reflex of other PNJ stops:
PNJ *(*a*=)*ka*^{n}*bɜtɜ̌* ‘night’ > TAP *a=gawəɾə̌*, but SUY (*a*=)*ka*^{n}*bɜɻɜ̌*;
PNJ *^{n}*bɛɖ*^{n}*ĩ* ‘honey’ > TAP *wɛy*, but TAP ^{n}*bɛy-tɨ* ‘bee’, SUY ^{n}*bɛnĭ*;
PNJ **pɨdɖi* ‘one’ > TAP, SUY *wɨti*;
PNJ **pɨ-* ‘verbal prefix with unclear meaning’ > SUY *wɨ-*.

- PNJ **mɾ* > TAP *ɾ*; PNJ *^{n}*bɾ* > TAP *nɾ*, SUY ^{n}*bɻ*; PNJ **kɾ* > TAP *kχ*, SUY *k*(^{h})*ɹ*; PNJ **ŋɾ* > TAP *ŋʈ*, SUY ^{n}*gɹ*; PNJ *^{n}*gɾ* > TAP ^{n}*gʁ*, SUY ^{n}*gɹ*:
PNJ **mɾũmŭ* ‘ant’ > TAP *ɾũwŭ* / *ɾũm-*;
Proto-Core Jê *^{n}*bɾɨ* ‘animal, game’ > TAP *nɾɨ*, SUY ^{n}*bɻɨ*;
PNJ *^{n}*bɾo-ti* ‘*Genipa americana*’ > TAP *nɾo-či*;
PNJ **ka*^{n}*bɾi* ‘heron’ > TAP *kanɾi*;
PNJ **kɾa* ‘offspring’ > TAP *kχa*, SUY *k*^{h}*ɹa*;
PNJ **kukɾɨtĭ* ‘tapir’ > TAP *kukχɨɾĭ*, SUY *kuk*(^{h})*ɹɨɾĭ*;
PNJ **ŋɾɜ̃ŋɾɜ̃* ~ **ŋɾɜ̃* ‘green’ > TAP *ŋʈə̃ŋʈə̃* ~ *ŋʈə̃* ‘blue, green, yellow’, SUY ^{n}*gɹa*^{n}*gɹa-nĭ* ‘yellow’;
PNJ *^{n}*gɾɛ* ‘egg’ > TAP ^{n}*gʁɛ*, SUY ^{n}*gɹɛ*;
PNJ *^{n}*gɾotŏ* ‘Pleiades’ > SUY ^{n}*gɹoɾŏ*;
PNJ *^{n}*gɾɔ* ‘to warm up’ > TAP *ka=*^{n}*gʁɔ* ‘warm’, SUY ^{n}*gɹɔ*, etc.

- PNJ ^{n}*b* > TAP ^{n}*b* ~ *m*, PNJ ^{n}*d* > TAP ^{n}*d* ~ *n*:
PNJ *^{n}*ba* ‘liver’ > TAP ^{n}*ba* ~ *ma*;
PNJ *^{n}*bɨtĭ* ‘sun’ > TAP ^{n}*bɨɾĭ* ~ *mɨɾĭ*;
PNJ *^{n}*de* ‘giant otter’ > TAP ^{n}*de* ~ *ne*;
PNJ *^{n}*da* ‘rain’ > TAP ^{n}*da* ~ *na*;
PNJ *^{n}*dɔ* ‘eye’ > TAP ^{n}*dɔ* ~ *nɔ*, etc.

- PNJ *Cw* > TAP *C*^{w}:
PNJ **kadɖwa* ‘salt’ > TAP *kat*^{w}*a*;
PNJ **kwəɾə̆* ‘manioc’ > TAP *k*^{w}*əɾə̌*;
PNJ **ʈwa* ‘sour’ > TAP *t*^{w}*a-či*, etc.

- PNJ **ky* > TAP *č*, PNJ **ty* > TAP *č*, SUY *s*, PNJ *^{n}*by* > TAP *y* ~ *ǯ* ~ ^{n}*ǯ*, SUY *mǯ*:
PNJ **kyɛ* ‘thigh’ > TAP *čɛ*;
PNJ **tyetĕ* ‘to burn’ > TAP *čeɾĕ*, SUY *seɾĕ*;
PNJ *^{n}*byed*^{n}*ĩ* ‘husband’ > TAP *yeɾĕ* ~ *ǯeɾĕ* ~ ^{n}*ǯeɾĕ*, SUY *mǯenĭ*, etc.

- In two words PNJ **k* disappears in Tapayúna; in both cases, the root is preceded by the same prefix (TAP *tu-* < PNJ **ʈu*):
PNJ **ʈu=ka*^{n}*dɛ* ‘medicine’ > TAP *tu=anɛ*, SUY *su=ka*^{n}*dɛ*;
PNJ **ʈu=ka*^{n}*ga* ‘lazy’ > TAP *tu=ẽnga*.

- According to Nonato (2014), *tʰ* and *kʰ* 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=tʰɛ̃-mɛ̃̌* ~ *i=tɛ̃-mɛ̃̌* 'my going'). As demonstrated above, SUY *tʰ* more often goes back to PNJ **t*, whereas SUY *t* usually goes back to PNJ **ɖ̥*. I was not able to find any similar correlations for SUY *kʰ* and *k*:
  PNJ **kukeɖ̥ⁿĩ̌* 'agouti' > SUY *kukʰenĩ̌*;
  PNJ **ʈwakɔ̃* 'coati' > SUY *swakɔ̃*, 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* > SUY *k* (might have also happened in Tapayúna but the words in question are not attested in available sources on that language):
  PNJ **ga* '2SG.NOM' > SUY *ka*;
  PNJ **ga* / **ʈ₃-ɾ* / **ɖ̥₃-ɾ* 'to fry' > SUY *ka*;
  PNJ **gu* '1INCL.NOM' > SUY *ku*, etc.

- In several isolated words, PNJ **kɾ* > TAP, SUY *k* (Guedes: *č*) before front vowels:
  PNJ **kɾĩ* 'village' > SUY *kĩ* (Guedes: *čĩ*);
  PNJ **kɾitĩ̌* 'pet' > TAP, SUY *kiɾĩ̌*;
  PNJ **kɾɛ̃* 'parakeet' > TAP *kχẽ*, SUY *kɛ̃* (Guedes: *čẽ*);
  PNJ **kɾitĩ̌* 'grasshopper, cricket' > TAP *kχit-čĩ̌* ~ *kit-čĩ̌*.

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 **kɾ* developed normally:
  PNJ **kɾɛ* 'hole' > TAP *kχɛ*, SUY *kɹɛ*;
  PNJ **kɾĩ* (/ **kɾĩ-ɾ ?*) 'to sit.PL' > SUY *kɹ̃ĩ*, etc.

- Apparently *ɾw*-like clusters are not tolerated in Tapayúna:
  PNJ **ⁿgɾwa* ~ **ⁿgɾuwə̃̌* 'moriche palm' > TAP *ⁿgʁuwə̃̌*;
  PNJ **kɾwəyə̃̌* 'Amazon parrot' > TAP *kχ₃tkχ₃*;
  PNJ **akɾwətə̃̌* 'cashew' > TAP *akχɔy-tĩ̌*.

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, **ũ* and **ã* were not phonemic, and **ɘ* and **ɨ̃* were very rare. **ye* and **iyə̃̌*, as well as **wa* and **uwə̃̌*, were frequently in variation, whose nature is yet to be discovered.

- **ũ* (~ **ɨ̃*) and **ã* were allophones of PNJ **u*, **ɨ* and **a* before nasal codas:[7]
  PNJ **ɖ̥ũmũ̌* 'father (vocative)' > PNR *sũ*, KAY *ʒ̃ũn*, TIM *cũm* ~ *cũ*, TAP *tu-ɾe*;
  PNJ **tũmũ̌* 'old' > PNR *=tũ*, API *tũmũ̌*, KAY *tũm*, TIM *tũm*, TAP *ʈũmũ̌*, SUY *tũmũ̌*;

[7] The marginal status of these phonemes in Kayapó has already been noted by Salanova (2001: 24).

Table 5. Vowels in Northern Jê languages.

PNJ	PNR	API	KAY	TIM	TAP	SUY
**a*	*a*	*a*	*a*	*a*	*a*	*a*
**ɔ*	*ɔ*	*ɔ*	*ɔ*	*ɔ*	*ɔ*	*ɔ*
**ɛ*	*ɛ*	*ɛ*	*ɛ*	*ɛ*	*ɛ*	*ɛ*
**ɜ*	*ɜ*	*ɜ, ə*	*ɜ*	*ɜ*	*ɜ*	*ɜ*
**o*	*o*	*o*	*o*	*o*	*o, ɘ†* (*_y*)	*o, wɘ* (*_y*)
**e*	*e*	*e*	*e*	*e*	*e*	*e*
**ɘ*	*ɜ*	*ɘ*	*ɘ*	*ɘ*	*ə*	*ɘ*
**u*	*u*	*u*	*u*	*u*	*u*	*u*
**i*	*i*	*i*	*i*	*i*	*i*	*i*
**ɨ*	*ɨ*	*ɨ*	*ɨ*	*ɨ*	*ɨ*	*ɨ*
**wa*	*wa*	*wa*	*wa*	*wa*	*a†*	*wa*
**uɯ̆*		*uə̆ ~ urŭ*	*uɯə̆*	*uɯă*	*uɯă*	
**wɘ*	*wɜ, wɨ, u*	*wɘ*	*wɘ*	*wɘ*	*ɘˡ*	*wɘ*
**ye*	*i, yɜ* (?)	*že, e‡*	*ye, e‡*	*ye, e‡*	*e‡*	*e‡*
**iyă*		*iə̆ ~ ža ~ irĭ*	*iyə̆*	*iyă*		*iyă*
**ã*	*ɜ̃ ~ aːŋ*	*ə̃ ~ ə*	*ã*	*a*	*a ~ ɐ̃*	*ɘ̃*
**ɔ̃*	*ɔ̃*	*ɔ̃*	*õ*	*ɔ̃*	*õ*	*ɔ̃*
**ɛ̃*	*ɛ̃*	*ɛ̃*	*ẽ*	*ɛ̃*	*ẽ*	*ɛ̃*
**ɜ̃*	*ɜ̃*	*ə̃*	*ɜ̃*	*ɜ̃*	*ɐ̃*	*ɘ̃*
**ĩ*	*ĩ*	*ĩ*	*ĩ*	*ĩ*	*ĩ*	*ĩ*
**ũ*	*ũ*	*ũ*	*ũ*	*ũ*	*ũ*	*ũ*
**ɨ̃*	*ĩ ~ iːŋ*	*ɨ̃*	*ɨ̃*	*ɨ̃*	*ɨ̃*	*ɨ̃*

N o t e s: † The onset becomes labialized. ‡ The onset becomes palatalized (see 3.2.).

PNJ **kũmtũmŭ̯ ~ *kũmtɨ̃mɨ̯̆* ‘capybara’ > PNR *intɨŋ*, KAY *kunũm*, TIM *kũmtũm*, TAP *koʧũnŭ̯ ~ koʧũwũ̯̆*, SUY *kutũmũ̯̆*;
PNJ **kũmũ̯̆* ‘smoke’ > API *kũmũ̯̆*, KAY *kũm*, TIM *kũm*, SUY *kusɨ=kũmũ̯̆*;
PNJ **mrũmũ̯̆* ‘ant’ > API *mrũmũ̯̆*, KAY *mrũm*, TIM *prũm*, TAP *rũwĩ̯̆*;
PNJ **ɲũmŭ̯ ~ *ɲɨ̃mɨ̯̆* ‘who’ > API *ɲəmə̯̆* (older speakers), *ɲamă* (younger speakers) ‘another’, KAY *ɲũm* (Xikrín), *ɲɨbⁿ* (Kayapó), TIM *yũm*, TAP *ɲɨ̃mă*, SUY *ɲũmũ̯̆*;
PNJ **bãmã̯̆* ‘other person’s father’ > API *pə̃mə̯̆*, KAY *bãm*, TIM *a=pam*, TAP *mɐ̃mɐ̯̆*, SUY *pɘ̃mɘ̯̆*;
PNJ **=ɗa / *ɗã-m / *ʈã-m* ‘to stand’ > PNR *sɜ̃ ~ saːŋ*, API *ča / čə̃-m ~ ča-r*, KAY *ǯa / ǯã-m / ã-m*, TIM *ca / ca-m / ha-m*, SUY *=ta / tã-mã̯̆ / sã-mã̯̆*;
PNJ **ʈãmã̯̆ / *ɲãmã̯̆* ‘chin’ > API *ɲəmə̯̆*, KAY *ama*, TIM *hama*;
PNJ **ʈãmã̯̆-ʈo / *ɲãmã̯̆-ʈo* ‘beard’ > API *ɲə̃mə̯̆*, KAY *ama-ʔo*, TIM *hama-ho*, TAP *tam-to*.

- Examples of PNJ **ɘ* (outside the diphthong **wɘ*):
PNJ **tɘʈĭ* ‘hard’ > PNR *tətĭ*, API *təyč / təyt*, KAY *tɘyč*, TIM *tɘy*, SUY *turŭ* (*tɘrə̆* ?);
PNJ **ʈɘ / *ɗɘ* ‘bitter’ > API *ɘ / ɘ ydⁿ / čɘ*, KAY *ɘ*, TIM *hɘ / cɘ*, TAP *tə*;
PNJ **ⁿbuɯ̆ / *ⁿbɘ-r* ‘to cry’ > API *ⁿbu-r ~ ⁿbuə̆ / ⁿbɘ-r*, KAY *muə̆ / mɘ-rə̆*, SUY *ⁿbɘ-lə̆*;
PNJ **kuɗɘ* ‘bad smell’ > KAY *kuǯɘ*, TIM *kučɘ*, TAP *kutə*;
PNJ **kurɘ* ‘smooth’ > API, TIM *kurɘ*.

The same correspondence is attested in a number of roots whose distribution is limited to Apinayé, Kayapó and Timbira:

PAMT *ⁿbɘ / *ⁿbɘ-dᵩⁿ ~ *ⁿbɘ-ɾ ‘to carry’ > API ⁿbɘ / ⁿbɘ-ydᵩⁿ ~ ⁿbɘ-ɾ, KAY =mɘ / mɘ-ydᵩⁿ ‘to grab’, TIM pɘ / pɘ-dⁿ (may be related to PNR ĩⁿpɨ-ɾĭ ‘id.’);

PAMT *ʈapɾɘ / *yapɾɘ ‘to insult, to dishonor’ > API apɾɘ / yapɾɘ, KAY apɾɘ / yapɾɘ, TIM apɾɘ / yapɾɘ ‘to name’;

PAMT *pɾɘ ‘corn husk’ > API pɾɘ ‘feather’, KAY pɾɘ, TIM pɾɘ ‘corn husk / feather’;

PAMT *ʈubɘbⁿɘ̃ ‘deep’ > API upɘmɘ̃, KAY ubɘbⁿ;

PAMT *kɘ ‘bad smell, fish smell’ > API, TIM kɘ, KAY kɘ, etc.

In one case the daughter languages disagree on the exact quality of Proto-Core Jê vowel: KAY y꜀t, TIM y꜀t, SUY y꜀ɾ̆ ~ ⁿy꜀ɾ̆ ~ ɟ̆꜀ɾ̆ ‘sweet potato’ point to Proto-Core Jê *y꜀tɟ̆, whereas API ɟ̆ɘtɘ̃ and TAP yərə̃ ~ ɟ̆ərə̃ ~ ⁿɟ̆ərə̃ ‘id.’ reflect PNJ *yɘtɘ̃.

- The sole reliable example of PNJ *ɾ̃ is:
  PNJ *ʈɾ̃ / *ʈɨ̃-ɾ / *ɲɨ̃ / *ɲɨ̃-ɾ ‘to sit.SG’ > PNR si:ŋ ~ sĩ / ɲĩ, API ɲɨ̃ / ɲɨ̃-ɾ, KAY ɲɨ̃ / ɲɨ̃-ɾɨ̃̆, TIM hɨ̃ / hɨ̃-ɾ / yɨ̃ / yɨ̃-ɾ, SUY =ɲɨ̃ / sɨ̃ / ɲɨ̃-ɺɨ̃̆.

- The alternation between *ye and *iyă can be exemplified by the following etymologies (note that the sequence *ɾy is regularly simplified to *y):
  PNJ *kɾiyă / *kye-ɾ ‘to raise’ > PNR ky꜂-ɾi (?), KAY kɾiyə̆ / kye-rĕ.
  PNJ *kukiyă / *kukye-ɾ ‘to ask’ > PNR ĩⁿky꜂-ɾi (?), API kukža / kukže-ɾ, TIM kukʰiyă ‘to search’, SUY kukʰiyă;
  PNJ *kokiyă / *kokye-ɾ ‘to split’ > PNR kye-y ‘to cut’ (?), API kokže ‘to pick, to lift’ (?), KAY kokye ~ kokiyə̆ / kokye-rĕ (Xikrín: -ɔ-), TIM kokʰye / kokʰye-dⁿ;
  Proto-Core Jê *a=kiyă / *a=kye-ɾ ‘to yell, to argue’ > API a=kiɾĭ / ža=kže-ɾ, KAY a=kiyə̆ ~ a=kya / ɟ̆꜀=kye-rĕ, TIM a=kʰye / a=kʰye-ɾ, a=kʰiyă ~ kʰiyă ‘angry’, SUY a=kʰiyă;
  Proto-Core Jê *ⁿgiyă / *ⁿgye-dᵩⁿ ‘to enter.PL, to put into a deep container.PL’ > API ⁿgye / ⁿgye-ydᵩⁿ, a=ⁿgye / ya=ⁿgye, KAY =ŋiyə̆ / =ŋye-ydᵩⁿ, a=ŋye-y, TIM a=kye-y, SUY a=ŋye / ŋye-ɺĕ;
  Proto-Core Jê *=ɾiyă ~ *=yetĕ / *yet ‘to hang.PL’ > API a=yetĕ / yet, KAY a=ɾiyə̆, SUY =yerĕ / a=yet, saɾiyă / yaɾiyă.

In some other cases no such alternation is attested:

PNJ *kye / *kye-dⁿ ‘to drag’ > PNR kɾ꜂-ɾi (?), API kže / kže-dⁿ, KAY kye / kye-dⁿ, TIM kʰye / kʰye-dⁿ;

Proto-Core Jê *kakye / *kakye-dⁿ ‘to scratch’ > API kakže, TIM kakʰye / kakʰye-dⁿ, SUY kak(ʰ)e-nĭ;

PAMT *ʈakye / *yakye / *ʈakye-dⁿ ‘to look for water’ > API akže / žakže / akže-dⁿ ‘to open a hole’, TIM hakʰye / yakʰye / yakʰye-dⁿ ‘to fetch water’;

Proto-Core Jê *kiyă ‘fire pit’ > API kiɾĭ ~ kiə̆, TIM kʰiyă;

PNJ *kye ‘thigh’ > API kže, KAY kye, TIM kʰye, TAP če;

PNJ *ⁿbyedⁿɨ̃ ‘husband’ > API ⁿbžeydᵩⁿ, KAY myedⁿ, TIM pyedⁿ, TAP ⁿɟ̆erĕ, SUY mɟ̆enĭ;

PNJ *tyetĕ ‘to burn’ > PNR titi, API četĕ, KAY čet / čerĕ, TIM cet, TAP čerĕ, SUY serĕ.

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). *iyă 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, *wɘ* and **uwə̆* can be illustrated with the following examples:
  Proto-Core Jê **kɾuwə̆ ~ *kɾwa* 'arrow' > API *kɾuð*, KAY *kɾuwð*, TIM *kɾuwə̆*, SUY *kɹwa*;
  PNJ **ⁿgɾwa ~ *ⁿgɾuwə̆* 'moriche palm' > PNR *ĩⁿkwa ~ kwa-*, API *ⁿgvɾa*, KAY *ŋɾwa*, TIM *kɾɔwə̆* 'moriche log', TAP *ⁿgʁuwə̆*, SUY *ŋɹwa*;
  PNJ **kaʈuwə̆ ~ *kaʈwa* 'mortar' > PNR *asuə̆* 'pestle', API *kauvð ~ kaʔu ~ kauɾŭ*, KAY *kawa*, TIM *kahuwə̆*;
  Proto-Core Jê **ɾuwə̆ / *ɾwɘ-k* 'to descend' > API *vɾɘ / vɾɨ*, KAY *ɾuwð ~ ɾwɘ / ɾwɘ-k*, TIM *wɾɘ / wɾɘ-k*, SUY *ɻwɘ / ɻwɘ-kɘ̆*;
  PNJ **ɖwa / *ʈwɘ-ɾ / *ɖwɘ-ɾ* 'to bathe' > PNR *sw3-ɾĩ*, API *čwa / wə-ɾ*, KAY *ǯuwð / wɘ-ɾ / ǯwɘ-ɾ*, TIM *cwa / wɘ-ɾ / cwɘ-ɾ*, SUY *twɘ ~ tʰwɘ*, etc.

The medial *-w-* was (and still is) prohibited in syllables with labial onset. The following examples should be understood as result of elision of **w* in the aforementioned environment:
PNJ **ⁿbuwə̆ / *ⁿbɘ-ɾ* 'to cry' > API *ⁿbu-ɾ ~ ⁿbuð / ⁿbɘ-ɾɘ̆*, KAY *muð / mɘ-ɾɘ̆*, SUY *ⁿbɘ-ɾɘ̆*;
Proto-Core Jê **pɨ=ⁿɖuwə̆ / *pɨ=ⁿɖwɘ-ɾ* 'to put vertically.PL' > API *=ⁿǯwɘ / =ⁿǯwɘ-yɖⁿ*, KAY *pɨ=m=yuwð / pɨ=m=yɘ-ɾɘ̆*, TIM *pɨ=cwɘ / pɨ=cwɘ-ɾ / =m=cɘ / =m=cɘ-ɾ*, SUY *wɨ=ntwɘ / wɨ=ntwɘ-ɻɘ̆*.

Once again, the original distribution of these nuclei is obscure. **uwə̆* and **wa* are restricted to open syllables, whereas **wɘ* is found both in open and closed syllable. I assume that originally **wɘ* was restricted to closed syllables; in open syllable, **uwə̆* and **wa* would have occurred in free variation. This is corroborated by other cases of alternation in individual languages, such as TIM *kwa / kw3-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 (major 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 **ɜ* > API *ɜ, ə* (Nikulin 2015a: 13):
  PNJ **aⁿbɜdⁿĩ* 'piranha' > API *aⁿbɜnə̆*;
  PNJ **=ʈɜ* 'basket' > API *ka=və*;
  PNJ **kɜ* 'skin; breast' > API *kə*;
  PNJ **kɜɾə̆* 'to whistle' > API *kərð / kɜɾ*;
  PNJ **pɜtə̆* 'southern tamandua' > API *pətð, pɜt-ɾɛ, pɜt-ti*, etc.

Their phonemic status is demonstrated by Oliveira (2005: 66–67). In most cases, *ə* is found in phonetically open syllables, while *ɜ* 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 *ɜ* may be realized as any of these in free variation: [ɜ, ɘ, ə].

- Irregular nasalization in Kayapó has been treated in 3.2.2.

- The reflexes of PNJ **wɘ* in Panará are uncertain. *w3* is found in verbs (e.g. PNJ **ʈwɘ-ɾ / *ɖwɘ-ɾ* 'to bathe.NMLZ' > PNR *sw3-ɾĩ*) but is not attested in nouns:
  PNJ **kwɘɾɘ̆* 'manioc' > PNR *kwɨ*;
  PNJ **ⁿdwɘdⁿĩ* 'snail' > PNR *paɾi=ⁿtu*;
  PNJ **twɘbⁿĩ* 'fat' > PNR *tũmã*, etc.

- I have already discussed possible irregular vowel splits (especially *ɜ > ɔ ~ ə; *i > i ~ ɨ) in Suyá (Nikulin 2015a: 12–14). However, the analysis in question was based on Guedes's data. Once Santos's and Nonato's recordings are taken into account, the problems discussed in the cited work are no longer valid: these authors consistently record ɜ where Guedes writes ɔ ~ ə and i where Guedes writes i ~ ɨ.

- In the proto-language of Tapayúna and Suyá, PNJ *o > *(w)ɘ before y:
  PNJ *boʈĭ 'to arrive' > SUY pɘyĭ / porŏ;
  PNJ *kukoyĭ 'monkey' > TAP kukʷəy, SUY kukwɘyĭ.

- In extremely rare cases the medial -w- is found before front vowels. These words have no known cognates outside Core Jê (like the words having w in the onset position):
  Proto-Core Jê *kwedɸⁿĭ 'bird, feather' > API kveydɸⁿ 'bird', KAY kweydɸⁿ 'bird', TIM kuwedⁿ 'bird', TAP tɜ=gwey 'feather', 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 Tapayúna 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 *tɛpɛ̆ 'fish' > PNR ʈɛpĭ, API tɛpɛ̆, KAY, TIM tɛp, TAP ʈɛwɛ̆, SUY tʰɛwɛ̆;
PNJ *ⁿbɨtɨ̆ 'sun' > PNR ĩⁿpɨtĭ, API ⁿbɨtɨ̆, KAY mɨt, TIM pɨt, TAP ⁿbɨɾɨ̆ ~ mɨɾɨ̆, SUY ⁿbɨɾɨ̆;
PNJ *tɘʈĭ 'hard' > PNR tətĭ, API təyč / təyt, KAY tɘyč, TIM tɘy, SUY turŭ (tɘɾɘ̆ ?);
PNJ *ⁿbɛʈĭ 'good' > PNR ĩⁿpɛ, API ⁿbɛč, KAY mɛč, TIM pɛy, TAP ⁿbɛy- ~ mɛy-, SUY ⁿbɛrĭ;
PNJ *ʈɜkɜ̆ 'hawk, bird' > PNR sə, API ɜk-ti, KAY ɜk, TIM hɜk, TAP tɜgɜ̆, SUY sɜkɜ̆;
PNJ *tobⁿĭ 'flour, powder' > API čobⁿ // čomŏ, KAY obⁿ / ǯobⁿ, TIM hobⁿ / čobⁿ;
PNJ *tɜbⁿĭ 'raw' > API tɜbⁿ // tɜmɜ̆, TIM tɜbⁿ, SUY tʰɜmɨ̆;
PNJ *ⁿbyedⁿĭ 'husband' > API ⁿbžeydɸⁿ, KAY myedⁿ, TIM pyedⁿ, TAP ⁿǯerĕ, SUY mǯenĭ;
Proto-Core Jê *todⁿĭ 'armadillo' > API todⁿ // tonŏ, KAY, TIM todⁿ, TAP ʈorŏ, SUY mǯenĭ;
PNJ *ⁿbɛdɸⁿĭ 'honey' > PNR nãⁿ=pɛyŋ, API ⁿbɛydɸⁿ, KAY mɛydɸⁿ, TIM pɛdɸⁿ, TAP wɛy, ⁿbɛy-tɨ 'bee', SUY ⁿbɛnĭ;
PNJ *kukoyĭ 'monkey' > PNR ĩko:, API kukoy, KAY kukoŋ, TIM kukʰoy, TAP kukʷəy, SUY kukwɘyĭ;
PNJ *purŭ 'field' > PNR pu:, API pur, KAY purŭ, TIM pur, TAP hurŭ, SUY hulŭ;
PNJ *ⁿdɨwɨ̆ 'field' > PNR ĩⁿtuĭ, API ⁿdɨvɨ̆, KAY nɨ, TIM [n]tuwă, TAP, SUY ⁿdɨwɨ̆.

Cf. also PNJ, Proto-Core Jê or PAMT *kopŏ 'fly (insect)', *ʈĩp=kɔpɔ̆ / *ɲĩp=kɔpɔ̆ 'claw, nail', *ⁿdɸepĕ 'bat', *ɾɔpɔ̆ 'jaguar', *tyetĕ 'to burn', *kɔtɔ̆ 'cicada', *kukɾɨtɨ̆ 'tapir', *kubɨtɨ̆ 'howler monkey', *ⁿbutŭ 'neck', *ketĕ 'not', *kadɸɜtɜ̆ 'cotton', *wɛtɛ̆ 'lizard', *pɜtɜ̆ 'southern tamandua', *yɘtɘ̆ 'sweet potato', *tutŭ 'pigeon', *kaⁿbɜtɜ̆ 'night', *ʈɔ̃=kotŏ / *ɲɔ̃=kotŏ 'chest', *ⁿgɾotŏ 'Pleiades', *ⁿboʈĭ 'to arrive', *ⁿboʈĭ 'courbaril', *ʈeʈĭ / *ɖeʈĭ 'to deceive', *peʈĭ 'to make', *kakĭ 'cough', *tɨkɨ̆ 'black', *kudɸekĕ 'vein', *tikĭ 'stomach', *kaⁿbɾekĕ 'red', *pokŏ 'to ignite', *kokŏ 'wind', *atɨkɨ̆ 'forest surrounding the village', *pe-k 'to fart', *tɨ-k 'to die', *ʈaⁿba-k / *ya=ⁿba-k 'to listen', *ɾwɘ-k 'to descend', *ⁿbakĭ 'scorpion', *twɘbⁿĭ 'fat', *ⁿbɜdⁿĭ 'macaw', *aⁿbɜdⁿĭ 'piranha', *ʈɜdɸⁿĭ / *ɖɜdɸⁿĭ 'sweet', *yudɸⁿĭ 'hummingbird', *kwedɸⁿĭ 'bird, feather', *kukedɸⁿĭ 'agouti', *ɾɔdɸⁿĭ 'grugru palm', *bayĭ 'snake sp.', *ⁿdɸɜyĭ 'woodpecker', *ɾorŏ 'termite', *bɜɾɜ̆ 'tree', *kwɘɾ 'manioc', *paɾĭ 'foot', *terĕ 'Euterpe sp.', *atɔɾɔ̆ 'tinamou', *kaⁿberĕ 'Turu palm', etc.

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

PNJ	PNR	API	KAY	TIM	TAP (internal†)	TAP (final†)	SUY (internal†)	SUY (final†)
*p	pĭ	p	p	p	p	wV	p	wV
*t	tĭ	t, yč‡§	t, yč‡	t	t	ɾV	t	ɾV, ɾĭ‡
*ʈ	tĭ	yč, t#	č	y	y	y	y, t#	y, ɾV#
*k	∅	k	k	k	k	gV	k	kV, kĭ‡
*bⁿ		bⁿ	bⁿ	bⁿ			m	mĭ
*dⁿ		dⁿ, yɖⁿ	dⁿ	dⁿ		ɾV	n	nĩ
*ɖⁿ	ŋ	yɖⁿ	ɲ	dⁿ	y	y	n	nĩ
*y	ː	y	ɲ	y	y	y	y	yĩ
*ɾ	ː, ɾĭ#¶	ɾ	ɾV, ɾi$	ɾ	y	ɾV, y‡	ɻV, y‡	ɻV, yĩ‡
*w	ĭ	w	∅	wă		wV	p	wV

N o t e s: † Internal = in the middle of an intonational phrase, final = immediately preceding a pause. ‡ After *a*. § After *i*. # In long verb forms. ¶ After *ɜ*. $ After *a*, in long verb forms also after *ɜ* or *ɔ*.

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

PNJ	PNR	API	KAY	TIM	TAP (internal†)	TAP (final†)	SUY (internal†)	SUY (final†)
*t		ⁿt	ⁿt	t			n	nV
*ʈ		ⁿč	ⁿč	y			n	nV
*k		ⁿk	ⁿk	k	k			
*m	∅	m	m	m	m	mV, wV	m	mV
*n		n	n	n		nV, ɾV	n	nV
*ɲ		ɲ, n	ɲ	n			n	nĭ
*y		y	∅	∅	y	y		
*ɾ		ɾ	ɾ, n‡	ɾ			ɻV	ɻV

N o t e s: † Internal = in the middle of an intonational phrase, final = immediately preceding a pause. ‡ After *ẽ, ĩ*.

Except in long verb forms, where much variation with *ɲ and *ɾ 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 *õp* / *ɲõp* 'elbow' of unknown origin. The most reliable etymologies are:

Proto-Core Jê *pɾɔ̃tɔ̃̆ 'to run' > API *pɾɔ̃ⁿtɔ̃̆*, KAY *pɾɔ̃ⁿt*, SUY *hɻɔ̃nɔ̃̆*;

Proto-Core Jê *tɔ̃ʈĭ 'sister' > API *tɔ̃ⁿč*, KAY *tõⁿč* 'brother', TIM *tɔ̃y*, SUY *tʰɔ̃nɔ̃̆*;

PNJ *katɔ̃kɔ̃̆ 'firearm' > PNR *atɔ̃*, API *katɔ̃ⁿkɔ̃̆*, KAY *katõⁿk*, TIM *katɔ̃k*;

Proto-Core Jê *kɔ̃kɔ̃̆ 'lizard' > API *kɔ̃ⁿkɔ̃̆*, KAY *kõⁿk*, TIM *kʰɔ̃k*, TAP *kõk-či*;

PNJ *kɛ̃nɛ̃̆ 'stone' > PNR *kĩɛ̆y* (?), API *kɛ̃nɛ̃̆*, KAY *kɛ̃n*, TIM *kʰẽn*, TAP *kẽnɛ̃̆*, TAP *kʰɛ̃nɛ̃̆*;

PNJ *ʈĩnĭ̃ / *ɲĩnĭ̃ 'faeces' > PNR *sĩ / yĩ*, API *ʔĩnĭ̃ / ɲĩnĭ̃*, KAY *ĩn / ɲĩn*, TIM *hĩn / yĩn*, TAP *tĩɾĭ̃*;

Proto-Core Jê *kɔ̃nɔ̃̆ 'articulation, knee' > API *kɔ̃nɔ̃̆*, KAY *kõn*, TIM *kɔ̃n*, TAP *kõrõ*, SUY *kʰɔ̃nɔ̃̆*;

PNJ *kapɾɜ̃nɜ̃̆ 'turtle' > PNR *apyɜ̃n*, API *kapɾɜ̃nɜ̃̆*, KAY *kapɾɜ̃n*, TIM *kapɾɜ̃n*, TAP *kahɾɛ̃m-či*, SUY *kahɻɜ̃-či*;

PNJ *kutɔ̃yĭ 'worm, blind snake' > API *kutɔ̃y*, KAY *kutõ*, TIM *kutɔ̃*, TAP *kuʈõy*;

PNJ *ɾɔ̃ɾɔ̃̆ '*Attalea speciosa* coconut' > API *ɾɔ̃ɾɔ̃̆*, KAY *ɾɔ̃n*, TIM *ɾɔ̃*;

Proto-Core Jê *tĩɾĭ̃ 'alive' > API *tĩɾĭ̃*, KAY *tĩn*, TIM *tĩɾ*, SUY *tʰĩɻĭ̃*.

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 Tapayúna and Suyá):

PNJ **kratĭ* 'base, stem, lower part of the body' > API *krată* 'waist, leg, beginning, medial part of a long object' ~ *krayč* 'wall, stem, stalk', KAY *krayč* 'trunk, stump, pelvis' (cf. SUY *kʰɻaɾĭ*);
PNJ **paɾĭ* 'foot' > TAP *hʷay*, SUY *hwayĭ* (cf. KAY *paɾĭ*);
PNJ **ⁿba* / **ⁿba-ɾ* 'to know' > **ⁿba* / **ⁿba-ɾĭ* > SUY *ⁿba* / *ⁿba-yĭ* (cf. KAY *ma-ɾĭ*);
PNJ **kapa* / **kapa-ɾ* 'to pull out' > **kapa* / **kapa-ɾĭ* > SUY *kapa-yĭ*.
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 **bitĭ* 'only' > API *pič*, but KAY *bit* (cf. TIM *pit*, maybe SUY *wiɾĭ* 'always');
PNJ **kritĭ* 'pet' > API *kritĭ ~ krič*, but KAY *krit* (cf. TAP, SUY *kiɾĭ*);
PNJ **=ɗi* / **ƭi-ɾi* / **ɗi-ɾi* 'to put' > SUY *=ti* / *si-ɻi* / *ti-ɻi* (cf. KAY *=ǰi* / *ǰi-ɾĭ*), 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 *ɜɾ* or *ɔɾ*. While in nouns with these rhyme the echo vowel is [i] (*bɜɾĭ* 'tree, horn'), in long verb forms it copies the nucleus (*akɜ-ɾǰ* / *yakɜ-ɾǰ* '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 **ɾ*. Compare the following pairs:
  PNJ **pa* / **pa-ɾ* 'to finish, to kill', Xavánte *pa* / *pa-ɾi* 'to finish, to erase';
  PNJ **paɾĭ* 'foot', Xavánte *paɾa* '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 **paɾă* '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 *pɘyĭ* / *pot* 'to arrive' < **boƭĭ* / **bot* < **boƭĭ* / **boƭ*;
  SUY *=yerĕ* / *a=yet* 'to hang.PL' < **=yetĕ* / **yet*, etc.

The depalatalization of PNJ **ƭ* through suppression of an echo vowel is attested in API *təyč* / *təyt* '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 **tɛ̃-m* 'to go.SG', **kɔ̃-m* 'to drink', **pe-k* 'to fart', **tɨ-k* 'to die', **ʈaⁿba-k* / **ya=ba-k* 'to listen', **rwɘ-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.

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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.