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Phonetic and Phonological Research in Mai-Ndombe: A Few Preliminary Notes on Rhotics and Double-Articulations

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Abstract: Mai-Ndombe is one of the southwestern provinces of the Democratic Republic of Congo. Ecologically, it can be characterised as a transition zone between a moist, broadleaf rainforest ecotone in the north and shrubland/savannah areas in the south. Linguistically, Mai-Ndombe, along with the rest of southwestern Congo all the way down to the border with Angola, is among the least well-surveyed areas of the planet. Within its borders, several different Bantu (Guthrie's zones B, C, and H) varieties are spoken, near the newly identified West-Coastal Bantu homeland, itself a hot spot of phonological diversity unlike any other in the West-Coastal Bantu domain. Phonetic and phonological accounts of its languages are particularly lacking (apart from impressionistic "grey literature" reports which seldom comply with the standards of present-day phonetic and phonological inquiry). This gap is particularly concerning as Mai-Ndombe is also an area of great anthropological diversity, with numerous hunter-gatherer Twa communities living deep in its eastern and northern forests. Their lects, collectively known as Lotwa, are severely endangered, as they face the threats of social stigma and the growing use of national and regional *linguae francae*. As part of the author's doctoral project (still underway), phonetic data were collected in the area between May and July 2021, specifically in Inongo (the provincial capital) and Nioki. The present contribution is intended as a brief note on the relevant results produced so far, mainly bearing on the analysis of some phenomena of interest in the languages of the region, including Sakata rhotics and labial-velars and the presence of unusual trilling/flapping realisations in Lotwa. The picture yielded by this preliminary exploration is one of striking phonetic and phonological variation, possibly pointing to earlier stages of greater linguistic diversity than previously supposed. It is also tentatively proposed that one of the specific characteristics of the phenomena attested in the present contribution is that they tend to affect more than one language at a time, working rather as areal "phonetic possibilities" than language-bound outcomes of traditional sound change rules; in this sense, it is suggested that in-depth documentation and description can help broaden our understanding of how language contact works in highly multilingual contexts.



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1. Introduction

The present contribution is a selective overview of a few phenomena of phonetic/phonological interest. It deals with some recently documented Bantu lects spoken in the Mai-Ndombe province of the Democratic Republic of Congo (DRC; see map at the end of this section). The province, named after Lake Mai-Ndombe (Omasombo Tshonda et al. 2019), is divided into eight administrative units or "territories", namely (from west to east), Kwamouth, Bolobo, Yumbi, Mushie, Inongo, Kutu, Kiri, and Oshwe. Extending latitudinally from the equator to S 4°0'0" and longitudinally from E 16°0'0" to E 21°0'0", Mai-Ndombe is at the centre of the Congo River Basin (*Cuvette centrale congolaise*) and is characterised by the presence of plateaus and low-level hills (Omasombo Tshonda et al. 2019, 21ff). Ecologically, it represents a transition zone between different ecoregions within the

Afrotropical realm, to wit, a tropical moist broadleaf forest to the north and northeast and tropical shrublands to the south and southwest. Part of this transition zone features a so-called forest–savannah mosaic, an ecotone marked by the presence of patches of woodland interspersed with savannah clearings, frequently constituting forest corridors/galleries (Olson et al. 2001). Linguistically, Mai-Ndombe, along with the rest of southwestern Congo all the way down to the border with Angola, is among the least well-surveyed areas of the planet (Hammarström 2016). It hosts several different Bantu varieties (Guthrie’s 1970 zones B, C, and H), and is located close to the newly identified West-Coastal Bantu (WCB) homeland (Pacchiarotti et al. 2019; Pacchiarotti and Bostoen 2020), between the Kamtsha and Kasai Rivers, in the Kwilu province of the DRC, immediately to the south of Mai-Ndombe, a hot spot of phonological diversity unlike any other in the WCB area. Mai-Ndombe is also home to remarkable anthropological diversity, with numerous hunter-gatherer communities living deep in its eastern and northern forests.

Data for the present contribution were collected between May and July 2021 in Inongo and Nioki. Inongo is Mai-Ndombe’s provincial capital and the province’s most multilingual city. Nioki is the province’s unofficial economic capital and its second most multilingual city. Recording conditions in the field were sub-optimal, and the resulting phonetic analysis is preliminary in nature, pending further data collection. An OSF link has been made available to provide the reader with the individual sound files associated with the spectrograms and oscillograms reported in the figures (https://osf.io/hs85b/?view_only=8c1b5e1ab3e541bb8e8d6be45e8648b3, accessed on 1 March 2024).

This contribution is divided into sections titled after specific phenomena of interest (rhotics, labial–velars). It deals with the following languages: Sakata, North Boma, Nunu, and Lotwa (see map).

Sakata, ISO 639-3 [skt]/glottocode [saka1287], is the commonest glossonym used to refer to the Bantu varieties spoken by the Sakata people, a group indigenous to the Kutu territory in southern Mai-Ndombe (cf. Maselli et al. n.d.b., in press). These have been variously classified as WCB or Central-Western Bantu, and research on their exact place in the broader Bantu phylogeny is still ongoing (Grollemund et al. 2015; Pacchiarotti et al. 2019; Koile et al. 2022).

In Guthrie’s (1970) referential classification, Sakata is inventoried as Bantu C34. In the author’s own fieldwork experience, Sakata is better understood as a continuum of closely related varieties. As reported by Maselli et al. n.d.b. (in press: 3), the degree of mutual intelligibility among Sakata varieties is considerable, with consultants often identifying as speakers of different regiolects. The data discussed here were collected with speakers (pseudonymised) of the following regiolects:

Variety	Speaker	Age	Place of origin	Geocoordinates
Kinzinzale	A	52	Nioki	−2.72, 17.69
Kibayi	B	49	Tolo	−2.95, 18.57
Kingingia	C	52	Nioki	−2.72, 17.69
Kingingele	D	52	Mongobele	−2.79, 17.87
Kitere	E	58	Kilima	−3.58, 18.54

The available linguistic literature on Sakata is scarce and largely unavailable to scholars outside the DRC, with specific phonetic and phonological information presented in Matabisi (1979), Tylleskär (1987), Bontenge (1995), and Bokwankon Bosonkie (1997).

North Boma and Nunu are two closely related WCB varieties, respectively inventoried as B82 and B822 by Maho (2009); while North Boma was already reported in Guthrie’s (1970) classification, Nunu was not. The two lects lack clear glotto- and ISO codes, with Hammarström et al. (2022) assigning North Boma the glottocode [boma1251] and linking it to the ISO 639-3 code [boh], and Eberhard et al. (2024) conflating two different languages, namely Boma Yumu (Bantu B80z) and North Boma, under the same ISO 639-3 code [boh], and Nunu not being assigned any codes at all.

The literature on North Boma and Nunu is scant, with the main source of information on the former being the outline provided by Stappers (1986), and the latter remaining

largely undocumented to this day (see [Pacchiarotti et al. 2019](#)). Data were collected in collaboration with the following speakers:

<i>Variety</i>	<i>Speaker</i>	<i>Age</i>	<i>Place of origin</i>	<i>Geocoordinates</i>
North Boma	F	50	Mushie	−3.02, 16.92
	G	37	Bobala	−2.56, 17.52
	H	35	Mbali	−2.38, 17.29
Nunu	I	36	Eboli	−2.84, 17.42

North Boma is the object of recent research ([Maselli et al. n.d.a.](#), in preparation). Based on the information now available, the degree of mutual intelligibility between North Boma and Nunu is high; several phonetic phenomena are shared across the two varieties.

Finally, “Lotwa” is the collective exonym by which the Bantu varieties spoken by rain-forest Twa (plural form: Batwa) are referred to throughout much of the central Congo Basin by their non-Twa neighbours. Most Mai-Ndombe hunter-gatherers live in the northern, forest territories of Kiri and Inongo, but a few small groups have also been reported in the southeastern territories of Oshwe and Kutu. The Batwa are generally considered to be autochthonous pre-Bantu forest dwellers ([Quintana-Murci et al. 2008](#); [Patin et al. 2009](#); [Batini et al. 2011](#)); however, unlike other autochthonous groups elsewhere in Africa (notably, the so-called “Khoisan” of southern Africa), the Batwa are presumed to have lost their original languages and to have adopted those of the “sedentary” Bantu-speaking newcomers ([Hiernaux 1966](#); [Motingea 1993, 1994, 2010](#); [Grégoire 2003](#); [Klieman 2003](#)). The question of whether their pre-Bantu lects have left a trace on the current linguistic landscape of the Congo Basin—or, in other words, the issue of whether some of the characteristics of present-day Bantu can be explained in terms of “Twa substrate”—is a long-standing one in the relevant historical-linguistic literature ([Trilles 1932](#); [Schebesta 1949](#); [Möhlig 1981](#); [Bahuchet 1993, 2006, 2012](#); [Olson and Hajek 2003](#)).

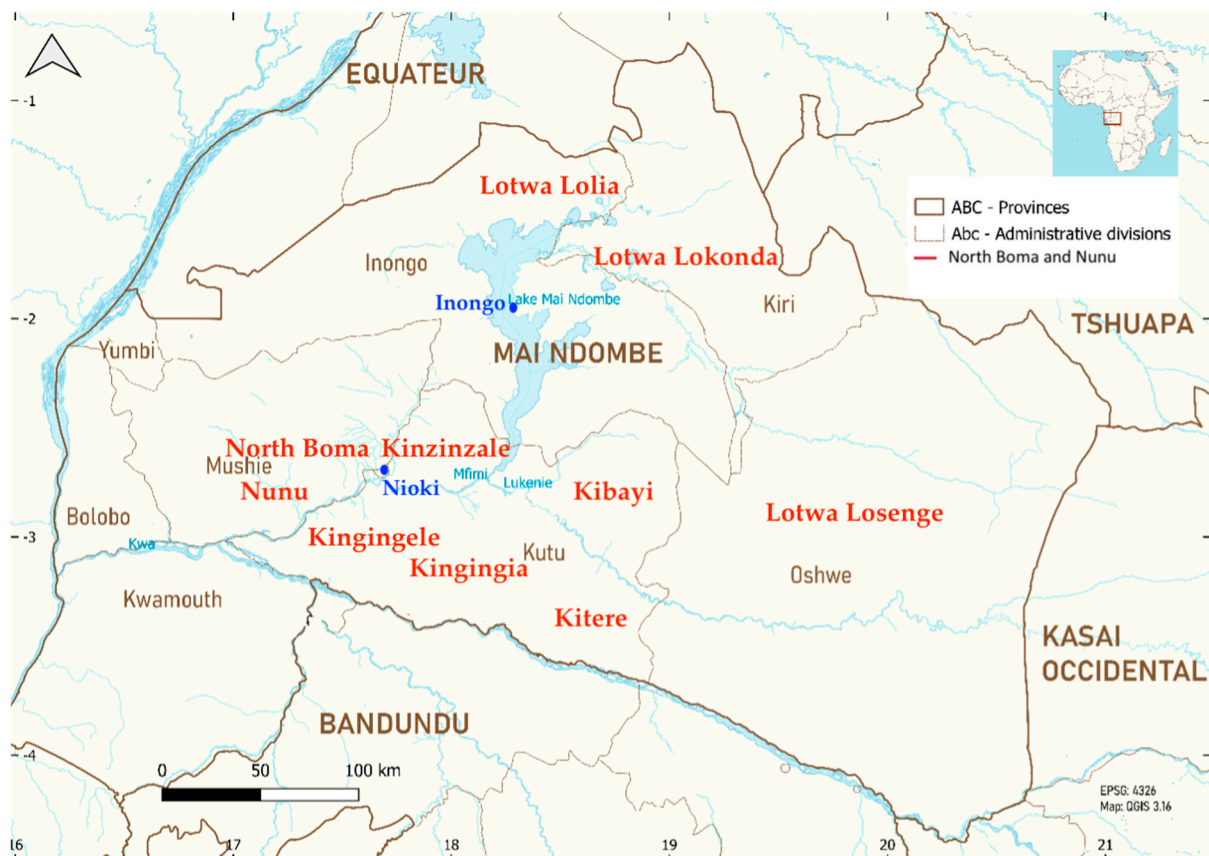
In Mai-Ndombe, Twa communities speak Bantu varieties similar to those of their northeastern and eastern Mongo neighbours. The data discussed here were collected with speakers of the following:

<i>Variety</i>	<i>Speaker</i>	<i>Age</i>	<i>Place of origin</i>	<i>Geocoordinates</i>
L. Lolia	J	33	Bolia	−1.61, 18.36
L. Losenge	K	45	Bisenge	−3.47, 19.8
L. Lokonda A	L	43	Lioko	N/A
L. Lokonda B	M	51	Mpendjwa	−1.10, 19.11

No descriptions of the varieties at hand could be found in the literature; a fully blown phonological analysis is therefore still pending. [Hammarström et al. \(2022\)](#) do list a variety they call “Batswa of Nkundo-Ntomba-Ekonda” which they assign the glottocode [bats1244], but it remains unclear whether this refers to Lotwa Lokonda as reported in the present venue (see also [Chabiron et al. 2013](#), pp. 127–28). However, several peculiarities allegedly typical of Lotwa dialects across the forest have been reported by various scholars (see [Motingea 2015](#) and the references cited therein).

As a collection of observations on various phenomena in different, often adjacent, varieties, this report is meant to (a) contribute to the discussion on the cross-linguistic typology of these phenomena and (b) shed light on a severely under-surveyed area of the world, tentatively proposing that some of its more widespread phonetic and phonological features are shared across its local varieties as a set of common phonetic possibilities.

Throughout the article, lexical items are transcribed phonetically (i.e., in square brackets), as full-fledged phonological accounts of the varieties at hand are still pending. Phonetic transcription (slashes) is used for individual sounds when they are treated as input to sound change.



Map—Mai-Ndombe province of the DRC with the approximate location of all varieties surveyed.

2. Rhotics

Sakata—The available sources on *Sakata* phonology lack reliable phonetic analyses. As concerns rhotics, most of these sources concur that *Sakata* only features one, which [Bokwankon Bosonkie \(1997, p. 20\)](#) describes as a “uvular trill” (*vibrante uvulaire*) in central *Sakata* (from Mbantin).

The situation documented here is somewhat more nuanced, with several Sakata varieties exhibiting both a uvular fricative /ʁ/ sound and an alveolar trill /r/; see Figure 1 for examples from Kinzinzale (minimal pair involving the following: [ozára] “to rip” vs. [ozáɾa] “to hit”). This is a typologically rare situation, in that most natural languages only display one rhotic phoneme, and those that have two typically contrast a flap and a trill (Harris 1969; Lipski 1990; Padgett 2003; Wheeler 2005; Wiese 2011). However, it is a feature that is shared by other Mai-Ndombe lects, as shown below.

Both /ɤ/ and /r/ are present across all Sakata varieties (cf. [lek:ákwə] “eyebrow”, a form present in Kibayi, Kinzinzale, Kingingia, Kingingele, and Kitere). While the phonological status of /ɤ/ is subject to a lot of regiolectal variation, the production of a voiced uvular fricative sound appears to be a readily available phonetic possibility throughout the Sakata domain. This is particularly interesting if we consider that some Sakata varieties, and particularly Kinzinzale, irregularly exhibit a voiceless uvular fricative in forms deriving from Proto-Bantu *k (in C₁ position); cf. *kómbó “broom” > Kinzinzale: [le:χwómo], *kómbá “navel” > Kinzinzale: [mu:χúmá] (see [Maselli et al. n.d.b.](#) in press: 7). Across varieties, /ɤ/ may also derive from a Proto-Bantu stop articulated around the velum, as appears to be the case in the following examples (1.a–f; the phenomenon itself is not new in the area, see [Pacchiarotti and Bostoen 2020](#) and the literature cited therein):

- 1.a “hands”: Kibayi, Kinzinzale—[bwóʔo] < *bókò
 1.b “hole”: Kibayi—[if:óʔo] < *poko
 1.c “cock”: Kibayi, Kinzinzale—[ɲkəʔó] < *kókó
 1.d “eyebrow”: all varieties examined—[lek:áʔə] < *kígè
 1.e “spell”: Kibayi, Kinzinzale—[ndwóʔo] < *dòg
 1.f “cooking pot”: Kibayi, Kinzinzale—[mpoʔó] < *pùgí

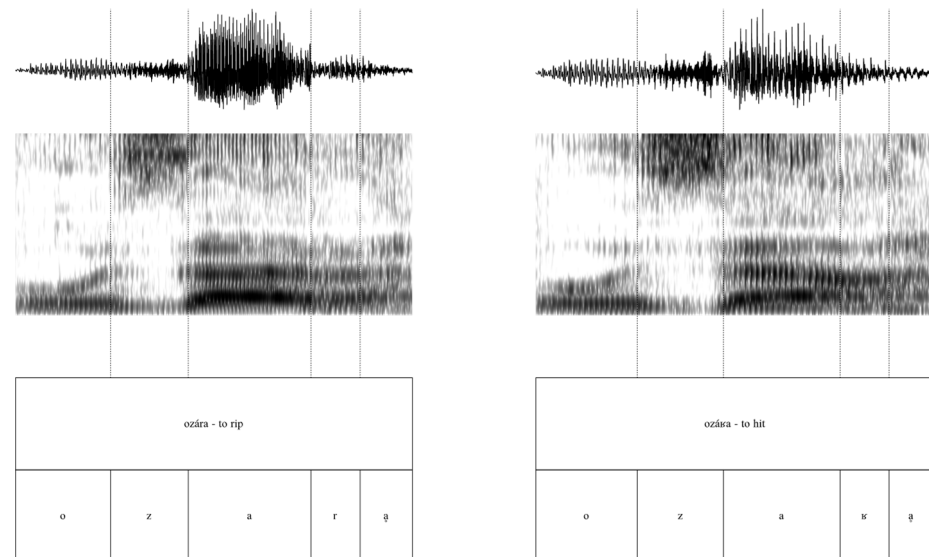


Figure 1. Minimal pair involving a /r/ (left) vs. /ʔ/ (right) opposition in Kinzinzale; audio files are available on OSF as Figure 1-1 and Figure 1-2.

Across varieties, /r/ appears to be more stable (i.e., subject to fewer/less-frequent reduction phenomena) than /ʔ/ (only sporadically attested in Kingingia, Kingingele, and Kitere); see the following (2.a–e):

- 2.a “male”: Kibayi, Kinzinzale, Kingingia, Kingingele—[munʒíri], Kitere—[uʒ:íri]
 2.b “to vomit”: Kibayi—[ídzərá], Kinzinzale, Kingingia, Kingingele, Kitere—[óʔərá]
 2.c “to pour”: Kinzinzale—[óʔəra], Kingingia, Kingingele, Kitere—[óʔərá]
 2.d “load”: Kibayi—[bodʒəre], Kinzinzale—[boʔəre], Kingingia, Kingingele, Kitere—[ód:əʔó]
 2.e BUT “sharp”: Kibayi—[mpúro], Kingingele, Kitere—[mpúʔə] vs. Kingingia—[mpú.o];
 “pirogue”: Kibayi, Kinzinzale—[váʔə], Kingingia, Kingingele, Kitere—[vá]; “debt”: Kibayi, Kinzinzale—[mbára], Kingingia, Kingingele, Kitere—[mbá]

Additionally, Kingingia and Kingingele (and possibly Kitere), i.e., the varieties in which /r/ appears least well established (those in which it occasionally elides, see 2.e), are also those which drop /ʔ/ the most often (3.a–c):

- 3.a “manioc leaf”: Kibayi—[bedʒará], Kinzinzale—[izáʔa] vs. Kingingia—[bəʒí.a], Kingingele—[beʒá]
 3.b “cooking pot”: Kibayi, Kinzinzale—[mpoʔó] vs. Kingingia, Kingingele—[mpo.ó]
 3.c “word”: Kibayi—[léláʔa], Kinzinzale—[ndáʔa] vs. Kingingia—[ndí.a], Kingingele—[ndá]

The situation is less diversified for Kingingia, where /ʔ/ generally reduces to zero, and more so in Kingingele (and possibly in Kitere), where /ʔ/ is more frequently maintained—and corresponds, albeit occasionally, to other sounds (4.a–d; notably, Kingingele is also the variety which exhibits the highest degree of variation in the realisation of labial-velar consonants in the Sakata domain, see Maselli et al. n.d.b. in press: 13):

- 4.a “sky”: Kibayi, Kinzinzale—[lóko], Kingingia—[ló:] vs. Kingingele—[lóga]
 4.b “ash”: Kibayi—[it:óko], Kinzinzale—[it:úku], Kingingia—[it:ó] vs. Kingingele—[it:úgu]
 4.c “to insult”: Kibayi—[it:úka], Kinzinzale—[ot:úka], Kingingia—[ot:fúa], Kitere—[untú] vs. Kingingele—[et:úga]
 4.d “on”: Kibayi—[ól:óko], Kinzinzale—[ól:úku], Kingingia—[ól:ú.u] vs. Kingingele, Kitere—[ól:úya]

Rhotics in Sakata are also occasionally present as variants of lateral consonants, as can be seen in the following examples (5.a–g):

- 5.a “fingernail”: Kibayi—[ledzála] vs. Kinzinzale—[ledzáka]
 5.b “lung”: Kinzinzale—[féle] vs. Kingingia, Kingingele—[fére]
 5.c “scar”: Kinzinzale—[ib:áli] vs. Kibayi—[éb:aé]
 5.d “antelope”: Kinzinzale—[ɲkəbála] vs. Kibayi—[ɲkəbára]
 5.e “to rub”: Kingingia—[ópələ] vs. Kibayi—[ipfúyurá], Kinzinzale—[ópfurá], Kingingele, Kitere—[ápərá]
 5.f “to fly”: Kingingia, Kingingele—[íf:əlá] vs. Kibayi—[ip:əbərá], Kinzinzale—[ópərá], Kitere—[óp:ərá]
 5.g “to be sated”: Kibayi—[izúla] vs. Kinzinzale—[ozúra]

Most of the rhotics and laterals reported in 5.a–g derive from Proto-Bantu *d in C₂ position (e.g., 5.a: *jáda, 5.b: *púd, 5.c: *báda); this is a widely attested diachronic process known as rhotacism (when the alveolar stop is realised as a rhotic) or lambdacism (in the case of lateral realisations) (Vogelgesang 1993; Catford 2001; Hock 1991). For a number of reasons, the author submits that lambdacism of *d occurred first, and that rhotacism of /l/ (possibly in free variation with a lateral realisation) only intervened at a later stage. First of all, within WCB, cognates of the forms listed above are more likely to exhibit a lateral than a rhotic as a derivation of Proto-Bantu *d (e.g., 5.a *jáda > Mpiin B863Y [kínzá], Ngong B864X [kenzá], East Nsong B85dZ [lódzá], East Ding B68U [ludzá], East Lwel B862X [lədzál]/[lédzá]; 5.f *pudumok > Nsambaan B85FX [kafula], East Ding B68U [kufúlá], East Lwel B862X [ofəl]/[ofələ], East Yans B85bY [kofula]; Bastin et al. 1999; Koni Muluwa and Bostoen 2015). Second of all, a lot of synchronic alternation is reported between laterals and voiced alveolar stops both in the region and, more generally, throughout Congo (Kutsch Lojenga 1991, 1994), and rhotacism of /l/ has also been documented north of the area where Sakata is spoken, between the Congo and Ubangi Rivers (Lekens 1952; Samarin 1959; Walker and Samarin 1997), as well as in some Mai-Ndombe Lotwa varieties (see below). Lastly, while both lambdacism and rhotacism of voiced alveolar stops are fairly well documented sound change patterns, rhotacism or delateralisation of a lateral is generally considered less marked than its counterpart, i.e., lambdacism of a rhotic, as the former requires less articulatory precision (at least in the case of rhotacism to [r], which might have constituted a first step before subsequent developments to [r] and [ʁ]; Barry 1997; Barry and Russo 2002, 2003). Given the data currently available, it is not possible to assess whether rhotacism of /l/ is phonologically conditioned. It is worth mentioning, though, that multiple repetitions of the same lexical item by the speakers often led to different realisations of the same target (i.e., one and the same person could often produce the same word with a lateral or a rhotic). This might indicate a still in fieri process of delateralisation of (singleton) /l/ in the intervocalic position.

Some Sakata varieties occasionally display complex rhotic clusters, presumably ensuring the fall of intervening vowels; specifically, in the case of the word for “animal” (probably from a Proto-Bantu form like *túg), some varieties present pre-nasalised monosyllabic sequences with syllabic rhotics: Kinzinzale [ntʃ], Kingingia [nsʃ]; cf. Kitere [ntúr].

The findings reported so far can be summarised as follows (where ++ = frequent occurrence, + = sporadic occurrence, and – = not reported in the data):

Phenomenon	Kibayi	Kinzinzale	Kingingele	Kingingia	Kitere
Presence of /r/	++	++	++	++	++
Presence of /ɤ/	++	++	+	+	+
/r/ > 0	–	–	+	++	+
/ɤ/ > 0	+	+	++	++	++
/ɣ/, /g/ for /ɤ/	+	+	++	+	+
/l/ > rhotic	+	++	+	+	+

The presence of an apical rhotic appears to be relatively well established across the Sakata domain, whereas that of a uvular fricative is more stable in Kibayi and Kinzinzale and less so in Kingingia, Kingingele, and Kitere; reduction-to-zero phenomena are more common in Kingingia, Kingingele, and Kitere; substitutions are rare, but particularly common in Kingingele; lastly, rhotacism of /l/ is ubiquitous but more prominently a feature of Kinzinzale. Grosso modo, this overview appears to describe two main dialectal areas, with Kibayi and Kinzinzale (stabler rhotics in the inventory) on the one hand, and Kingingia, Kingingele, and Kitere on the other.

If these findings were confirmed, given the specific lay of the Kutu territory (cf. map), the demarcation provided by the Mfimi–Lukenie River complex would represent a (the?) major phonological isogloss in Sakata dialectology, cutting the area from east to west immediately to the south of Lake Mai-Ndombe, with Kibayi and Kinzinzale to the north and all other speech communities closer to the Kasai River. While this exceeds the scope of the present contribution, it is the author's impression that this situation tallies with the distribution of other sound changes in the area, e.g., the development of nasal vowels in Kingingia and Kingingele and the fricativisation of labial–velar stops (see below).

North Boma and Nunu—Regarding North Boma, [Stappers \(1986\)](#) describes a situation similar to that presented above for Sakata, i.e., one where an apical /r/ and a uvular fricative /ɤ/ alternate phonemically (as in [mpúro] “angry” vs. [mpúɤo] “mouse”). This appears to hold true for Nunu as well. As was the case in Sakata, [ɤ] seems to be the reflex of a velar, and a certain degree of synchronic velar vs. (non-velar) rhotic alternation between the two varieties can still be detected; this occasionally extends to the apical (6.a–d):

- 6.a “trap”: North Boma—[kozjáɤampéro] vs. Nunu—[kozígelempéro]
- 6.b “to reap”: North Boma—[kos:áɤó] vs. Nunu—[kos:áyana]
- 6.c “eyebrow”: Nunu—[ek:íɤe] vs. North Boma—[ek:éɤe]
- 6.d “grandson”: Nunu—[mut:úɤulemuzíri] vs. North Boma—[mus:ú:ɤumuɤjúɤu]

The items reported in 6.d are particularly interesting, as they probably derive from the Proto-Bantu form *jintò “woman”, which must have undergone a process of semantic extension from “woman” to “human” to “man”; its acceptance of “man” is widespread in Mai-Ndombe (it is present in all Sakata varieties, and has been reported in Boma Yumu; see [Bastin et al. 1999](#); [Koni Muluwa and Bostoen 2012](#)), and the /nt/ > (/nt/ + TRILL) > TRILL change is one that deserves further scrutiny from the viewpoint of broader-scope cross-Bantu post-nasal trilling phenomena (cf. [Shinagawa et al. 2022](#) and the literature cited therein).

Rhotacism of /l/, as observed for Sakata (see above for general considerations on the directionality of this specific sound change in the languages of Mai-Ndombe), is attested in North Boma and Nunu too. The phenomenon is, however, more markedly characteristic of Nunu; it also appears to have different outcomes in the two varieties, with North Boma favouring the fricative and Nunu the trill (7.a–g):

- 7.a “year”: Nunu—[ɲvələ] vs. North Boma—[mwáɤa]
- 7.b “to smelt”: Nunu—[kok:ála] vs. North Boma—[kok:áɤo]
- 7.c “antelope”: North Boma—[ɲvúli] vs. Nunu—[ɲərí]
- 7.d “throat”: North Boma—[mu:elí] vs. Nunu—[múyurí]
- 7.e “oil”: North Boma—[ma:lí] vs. Nunu—[ma:rí]
- 7.f “skirt”: North Boma—[mú:ɲfulé] vs. Nunu—[mú:ɲfurí]
- 7.g “catfish”: North Boma—[mbelí] vs. Nunu—[mbe:rí]

Interestingly, North Boma rhotics occasionally correspond to palatal approximants in Nunu, a feature which, to the best of the author’s knowledge, is not shared by any other Mai-Ndombe varieties (8.a–d):

- 8.a “to boil”: North Boma—[kob:óyɔ̯ɔ̯ɛ] vs. Nunu—[kob:óyɔ̯jé]
- 8.b “stock (bouillon)”: North Boma—[kəb:əyɔ̯ɔ̯ɛ] vs. Nunu—[kəb:əyɔ̯jé]
- 8.c “thirst”: North Boma—[mpɸ] vs. Nunu—[mpíja]
- 8.d “hole”: North Boma—[ipfurú] vs. Nunu—[if:ují]

It can be hypothesised that Nunu rhotics have a greater degree of sonority than their North Boma counterparts (approximants are known to act as highly sonorous rhotics in some languages; see Colantoni 2006; Wiese 2011).

To summarise, North Boma and Nunu display similar sets of rhotics in their phonology; they do, however, exhibit typical Mai-Ndombe rhotic-related phenomena to varying degrees, with Nunu being more prone to delateralisation and North Boma being more resistant to approximant-for-rhotic substitutions.

Lotwa—Concluding this section is a note on flapping (i.e., the production of a transient retroflex rhotic, see Laver 1994) in several eastern Mai-Ndombe Lotwa varieties. Numerous phonological peculiarities (allegedly) typical of Lotwa dialects across the forest have been documented in the literature (cf. Motingea 2015 and the references cited therein). For the purposes of the present contribution, the following observation by Motingea (2010, p. 205) on a Twa language of Équateur (DRC) is of particular interest: “[...] there is one phoneme that one can hear among the Batwa, i.e., the flapped consonant /ɾ/, which is otherwise represented in the literature as a rolled /r/ present in several local toponyms [...]. We can only assume that these phonetic traits are shared by all pygmy varieties” (author’s translation). This statement appears to match earlier claims by Vorbichler (1966–1967), who reported that northeastern (non-Bantu) hunter-gatherer varieties from the Ituri show retroflexion (flapping) on both /r/ and /d/.

The data presented here appear to confirm the existence of a flap (/ɾ/) in all four aforementioned Mai-Ndombe varieties as well; see Figure 2 for an example from Lotwa Lolia.

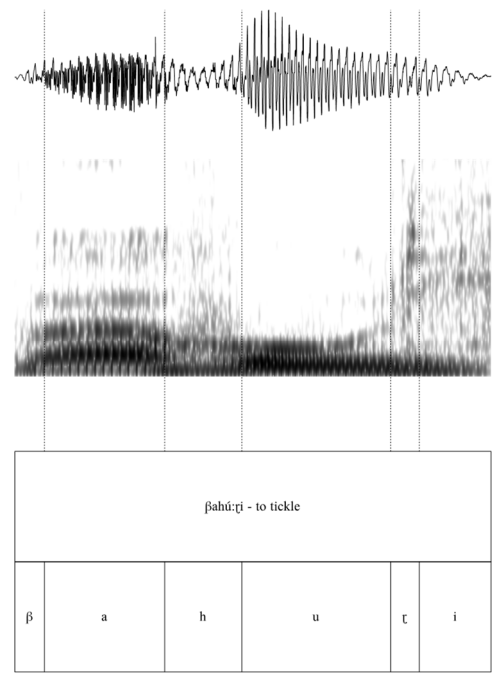


Figure 2. Example of /ɾ/ in Lotwa Lolia; audio files available on OSF as Figure 2.

While flaps are attested in all four varieties surveyed, not all of them display them to the same extent. As a matter of fact, speaker J (and, to a lesser extent, K) often seemed to

either produce a plain /l/ where a flap had been recorded in Lotwa Lokonda, or to reduce the sound to zero (9.a–g; “L.” stands for “Lotwa”):

- 9.a “beard”: L. Lokonda A, B—[lo.ɔ́ɛ] vs. L. Lolía—[lo:lé]
- 9.b “spirit”: L. Lokonda A, B—[boɾímu] vs. L. Lolía—[bolíma]
- 9.c “hunter”: L. Lokonda A, B—[boɾíaciã:a:ma] vs. L. Lolía—[bóli.aki.ónám:a], L. Losenge—[boja:kí.anáma]
- 9.d “to get on”: L. Lokonda A, B—[jóuɾɛɾa] vs. L. Lolía—[joj:éla], L. Losenge—[uléa]
- 9.e “to wake up”: L. Lokonda A, B—[jóem:úɾa] vs. L. Lolía—[jó.im:úa], L. Losenge—[zemúa]
- 9.f “co-wife”: L. Lokonda A, B—[bóká:ɾɛ] vs. L. Losenge—[bok:á:lí]
- 9.g “to boil”: L. Losenge—[pe:ɾía] vs. L. Lolía—[jóɸelía]

The link between /l/ and /ɾ/ appears to point in the direction of a similar phenomenon to the one described for Sakata, i.e., one of ongoing delateralisation of /l/ in favour of various rhotic allophones. This claim is predicated on similar grounds to those mentioned above for Sakata: most of the entries reported in 9 derive from protoforms which have been reconstructed with a *d in Proto-Bantu (e.g., 9.a: *dèdù, 9.b: *dímbù) and have cognates in the general area which present a lateral rather than a rhotic (Embanga Aborobongui 2013)—this, of course, is in addition to Motingea’s (2010, 2015) considerations. This process of delateralisation would be most advanced in Lotwa Lokonda and least so in Lotwa Lolía. Thus, delateralisation (possibly an areal feature) and retroflexion/flapping (possibly a substrate/contact feature deriving from the presence of hunter-gatherer communities in the area) appear to influence each other in the province’s Lotwa varieties. This is particularly interesting in that retroflexion, while generally rare in the area, has been documented in North Boma and Nunu (Stappers 1986; Maselli et al. n.d.a., in preparation), both of which exhibit nasal retroflexes in their phonological inventory. Historically, retroflexes are often the outcome of an articulatory shift in the presence of a rhotic (Bhat 1973; Bertinetto 2004), but the contexts in which they seem to arise in natural languages are limited. Therefore, their presence in specific regions has often been interpreted as a contact phenomenon, and independent internal development is generally excluded (Hamann 2003; Zhivlov 2016). As a matter of fact, sociophonetic factors have been claimed to influence the diffusion of retroflexes through neighbouring speech communities (Emeneau 1956; Hamp 1996; Hamann and Fuchs 2010; Tse 2015, 284ff). In this sense, while further data collection is pending, the presence of retroflexes in the North Boma/Nunu area might be connected to that of flaps in Lotwa.

3. Labial–Velars

Labial–velar stops have been found in several varieties of Sakata. Labial–velar stops are doubly articulated sounds produced with simultaneous occlusions at different points of the oral cavity, one around the velum and one in the labial area (see, e.g., Ladefoged 1968a, 1968b; Ponielis 1974; Ohala and Lorentz 1977; Maddieson 1993; Connell 1994; Ladefoged and Maddieson 1996; Ladefoged 2003). These closures are released almost simultaneously, but the velar burst always seems to occur first (see Painter 1978; Connell 1987, 1991a, 1991b, 1994; Dogil 1988; Maddieson and Ladefoged 1989; Cahill and Hajek 2001; Cahill 2018, p. 154). Their presence in the phonological inventory of Sakata is interesting for several reasons.

First, labial–velar stops are rare in the world’s languages, occurring in but 8% of the languages reported by Maddieson (2018). Other estimates do not differ significantly (see Cahill 2008). Labial–velar stops are mostly concentrated in Africa; according to Cahill’s (2017) updated database of 848 languages with phonemic labial–velar stops, only 8% of them are spoken outside of Africa (chiefly in Papua-New Guinea, Oceania, and South America). Within Africa, virtually all are spoken north of the Congo rainforest.

Second, labial–velar stops have often been interpreted as an areal feature¹ typical of an alleged *Sprachbund* known as the Macro-Sudan Belt, a stretch of land extending contiguously from the western end of the African landmass to the Ethiopian escarpment in the east (Clements and Rialland 2008; Güldemann 2008, 2018, pp. 479–86; Idiatov and Van de Velde

2021). In this area, shared linguistic features are attributed more to geographical proximity than to genealogical relationships. The prevalence of labial–velar stops in the Macro-Sudan Belt has been variously explained as retention and spread from Proto-Niger–Congo (Greenberg 1983), substrate interference from an unknown source (Vogler 2014; cited in Idiatov and Van de Velde 2021, p. 73), or transfer from undocumented hunter-gatherer forest languages (Schebesta 1949). The presence of labial–velar stops in some parts of the Bantu-speaking domain south of the Macro-Sudan Belt has been claimed to be contact-induced (cf. Bostoen and Donzo 2013; Cahill 2018, p. 156). However, Sakata, not being adjacent to the Macro-Sudan Belt, presents a unique case. While other southern Congo Bantu (esp. B80) varieties from DRC’s Kwilu also exhibit labial–velar stops like /gb/ and /kp/ in their phonological inventories (see Maselli et al. 2021 for a recent overview), Sakata stands out in that it also presents the labial–velar nasal stop /ɲm/ (and, possibly, a labial–velar fricative; see below). In other words, Sakata’s labial–velar set covers the entire series minus the rarer uvular and implosive counterparts.

The following relies heavily on the information (acoustic analyses) provided by Maselli et al. n.d.b., in press.

Figure 3 shows F2 transitions marked by a steep rise into the subsequent vowel, as indicated by the red line in the spectrogram. A (partial) voicing bar, typically observed with voicing (see Ladefoged and Maddieson 1996, among others), is visible in [gb] (marked by the red square). However, this feature does not seem to distinguish the two as neatly as one might expect.

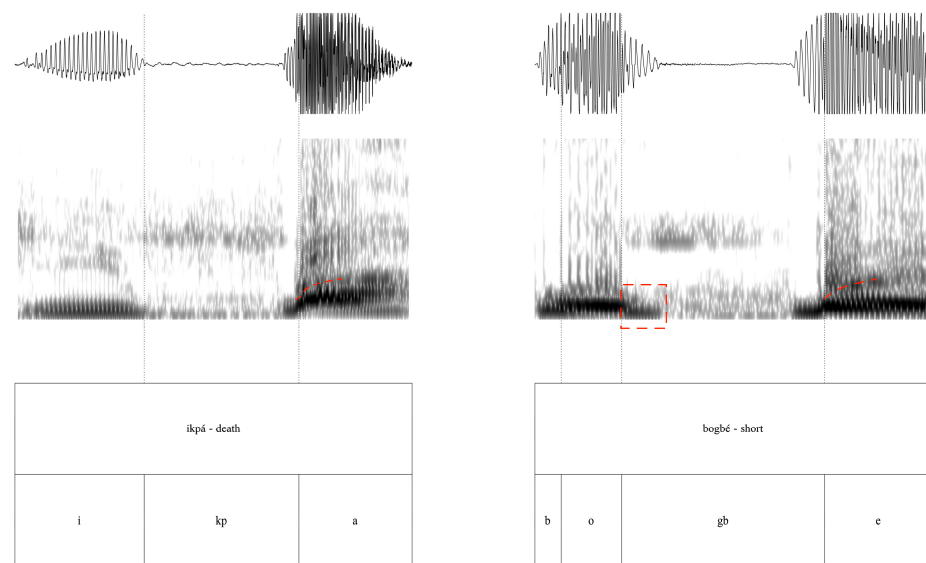


Figure 3. Realisations of /kp/ (left) vs. /gb/ (right) in Kinzinzale; audio files available on OSF as Figure 3-1 and Figure 3-2.

Figure 4 illustrates one realisation of a labial–velar nasal stop in Kitere. Labial–velar nasal stops have not been reported in any other languages of the region, but they are common in the Macro-Sudan Belt (cf. Idiatov and Van de Velde 2021). Despite the absence of visible release signs in the spectrographic trace, a steep F2 rise is still observable (indicated by the red line).

A case of particular interest is the potential presence of labial–velar fricatives in certain Sakata varieties, as illustrated in Figure 5. While the physiological feasibility of articulations with two simultaneous sources of friction has been contested in the literature (Ladefoged and Maddieson 1996, pp. 329–32; Cahill 2018), the concept of a voiceless labial–velar fricative is still recognised in the field of English dialectology (Schützler 2010; Bridwell 2019; Li and Gut 2022). No articulatory data are available to investigate the exact phonetic nature of the sounds in question. Nonetheless, it is interesting to note that these

alleged labial–velar fricatives occur in Sakata in contexts where one would expect to find a labial–velar stop. As a matter of fact, labial–velar stops are often considered to be the result of a temporal compression phenomenon from a velar + labial–velar approximant sequence (*KW) to a full-fledged double articulation (KP; Ponelis 1974; Connell 1998–1999). However, in Sakata, this compression occasionally yields [χw] or [ɱ]; see 10.a-d:

- 10.a

*kú “to die” > Kibayi, Kinzinzale, Kingingia—[òkpá], Kitere—[i:kpá]
- 10.b

*kúá “inhabitant” > Kibayi, Kinzinzale—[múngbà], Kitere, Kingingia—[úŋ | gbà]
- 10.c

*kómbó “broom” > Kibayi—[lèkwámò], Kinzinzale—[lèχwómò]/-[mò], Kingingele, Kingingia, Kitere—[lèɱó]
- 10.d

*kómbá “navel” > Kinzinzale—[mù:χúmá], Kingingia—[ù:ɱũá], Kingingele—[ù:kfũà]/[ù:pfũà].

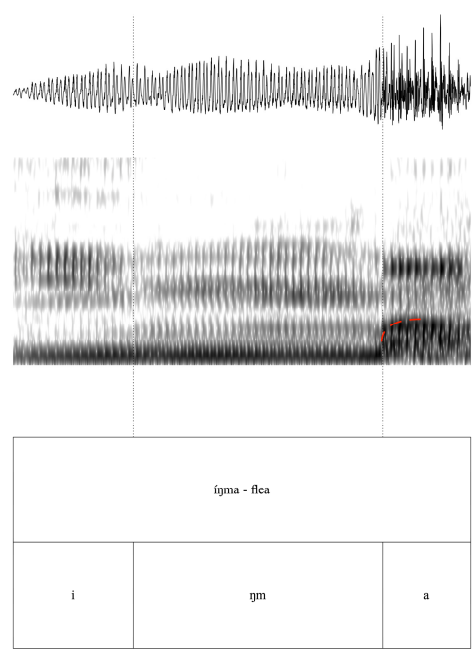


Figure 4. Realisations of /ɲm/ in Kitere; audio file available on OSF as Figure 4.

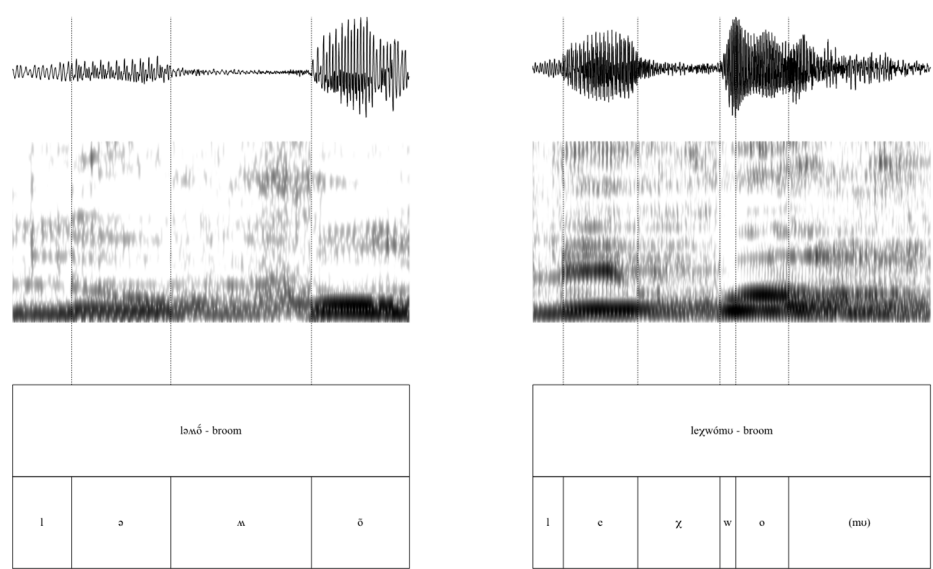


Figure 5. Realisations of /ɱ/ (Kingingia, left) vs. /χw/ (Kinzinzale, right); audio files available on OSF as Figure 5-1 and Figure 5-2.

In the case of the reflexes of Proto-Bantu *kómbó “broom”, the Sakata varieties surveyed here display a notable fricativisation process on the stop (/k/ > /χ/ in Kinzinzale), an outcome absent in the rest of WCB (cf. Esiñji B76b [èkwóómò], Tio Bali B75U [kwúm]) or in Central-Western Bantu, the branch to which some recent studies ascribe Sakata (Koile et al. 2022) (cf. Ndengese C81 [lɔnkɔmbɔ], Longandó C63 [lɔkómbɔ]). In turn, the back fricative + labial–velar approximant sequence appears to be subject to varying degrees of temporal compression in Kinzinzale (and possibly Kibayi), on the one hand, and in Kingingele, Kingingia, and Kitere on the other. Interestingly, Kingingele appears to take fricativisation even further than Kingingia and Kitere, by regularly substituting (in free variation) labial–velar stops with affricates such as [pf] (/ [kf]) and [dz] (see above, 10.d; Maselli et al. n.d.b., in press). Regardless of the exact phonetic nature of this sound, the reflexes in 10 appear to indicate that both labial–velar stops and these newly documented fricatives constitute one sound class in Sakata. The sounds [χw], [ɰ], and [kp]/[gb] in Sakata all seem to derive from Proto-Bantu *ku/ku.

Sakata speakers consider the presence of labial–velar stops in their language as an identity marker distinguishing them from other Bantu speech communities in the area. Complementarily, their neighbours commonly identify Sakata speakers by their extensive use of labial–velar stops, thereby rendering this sound class a defining linguistic mark of the Sakata domain. This includes labial–velar fricatives as well as stops.

Summarising the results, the behaviour of labial–velars in Sakata partially matches that of rhotics:

Phenomenon	Kibayi	Kinzinzale	Kingingele	Kingingia	Kitere
Presence of /kp/	++	++	+	++	++
Presence of /gb/	++	++	+	+	++
Presence of /ɲm/	++	–	–	++	+
Fricativisation	+	+	++	++	++
Affricativisation	–	–	++	–	–

Fricativisation seems to be more common in Kingingia, Kitere, and Kingingele, which again appear to constitute a regiolectal sub-group within Sakata (cf. the rhotic situation described above). The distribution of /ɲm/, however, does not match these preliminary findings.

4. Conclusions

To this day, the Mai-Ndombe province of the DRC, along with the rest of southwestern Congo, remains among the least well-surveyed areas of the planet in terms of linguistic and anthropological documentation. Detailed phonetic analyses of the languages spoken in the region are particularly lacking, as are reliable socio-linguistic accounts. This represents a severe gap in our knowledge of the WCB domain for several reasons.

First, Mai-Ndombe is located in close proximity to the putative WCB homeland (as recently redefined by Pacchiarotti et al. 2019, between the Kamtsha and Kasai Rivers, in the Kwilu province of the DRC, immediately to the south of Mai-Ndombe). In turn, the WCB homeland is the region of highest linguistic diversity within the entire WCB branch, hosting languages which exhibit a lot of phonological characteristics which are otherwise uncommon in Bantu, including rare vowel harmonies, umlaut effects, final vowel loss, systems of nine and more vowels, and uncommon labial–velar stops and affricates (Daeleman 1977; Rottland 1977; Bostoen and Mundeke 2011a, 2011b; Koni Muluwa and Bostoen 2011, 2012; Pacchiarotti and Bostoen 2021). Recent research, as summarised in this article, has shown that similarly exceptional features can be found well into Mai-Ndombe, where the languages reviewed here have been documented to present retroflexion, labial–velars, and systems of more than one non-flap rhotic. Considering that the existence of a pre-Bantu “forest substrate” (see above) has already been hypothesised to account for the great degree of linguistic diversity among the Bantu languages of western–central Africa, and that numerous hunter-gatherer Twa communities have been reported and documented in the broader area of interest, at least some of the diversity attested in the languages of

Mai-Ndombe could be explained in terms of a Twa substrate, betraying signs of greater “archaic heterogeneity” (Hetzron 1976) than the relative uniformity of present-day Bantu might suggest. In this scenario, some of the rarer phenomena reported in the region could therefore constitute traces (“fossils”) of even greater (and now largely submerged) phonological and phonetic diversity. In particular, the co-occurrence of retroflexion in Lotwa and North Boma/Nunu begs the question of whether retroflexion as such should be considered as a substrate feature of the languages of the region.

Second, one of the specific characteristics of the phenomena described in the present contribution is that they tend to affect more than one language at a time, working rather as “phonetic possibilities” than language-bound outcomes of traditional sound change rules. Phonemic double rhotics are a typologically rare feature that is, however, well established in the Sakata domain, itself a continuum of closely related dialects, and is attested in North Boma and Nunu too, suggesting that this specific characteristic is a common phonetic possibility in the area. Production of a retroflex flap in lieu of an intervocalic lateral is shared by all the Twa varieties documented here. This alternation often occurs as free variation, is distinctive of Twa groups in the Mongo area, and would appear to be shared by other hunter-gatherers in the central Congo Basin region. The presence of labial–velar consonants is another case in point: the variability in realisation of labial–velar sequences and the sporadic presence of more or less temporally compressed labial–velar fricative sounds appear to affect the entire Sakata domain more than any specific Sakata lect individually. As a matter of fact, free variation between KW and KP is a very common occurrence in several southern Mai-Ndombe and Kwilu varieties, suggesting that the realisation of labial–velar sounds itself is actually a common phonetic possibility shared across the region, with different levels of phonologisation (from full-fledged phonemes, as in most Sakata lects, to mere variants of KW). In this sense, Mai-Ndombe is a unique testing ground to challenge traditional notions of sound change.

This contribution, meant as a report on the author’s first foray into the region and intended to be chiefly exploratory in nature, represents the first attempt to tackle these issues organically and from an areal perspective.

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Data Availability Statement: All relevant data can be found on OSF (https://osf.io/hs85b/?view_only=8c1b5e1ab3e541bb8e8d6be45e8648b3, last accessed on 1 March 2024).

Conflicts of Interest: The author declares no conflict of interest.

Notes

- ¹ Though (possibly) one with little diagnostic power (cf. Hyman 2011; Cahill 2017).

References

- Bahuchet, Serge. 1993. *La Rencontre avec des Agriculteurs: Les Pygmées parmi les peuples d’Afrique Centrale (Histoire d’une civilisation forestière 2)*. Paris: Peeters, SELAF 344. Ethnoscience 9.
- Bahuchet, Serge. 2006. Languages of African rainforest ‘pygmy’ hunter-gatherers: Language shifts without cultural admixture. In *Historical Linguistics and Hunter-Gatherers Populations in Global Perspective*. Leipzig: Max Planck Institute.
- Bahuchet, Serge. 2012. Changing language, remaining Pygmy. *Human Biology* 84: 11–43. [CrossRef] [PubMed]
- Barry, William John. 1997. Another R-tickle. *Journal of International Phonetics Association* 27: 35–45. [CrossRef]
- Barry, William John, and Michela Russo. 2002. *Lambdacismo e Rotacismo in area Napoletana: Realizzazione Fonetica e Posizione Fono-logica*, 29o Convegno Nazionle dell’Associazione Italiana di Acustica, Ferrara, Italy, 12–14 Giugno. Padova: Arti Grafiche Padovane, pp. 377–82.

- Barry, William John, and Michela Russo. 2003. Lambdacismo e rotacismo nelle varietà di Ischia e Pozzuoli (NA): Analisi acustico-uditiva delle varianti lenizzate dell'occlusiva sonora. In *Voce Canto Parlato. Studi in onore di Franco Ferrero*. Edited by Piero Così, Emanuela Magno Caldognetto and Alberto Zamboni. Padova: Unipress, pp. 37–42.
- Bastin, Yvonne, André Coupez, and Michael Mann. 1999. *Continuity and Divergence in the Bantu Languages: Perspectives from a Lexico-statistic Study*. Tervuren: MRAC.
- Batini, Chiara, Gianmarco Ferri, Giovanni Destro-Bisol, Francesca Brisighelli, Donata Luiselli, Paula Sánchez-Diz, Jorge Rocha, Tatum Simonson, Antonio Brehm, Valeria Montano, and et al. 2011. Signatures of the Preagricultural Peopling Processes in Sub-Saharan Africa as Revealed by the Phylogeography of Early Y Chromosome Lineages. *Molecular Biology and Evolution* 28: 2603–13. [[CrossRef](#)] [[PubMed](#)]
- Bertinetto, Pier Marco. 2004. Retroflesso. In *Gian Luigi Beccaria, Dizionario di Linguistica*. Torino: Einaudi.
- Bhat, Darbhe Narayana Shankara. 1973. Retroflexion: An Areal Feature. *Working Papers on Language Universals* 13: 27–67.
- Bokwankon Bosonkie, John. 1997. *Structure Phonologique du kiSakata C34*. Travail de fin d'études. Inongo: Institut Supérieur Pédagogique d'Inongo, Inongo, Democratic Republic of Congo.
- Bontenge, M. 1995. Étude comparative du kambamba, kambanza, kambate, kangyengye et ketere: Variantes dialectales sakata. Master's thesis, IPN, Kinshasa, Zaire.
- Bostoen, Koen, and Jean-Pierre Donzo. 2013. Bantu-Ubangi Language Contact and the Origin of Labial-Velar Stops in Lingombe (Bantu, C41, DRC). *Diachronica* 30: 435–468. [[CrossRef](#)]
- Bostoen, Koen, and Léon Mundeke. 2011a. The Causative/Applicative Syncretism in Mbuun (Bantu B87, DRC): Semantic Split or Phonemic Merger? *Journal of African Languages and Linguistics* 32: 179–218. [[CrossRef](#)]
- Bostoen, Koen, and Léon Mundeke. 2011b. Passiveness and inversion in Mbuun (Bantu B87, DRC). *Studies in Language* 21: 72–111. [[CrossRef](#)]
- Bridwell, Keiko. 2019. The Distribution of [ɱ]: An acoustic Analysis of Sociophonetic Factors Governing the Wine-Whine Merger in Southern American English. Ph.D. dissertation, University of South Carolina, Columbia, SC, USA.
- Cahill, Michael. 2017. Labial-velars: A questionable diagnostic for a linguistic area. In *Proceedings of the 8th World Congress of African Linguistics Kyoto 2015*. Tokyo: ILCAA, Tokyo University of Foreign Studies, pp. 13–23.
- Cahill, Michael. 2008. Why labial-velar stops merge to /gb/. *Phonology* 25: 379–98. [[CrossRef](#)]
- Cahill, Michael, and John Hajek. 2001. Why [kp]? Paper presented at the Linguistic Society of America Annual Meeting, Washington, DC, USA, January 4–7.
- Cahill, Mochael. 2018. Labial-velars of Africa: Phonetics, phonology, and historical development. In *The Routledge Handbook of African Linguistics*. Edited by Augustine Agwuele and Adams Bodo. London: Routledge.
- Catford, John Cunnison. 2001. On Rs, rhotacism and paleophony. *Journal of the International Phonetic Association* 31: 171–185. [[CrossRef](#)]
- Chabiron, Clothilde, Silvia Gally, and Didier Demolin. 2013. Les parlers pygmées du bassin équatorial du Congo. *Géolinguistique* 14: 25–144. [[CrossRef](#)]
- Clements, George Nickerson, and Annie Rialland. 2008. Africa as a phonological area. In *A Linguistic Geography of Africa*. Edited by Bernd Heine and Derek Nurse. Cambridge: CUP.
- Colantoni, Laura. 2006. Increasing Periodicity to Reduce Similarity: An Acoustic Account of Deassibilantion in Rhotics. In *Selected Proceedings of the 2nd Conference on Laboratory Approaches to Spanish Phonetics and Phonology*. Somerville: Cascadia Proceedings Project, pp. 22–34.
- Connell, Bruce. 1987. *Temporal Aspects of Labiovelar Stops*. Work in Progress, 20. Edinburgh: Department of Linguistics, University of Edinburgh, pp. 53–60.
- Connell, Bruce. 1991a. Accounting for the reflexes of labial-velar stops. *Proceedings of the XIIth ICPhS, Aix-en-Provence* 3: 110–13.
- Connell, Bruce. 1991b. *Phonetic Aspects of the Lower Cross Languages and their Implications for Sound Change*. Ph. D. dissertation, The University of Edinburgh, Edinburgh, UK.
- Connell, Bruce. 1994. The structure of labial-velar stops. *Journal of Phonetics* 22: 441–76. [[CrossRef](#)]
- Connell, Bruce. 1998–1999. Feature Geometry and the Formation of Labial-Velars: A Reply to Mutaka and Ebovissé. *Journal of West African Languages* XXVII: 17–32.
- Daeleman, Jan. 1977. A Comparison of Some Zone B Languages in Bantu. *Africana Linguistica* 7: 93–144. [[CrossRef](#)]
- Dogil, Grzegorz. 1988. On the acoustic structure of multiply articulated stop consonants (labiovelars). *Wiener Linguistische Gazette* 42–43: 3–55.
- Eberhard, David, Gary Simons, and Charles Fennig, eds. 2024. *Ethnologue: Languages of the World*, 25th ed. Dallas: SIL International.
- Embanga Aborobongui, Georges Martial. 2013. *Processus segmentaux et tonaux en Mbondzi — (variété de la langue embosi C25) — Linguistique*. Paris: Université de la Sorbonne nouvelle—Paris III.
- Emeneau, Murray Barnson. 1956. India as a linguistic area. *Language* 32: 3–16. [[CrossRef](#)]
- Greenberg, Joseph Harold. 1983. Some areal characteristics of African languages. In *Current Approaches to African Linguistics* 1. Edited by Ivan Dihoff. Berlin: Mouton de Gruyter, pp. 3–21.
- Grégoire, Claire. 2003. The Bantu Languages of the Forest. In *The Bantu Languages*. Edited by Derek Nurse and Gérard Philippson. London and New York: Routledge, pp. 349–70.

- Grollemund, Rebecca, Simon Branford, Koen Bostoen, Andrew Meade, Chris Venditti, and Mark Pagel. 2015. Bantu expansion shows that habitat alters the route and pace of human dispersals. *Proceedings of the National Academy of Sciences of the United States of America* 10: 13296–301. [CrossRef]
- Guthrie, Malcolm. 1970. *Comparative Bantu: An Introduction to the Comparative Linguistics and Prehistory of the Bantu Languages. Volume 2: Bantu Prehistory, Inventory and Indexes*. London: Gregg International.
- Güldemann, Tom. 2008. The Macro-Sudan Belt: Towards Identifying a Linguistic Area in Northern Sub-Saharan Africa. In *A Linguistic Geography of Africa*. Edited by Bernd Heine and Derek Nurse. Cambridge and New York: Cambridge University Press, pp. 151–85.
- Güldemann, Tom, ed. 2018. Areal linguistics beyond contact, and linguistic areas of Afrabia. In *The Languages and Linguistics of Africa*. Berlin: Mouton de Gruyter, pp. 448–545.
- Hamann, Silke. 2003. The Phonetics and Phonology of Retroflexes. Ph. D. dissertation, Universiteit Utrecht, Utrecht, The Netherlands.
- Hamann, Silke, and Susanne Fuchs. 2010. Retroflexion of Voiced Stops: Data from Dhao, Thulung, Afar and German. *Language and Speech* 53: 181–216. [CrossRef]
- Hammarström, Harald. 2016. Linguistic diversity and language evolution. *Journal of Language Evolution* 1: 19–29. [CrossRef]
- Hammarström, Harald, Robert Forkel, Martin Haspelmath, and Sebastian Bank. 2022. *Glottolog 4.7*. Leipzig: Max Planck Institute for Evolutionary Anthropology. Available online: <http://glottolog.org> (accessed on 1 March 2024).
- Hamp, Eric Pratt. 1996. On the Indo-European Origins of the Retroflexes in Sanskrit. *Journal of the American Oriental Society* 116: 719–23. [CrossRef]
- Harris, James Wesley. 1969. *Spanish Phonology*. Cambridge: MIT Press.
- Hetzron, Robert. 1976. Two principles of genetic reconstruction. *Lingua* 38: 89–108. [CrossRef]
- Hiernaux, Jean. 1966. Les Bushong et les Cwa du royaume Kuba (Congo-Kinshasa): Pygmées, Pygmoïdes et pygméisation; anthropologie, linguistique et expansion bantoue. *Bulletins et Mémoires de la Société d'Anthropologie de Paris* 9: 299–336. [CrossRef]
- Hock, Hans Henrich. 1991. *Principles of Historical Linguistics*, 2nd ed. Berlin: Mouton de Gruyter.
- Hyman, Larry. 2011. The Macro-Sudan Belt and Niger-Congo Reconstruction. *Language Dynamics and Change* 1: 3–49. [CrossRef]
- Idiatov, Dmitry, and Mark Van de Velde. 2021. The lexical distribution of labial-velar stops as a window into the linguistic prehistory of Northern Sub-Saharan Africa. *Language* 97: 72–107. [CrossRef]
- Klieman, Kairn. 2003. *'The Pygmies Were Our Compass': Bantu and Batwa in the History of West Central Africa, Early Times to c. 1900 C.E.*. Portsmouth: Heinemann, Social History of Africa.
- Koile, Ezequiel, Simon Greenhill, Damián Blasi, Remco Bouckaert, and Russell Gray. 2022. Phylogeographic analysis of the Bantu language expansion supports a rainforest route. *Proceedings of the National Academy of Science USA* 119: e2112853119. [CrossRef] [PubMed]
- Koni Muluwa, Joseph, and Koen Bostoen. 2012. La diphtongaison dans les langues bantu B70–80 (Bandundu, RDC): Typologie et classification historique. *Africana Linguistica* 18: 355–386. [CrossRef]
- Koni Muluwa, Joseph, and Koen Bostoen. 2015. *Lexique comparé des langues bantu du Kwilu (République démocratique du Congo): Français—Anglais—21 langues bantu (B, C, H, K, L)*. (Grammatical Analyses of African Languages, 48). Köln: Köppe.
- Koni Muluwa, Joseph, and Koen Bostoen. 2011. Umlaut in the Bantu B70/80 languages of the Kwilu (DRC): Where did the final vowel go? Paper presented at 41th Colloquium on African Languages and Linguistics, Leiden, The Netherlands, August 29–31.
- Kutsch Lojenga, Constance. 1991. Lendu: A new perspective on implosives and glottalized stops. In *Afrika und Übersee*. Kinshasa: SIL, p. 74.
- Kutsch Lojenga, Constance. 1994. Kibudu: A bantu language with nine vowels. *Africana Linguistica* 11: 127–33. [CrossRef]
- Ladefoged, Peter. 1968a. *A Phonetic Study of West African Languages: An Auditory-Instrumental Survey*, 2nd ed. Cambridge: Cambridge University Press.
- Ladefoged, Peter. 1968b. Linguistic aspects of respiratory phenomena. *Annals of the New York Academy of Sciences* 155: 141–51. [CrossRef]
- Ladefoged, Peter. 2003. *Phonetic Data Analysis: An Introduction to Fieldwork and Instrumental Techniques*. Oxford: Blackwell.
- Ladefoged, Peter, and Ian Maddieson. 1996. *The Sounds of the World's Languages (Phonological Theory)*. Oxford and Cambridge: Blackwell.
- Laver, John. 1994. *Principles of Phonetics*. Cambridge: Cambridge University Press.
- Lekens, Benjamin. 1952. *Dictionnaire Ngbandi (Ubangi-Congo Belge)*. Antwerpen: Sikkell.
- Li, Zeyu, and Ulrike Gut. 2022. The distribution of /w/ and /ɱ/ in Scottish Standard English. *Corpus Linguistics and Linguistic Theory* 19: 271–87. [CrossRef]
- Lipski, John. 1990. Spanish taps and trills: Phonological structure of an isolated opposition. *Folia Linguistica* 24: 153–74. [CrossRef]
- Maddieson, Ian. 1993. Investigating Ewe articulations with electromagnetic articulography. *Forschungsberichte des Instituts für Phonetik und Sprachliche Kommunikation der Universität München* 31: 181–214.
- Maddieson, Ian. 2018. Phonetics and African Languages. In *The Languages and Linguistics of Africa*. Edited by T. Güldemann. Berlin: De Gruyter Mouton, pp. 546–601.
- Maddieson, Ian, and Peter Ladefoged. 1989. Multiply articulated segments and the feature hierarchy. *UCLA Working Papers in Phonetics* 72: 116–38.

- Maho, Jouni Filip. 2009. NUGL Online: The Online Version of the New Updated Guthrie List, a Referential Classification of the Bantu Languages. Available online: https://brill.com/fileasset/downloads_products/35125_Bantu-New-updated-Guthrie-List.pdf (accessed on 18 March 2024).
- Maselli, Lorenzo, Sara Pacchiarotti, and Koen Bostoen. 2021. Labial-velar stops outside the Macro-Sudan Belt: New evidence from Lwel (West-Coastal Bantu, B862). *Africana Linguistica* 27: 141–64.
- Maselli, Lorenzo, Véronique Delvaux, Jean-Pierre Donzo, Sara Pacchiarotti, and Koen Bostoen. n.d.a. *In Preparation*. Retroflex Nasals in Mai-Ndombe: The case of North Boma B82 and Nunu B822.2024.
- Maselli, Lorenzo, Véronique Delvaux, Jean-Pierre Donzo, Sara Pacchiarotti, and Koen Bostoen. n.d.b. Labial-velar stops in Sakata (Bantu C34): Preliminary phonetic and phonological observations. *Studies in African Linguistics*, in press.
- Matabisi, K. Mb. 1979. *Phonologie, morphonologie et morphologie de la langue sakata*. Kinshasa: Institut Pédagogique National (IPN).
- Motingea, André. 1993. Notes sur le parler des Batswa de Bosabole (Z—Maindombe). *Annales Aequatoria* 14: 483–501.
- Motingea, André. 1994. Notes sur le parler des Pygmées d'Itendo (Zone de Kiri—Maindombe). *Annales Aequatoria* 15: 341–382.
- Motingea, André. 2010. Echantillon d'un parler tswá. Available online: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi-_7KX_2EAxXZTaQEhX0WCikQFnoECA4QAAQ&url=https://tufts.repo.nii.ac.jp/record/7674/files/monograph_No.5-06.pdf&usq=AOvVaw2BYgSyX3Od96scDEqLsvMw&opi=89978449 (accessed on 1 March 2024).
- Motingea, André. 2015. Déclin des langues et convergence linguistique dans le bassin central congolais. *ARSOM/KAOW, Bulletin des Séances/Mededeelingen der Zittingen* 61: 59–132.
- Möhl, Wilhelm. 1981. Stratification in the History of the Bantu Languages. In *Sprache und Geschichte in Afrika*. Köln: Rudiger KoppeVerlag, pp. 251–317.
- Ohal, John Jerome, and James Lorentz. 1977. The story of [w]: An exercise in the phonetic explanation for sound patterns. In *Proceedings of the Third Annual Meeting of the Berkeley Linguistic Society*. Washington, DC: Linguistic Society of America, pp. 577–99.
- Olson, David, Eric Dinerstein, Eric Wikramanayake, Neil Burgess, George Powell, Emma Underwood, Jennifer D'amico, Illanga Itoua, Holly E. Strand, John Morrison, and et al. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth—A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity. *BioScience* 51: 933–38. [CrossRef]
- Olson, Kenneth, and John Hajek. 2003. Crosslinguistic insights on the labial flap. *Linguistic Typology* 7: 157–86. [CrossRef]
- Omasombo Tshonda, Jean, Daniel Bolanzowu, Élodie Stroobant, Jérôme Mumbanza, Joris Krawczyk, Mohamed Laghmouch, and Antoine Batamba. 2019. *Mai-Ndombe: Mosaïque de Peuples établie sur un Patrimoine Naturel*. Tervuren: Peeters.
- Pacchiarotti, Sara, and Koen Bostoen. 2021. Final Vowel Loss in Lower Kasai Bantu (DRC) as a Contact-Induced Change. *Journal of Language Contact* 14: 438–76. [CrossRef]
- Pacchiarotti, Sara, and Koen Bostoen. 2020. The Proto-West-Coastal Bantu Velar Merger. *Africana Linguistica* 26: 139–95.
- Pacchiarotti, Sara, Natalia Chousou Polydouri, and Koen Bostoen. 2019. Untangling the West-Coastal Bantu Mess: Identification, Geography and Phylogeny of the Bantu B5080 Languages. *Africana Linguistica* 25: 155–229.
- Padgett, Jaye. 2003. *Systemic Contrast and Catalan Rhotics*. Santa Cruz: University of California, Unpublished.
- Painter, Colin. 1978. Implosives, inherent pitch, tonogenesis, and laryngeal mechanisms. *Journal of Phonetics* 6: 249–74. [CrossRef]
- Patin, Étienne, Guillaume Laval, Luis Barreiro, Antonio Salas, Ornella Semino, Silvana Santachiara-Benerecetti, Kenneth Kidd, Judith Kidd, Lolke Van der Veen, Jean-Marie Hombert, and et al. 2009. Inferring the Demographic History of African Farmers and Pygmy Hunter–Gatherers Using a Multilocus Resequencing Data Set. *PLoS Genet* 5: e1000448. [CrossRef]
- Ponelis, Fritz. 1974. On the dynamics of velarization and labialization: Some Bantu evidence. *Studies in African Linguistics* 5: 27–58.
- Quintana-Murci, Lluís, Hélène Quach, Christine Harmant, Francesca Luca, Blandine Massonnet, Étienne Patin, Lucas Sica, Patrick Mouguiama-Daouda, David Comas, Shay Tzur, and et al. 2008. Maternal traces of deep common ancestry and asymmetric gene flow between Pygmy hunter-gatherers and Bantu-speaking farmers. *Proceedings of the National Academy of Science USA* 105: 1596–601. [CrossRef]
- Rottland, Franz. 1977. Reflexes of Proto-Bantu Phonemes in Yanzi (B85). *Africana Linguistica* 7: 375–96. [CrossRef]
- Samarin, William John. 1959. Prospecting Gbaya dialects. *AS* 18: 68–73. [CrossRef]
- Schebesta, Paul Joachim. 1949. La langue des Pygmées. *Zaire* 3: 119–28.
- Schützler, Ole. 2010. Variable Scottish English consonants: The cases of /ə/ and non-prevocalic /r/. *Research in Language* 8: 5–21. [CrossRef]
- Shinagawa, Daisuke, Seunghun Lee, and Lorenzo Maselli. 2022. Postnasal trilling in Bantu: Cross-linguistic variation and typological overview, Blantyre, Malawi, Bantu9 conference presentation.
- Stappers, Leo. 1986. *Boma: Eine Sprachskizze*. Hamburg: Helmut Buske.
- Trilles, Henri. 1932. *Les Pygmées de la forêt équatoriale*. Paris: Librairie Bloud & Gay.
- Tse, Holman. 2015. The Diachronic Emergence of Retroflexion in Somali Bantu Kizigua: Internal Motivation or Contact-Induced Change? In *Selected Proceedings of the 44th Annual Conference on African Linguistics*. St. Paul: School of Humanities, Arts and Sciences, pp. 277–89.
- Tylesskär, Thorkild. 1987. *Phonologie de la langue sakata (BC 34): Langue bantoue du Zaïre parler de Lemvien Nord*. Master's thesis, Université de la Sorbonne Nouvelle, Paris, France; 205p.
- Vogelgesang, Manfred. 1993. Die Mundart von Bliesmengen Bolchen (Saarland). In *Phonetica Saraviensia*. Saarbrücken: Universität des Saarlandes, vol. 11.

- Vogler, Pierre. 2014. La Formation des Labiales-vélaires à double Occlusion en Niger-Congo. Illkirch-Graffenstaden, ms. Available online: <https://hal.archives-ouvertes.fr/hal-01183115/document> (accessed on 1 March 2024).
- Vorbichler, Anton. 1966–1967. Erzählungen in der Mamvu-Sprache. Mit einer vergleichenden Einführung in die Phonologie und das Verbalsystem. *Afrika und Übersee* 50: 244–78.
- Walker, James, and William John Samarin. 1997. Sango phonology. In *Phonologies of Asia and Africa (Including the Caucasus)*. Ann Arbor: Eisenbrauns, p. 2.
- Wheeler, Max. 2005. *The phonology of Catalan*. Oxford: Oxford University Press.
- Wiese, Richard. 2011. The Representation of Rhotics. In *The Blackwell Companion to Phonology*. Edited by Mark Oostendorp, Colin Ewen, Elizabeth Hume and Karen Rice. Hoboken: Blackwell.
- Zhivlov, Mikhail. 2016. The origin of Khanty retroflex nasal. *Journal of Language Relationship/Вопросы языкового родства* 14: 293–302. [[CrossRef](#)]

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