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## Shooting Through the Nose in Karekare: A Study of Nasally Released Stops in a Chadic Language

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### Abstract

Karekare, a Chadic language spoken in Yobe State of northeastern Nigeria, has a set of consonants with both orally released and nasally released allophones, similar to the allophones of /d/ in English **ride** vs. **ridden**. Specifically, an underlying sequence /CinV/ → [C<sup>n</sup>ηV], where C = an alveolar [-continuant]. Video recordings and instrumental records of the audio show that the alveolar consonants /d, t, ɗ, n/ remain articulatorily distinct from each other under nasal release, though /n, nd/ become neutralized as [ŋ]. The alternation between orally and nasally released consonants is a typical case of phonetically conditioned allophonic variation, and standard assumptions of linguistic analysis would suggest that speakers would hear the alternants as “the same sound”. Karekare speakers, however, are very much aware of the difference and prefer to represent the orally and nasally released allophones with different symbols in a standard orthography. Study of the nasal release phenomenon calls attention to the fact that the typology of Karekare vowels is more like that of Ngizim, a distant linguistic cousin but close geographic neighbor, than it is like that of its closer linguistic relatives, Bole and Ngamo.

*Keywords:* Nasal, Nasal release, Nasal plosion, Allophonic variation, Chadic

### 1. Introduction

Karekare is a Chadic language spoken in northeastern Nigeria in the area around Potiskum, the largest town in Yobe State. Karekare belongs to the A Sub branch of the West Branch of Chadic (Newman 1977). Karekare’s closest linguistic relatives are the languages of the Bole-Tangale group. Two of these languages, Ngamo and Bole, are geographic neighbors of Karekare to the south in Yobe State.

Karekare, Ngamo, and Bole are typologically similar in most respects, but Karekare is phonologically unique among its Chadic sisters in having a set of nasally released stops where its sisters have a Stop+Vowel+Nasal sequence. Thus, for example, the verbal noun of the verb ‘eat’ in the three Bole-Tangale languages of Yobe State is **tunà** in Ngamo (Yaya dialect), **tinà** in Bole, but [**t<sup>n</sup>ɲaɪ**] in Karekare. In describing such sounds, Ladefoged (2006:61) says, “...the air pressure built up behind the stop closure is released through the nose by the lowering of the soft palate (the velum) for the nasal consonant. This phenomenon is known as *nasal plosion*...” and is found in the nasal release of stops in German in such words as **reden** [**reɪd<sup>n</sup>ɲ**] ‘to talk’ and **retten** [**ret<sup>n</sup>ɲ**] ‘to rescue’ or in English in words like **sudden** [**sʌd<sup>n</sup>ɲ**] and **hedonist** [**hid<sup>n</sup>ɲɪst**]. Three terms have been applied to this category of sounds: *nasal plosion*, *prestopped nasals*, and *nasally released stops*. Of the latter two terms, Ladefoged and Maddieson (1996:128) say, “We do not know of a language in which it has been proposed that these two types of elements contrast, but the phonological patterns suggest that different analyses are appropriate in different cases.” Such phonologically different analyses would depend on whether one could argue that the element in question derived from an underlying nasal (*prestopped nasal*) or an underlying stop (*nasally released stop*). Data will show that in Karekare, these elements derive from and, indeed, alternate with stops. For the same reason, I

prefer to refer to the phenomenon in Karekare as *nasal release of stops* rather to use the phonologically neutral phonetic expression, *nasal plosion*.

Though nasally released stops in Karekare phonetically resemble those heard in German and English, Karekare differs from German and English in at least two ways. First, Karekare extends nasal release to all [-continuant] coronals and, second, Karekare permits nasal release of stops in initial as well as postvocalic environments. Malam Kariya Gambo, who provided some of the data for this study, aptly referred to nasally released stops in his language as *harbi ta hanci*, Hausa for “shooting through the nose”, whence the title of this paper.

In following sections, I lay out the environments in which nasally released stops appear in Karekare, followed by a phonetic description of the segmental sequences of which the nasally released stops are a part. I address the decades old issue of the psychological reality of the phoneme and finally speculate on why Karekare has altered certain CVN sequences whereas its closest linguistic relatives have not.

## 2. Environments for “Harbi ta Hanci”

Karekare has five sets of [-continuant] consonants. I follow the practice, dating from Chomsky and Halle (1968), of classifying nasal consonants as [-continuant] because of complete closure of the oral cavity:<sup>1</sup>

- voiceless stops: (**f** = [ϕ/p]), **t**, **c**, **k**
- voiced stops: **b**, **d**, **j**, **g**
- implosive glottalized: **ɓ**, **ɗ**, **ʔy**
- regular nasals: **m**, **n**
- prenasalized voiced stops: **mb**, **nd**, **ng**

Note that there is an asymmetry in the labial series, with the voiceless labial usually being pronounced as a bilabial fricative [ϕ], with a stop allophone [p] only in /\_\_C and /m\_\_, and the voiced labial stop **b** having no fricative counterpart.

Of these consonants, all of the alveolars have nasally released counterparts in the configuration of the rule in (1):

$$(1) \left[ \begin{array}{l} +\text{alveolar} \\ -\text{continuant} \end{array} \right] \text{inV} \rightarrow [+ \text{nasal release}] \text{ɲV}$$

That is, when a /Ci/ syllable (C = alveolar non-continuant consonant) precedes a syllable of the form /nV/, the /C/ is nasally released directly into a syllabic nasal, which replaces the underlying /i/ and merges with the nasal onset of the /nV/ syllable. The syllabic nasal bears the tone that would otherwise have been born by the vowel. The /Ci/ syllable may be phrase initial or medial. The table in (2) gives examples. The forms in

<sup>1</sup> Except for specifically phonetic representations, where I use IPA symbols, I will cite Karekare words in the standard orthography being used in the Yobe Languages Research Project (see Acknowledgements at the end of this paper), with diacritics for tone and vowel length added. Note especially the following conventions: **c** = IPA [tʃ], **j** = IPA [dʒ]; **y** = IPA [ʔʲ], though structurally, this is the glottalized counterpart of the affricates **c** and **j**; orthographic **mb**, **nd**, **ng** are prenasalized units [m̥b, n̥d, ŋ̥g] respectively in word initial position but are NC sequences word medially; the orthographic vowel “i” in Karekare is phonetically [i̥] (see below); a macron over a vowel represents a long vowel, as in **nā** (IPA [na̐]) ‘it is’; grave accent over a vowel (long or short) represents low tone, as in **kà** ‘with’, **bè** ‘son’; syllables with no accent mark bear high tone.

the “Orthography” column stand in for the phonologically underlying forms (though in a later section we address the question of what the orthography should actually be). I return to phonetic details in section 3 of the paper. I do not mark tone in the phonetic transcriptions in order to avoid cluttering the transcriptions with extra diacritics. In any case, base tones are preserved in the phonetic forms, and tone plays no role in the conditioning of nasal release.

(2) Examples of nasally released alveolars

	Orthography	Phonetic form	
a.	d̄inau	[d̄ <sup>n</sup> ɲΛσ]	‘me’
b.	d̄inì	[d̄ <sup>n</sup> ɲi]	‘him’
c.	kà d̄inau	[kΛd̄ <sup>n</sup> ɲΛσ]	‘with me’
d.	kà d̄inì	[kΛd̄ <sup>n</sup> ɲi]	‘with him’
e.	tinà	[t̄ <sup>n</sup> ɲaɪ]	‘eating; food’
f.	nā là tinà	[na:lɑ:t̄ <sup>n</sup> ɲaɪ]	‘he will eat’
g.	d̄inà	[ʔ <sup>n</sup> ɲaɪ]	‘mounting’
h.	nā là d̄inà	[na:lɑ:ʔ <sup>n</sup> ɲaɪ]	‘he will mount’
i.	ninà	[ɲaɪ]	‘seeing’
j.	ndinà	[ɲaɪ]	‘going’
k.	nà ndinà	[na:ɲaɪ]	‘I will go’

The justification for the forms in the “Orthography” column of (2) comes from tokens of the same roots or affixes in constructions not meeting the environment in (1). Compare the phonetic forms of the roots and affixes in (3) with the parallel forms containing nasally released counterparts in (2).

(3) Morphemes from (2) with orally released variants

	Orthography	Phonetic form	
a.	d̄ikau	[d̄ikΛσ]	‘you’ (masc. sg.)
b.	d̄itau	[d̄itΛσ]	‘her’
c.	kà d̄ikau	[kΛd̄ikΛσ]	‘with you’ (m.s.)
d.	kà d̄itau	[kΛd̄itΛσ]	‘with her’
e.	tikàu	[tikΛσ]	‘he ate’
f.	nà tikàu	[nΛtikΛσ]	‘I ate’
g.	d̄ākàu	[d̄a:kΛσ]	‘he mounted’
h.	nà d̄ākàu	[nΛd̄a:kΛσ]	‘I mounted’
i.	nà n̄â-nninkì	[nΛn̄anniki]	‘I saw him’
j.	ndikàu	[nd̄ikΛσ]	‘he went’
k.	nà ndikàu	[nΛnd̄ikΛσ]	‘I went’

It turns out that the number of roots and affixes that provide environments for nasally released consonants is small, but because most of these items bear a heavy functional load, nasally released consonants are of common occurrence in Karekare discourse. To date, I have identified the following items as sources of nasally released consonants:

- /d/: (1) A formative /d̥i-/, the base for the independent pronouns, which is nasally released with the **n**-initial pronominal roots **-nau** ‘me’, **-nì** ‘him’ (2a-d) but is orally released as [d̥i-] with pronouns beginning in other consonants, e.g. **-kau** ‘you (masc.sing.)’, **-tau** ‘her’ (3a-d); (2) the word /b̥adinè/ → [b̥aɪd̥<sup>n̥</sup>ɛ] ‘girl’.
- /t/: (1) The verb root /t̥i-/ ‘eat’, which uses a suffix **-in̥à** for the verbal noun and future form (2e-f) but has other suffixes elsewhere, e.g. the completive suffix **-kau** (3e-f); (2) the genitive linker /t̥i-/ with **n**-initial pronouns, e.g. **lō t̥inì** → [lōɪt̥<sup>n̥</sup>ɪ] ‘his meat’ (cf. **lō t̥ikau** ‘your (m.s.) meat’); (3) the verbal totality extension /-t̥i-/ with the intransitive copy pronoun (ICP) **-na-**,<sup>2</sup> e.g. /n̥à d̥ā-t̥i-na-k̥àu/ → [n̥<sup>n̥</sup> d̥āɪt̥<sup>n̥</sup>ɪn̥<sup>n̥</sup>k̥<sup>n̥</sup>ɔ] ‘I climbed’ /I climb-tot-ICP-completive/—cf. **d̥ā-t̥i-n-k̥ì** ‘he climbed’ /climb-tot-ICP-completive/. Even though **n** follows **-t̥i-** in the latter example, the **t** does not become nasally released because the rule for nasal release requires that the **Ci** syllable precede an open syllable.
- /d̥/: The verb /d̥ā-/ ‘mount, climb, go up’, which, like other monoconsonantal verbs, has a verbal noun and future suffix **-in̥à** (2g-h), but uses the stem vowel **-ā-** elsewhere, e.g. in the completive (3g-h).
- /n/: The verb /n̥ā-/ ‘see’, which, like other monoconsonantal verbs, has a verbal noun and future suffix **-in̥à** (2i), but uses the stem vowel **-ā-** elsewhere, e.g. in the completive (3i).<sup>3</sup>
- /nd̥/: The verb /nd̥i-/ ‘go’, which, like other monoconsonantal verbs, has a verbal noun and future affix **-in̥à** (2j), but uses suffixes with consonants other than **n** elsewhere, e.g. in the completive (3k) with the suffix **-k̥àu**.

One would expect there to be a certain number of lexical roots containing nasally released stops without forms of the same root containing oral stop alternants. Despite my asking speakers if they could think of words containing these sounds—sounds which they readily recognize as “special” (see section 4)—the only non-alternating root that I have been able to identify is the word for ‘girl’ listed above under /d̥/. I cannot say whether this distributional fact is significant, but note that most cases of nasally released /d̥/ in English and German also appear in inflected or derived forms, such as *hidden*, *gladden*, etc.

It may seem strange to include /n/ among the consonants under investigation here, since a nasal consonant, by definition, is nasally released. It fits into the broader picture, however, because, as the example in (2i) shows, the underlying syllable /ni-/ becomes syllabic [n̥] in exactly the environments where the other /Ci-/ syllables become [C<sup>n̥</sup>ɪ].

<sup>2</sup> The totality extension indicates action thoroughly done (with the verb ‘climb’ here, its force would be something like “climbed clear up”). The intransitive copy pronoun (ICP) is a pronominal subject agreement suffix used with intransitive verbs. In Karekare and other Yobe State Chadic languages, the ICP can only be used in combination with the totality extension.

<sup>3</sup> The analysis of (3i) is **n̥à n̥ā-n-ni-n-k̥ì** ‘I see-tot-him-tot-completive’. I failed to elicit examples where the **ni-** syllable of ‘see’ is post-vocalic. It proved problematic to elicit the desired forms of this verb, partly because it is a stative verb, a feature that affects verb morphology, partly because it seems to be in the process of being replaced by an unrelated root **moy-**, which also means ‘see’ in Karekare, a shift from the original meaning which was ‘watch, look at’.

Let us examine in more detail the environments for nasally released consonants. First, the underlying vowel in the syllable with a nasally released onset must be a short high vowel. The proposed standard orthography writes this vowel as “i”, the symbol used in the “Orthography” forms of (2-3), but in fact, as I will argue in section 4, Karekare does not distinguish short /i/ and /u/ in word medial position, the normal realization of any medial short high vowel normally being something like [i̠]. The syllables with nasally released onsets in (2) all have /i/ as their underlying nucleus. Syllables with other vowels in the same environment do not undergo the rule in (1), e.g. **danò** ‘sweet juice of locust bean flowers’ is [danɔ̠], not \*[d<sup>n</sup>ɔ̠]; **atanā** ‘hedgehog’ is [atana̠], not \*[at<sup>n</sup>na̠].

Second, the syllable following the /Ci/ syllable must be open, e.g. **dìndì** ‘toad’ is [d̠indi], not \*[d̠<sup>n</sup>di], **tìngātinkì** ‘he sat down’ is [t̠ingait̠inki], not \*[t̠<sup>n</sup>ggait̠inki]. Here Karekare differs from German and English. The most common environment for nasally released consonants in these languages is in word-final unstressed syllables, e.g. German **reden** [reid̠n̠] ‘to talk’. Karekare apparently does not allow nasally released consonants as onsets of word final syllables, presumably because of the requirement that the syllable with nasally released onset must be followed by an open syllable. I say “apparently” because current data for Karekare provides only the following candidates for nasal release in a final syllable: **indìn** ‘urine’ → [ind̠in], not \*[ind̠<sup>n</sup>]; **wùntin** ‘nose’ → [wunt̠in], not \*[wunt̠<sup>n</sup>]. These words both have a nasal preceding the candidate for nasal release, which could conceivably block this release. However, Karekare does allow nasal release of a consonant after **n** in word medial position, e.g. /àsantini/ → [asant̠ni] ‘they took (it) for him’ (**as-** ‘take’, **-an-** plural subject, /t̠ini/ ‘him (ind. object)’). Also, a preceding nasal does not prevent nasal release in a word final syllable in English, e.g. **abandon** → [ə'bænd̠n̠] in casual speech.

Finally, in currently available data, nasal release applies only to alveolar consonants. In German, nasal release can take place at all points of articulation, e.g. **haben** → [hab̠n̠] ‘to have’, **sorgen** → [zɔ̠rg̠n̠] ‘to care about’.<sup>4</sup> Absence of nasally released consonants in Karekare at non-alveolar points of articulation may result from the absence of candidates for nasal release rather than a systematic restriction. As Ladefoged (2006:62) notes, for nasal release (which Ladefoged calls *nasal plosion*) to take place, the stop and the nasal must be homorganic. Words such as **tìmè** ‘pointing’, **bìni** ‘grindstone’, **mìni** ‘his’, **kinà** ‘transplanting’ cannot be realized with nasally released stops because the stops and following nasals are not homorganic.

A velar consonant in Karekare would never be subject to nasal release inasmuch as Karekare does not have a velar nasal phoneme /ŋ/ and no environments where a phonetic [ŋ] could initiate an open syllable. At the labial place of articulation in open syllables, the only voiceless consonant is [ɸ], which, being a fricative, does not involve oral closure and hence could not be nasally released. In currently available data, there are no words with other labials in the required configuration, e.g. words of a form such as **bima** that might become [b̠m̠a]. The word **bimbad** ‘ten’ has a preferred pronunciation variant that I have transcribed in my notes as [mbad̠], though I suspect that it is actually [b̠m̠bad̠]—I failed to make an audio recording that I can check instrumentally. Even if this is an example of a nasally released /b/, it is a special case since, as noted above,

<sup>4</sup> I am not sure whether nasal release applies freely to non-alveolars in English. To me, **rob 'em** → [rab̠m̠] seems possible, if somewhat marginal, in casual speech, but **toboggan** → ?\*[tə'bag̠n̠] seems impossible in any style. Unlike German, English tends not to assimilate the nasal to the stop, creating the environment for nasal release. In a very casual speech style, **cabin** → [kæbm̠] seems possible, but in my speech at least, assimilation to a velar, as would be required in **toboggan**, seems never to take place.

alveolars do not become nasally released when initiating closed syllables (compare the pronunciation of ‘ten’ with *dìndàmar* -/-> \*[d<sup>n</sup>ɔdamar] ‘bran’).

### 3. The Phonetics of Karekare Nasally Released Consonants

As I noted in section 2, tokens of nasally released stops are quite common in Karekare discourse despite the fact that the number of distinct roots and affixes in which they appear is small. Although these sounds are frequent in spoken Karekare, I was uncertain, even on repeated impressionistic listening, as to whether nasal release neutralized the phonological distinctions between consonants that appeared in forms of the same items in environments without nasal release, such as those in (3). This uncertainty was reinforced by the fact that Karekare speakers with whom I was working were happy to write “**hn**” as a representation of any nasally released stop (see section 4). Videotaped tokens of words with nasally released consonants and instrumental records made from the sound track of those videotapes make it clear, however, that the distinctions between consonants are maintained even with nasal release.

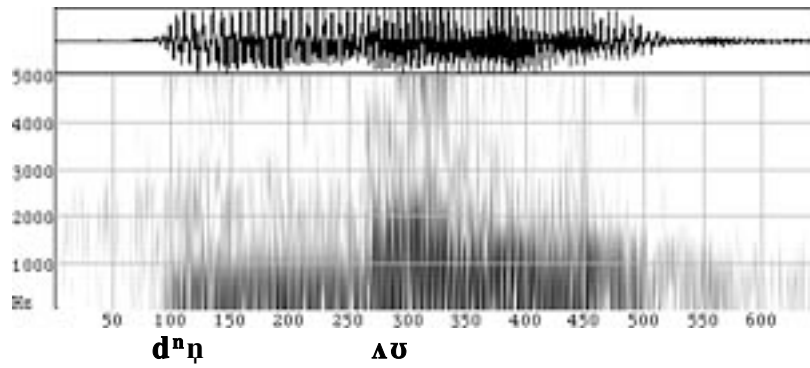
On August 19, 2003 in Potiskum, Nigeria I videotaped items illustrating various aspects of Karekare phonology, including nasally released consonants. The speakers were Malam Kariya Gambo, a 67-year old retired teacher, former member of the State Assembly, and church elder, and Miss Rifkatu I Bumi, a woman in her early 20’s and, at that time, a graduate student in Library Science at the University of Maiduguri. Their idiolects are slightly different, most notably in the extent to which they diphthongize word final mid vowels, but not in ways relevant to the realization of nasally released consonants. I made the recordings with a Sony TRV10 mini-DV camcorder, using a Sony monaural WCS-999 wireless lapel microphone rather than the built-in camcorder mic. The recordings were done in an exterior courtyard, so some noise can be heard from the street, but this does not interfere significantly with the clarity of the audio. In order to conveniently juxtapose the recorded tokens, I edited the video using Final Cut Pro 3 on a Macintosh G4 computer. For each speaker, I clipped out the tokens of nasally released stops and collated them. I then compressed the edited video using Cleaner 6. Compression degrades the video slightly, though it is still of good quality. The audio sampling rate remains at 44.1 Khz and thus retains the same quality as the audio track of the uncompressed video. For convenient playback and quick juxtaposition of tokens, I used LiveStage Pro 4.0 to embed the video in a QuickTime movie with clickable links that allow pairs of tokens to be played in quick succession as well as to repeat tokens by simple mouse clicks. I used PitchWorks sound analysis software to make waveforms and spectrograms from the sound track of the edited video. I added the wave forms and spectrograms to the respective segments of the QuickTime movie so that the instrumental record can be viewed at the same time the video plays. The QuickTime movie is available for playing or download at

[www.humnet.ucla.edu/humnet/aflang/Karekare/karekare.html](http://www.humnet.ucla.edu/humnet/aflang/Karekare/karekare.html)

Figures 1-8 show the waveforms and spectrograms of the two speakers for the utterances in (2a, c, e-j).

Figure 1. /d̥inau/ ‘me’

Malam Kariya



Rifkatu Bumi

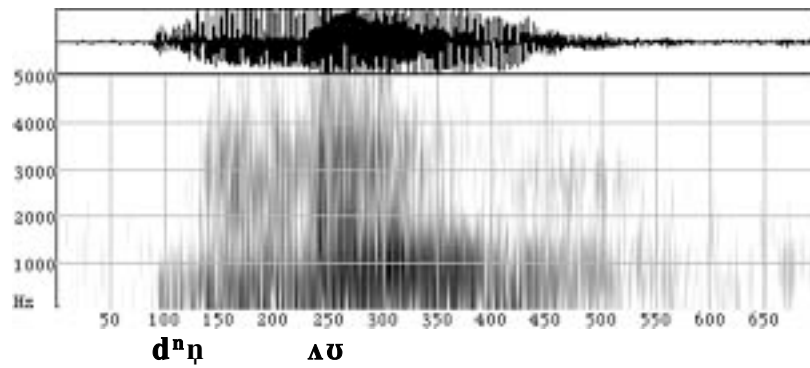
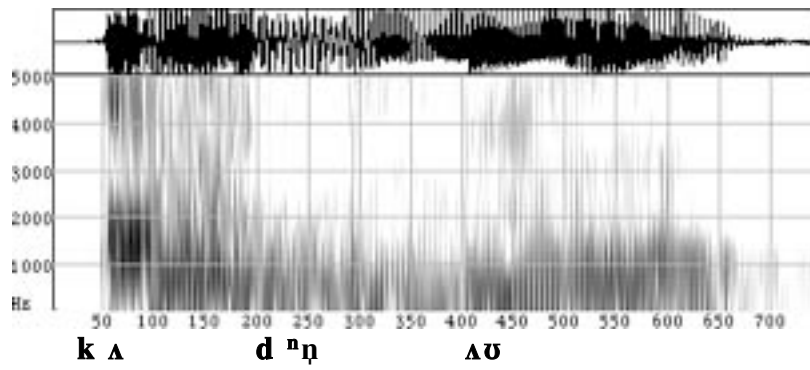


Figure 2. /k̥à d̥inau/ ‘with me’

Malam Kariya



Rifkatu Bumi

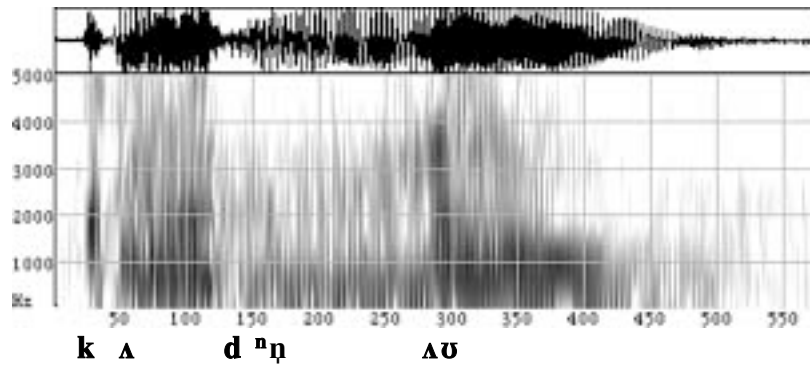
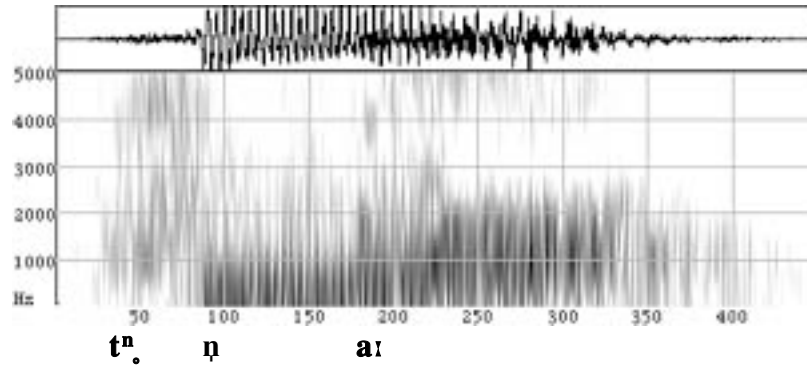




Figure 3. /tinà/ 'eating'

Malam Kariya



Rifkatu Bumi

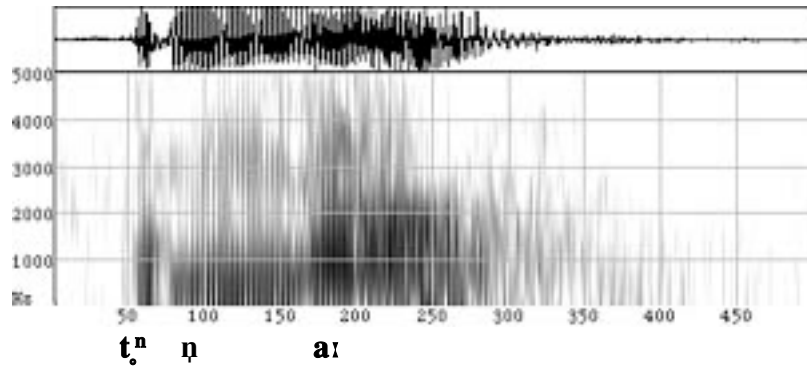
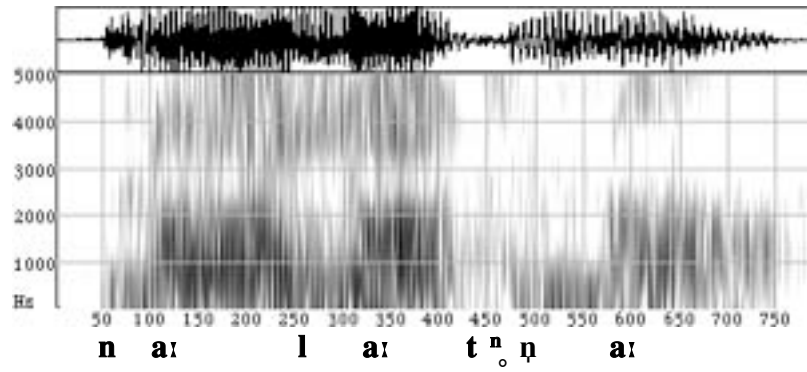


Figure 4. /nā là tinà/ 'he will eat'

Malam Kariya



Rifkatu Bumi

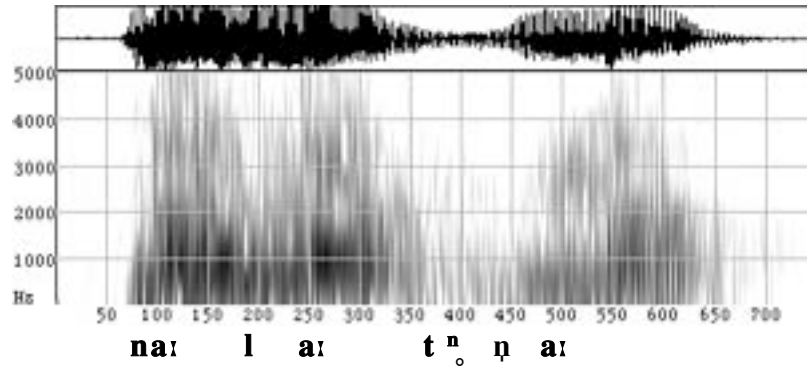
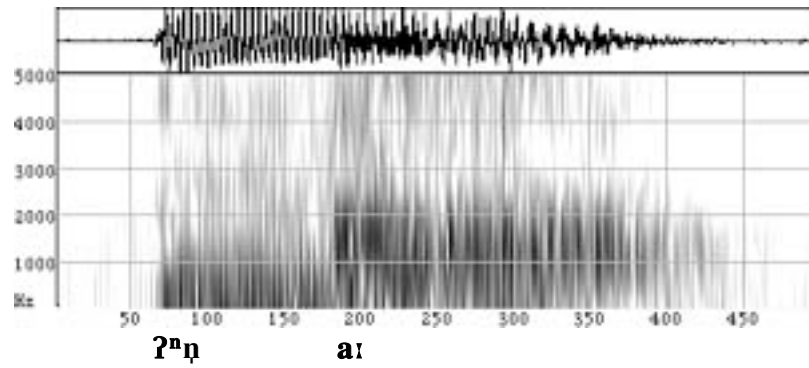


Figure 5. /*ɗinà*/ ‘mounting’

Malam Kariya



Rifkatu Bumi

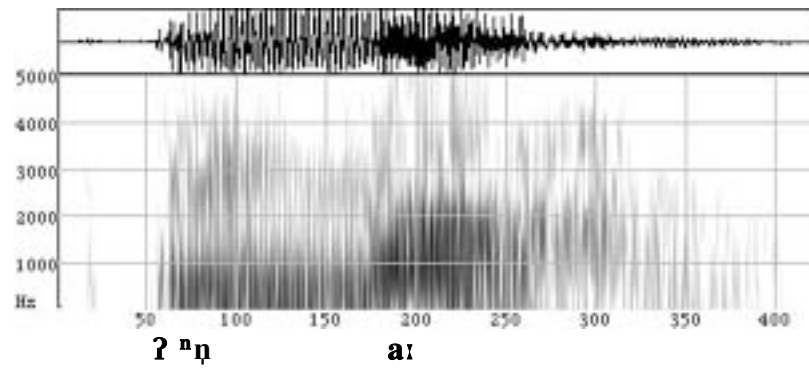
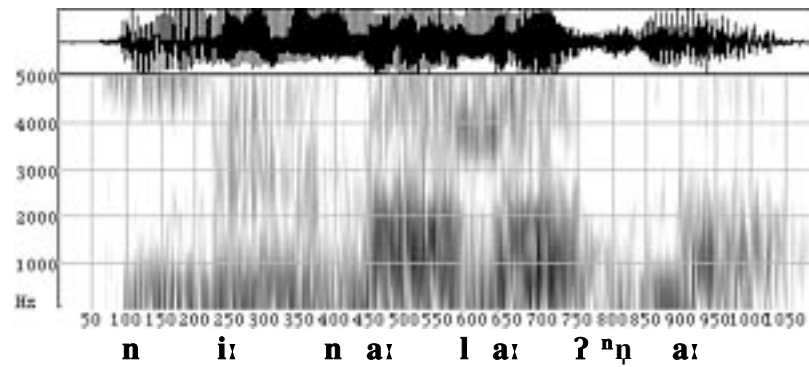


Figure 6. /*(nī) nā lā ɗinà*/ ‘(him) he will mount’

Malam Kariya



Rifkatu Bumi

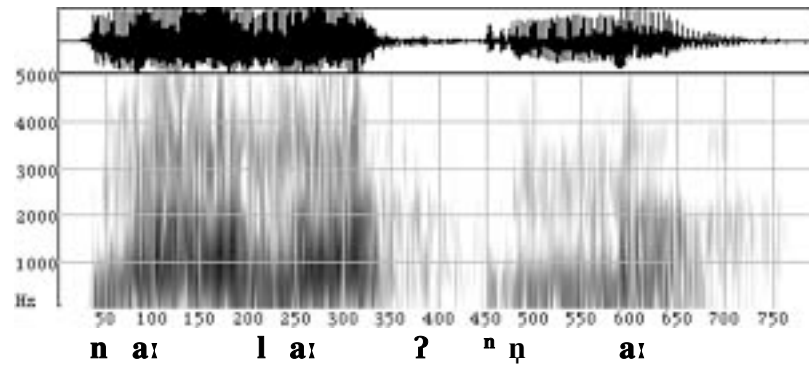
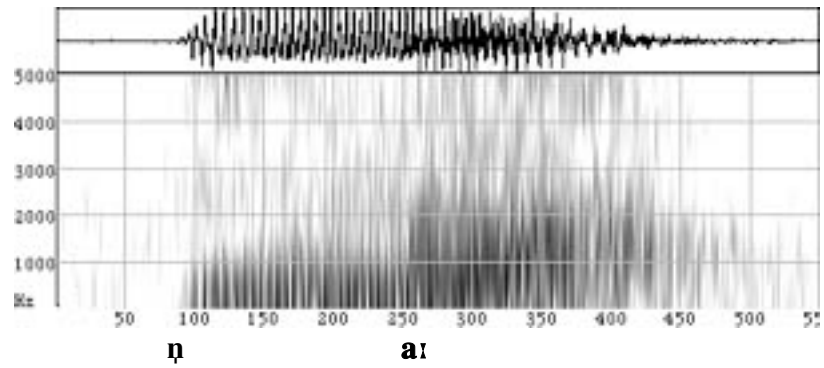


Figure 7. /ninà/ 'seeing'

Malam Kariya



Rifkatu Bumi

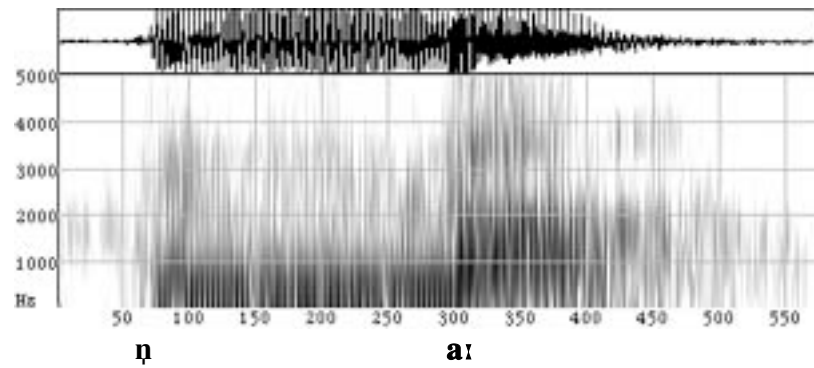
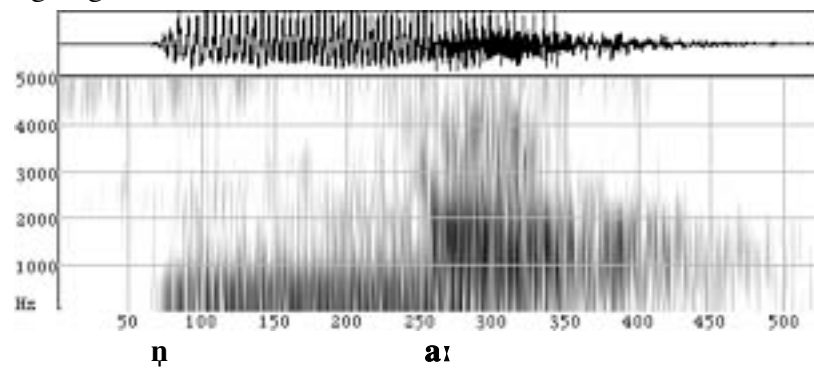
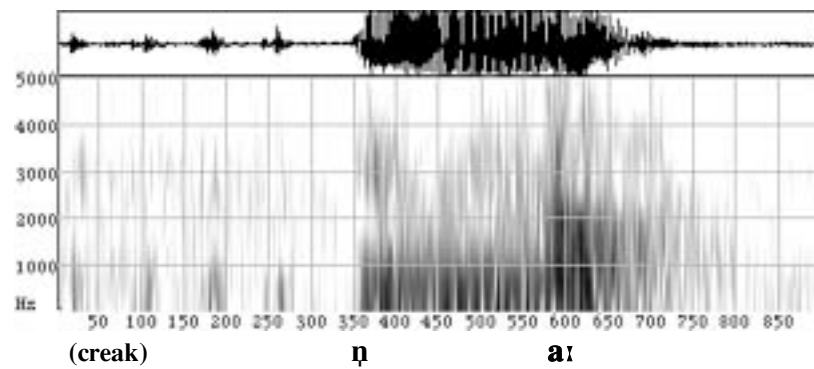


Figure 8. /ndinà/ 'going'

Malam Kariya



Rifkatu Bumi



By using the QuickTime movie described in the previous paragraph to juxtapose samples of nasally released consonants and to play them repeatedly without driving speakers to tears of boredom and frustration, it becomes obvious even from impressionistic listening, that the nasally released consonants differ from each other, i.e. that they maintain the same set of contrasts as their non-nasally released counterparts, with the exception of the /n/ ~ /nd/ distinction (see below). The instrumental records confirm this observation. I discuss each in turn, referring to the figures displaying wave forms and spectrograms.

Figures 1-2 (/d̥in̩au/ → [d̥<sup>n</sup>ɲΛσ] ‘me’, /kà d̥in̩au/ → [kΛd̥<sup>n</sup>ɲΛσ] ‘with me’): All the word initial and medial tokens show that there is no oral vowel between the stop and the syllabic [ɲ], i.e. the stop must have been nasally released. This is the case for all the samples presented here, so I will not repeat this observation for each set of samples. The modal voicing of the /d/ preceding the louder voicing of the syllabic [ɲ] is particularly clear in Rifkatu’s tokens. In Malam Kariya’s medial token, the /d/ shows up as more widely separated pulses in the waveform than those for the /n/, and the dropping of the velum for the oral release appears to show up as a short burst of energy in the spectrogram. A period of modal voicing for Malam Kariya’s initial /d/ does not show up clearly in waveform and spectrogram, but a stop onset is clear in the audio recording, and the spectrograms for ‘seeing’ in Figure 7 and ‘going’ in Figure 8, which have initial /n/, show a smoother onset of the voicing than does ‘me’, with initial /d/. The onset of the vowel following the [d̥<sup>n</sup>ɲ] syllable in Figures 1 and 2 is clear for both speakers in these and all the following waveforms and spectrograms. I waffled as to whether to include a nasal onset for that syllable, e.g. whether to represent ‘me’ as [d̥<sup>n</sup>ɲΛσ] or as [d̥<sup>n</sup>ɲnΛσ]. All syllables in Karekare require a consonantal onset, and from listening and attempting to imitate Karekare speakers’ pronunciation, one “feels like” there is a nasal onset, but the instrumental record provides no evidence for a nasal onset separate from the syllabic nasal of the preceding [d̥<sup>n</sup>ɲ] syllable, so I have opted for a transcription with just the syllabic nasal, assuming that the onset, such as it is, is actually the TRANSITION from the syllabic nasal to the oral vowel, i.e. the combined gestures of raising the velum and releasing the oral closure.

Figures 3-4 (/tin̩à/ → [t̥<sup>n</sup>ɲaɪ] ‘eating, food’, /nā là tin̩à/ → [naɪlaɪt̥<sup>n</sup>ɲaɪ] ‘he will eat’): The effect of the underlying voiceless onset /t/ in Figures 3-4 is in contrast to the voiced /d/ exemplified in Figures 1-2. For both speakers for both initial and medial tokens there is a clear period of voicelessness, represented by a patch of white noise on the spectrograms and as strong attenuation in the waveforms. In the tokens where /t/ is medial, neither speaker creates a real stop. Rather, they realize the /t/ as a voiceless nasal separating the preceding vowel and the following syllabic nasal. Malam Kariya seems to do the same in initial position, with continuous air flow through the nasal passage, starting without voicing, then with the onset of voicing signaling the end of the syllable onset and the beginning of the nucleus. Rifkatu, on the other hand, appears to have a full closure of the vocal tract as an onset to the initial syllable, with the nasal release showing up as a burst of energy preceding the onset of the syllabic nasal.

Figures 5-6 (/d̥in̩à/ → [ʔ<sup>n</sup>ɲaɪ] ‘mounting’, /nā là d̥in̩à/ → [naɪlaɪʔ<sup>n</sup>ɲaɪ] ‘he will mount’): Both speakers seem to realize /d̥in-/ in a way similar to, if not identical to the sequence /...tən.../ in English as in [ˈkɑʔɲ] ‘cotton’. That is, although the tongue may be making an oral closure at the alveolar point of articulation, the actual blockage of air in the vocal tract is in the larynx, followed by a direct release of air through the nasal

passage.<sup>5</sup> In the word initial tokens, this is seen by the abrupt onset of the syllabic nasal as compared to all the other underlying sounds in initial position. Medially, the /...a d̥in.../ portion of Rifkatu's utterance, with clear full glottal closure, could probably be spliced with initial /k/ and would sound like English 'cotton'. Malam Kariya's utterance, on the other hand, shows laryngeal activity throughout. Based only on this one token and given the short duration of the portion of interest, it is not clear what to attribute this laryngeal activity to. In the absence of more data and a clearer instrumental record, I propose that rather than creating a full glottal closure, as Rifkatu does, Malam Kariya is realizing the /d̥/ as a laryngealized segment. Ladefoged (1964:16) argues that the putatively implosive consonants of Hausa are laryngealized, saying, "...these sounds may be incidentally implosive on some occasions; but they are always distinguished from their voiced counterparts by being laryngealized." In Schuh (1968), I showed that at least some Hausa speakers do create strong negative supralaryngeal pressure in the pronunciation of these consonants, which would be possible only with full glottal closure. It seems likely that, as in Hausa, variation in the relative strength of implosion and laryngealization exists among Karekare speakers as well, with the speakers here illustrating that variation.

Figures 7-8 (/ninã/ → [n̥aɪ] 'seeing', /ndinã/ → [ɲnaɪ] 'going'): As I mentioned in section 2, it may seem anomalous to include the regular nasal /n/ of 'seeing' in a discussion of "nasally released" consonants because /n/, by definition, is nasally released. However, there are two noteworthy components of the phenomena under investigation here: (1) nasal release of normally orally released consonants and (2) absence of any oral vocalic component in the syllable nucleus, which is realized as a syllabic [ŋ]. The phonetic realization of the word /ninã/ → [n̥aɪ] 'seeing' shares the latter component with the other items, but the nasal onset, the syllabic [ŋ] from underlying /i/, and the /n/ onset of the second syllable merge as a single syllabic [ŋ].

The initial syllable of /ndinã/ 'going', with a prenasalized stop onset, comes out identical to /ninã/ 'seeing', with a plain nasal onset. The wave forms and spectrograms in Figures 7-8 all show a direct transition from the syllabic nasal to the vowel with no evidence of voicing attenuation corresponding to the stop portion of **nd**.<sup>6</sup> This is a natural outcome in the light of the articulatory gestures involved. Sounds such as the initial /nd/ of 'going' are usually called *prenasalized stops*, but in Karekare and other Chadic languages, a better term would be *orally released nasals*. Gimba (1998:Appendix 1) did a phonetic study of the comparable consonants in Bole, a language closely related to and geographically near Karekare. Gimba found that the duration of the nasal component was 3-4 times as long as the stop. For example, over six recorded tokens of word initial /nd/, the nasal component averaged 51.5 milliseconds while the stop component averaged only 13.6 milliseconds, a duration so short as to amount to little more than a slight discontinuity in timing between the closure of the nasal passage and the release of the oral closure, creating an audible transition from the nasal to the following vowel. Gimba's six tokens of /mb/ in Bole show the difference in respective durations to be even greater. Clearly, it is the nasal component that is the

<sup>5</sup> Karekare maintains a three-way obstruent distinction where English has only a two-way distinction. The voicelessness of the glottal closure in English ['kaʔŋ] 'cotton' is sufficient to keep it distinct from the voiced, nasally released /d/ in ['sad<sup>n</sup>ŋ] 'sodden'. In Karekare, voiceless /t/ in a word like /tinã/ 'eating' is realized as a voiceless nasal, leaving [ʔ] available to be associated with the glottalized /d̥/.

<sup>6</sup> The recording of Rifkatu begins with a period of creak. This is unrelated to the issue of a distinction between **n** and **nd** in this environment. From looking at her facial expression in the video, it is clear that she momentarily hesitated as she thought about her utterance. Unfortunately, I do not have another recording with Rifkatu pronouncing /nd/ in an environment calling for nasal release.

predominant articulatory feature of these segments. I do not have sufficient data for word initial NC segments in Karekare to demonstrate that the same facts hold, but I suspect that they would. Thinking of /nd/ as a nasal with a stop component rather than a stop with a nasal component, we can view the relationship expressed by the rule /ndinà/ → [n̥aɪ] as avoidance of the quick raising and lowering of the velum that would be required to move from the nasal onset to the syllabic nasal that replaces the oral vowel.

The words /d̥inau/ ‘me’ (Figure 1), /ninà/ ‘seeing’ (Figure 7), and /ndinà/ (Figure 8) ‘going’ all begin with voicing. The modal voicing of the obstruent /d/ is probably sufficient to keep it distinct from purely nasal onset, but another component that serves to keep /di-/ distinct from /n(d)i-/ is duration of the syllabic nasal, which, in the latter case, is the conflation of a nasal onset and [n̥] that replaces the vowel. This not strongly evident in the tokens from Malam Kariya (partly because it is difficult to tell exactly where his syllabic nasal begins in Figure 1 ‘me’), but in Rifkatu’s tokens, the syllabic nasal is about twice as long in the words with nasal onset as the one with /d/ onset. I arrived at the following rather approximate figures by measuring the paper records in the respective figures:

(4) Figures for duration of syllabic nasals, Figures 1, 7, 8

	Malam Kariya	Rifkatu
[d̥ <sup>n</sup> n̥aɪ] (Fig. 1)	140 ms.	100 ms.
[n̥aɪ] (Fig. 7)	163 ms.	225 ms.
[n̥aɪ] (Fig. 8)	180 ms.	220 ms.

In conclusion, the instrumental records make it clear that, except for the /n-/ ~ /nd-/ distinction, which seems to be neutralized, nasally released consonants in Karekare retain the same phonological distinctions as their oral counterparts and do so in natural phonetic ways that relate directly to the oral counterparts. Inasmuch as the number of tokens is rather small and data comes from only two speakers, it would be worthwhile to expand the study with a larger data set in order to get more precise figures concerning issues such as relative durations of the various articulatory gestures and to incorporate tokens from varying speech styles in order to look more carefully into the issue of whether neutralizations may take place under nasal release in casual or rapid speech styles. However, it seems unlikely that these speakers were producing artificial distinctions. They are of different generations with quite different backgrounds. Moreover, it is unlikely that priming played a role in their pronunciation in this data-gathering session. The data were elicited orally, using Hausa as the language of elicitation, so the elicitation cues were phonologically unrelated to the responses, and the utterances examined here were mixed with utterances not involving nasally released consonants, including tangents in discussion that had nothing to do with the target utterances.

#### 4. Phonetics, Psychological Reality of the Phoneme, and Orthography

Karekare consonants with nasally released counterparts represent a classic case of a set of phonemes with phonetically conditioned allophones. The conditioning for nasal release can be defined in purely phonological terms, the same set of distinctions exists for both orally and nasally released allophones (aside from the neutralization of /n/ and /nd/ in nasal release environments), nasal release does not result in the neutralization of any of

these consonants with other Karekare consonants, and the orally and nasally released counterparts of each consonant are related in phonetically natural ways.

For such a situation, a linguist describing Karekare phonology would set up an underlying representation that displayed the set of phonemes in the most natural way, presumably using the feature specification for the oral counterparts inasmuch as they are less marked from a number of perspectives, and, depending on the analytical framework chosen, would write a (set of) rule(s) or propose a set of output constraints that would relate the underlying representation to the attested phonetic forms. In fact, this is what I have done in (1-3) and Figures 1-8 and discussion relating to that data.

A longstanding principle in establishing practical orthographies is application of the *psychological reality of the phoneme*. Speakers are generally not even aware that they make phonetic alternations where the conditioning is purely phonological and the alternants are phonetically related. Hence, an orthography that represents sub phonemic distinctions would not only be inefficient, but it would also be difficult for speakers to use because they would not understand why there were multiple symbols for “the same sound”. For example, it seems unlikely that most English speakers are aware that the final sound in **ride** is in any way different from the medial sound in **ridden**, and they would balk at symbolizing these sounds in different ways.

I was thus surprised that Malam Kariya, a well-educated man literate in both English and Hausa, was insistent on having a special way to symbolize nasally released consonants. He provided, in writing, many of the Karekare texts that we have incorporated into the Yobe Languages Research Project, some of which appear in Gambo (2003), the first published work entirely in Karekare. Karekare does not have a widely used standard orthography, but Malam Kariya and others have found it easy to adapt standard Hausa orthography. Part of Malam Kariya’s adaptation has been to consistently represent nasally released consonants in a way distinct from their oral counterparts. After discussing and trying various alternatives, we settled on “**hn**” as the representation for the syllables that I have been writing phonetically as [C<sup>a</sup>ŋ] in this paper. Likewise, Hassan (1988), the first formal proposal for a Karekare orthography, writes **hn**, e.g. **hnnau** ‘me’ (cf. 2a) and **hanna** ‘food’ (cf. 2e), showing that Malam Kariya’s desire for a special representation of orally released consonants is not a personal idiosyncrasy.<sup>7</sup> Note that both Malam Kariya and Hassan (1988) are content to use a single representation for all the nasally released consonants.<sup>8</sup> As a practical matter, it would hard to come up with parallel distinct representations for nasally released /d/ ~ /t/ ~ /d̥/, and given the small number of individual roots and affixes that provide environments for nasal release, plus the fact that the most commonly used ones would be in near syntactic complementary distribution, a single representation for all of them suits practical orthographic purposes.

The conclusion to be drawn here is that complementary distribution and phonetic similarity, though they may lead to an elegant linguistic analysis consisting of a single underlying phoneme and a rule designating pronunciation variants, do not necessarily represent a single psychological unit from the point of a native speaker of a language. Phonetic distinctiveness seems to play a role in the way speakers think of their languages. One wonders then, to what extent orthography drives the psychological grouping of sounds that are in complementary distribution rather than vice versa. In the case of

<sup>7</sup> Hassan (1988) and the Yobe languages Project group arrived at the **hn** representation independently. I had not seen Hassan (1988) until August 2003, late in my second summer of work on Karekare, and as far as I know, Malam Kariya had not consulted Hassan’s book, which is not widely available.

<sup>8</sup> Hassan (1988:15) refers to **hn** as “a voiceless nasal sound”. As the data in section 3 of this paper show, this not quite correct, though it does capture fairly well the articulation of the nasally released /t/.

Karekare, which most speakers, even well-educated ones, have never seen in written form, speakers seem to want to represent a distinction that linguists would say is predictable and thus unnecessary. If English were unwritten before the beginning of the 21<sup>st</sup> century, one wonders whether speakers would choose to maintain written morpheme identity in words like **write** ~ **writing** ~ **written**, where the consonants represented as “t”, though in complementary distribution, are phonetically dissimilar, much less words like **booty** and **button** with no alternants to give a cue as to what the medial consonants might “really be”.

### 5. Why Does Karekare Shoot through the Nose?

Karekare is unique among its Chadic cousins as well as being unusual among languages of the world in having nasally released stops.<sup>9</sup> Why has this one language undergone this phonological development while its nearby Chadic relatives have not? One can never be sure what leads a language to introduce an unusual linguistic feature, but one possible explanation for the Karekare innovation is the phonologization of a phonetic process. Ladefoged and Maddieson (1996) devote a substantial part of their chapter on nasals to discussion of articulatory timing issues between nasals and contiguous segments. For example, they propose that in some Australian languages *prestopped nasals* have developed from intervocalic nasals following stress through anticipation of the articulation of the nasal by creating an oral closure before dropping the velum (Ladefoged and Maddieson 1996:128-129). Timing could also be involved in creating *nasally released stops*. In a stop+nasal sequence, nasal release of the stop is, articulatorily speaking, conflation of a sequence of two gestures—oral release of the stop and dropping of the velum as onset of the nasal—into the single gesture of dropping the velum. This is, of course, exactly what happens phonetically in the realization of Karekare nasally released stops, but phonetic timing cannot be the explanation of how these sounds developed in the first place. This explanation would require that the stop and the nasal be contiguous, but we know that the source sequence for nasally released stops in Karekare originally had a vowel intervening between the stop and the nasal. Nor can we save phonetic timing as an explanation by suggesting that the vowel was syncopated, creating a stop+nasal sequence. As the data in (3) show, there has been no general process of syncopation in Karekare, and nasal release of stops even takes place in word initial position, where syncopation would have created a #CC... sequence, a sequence strongly disallowed in Karekare, and indeed, in all Chadic languages. A final timing-based explanation might be that at one stage of the language, the vowel was nasalized preceding the nasal (i.e. dropping of the velum came to precede the oral closure of the nasal consonant), and the oral closure of the vowel, over time, became shorter and less open until it was eliminated altogether—in effect a “gradual syncopation”.

Another way to seek an understanding of why Karekare differs from its cousins would be to compare their phonologies to see whether there are correlations in addition to the target phenomenon of nasally released stops. There is such a correlation between the vowel system of Karekare and the vowel systems of its close sisters and geographic neighbors, Ngamo and Bole, vs. the vowel system of its more distant but geographically contiguous cousin, Ngizim. Ngamo and Bole have a phonological contrast between

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<sup>9</sup> Ladefoged and Maddieson (1996:128-129) devote less than two pages out of a 35 page chapter on nasals to stop+nasal sequences and mention no languages in which one or more stops have nasally released variants, though of course such sounds do occur in at least two well-documented languages, German and English.



medial /i/ and /u/.<sup>10</sup> Karekare does not contrast these vowels medially. The “neutral” medial short high vowel in Karekare is phonetically a high, unrounded central vowel [ɨ], though it may be pulled toward [ɪ] in a strongly palatalizing environment, e.g. when following a palatal consonant, and toward [ʊ] in a strongly labializing environment, e.g. when preceding a syllable that begins with a labialized velar or w.<sup>11</sup> To demonstrate the presence of a contrast in Bole and Ngamo but an absence of contrast in Karekare, I recorded a few cognate items, including some loanwords, with two Karekare speakers, two Bole speakers, and two Ngamo speakers. The recorded items are displayed in (5) in a standardized orthography (aside from using “ə” in Karekare rather than “i”). The symbolization of the medial high vowels is approximate: “i” and “u” in the Bole and Ngamo examples are more like [ɪ] and [ʊ] respectively, and the “ə” in the Karekare examples is the symbol used in Chadic studies for [ɨ]. The differences between the languages is clear even on impressionistic hearing. A QuickTime movie<sup>12</sup> of speakers pronouncing the items in (5) is available at

[www.humnet.ucla.edu/humnet/aflang/Karekare/karekare.html](http://www.humnet.ucla.edu/humnet/aflang/Karekare/karekare.html)

(5) Examples showing /i/ ~ /u/ contrast in Bole and Ngamo and absence of the contrast in Karekare

	Karekare	Bole	Ngamo
‘monkey’	<b>bə̀dà̀u</b>	<b>bìdò</b>	<b>bìdò</b>
‘ashes’	<b>bə̀tau</b>	<b>bùto</b>	<b>bùtò</b>
‘peering’	<b>zə̀nkà̀u</b>	<b>zinge</b>	(not cognate)
‘harvesting’	<b>zə̀nkau</b>	(not cognate)	<b>zùnkò</b>
‘sugar’	<b>səkà̀ri</b>	<b>sukùr</b>	<b>sugà</b>
‘tomato’	<b>təmātə̀r</b>	<b>tùmātìr</b>	<b>atùmātà̀r</b>

Nasal release of the initial consonant and concomitant conversion of the vowel to a syllabic nasal in a word like /tinà/ → [t<sup>n</sup>ɨnə̀] ‘eating, food’ destroys the identity of the underlying vowel. However, in Karekare, where a medial short high vowel contrast is neutralized, no information is lost. Syllabic [ɨ] simply joins [ɨ, ɪ, ʊ] as one of the conditioned allophones of this vowel in the same way that syllabic sonorants in English words like **button**, **butter**, and **bottle** join [ə] as allophonic variants of the nuclei of

<sup>10</sup> All the languages of Yobe State have a full five vowel contrast in word final position. Since nasal release of consonants takes place only before MEDIAL high vowels, the word final contrast is not relevant to the discussion here. Nasal release of consonants does not take place when a word boundary intervenes somewhere in the /CinV/ environment necessary for nasal release. Thus, the underlined “t” in **sàkìtì nāsikà̀u** ‘the vulture saw it’ would not be subject to nasal release.

<sup>11</sup> Malam Kariya, in a video recording illustrating high vowel pronunciations, says [d<sup>u</sup>ɨŋk<sup>u</sup>u: amu] ‘she boiled water’ with clear lip rounding but [d<sup>u</sup>ɨŋk<sup>u</sup>ik<sup>u</sup>ʌu] ‘she boiled (it)’ without noticeable rounding. While Malam Kariya fairly consistently writes vowels such as those underlined with the symbol “i”, one speaker with whom I worked tended to write closer to the phonetic surface, preferring to write the vowels as they sounded to him for each token rather than to preserve morpheme identity. See remarks on orthography at the end of section 4.

<sup>12</sup> The equipment for recording and the techniques for creating this QuickTime movie are the same as for the movie that displays the nasally released consonants, described in section 3. I did not make instrumental records of the vowels of interest in (5). I believe that simply hearing the speakers will convince the listener of the correctness of the claims here.

unstressed syllables, where vowel distinctions are neutralized. In short, the most likely motivation for the development of nasally released stops in Karekare is one of articulatory economy, moving directly from a stop to nasal by removing the oral transition that would have been required for a vowel whose identity was predictable. In Bole, on the other hand, such a development would result in the neutralization of a vowel distinction in word pairs like /**dinàr**/ ‘gold’ and /**dunābà**/ ‘coarsely ground millet’, where the initial syllables would both come out as [**d<sup>n</sup>n**].

If this explanation is on the right track, another question arises, viz. why does Karekare does not have a distinction between medial short high vowels whereas Bole and Ngamo do? Within the Bole-Tangale group, it is fairly clear that Karekare is the innovator. The languages of this group for which we have reliable information—Bole, Ngamo, Tangale (Jungraithmayr 1991, Kidida 1985), Kanakuru (Newman 1974)—have a contrast between short high vowels in all positions. On the other hand, Ngizim, Karkare’s more distant linguistic cousin but geographic neighbor, does not have a contrast between medial short high vowels, a feature shared by Ngizim’s sisters, Bade and Duwai, and hence a feature most likely inherited from Bade-Ngizim parent language.

Karekare has undergone extensive linguistic and cultural influence from Ngizim. The Karekare lexicon includes large numbers of Ngizim loanwords, and, under Ngizim influence, Karekare has even introduced lateral fricatives into its sound inventory.<sup>13</sup> This influence must be of long duration since many Karekare words that contain lateral fricatives are no longer found in Ngizim or have shifted in meaning in one or the other language, e.g. Ngizim **ɬau** ‘arise’, Karekare **ɬa-kàu** ‘reach, be enough’. Shift in the phonological status of short high vowels must be another outcome of Ngizim influence.

A typological tendency in the Bade-Ngizim languages is reduction of syllables containing short high vowels as long as impermissible syllable structures would not be the result (essentially, non-creation of syllables with complex margins). In Ngizim, for example, the verb **mènu** ‘he waited’ must have a ə = [i] in the first syllable to avoid an initial #CC... cluster, but in the phrase **na-mn-acî** ‘I waited for him’, where a vowel final clitic **na** precedes and a vowel initial object **acî** follows, the verb is reduced to its consonantal skeleton. The Bade cognate verb, **m̩nu** ‘he was on guard’, is pronounced with a syllabic nasal, another strategy for avoiding a CC syllable initial cluster (see Schuh (1978) for this and related changes in Bade related to the phonology of short high vowels). The Karekare change of **CinV** structures to [**C<sup>n</sup>ɲV**] can be viewed as a manifestation of a shift toward the Bade-Ngizim vowel typology, where medial short high vowels function as default syllable nuclei, and away from the Bole-Tangale vowel typology of relatively stable, lexically specified vowels.

## 6. Conclusion

Karekare has been one of five target languages of the Yobe Languages Research Project. Working on several linguistically related and geographically contiguous languages gives the opportunity for comparisons and insights that would not emerge from concentration on a single language. Nasal release of certain consonants in certain environments in Karekare is a case in point. This feature makes Karekare stand out from its closest sister languages, a contrast that is made especially striking by hearing frequently used cognate items pronounced so differently across the languages. This raises the question of why Karekare alone among close sister languages might have

<sup>13</sup> “Reintroduced” would be more accurate. Proto-Chadic had lateral fricatives, preserved in West Chadic B but changed to **l** in West Chadic A (Newman 1977)—cf. Ngizim **ɬuwai** ‘meat’ vs. Bole **lo**, Karekare **lō**.

developed these articulations, and that question in turn draws attention to the contrasting vowel typologies of the Bole-Tangale languages vs. the neighboring Bade-Ngizim languages and the place of Karekare in the overall picture. Whether the speculations here will stand up to further scrutiny remains to be seen, but without the comparative perspective, the issue of nasally released consonants in Karekare would appear to be nothing more than documentation of an isolated phonetic oddity.

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