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NASAL CONSONANT HARMONY AT A DISTANCE: THE CASE OF YAKA*

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In a number of Bantu languages the [d~l] reflex of Proto-Bantu *-Vd- suffixes alternates with [n] when the consonant of the preceding syllable is nasal, e.g., /dim-id-/ 'cultivate for' → [dim-in-]. Because these Bantu languages do not allow nasalized vowels, it is necessary to view such assimilation as operating "at a distance" [Poser 1983], with the intervening vowel(s) being transparent. Transvocalic nasal consonant harmony (NCH) is widespread within Bantu [Greenberg 1951], and was repeatedly cited by phonologists in the 1970's, e.g., from Luba [Howard 1972, Johnson 1972] and Lamba [Kenstowicz and Kisseberth 1979]. In this paper I treat a more extensive and dramatic case of NCH at a distance in Yaka, a language spoken in Zaire. In this language /-Vd-/ suffixes are realized [-Vn-] even when the triggering nasal consonant is not in the immediately preceding syllable, e.g., /-miituk-id-/ 'sulk for' → [miituk-in-] (cf. Ao [1991], Piggott [1993] and Odden [1994], who cite parallel facts from Kongo). I begin by documenting the pervasiveness of the (stem-level) nasal harmony effects in the language, which therefore require a phonological analysis (vs. one involving allomorphy). Discussion centers around the problem of why voiceless and prenasalized consonants should be transparent to NCH.

1. Introduction

As noted by Greenberg [1951], in many Bantu languages the consonant /d/ or /l/ assimilates in nasality across a vowel which does not nasalize.[1] Examples are seen

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[1] The one exception I know to this is Umbundu [Schadeberg 1982], where approximants such as /l/ nasalize in the same context. Schadeberg points out that both the preceding and following vowels are also nasalized after nasalized approximants (but not before and after nasal stops).

in (1) from Yaka, a language spoken in Zaire (Guthrie H.31) and the subject of this paper.[2]

(1) a.	*tsúb-idi*	'vagabonder'	b.	*tsúm-ini*	'coudre'
	kúd-idi	'chasser qqn'		*kún-ini*	'planter'
	kík-idi	'barrer'		*wún-ini*	'murmurer' (< *-wuny-*)
	kás-idi	'lier'			

c. /tsúm-idi/, /kún-idi/, /wúny-idi/, etc.

In these examples I cite perfective forms of verbs from the Ruttenberg [1970] dictionary, from which most of the data presented in this study are also taken.[3] As seen, the perfective ending is *-idi* in (1a), where the preceding consonant is oral, vs. *-ini* in (1b), where the preceding consonant is nasal. The underlying representations in (1c) can be assumed, with the /d/ of the /-idi/ ending becoming nasalized whenever the base to which it is added ends in one of the three nasal consonants in the language: /m, n, ny/. I shall refer to this rule as nasal consonant harmony (NCH).

The purpose of this paper is to provide a detailed description of NCH in Yaka. In order to appreciate NCH fully, we will find it necessary to consider the distribution of nasality in this language in general. In the discussion that follows it will be suggested that only voiced consonants are nasal-bearing units (NBU's) in Yaka, and that there are literally no opaque segments to NCH, which not only regularly crosses vowels but also voiceless and prenasalized consonants. We will see that nothing blocks the rightward spread of nasality if the [+nasal] feature can find an appropriate NBU to its right within the stem. This conflicts with certain views on nasal spreading (and locality conditions in general) that have been proposed in the literature. The study thus naturally raises two questions: first, how can transparent segments be represented formally; and, second, how can one account for Yaka-style long-distance spreading of nasality without bending the theory so badly that other (consonant-) harmonies are let in that we would like to rule out. These are the questions that are taken up in the following sections.[4]

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[2] Throughout this paper I refer to Bantu languages without their class 7 *ki- noun class prefix. Thus: Yaka instead of Kiyaka, Kongo instead of Kikongo, Luba instead of Ciluba, etc.

[3] For this purpose the Yaka-Français part of Ruttenberg (1970) was scanned, proof-read, and entered into the Comparative Bantu On-Line Dictionary (CBOLD) at Berkeley.

[4] As will be pointed out, the same essential facts of NCH can be found in the Kongo dialect/language cluster spoken to the West of Yaka in Zaire and Congo, where they have been known for quite some time [Bentley 1887:627; Meinhof 1932]. NCH in Kongo has received attention recently by Ao [1991], Piggott [1993] and Odden [1994].

2. The Basic Facts of NCH

In this section I establish the basic facts of NCH in Yaka. Most of the demonstration will center around the realization of the perfective suffix /-idi/, which was seen to alternate between [-idi] and [-ini] in (1). The data in (2) differ in two ways from those already seen.

(2) a. *kéb-ele* 'faire attention'
sód-ele 'déboiser'
ték-ele 'vendre'
sób-ele 'changer'

b. *kém-ene* 'gémir'
són-ene 'colorer'
kón(y)-ene 'retrousser' (< *-kóny-*)

c. /kém-idi/, /són-idi/, /kóny-idi/, etc.

[N.B. /d/ is pronounced [l] except when preceded by [n] or followed by [i].
I will thus henceforth write "d" in all cases where /d/ is oral.]

First, the perfective ending shows the familiar Bantu height harmony: When the preceding vowel is mid, the perfective ending will have the vowel [e] in both syllables, rather than [i]. Second, the oral consonant in (2a) is [l] rather than [d]. This is because the phoneme /d/ is realized [l] unless preceded by a nasal or followed by /i/, in which case it is still realized [d].[5] For the purpose of this study, I thus recognize the underlying representation /-idi/ in (2c), which undergoes height harmony to become *-ele* and, where appropriate, NCH to become *-ene*. Because of this complementary distribution, I will write "d" for [l] in most cases.

A basic question that arises is how does nasality cross the vowel? A possible approach is to first nasalize the vowel, then the consonant. In this case the nasalization would be strictly local (though applying twice). There are two problems with this. First, how do we state the rule so that it hits exactly one vowel and one (nasalizable) consonant? The second problem is that these languages do not have nasalized vowels. One might think this is not a problem and that the nasality can simply be removed from vowels later. This seems unlikely, given the structure-preserving nature of nasal consonant harmony, which I now demonstrate.

But first note that the nasal harmony applies only within the "stem domain", which we can also identify as "stratum 1" within the framework of lexical phonology. As seen in (3a), the Yaka stem, as generally the case in Bantu, consists of a verb root and possible suffix(es). Prefixes such as noun class 6 *ma-* to the right in (3a) fall outside the stem and are added only at the word level. As seen in

[5] Kidima [1991] assumes /l/ with a hardening rule to [d] after /n/, also before /i/. Nothing seems to hinge on this choice—although see Odden's [1994] analysis of NCH in Kongo which crucially refers to [+lateral] and, hence, to underlying /l/.

(3b), the /m/ of *ma-* does not cause the root-initial /d/ to become [n]. What this also means is that forms such as (3c) must be analyzed as consisting of a prefix (*ma-*) plus stem. (Recall that /d/ will be pronounced [l] unless preceded by /n/ or followed by /i/.)

(3) a. [tsúm-ini]$_{stem}$ 'coudre' vs. [ma- [dáfú]$_{stem}$]$_{word}$

b. *ma-dáfú* 'vin de palme' (cl. 6)
ma-dókísí 'bruit' (cl. 6)
ma-déemba 'douceur' (cl. 6)

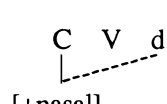
Since NCH applies in stratum 1, it is not surprising that it is a neutralizing rule. In (4a) we see that /d/ and /n/ contrast in root-final position.[6]

(4) a.	*búd-idi*	'briser'	*bún-ini*	'péter'
	yád-idi	'étaler'	*yán-ini*	'crier de mal'
	tékwédé	'toucher qqn pour l'appeler' (< *-tékud-*)	*tékwéné*	'verser' (< *-tékun-*)
b.	*dók-ede*	'ensorceler'	*nók-ene*	'pleuvoir'
	du-dúungu	'fruit d'un poivrier'	*du-núungu*	'raison'

The examples in (4b) show that /d/ and /n/ constrast in root-initial position as well. Thus, NCH clearly neutralizes /d/ and /n/, or is structure-preserving, not introducing any new segment into the inventory.

An alternative to spreading the nasality first to the vowel then the consonant is to establish a feature geometry such that the appropriate node of the consonant can be targeted across the vowel. This would not be a problem, for example, if, as generally assumed, the feature [nasal] were on its own tier. Simply by stipulating that lexically only consonants can have a [+nasal], NCH can be stated as in (5).

(5) Nasal Consonant Harmony (NCH):



For the moment let us sidestep the question of how the /d/ is uniquely targeted. The important point is that the [+nasal] should be able to get to the /d/ without first hitting the intervening vowel. In this way the transparency of vowels derives from their not being NBU's, and the rule falls under the general heading of

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[6] The third example of each column shows the *-idi* suffix becoming "imbricated" [Bastin 1983], such that instead of getting *tékud-idi* and *tékun-ini*, we obtain *tékwédé* and *tékwéné*.

"consonant harmony" (cf. Shaw [1991] and Odden [1994] for surveys of such phenomena, especially coronal harmony).

Now, many Bantu languages do exactly as we have shown above: *-idi/-ele* equivalents are pronounced with [n] just in case the immediately preceding consonant is [+nasal], e.g., Bemba, Lamba, Tonga, Luba, Suku, etc. These languages also share the property that nasal harmony is not conditioned by an immediately preceding prenasalized consonant. The examples in (6) show that [+nasal] does not spread rightwards from a prenasalized consonant in Yaka either.

(6) a.	*bíímb-idi*	'embrasser'	b.	*bééndz-ede*	'couper au couteau'
	kúúnd-idi	'enterrer'		*hééng-ede*	'tamiser'
	tááng-idi	'lire, compter'		*kóómb-ede*	'balayer'

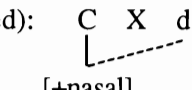
Whatever framework one assumes, and whatever representation of prenasalized consonants, the facts in (6) are as expected. We expect nasality to be propagated only by a consonant which has a nasal release, not by a prenasalized consonant which is released orally. This non-propagation of nasality would automatically be accounted for if prenasalized consonants were represented with a [+nasal][-nasal] contour, or with two root nodes, the first of which is [+nasal], the second [-nasal] (or [o nasal]).

There is, however, an important aspect in which Yaka diverges from the above-mentioned languages. The interest of Yaka (as well as Kongo) is that it takes the nasal harmony process one step further. As seen in (7), NCH can also go through a voiceless consonant.

(7) a.	*mák-ini*	'grimper'	b.	*fínúk-ini*	'bouder'
	mék-ene	'essayer'		*hámúk-ini*	'se casser'
	ník-ini	'moudre'			
	nók-ene	'pleuvoir'	c.	*míítuk-ini*	'bouder'
	nyéék-ene	'se baisser'		*nútúk-ini*	's'incliner'

The examples in (7a) show that nasality can spread through a voiceless consonant from stem-initial position, while those in (7b) show nasal spreading from stem-medial position. Finally, as seen in (7c), [+nasal] can spread through more than one [-voice] consonant. As a result of these facts, (5) might be revised as in (8).

(8) NCH (revised):



(where X contains V's and voiceless C's)

This is truly surprising, since we think of voiceless obstruents blocking the spread of nasality (if this is related to "local nasal assimilation"). In fact, since nasality

was shown in (4) to be contrastive on consonants, Yaka reveals itself to be a serious counterexample to the claim that "voiceless consonants are opaque, if Nasal is distinctive in consonants; they are neutral, if Nasal is redundant" (Noske, to appear). NCH in Yaka is thus of considerable typological interest.

We might at this point contrast two approaches that have been taken to account for the differential behavior of consonants with respect to nasal spreading. First, noting that voiceless consonants are clearly not NBU's in such systems, Pulleyblank [1989] suggests that a possible account of this would be to say that /t, k/, etc., also cannot be specified for [nasal]. However, Pulleyblank's account is for one where /t, k/, etc., are *opaque* with respect to nasalization, not transparent. The idea is that nasality will spread (rightwards in this case) until it reaches a segment to which it cannot link. This is accomplished through a "grounding condition" (cf. Archangeli and Pulleyblank [1994]): If [-voice], then not [+nasal]. While this correctly handles the fact that /t, k/ cannot become nasalized in Yaka, it incorrectly suggests that they should therefore stop nasal spreading from proceeding any further. However, as we have shown, /t, k/ are not opaque in Yaka, but transparent. The equation of non-NBU with opacity also incorrectly predicts that spreading of [+nasal] should actually have been blocked by the vowel even before reaching the [-voice] consonant (i.e., if a vowel, then [-nasal]).

A more promising strategy would thus be to adopt Archangeli and Pulleyblank's [1987] distinction between "minimal/maximal scansion": A feature may target either the immediately dominating mother node (=minimal scansion) or may target the next segment, whatever it is (=maximal scansion). If /d/ has an appropriate landing site for [+nasal] which both vowels and [-voice] consonants lack, we could regard NCH as a minimal scansion rule (cf. Shaw's [1991] conclusion concerning consonant harmonies in general). Although an ad hoc move, for this purpose one might adopt Piggott's [1992] soft-palate (SP) node and say that nasal consonants have a SP node with a [+nasal], while /d/ has a SP node lacking a [+nasal]. The rule would then be to spread [+nasal] to the next SP node (see below). Since vowels and voiceless consonants lack the SP node, they would automatically be skipped by this minimal scansion.[7]

There is, however, a problem with this. The second surprising fact in Yaka is that prenasalized consonants are also transparent, as seen in (9).[8]

(9) a.	*mwááng-ini*	'semer'	*nóóng-ene*	'viser'
	nááng-ini	'durer'	*núúng-ini*	'remporter une victoire'
	mééng-ene	'haïr'	*nyééng-ini*	'être consummé'
b.	*bééng-ede*	'mûrir'	*ngéng-ede*	'luire'

[7] Piggott [1993:8] considers analyses whereby voiceless consonants too can be targeted by NCH. I return to this below.

[8] Unfortunately the only NVCVNC- and CVCVNC- stems in Kiyaka involve the ending *-ung*, which has special properties (see the examples in (30c) below).

It does not seem promising to assume that prenasalized consonants are also not NBU's. And yet, we first saw that they fail to condition nasal harmony in (6), and now that they are transparent to nasal harmony in (9).

Assuming that the non-triggering of nasal harmony by NC is not a problem, we still have three things to explain:

(10) a. Action at a distance
b. Transparency of voiceless consonants
c. Transparency of prenasalized consonants

The major problem I have been discussing is how to allow the nasal harmony rule to seek out a /d/ at some distance without weakening phonological theory to allow any and all kinds of long distance effects of this type. For example, could we have a language where [+voice] spreads from certain consonants to others, or maybe [+cont], etc.? The second problem has to do with the surprising result that something which normally blocks nasal harmony fails to do so here, viz. voiceless consonants. The third problem is that the [+nasal] of prenasalized consonants can be crossed in nasal harmony, so to speak. In the next section we show that the effects of NCH are considerably more general than the above would suggest.

3. The Distribution of Nasality

As a means of introducing the distributional properties of nasality in Yaka, let us mention a possible strategy that might seem at first glance to get us out of the problems mentioned in §2. This would be to say that the nasal harmony is not a phonological rule, but rather a case of allomorphy. If it is allomorphy, this means that there are two forms /-idi/ and /-ini/ (abstracting away height harmony). The allomorph /-ini/ is chosen when there's a full nasal in a stem; the allomorph /-idi/ is chosen in the elsewhere case (i.e., when there is no full nasal, but possibly an NC).

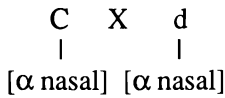
The first argument against this strategy is: Even if it's allomorphy, we still need to account for it. We should not suppose that phonologically conditioned choice of allomorphs is completely arbitrary. Most cases we know are natural in the sense that there is a motivated relationship between the choice of the allomorph and the environment in which it is chosen. In the Yaka case, the nasal allomorph is chosen in a nasal environment (however problematic the statement of that environment might be). In addition, there is frequently a natural relationship between the "conditioned" allomorph and the elsewhere case. That is, it is not arbitrary that we get [n] in the nasal environment, but [d/l] in the non-nasal environment.[9]

[9] Phonological conditioning is not always completely natural in this sense, e.g., the nominative case marker is *-ka* after vowels vs. *-i* after consonants in Korean. The syllable structure is motivated, so we have the naturalness of the allomorph to the environment. In this case, however, it is not clear which is the "conditioned allomorph".

Thus, even if this is allomorphy, we would want to have a theory of what is "visible" to allomorph selection. Can an allomorph arbitrarily look into a base for whatever feature it wants? That is, does replacing the phonological account with the allomorphy rule "choose *-ini* when there's a full nasal in the base, otherwise choose *-idi*?" make the situation any more natural or expected? It does not seem so. Assume for the moment what would be possible if NCH were treated as allomorphy. First, and perhaps not that bad, we could have an arbitrary relationship between the allomorphs, e.g., *-ini* after a base with a full nasal, but, say, *-aka* in the elsewhere case. But second and more important, we could have *-ini* after a base which has a labial, and *-idi* in the elsewhere case. The only way to enforce a natural relationship between the phonologically conditioned allomorph and the base is to express this in *phonological* terms. But in this case the phonological terms appear to be "at a distance" [Poser 1983]. Thus, the problem of locality is still there and there is no advantage of attempting allomorphy.

Note that the same argument would hold against an analysis which is phonological but does not see the nasal harmony as assimilation (i.e., as spreading within the autosegmental context). In (11) I have expressed the rule as one of "nasal agreement", i.e., [α nasal] in the SPE sense.

(11) Nasal "agreement":



(where X contains V's and voiceless C's)

This is equivalent to allomorphy and only hides the same question, which is when can one alpha see another alpha? The rule in (11) is no advantage over (8).

However, there is a more important argument against such an allomorphy analysis: Nasal consonant harmony is not restricted to the perfective suffix and, hence, is not allomorphy in Yaka. It's phonology. In order to appreciate this consider, first, that NCH affects all suffixes that have a /d/ in them in exactly the same way we saw for perfective /-idi/. Consider the data in (12)-(14).

(12) a.	*fut-id-*	'payer pour'	*hyook-id-*	'passer par'
b.	*hang-id-*	'faire pour'	*dong-id-*	'enseigner à'
c.	*hun-in-*	'tromper pour'	*son-in-*	'colorer pour'
d.	*nat-in-*	'porter à'	*mek-in-*	'essayer pour'
e.	*miituk-in-*	'bouder à/pour'	*nutuk-in-*	's'incliner à'

(13) a.	*bal-uk-*	'être renversé'	*bad-ud-*	'renverser'
	dob-uk-	'sortir'	*dob-ud-*	'évacuer, faire sortir'
b.	*haamb-uk-*	'se séparer, être séparé'	*haamb-ud-*	'mettre à part, séparer'
	huung-uk-	'être ramené'	*huung-ud-*	'ramener'

c.	*hon-uk-*	'se défaire, tomber'	*hon-un-*	'défaire, laisser tomber'
	sun-uk-	'se défaire (noeud)'	*sun-un-*	'délier' (noeud)
d.	*nik-*	'moudre, pulveriser'	*nik-un-*	'remuer, essuyer, effacer'
	nut-uk-	's'incliner' (**nut-*)	*nut-un-*	'bousculer, élancer'

(14) a.	*beet-*	'frapper'	*beei-udud-*	'frapper de nouveau'
	hyook-	'passer, dépasser'	*hyok-udud-*	'repasser'
b.	*hang-*	'faire'	*hang-udud-*	'reconstruire, refaire'
	sumb-	'acheter'	*sumb-udud-*	'racheter'

The examples in (12), partly from Ruttenberg, partly based on extrapolations from Ruttenberg and from van den Eynde [1968], show that the applicative suffix /-id-/ is realized *-in-* after a base that has a full nasal. The examples in (13) are all from Ruttenberg, who without exception indicates a relationship between the forms in the left and right columns. In these examples, /-uk-/ is the intransitive reversive suffix, while /-ud-/ is the corresponding transitive reversive. As seen, /-ud-/ is realized *-un-* after a root with a full nasal. In (14) I show cases of the /-udud-/ suffix that marks repeated action. Unfortunately, there were no examples of this suffix appearing after a base with a full nasal in Ruttenberg [1970]. This should be possible, in which case we expect *-unun-* (as in related languages). It is also possible to add nasal suffixes to each other, e.g., *-un-in-*, but few of these were found in the dictionary.[10] One case that does appear in Ruttenberg is *-nyeek-in-* (applicative of *-nyeek-* 'se baisser, se courber'), which has the perfective *-nyéék-én-éné*, i.e., applicative followed by perfective, with height harmony. In this case we see the multiple application of the NCH rule. Finally, (15) shows that nasality spreads not only through /t/ and /k/, but also the /s/ of the causative suffix -is-.[11]

(15)	*dem-is-in-*	'faire attendre pour'
	dam-is-in-	'faire coller pour'

So, if this were allomorphy, it would be odd that every suffix with /d/ would have show the same variation.

Two even more conclusive arguments that NCH is phonological are available. The first is that the n/d distributions are completely general at the stem (stratum 1) level. Whether mono-, bi-, or tri-morphemic, verb roots do not permit a /d/ to occur after a full nasal in a verb. The second is that these distributions extend beyond /d/.

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[10] We can be confident, however, that these exist in Yaka. Both Howard [1972] and Johnson [1972] are particularly concerned with multiple application of NCH. Thus, both cite the Luba derivation /u-dim-id-id-e/ 'he cultivated for' → [u-d^{y}im-in^{y}-in-e], which shows both applicative /-id-/ followed by perfective /-id-/ undergoing NCH.

[11] Since there are no roots of the shape -NVf- or -NVs-, it is necessary to cite such causative + applicative forms to show that nasal harmony also crosses voiceless fricatives. Lukowa Kidima has kindly provided the examples in (15).

For the purpose of studying the distribution of the various [±nasal] consonants, the Comparative Bantu On-Line Dictionary (CBOLD) project prepared an electronic version of the Yaka-French portion of Ruttenberg's [1970] dictionary. Approximately 3800 entries were obtained in the scanned section and are presently useable on FilemakerPro™.[12] The Yaka dictionary has the following fields available:

(16) CBOLD Yaka Dictionary Fields

prefix	stem	pos	gfn	class	gloss
	perfect				
	segments				

Looking at the first row, the first field has noun prefixes, followed by the stem, the part of speech [pos] (typically n. or v.), grammatical function [gfn] (e.g., applicative, causative, connective), noun class (e.g., 1/2) and gloss (which can wrap around to include as much information as needed or desired). On the second row the perfective forms of verbs are indicated. The third row is identical to the root field, except that there are no indications of tone. This was included in case the presence of accent marks interfered with the search functions of FilemakerPro™.

For this study I did the following searches in the stem field (for both [l] and [d], since Ruttenberg distinguishes these in his orthography), indicated in (17).[13]

(17) Sample searches in segments field:

a. *m*l* and *m*d* [omit *mb*l* and *mb*d*]
b. *n*l* and *n*d* [omit *nd*l*, *nd*d*, *ng*l*, *ng*d*]

The results of the search in (17a) are shown in (18), while the results of the search in (17b) are given in (19).

(18) Results of search (17a)

a. Prefix-stem demarcation

maléemba 'doucement' (cf. cl. 6 *ma-léemba* 'douceur, lenteur')
máálu 'jambes, pieds' (cf. cl. 5 *kúúlu* 'jambe, pied', hence < /ma-Vdu/)

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[12] I would like to acknowledge the help of John Lowe, Jeri Moxley, Gail Solomon, Van Wong and myself for the efficienct job we did so that the first presentation of this paper could be made on Nov. 3, 1994.

[13] What will eventually be built into the FoxBasePro™ version of CBOLD is a featural capability of searching. For the moment, the system is imperfect.

b. Borrowings

súmééla	'chômeur'	*kómísyééla*	'commissaire'
kómélésáa	'commerçant'	*mandéléni*	'mandarine'
kómélése	'commerce'		

c. Residue

moola	'peut-être'	
bu-móólo	'paresse'	
tímíláádi	'tribunal'	
mong-ulul-	'reprendre'	(cf. *bong-ulul-* 'reprendre' < *bong-/mong-* 'prendre')

(19) Results of search (17b)

a. Prefix-stem demarcation: n/a (no prefix has shape nV-)

b. Borrowing

nóódi	'nord'
sántúnyééla	'sentinelle, gardien'
n-sínyéela	'monseigneur, évêque'
nééla	'fenêtre, volet' (< Port.)

c. Residue

yúúnuk-idi	'être étiré, être allongé'
náámbik-idi	'mettre au lit'
nyáámbik-idi	'amasser, accumuler'

As seen in (18a) and (19a), where we did not have explicit identification, our imperfect parsing may occasionally include a prefix within the stem domain (rather than separating it into the prefix domain). This happens particularly when an item is identified as an adverb or the like (i.e., when it is neither a noun, which has an identifiable noun class prefix, or a verb, which is entered without any prefix). Eliminating these, we then see in (18b) and (19b) that there are borrowings that fail to obey the pattern. Finally, in (18c) and (19c) there is a very small residue. (The form *-mongulula* has an alternate *-bongulula*, which is regular; perhaps the former exists dialectally?).

We thus arrive at the following inescapable conclusion: There is a constraint against /m/ and /n/ being followed by /d/ within the "stem", i.e., whether within morphemes or across them at the stem (stratum 1) domain.

There can be no question of allomorphy then. There is a generalization that covers morphemes and derived stems that must be accounted for, and it seems that the account must be a phonological one.

To see whether the above story could be generalized further, I did additional searches involving all other consonants in initial vs. non-initial position within the

stem. In (20) I give the full C_1 consonant system (i.e., consonants that are found initially in roots).

(20) The Yaka Consonant System

a. *"Soft" Consonants*				b. *"Hard" Consonants*		
h	t	k		ph	th	kh
f	s			pf	ts	
b	d		⇒	mb	nd	ng
v	z			mbv	ndz	
w		y		ngw		ngy
m	n	ny		mb	nd	ndy[14]

For expository reasons I have divided the system into two groups: the soft consonants vs. the hard consonants. The hard consonants are generally found in environments where a preceding nasal is structurally (and often phonetically) present (e.g., 1sg. prefix, 9/10 prefix, etc.).[15] What is important for our purposes are the restrictions on stem-internal consonants, both when preceded by a nasal and when not. The frequent "C_2" consonants are shown in (21).

(21) "Well-Attested" C_2 Consonants

a. *"Soft" Consonants*			b. *"Hard" Consonants*		
	t	k			
f	s				
b	d		mb	nd	ng
				ndz	
w		y			
m	n	ny			

I have left out from (21) those consonants that are not attested or attested only in a small number of forms in C_2 position (e.g., ph, v, etc.). What is important for our argument that the d/n alternation is phonological is the following: Without exception, there are no words that contain a full nasal (m, n, ny) followed by [b], [w], [d], [l] or [y]. That is, voiced oral consonants may not occur in stems which have an earlier (full) nasal. All other (soft and hard) C_2 consonants are free to occur after either an oral, prenasalized or full nasal consonant.

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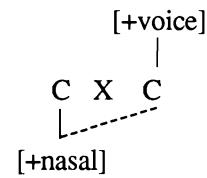
[14] Published sources typically omit any mention of the realization of the palatal nasal when preceded by a nasal morpheme. Thanks to Lukowa Kidima for this information.

[15] Note that the nasal consonants /m, n/ become [mb, nd] when prenasalized [Ruttenberg 1970; Kidima 1991]. This will be important for the analysis. Also note that "soft" "p" is realized [h]. There are some occurrences of unaspirated [p], but they are limited. Finally, not all hard consonants owe their etymology to a nasal (e.g., *-tsum-* 'sew' is from Proto-Bantu (PB) *-tụm-).

The alternation between n/d must thus fall out from the more general property that nasality spreads onto a following voiced consonant, as in (22).

(22) NCH (revised):



(where X does not contain a non-prenasalized voiced consonant)

(22) operates first as a morpheme structure condition and then as a phonological rule. Unfortunately, the only stem-level morphemes that can undergo (22) have underlying /d/, so we do not actually see m/b alternations (nor do we know what /w/ and /y/ would alternate with—though their "hard" counterparts are [ngw] and [ngy], respectively). Specified as in (22), the variable X now stands for anything *but* a [+voice] consonant: i.e., it may contain vowels, voiceless consonants—and, for some reason, prenasalized consonants, the last of which must be voiced in Yaka (i.e., there is [mb, nd, ng], but no *[mp, nt, nk], which, with only a small amount of residue, have developed into [ph, th, kh]).

4. Interpretation and Analysis

To recapitulate with slight revision, the questions we face in this study are those listed in (23).

(23) *Questions:*

a. Why are only voiced consonants targeted?
b. How/why are voiceless consonants not subject to nasalization? transparent?
c. How/why are prenasalized consonants not subject to or conditioners of nasalization? transparent?

The answer to the first question may conceivably have to do with structure preservation. We have shown that NCH is a property of stratum 1 phonology. As expected, it is a neutralization rule. In other words, it is structure preserving. So, if the structure preservation constraint is operative, this will mean that the segments that can be targeted for nasalization are those which have underlying nasal counterparts, viz. voiced b/m and d/n, for instance.[16]

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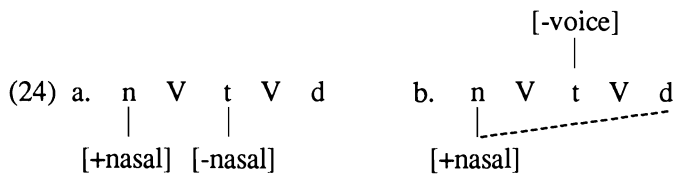
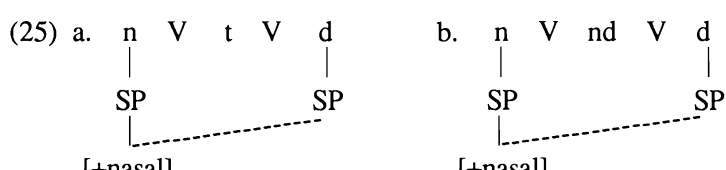
[16] The issue is less clear for /w/ and /y/; Are their counterparts ngw and ngy? If so, then why don't /t, k/ nasalize as [th, kh]? On the other hand, it is possible that /y/ is a real consonant, but that /w/ is really /Cw/. There is no evidence for plain /g/ when not prenasalized. On the other hand, since [w] and [y] alternate with [ngw] and [ngy], it is possible that /w/ is /gw/ and that /y/ is /gy/, with the /g/ dropping out when not prenasalized. Cf. *kúúlu* 'leg' < PB *ku-gudu.

The second question is why voiceless consonants are (a) not subject to nasalization; (b) transparent? The first part of this question has been answered in a number of ways in the literature. One is to say that voiceless consonants are prelinked as [-nasal], as in (24a).



This representation would, however, prevent the [+nasal] from spreading rightwards, since NCH would result in a line-crossing. To allow [+nasal] to spread through them, we might underspecify [nasal] (and possibly [voice]) on voiceless consonants or we could prespecify them at [-voice] as in (24b). In this case there is no line-crossing, since the features [nasal] and [voice] are on separate tiers. But the question still remains as to why voiceless consonants allow [+nasal] to spread through them, i.e., why they are transparent. As mentioned above, this is a surprising result. Pulleyblank [1989], for instance, establishes an antipathy between nasality and voicelessness in order to account for the *blocking* effect that the latter have on nasal spreading. The problem here is that this antipathy in Yaka is only against association *to* the voiceless consonant—not to continued spreading onto a subsequent appropriate consonant.[17]

Another tack we might take involves the establishment of a more articulated feature geometry. For the purpose of illustration I will use Piggott's [1992] SP node. Voiceless consonants could be claimed to lack a SP node. Consequently, the feature nasal would hit a /d/ by simply targeting the next SP node, as in (25a).



We would have to say that only voiced consonants have an SP node. /b, d, w, y/ have the SP node, but no feature [-nasal]. Thus, nasal spreading passes easily through voiceless consonants, as desired. The crucial point is that NCH is not

[17] Technically we have not demonstrated that [+nasal] fails to associate to voiceless consonants, only that there is no audible evidence of this. Schadeberg [1982] shows that /k/ in Umbundu becomes nasalized [$h^{\tilde{}}$] when a nasal consonant occurs in the preceding syllable. This suggests that we could consider an analysis where [+nasal] hits voiceless as well as voiced consonants in Yaka (cf. Piggott [1993]).

allowed to build nodes as it goes. In this case, this is taken care of by structure preservation.

How does this analysis fare with respect to prenasalized consonants, however? These do not condition nasalization, so we must first ask why not. They also are transparent to NCH (and do not appear to undergo it—see below, however, for whether they do undergo NCH vacuously). The natural first attempt would be to extend the representation of (25a) to (25b), where the prenasalized consonant, like voiceless consonants, lacks an SP node. It would then be necessary only to propose a proper underlying representation for NC's onto which the SP and [+nasal] could later be inserted.

Such an analysis in fact already appears in Ao [1991], who treats prenasalized consonants as CC clusters. Ao suggests that the nasality on the first C is predictable and can thus be underspecified, allowing the [+nasal] to spread right across it (i.e., ignoring it). This also accounts for why NC's do not condition nasalization to their right. However, according to what we have said, it should be possible for NCH to hit the NC, particularly since the C is voiced.[18] Now, it turns out in Yaka that /mp, nt, nk/ do not surface as such, but rather as [ph, th, kh], which are very rare in C_2 position. Because Kongo allows [mp, nt, nk], which are in turn transparent to NCH, we will not attempt an analysis whereby Yaka stem-internal [mb, nd, ng] would be analyzed as /mp, nt, nk/.[19]

Given recent feature geometric accounts of prenasalization, we are not forced into a CC analysis. Piggott [1989] sees prenasalized consonants as single segments consisting of two root nodes, while Steriade [1993] analyzes these as a single consonant with two aperture nodes, the first nasal, the second oral. On the other hand, Padgett [1991:54-55] considers that prenasalized consonants "are simply homorganic nasal-obstruent onset clusters". Whether NC are analyzed as complex consonants vs. consonant sequences depends in part on one's model, specifically on whether there is something corresponding to a skeletal (CV or X) tier, or whether there are only moras/weight units. In Yaka a single C analysis would seem to be preferable, particularly since the language shows vowel length opposition before NC (e.g., *-denga* 'partir en vacances' vs. *-deenga* 'rendre lisse, polir'). By Ao's argument, we would need to syllabify /deenga/ as deen.ga, which is highly unlikely from a Bantu persective. On the other hand, we could get the

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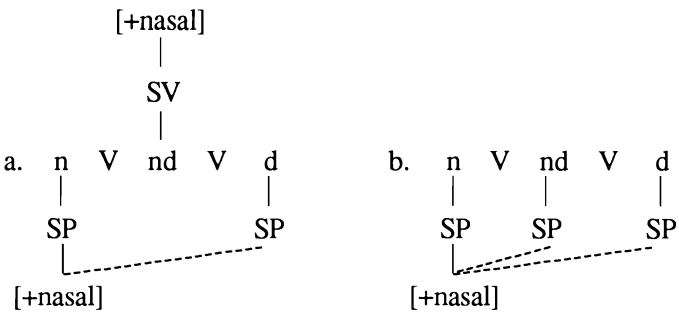
[18] Both Ao [1991] and Odden [1994] skirt around this problem without addressing it. Ao has nasal spreading onto a [+cor, -str] consonant, not addressing why it fails to hit /t/ or whether he considers it to hit /nd/. Odden spreads [+nasal] onto a [+lat]. This works only if the underlying representation of [d/l] is /l/ and the rule applies before /l/ is specified as [d] before /i/. In this case NCH would also presumably apply to /nl/ (which I assume would be Odden's underlying representation of [nd]), thereby deriving Cn, if we assume Ao's CC representation. (Odden doesn't discuss prenasalized C's in his brief citing of NCH in Kikongo). Although aware of distributional constraints (e.g., failure to find roots of the shape -mVb-), neither author incorporates the effects of NCH functioning as an MSC.

[19] This would, however, have the advantage of explaining why we have [ng], but not [g] in this language. The fact that /m+p/, /n+t/ and /n+k/ sequences are realized [ph], [th] and [kh], respectively, across a stem boundary would not necessarily be fatal to this other analysis, since we could assume a difference at stratum 1 (stem) vs. stratum 2 (word). Prefixes, recall, come in only at stratum 2 and could have a different phonology from the stem phonology.

same result by assuming that the preconsonantal nasal is a segment, but non-moraic.

In any case, a tempting strategy to account for the behavior of NC entities would be to underspecify them for [nasal]. In addition to underspecification, the logical alternative is present to exploit feature geometry further. I personally would seek to avoid an analysis whereby the [+nasal] feature of NC would be different—for example, on a different plane—from the [+nasal] of pure nasals, as in (26a).

(26)



Odden [1994] allows for potential transparency such as that shown in (26a), where the [+nasal] would be on different planes, because the mother node is different. In this case I have arbitrarily shown the [+nasal] of the NC to report to a "spontaneous voicing" (SV) node vs. the SP of the full nasal.[20] Steriade [1993] has proposed a representation of nasal vs. prenasalized consonants in terms of aperture nodes, such that the spreading process could be conditioned to start from a "released" nasal (i.e. from the last aperture node of a nasal consonant). One natural extension to make of (25) would be to set up an SP node for the nasal part of the NC sequence (reporting to its own root node), as in (26b). As shown, the [+nasal] of the preceding nasal consonant would first spread onto the nasal half of /nd/ and then on to the /d/ of the next syllable. It would not hit the /d/ of the /nd/ because of two possible reasons: Either this /d/ lacks an SP (as in (26b)), or if it has an SP, NCH would be blocked by structure preservation (because *nn is not permitted).[21] On the other hand, as was indicated in (20), illustrated in (27),

[20] Since preparing this presentation I have received Piggott [1993], who talks about an analysis where voiced C_2 consonants would be treated as sonorants, i.e., with an SV node, vs. prenasalized consonants, which would have the normal SP nasal feature. This is the opposite of what is shown in (26a). There seems to be no end to the strategies available to us. Another conceivable way to get the feature nasal on different planes would be to consider the nasality of full nasals to be a "morpheme feature" which maps on to all available NBU's starting from the one to which it is prelinked.

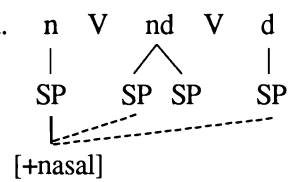
[21] In fact Yaka has two preconsonantal nasals: a non-moraic one (which we have been investigating) vs. a moraic one which is derived from *mu- prefixes, e.g., *n-náti* 'porteur' (< mu-nat-i). So what has to be said is that one cannot have a sequence of non-moraic nasal + nasal consonant in Yaka.

structurally "prenasalized nasals" are realized as the corresponding prenasalized voiced oral consonants.[22]

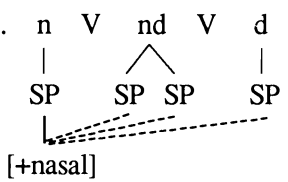
(27)	a.	N+m	→	mb	*e.g.*,	[N- [mak-idi]]	→	*mbakiní*	'I carved'
		N+b	→	mb	*e.g.*,	[N- [bak-idi]]	→	*mbakidí*	'I caught'
	b.	N+n	→	nd	*e.g.*,	[N- [nuuk-idi]]	→	*nduukiní*	'I smelt'
		N+d	→	nd	*e.g.*,	[N- [duuk-idi]]	→	*nduukidí*	'I became wise'
	c.	N+ny	→	ndy	*e.g.*,	[N- [nyem-idi]]	→	*ndyemené*	'j'ai poussé'

Also, note in (27a), as pointed out by Kidima [1991], that NCH first nasalizes the perfective ending before denasalization of N+m to [mb]. Thus, it is possible to have (28a) or (28b).

(28) a.



b.



In (28a) we show NCH hitting the first SP of /nd/, but not the second, because of structure preservation (noting, however, that it could hit it, and then undergo the same denasalization process illustrated in (27)). In (28b) we show the [+nasal] hitting both SP nodes of the /nd/ consonant.

However, what would these SP's be? In this analysis we have used the presence of the SP to condition NCH. Piggott [1992], on the other hand, uses the SP to block nasalization: voiceless consonants have an SP, but no nasal feature (or perhaps a [-nasal]), and by his Maximal Application Principle, it is the SP node that spreads, not the feature [+nasal]. We have done just the opposite (as per the minimal scansion of Archangeli and Pulleyblank [1987]). In our case, the SP node encodes voicing—although with some question as to whether /mb, nd, ng/ should have one vs. two SP nodes. Since /mp, nt, nk/, as existing in Kongo would presumably have only one, i.e., on the nasal part of the complex segment, we assume that one would be led to the double representation in (28a) (rather than the single SP in (26b)). But if SP is just a stand-in for [+voice], why not refer directly to the latter instead, as in (22)?

The problems with the above are thus two: First, it is not clear how to represent the prenasalized portion of the NC segment. It could have any of the following representations in (29):

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[22] The data in (27a,b) are from Kidima [1991].

(29) *Representation of N part of NC:*

a. Empty first root node
b. Root node with empty SP
c. Root node with empty SP and [-cont]
d. Root node with empty SP, [-cont] and [+voice]
e. Aperture analysis [Steriade]

As we can see from the "hard" consonants in (20), there is reason to have [-cont], since fricatives harden. There is, however, also reason to have [+voice], since this could condition the dropping of the nasal before a voiceless consonant, with which [+voice] is not compatible. On the other hand, [+nasal] could also do this—and in any case, we have to derive the [+spread] found on aspirated consonants.

Whichever way we do it, there is a second problem: As soon as we let [+nasal] spread onto the NC, whatever its representation, we have violated structure preservation—which we held to be responsible for the targeting of voiced consonants in the first place. That is, when [+nasal] hits the SP of a voiced consonant we derive a nasal (e.g., d → n). This is a neutralization. When the [+nasal] would hit the SP of a prenasalized structure, the output would not be distinct from the input, i.e., this would not be a neutralization. The more likely solution, then, would be not to have an SP node on the nasal, and to block spreading onto the SP node of the voiced consonant (if there is one—but if there isn't, why isn't there? It would be redundant in both cases, i.e., both on /nd/ and on /d/, unless SP is taking the place of [+voice]).

However, another interpretation is possible by which the linking of [+nasal] to an underspecified NC is in fact structure-preserving. What we have thus far avoided is using an overt [+nasal] specification on NC consonants. This has allowed us to account for the failure of NC's to nasalize *-idi* (etc.), as in (30a), and also for their transparency to nasalization going through them from the left, as in (30b).

(30) a.	*búúng-idi*	'gaspiller'		*bééng-ede*	'mûrir'
	hááng-idi	'créer'		*sóóng-ede*	'aiguiser'
b.	*mwááng-ini*	'semer'		*méeng-ene*	'haïr'
	núúng-ini	'triompher'		*nóóng-ene*	'viser'
c.	*húkung-ini*	'errer'		*tébong-ene*	'devenir faible' < *-tebung-*
	díndung-ini	'rouler (intr.)'		*syéétong-ene*	'glisser (intr.)' < *-syeetung-*

However, as seen in (30c), verb roots which have a third syllable with *-ung-* invariably show nasal allomorphs such as *-ini*. The best way I can see to get this would be to say that the *-ung-* ending, probably a suffix [van den Eynde 1968], has a prelinked [+nasal] on the nasal part of its /ng/ segment. A search through the Yaka dictionary on computer has revealed that *-ung-* is the only VNC to

occur in post-CV(V)(N)C position within the stem domain.[23] If we adopt a prespecified [+nasal] only on the quasi-formative *-ung-*, restricted in this way, then the linking of [+nasal] as in (28a), would constitute only a minor violation of structure-presevation: A [+nasal] NC would thus already exist lexically, though limited in distribution. On the other hand, it may be that not all applications of NCH must obey structure preservation.

5. Conclusion

In the preceding sections we have taken a close look at nasal consonant harmony at a distance in Yaka. The pattern which we have discovered is an unusual one. In order to account for it we have considered (combinations of) two strategies: unusual underspecification and unusual feature geometry. None of the analyses considered here or in Ao [1991], Piggott [1993] or Odden [1994], is particularly persuasive or conclusive. Yaka NCH is not problematic because no solution can be found for it, but rather because so many ad hoc ones can be produced on the spot. I have attempted to make each one as reasonable-sounding as possible, and there are still other ones that might be pursued. While it has not been possible to choose definitively between these approaches, we at least get a clear picture of a quite general case of NCH. Other Bantu languages have variations on this theme, which I am now investigating from a comparative and historical perspective. For example, there are languages which nasalize *d only when the preceding nasal consonant is tautomorphemic (e.g., *-mid- 'swallow' > *-min-*) vs. heteromorphemic (e.g., *-túm-id- 'send to' > *-túm-il-*). There are others where certain roots condition nasalization of suffixes, but not others. The study that I have in mind would carefully investigate the phonologization and dephonologization of NCH throughout the Central and Western Bantu languages where it is attested. It is hoped that a comprehensive (electronic) lexical study of NCH in some of the languages neighboring Yaka might shed further light on this problem.[24]

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[23] The only exception to this statement among verb roots is *-fining-* 'couvrir'. In this case it is not clear if the [n] in its perfective, -fíning-ini, is due to the preceding /ng/ or to the preceding [n].

[24] One of the questions which I am currently investigating, for instance, concerns the question of whether the Yaka-Kongo version of NCH can exist only in a language in which N+N results in a denasalization of the second nasal, as we saw in (27). In other words, is denasalizaiton a prerequisite for NC transparency? So far I have found only one additional language, Bushong, which also regularly denasalizes root-initial nasals when a nasal prefix precedes [Edmiston, n.d.: 13]. While Bushong has denasalization without NCH, I know of no language with transparent NC, but without N+N denasalization.

APPENDIX

Unconditioned Nasality

In response to a question posed to me by Thilo Schadeberg, a search was undertaken to find cases of unconditioned nasality among the 1,780 verb entries in the Yaka dictionary. The results of this search are, I think, important to report here in this Appendix. For this search reflexes of the *-am-* and *-an-* suffixes were ignored, since these are reconstructed with nasality in Proto-Bantu. I instead endeavored to find possible cases where reconstructed *id and *ud appear as [in] and [un] without an appropriate preceding nasal conditioner. In the examples below tone marks are not indicated on verb roots, since they are not contrastive. The results of this search are as follows:

1. Unconditioned nasality of [in]
   A single example was found of unconditioned [in]:
   -sukinin- 'arriver en retard, être en retard'

The related forms *-suk-* 'prendre fin, être fini' and *-sukinis-* 'retarder' (= a causative form) indicate that the above verb should be analyzed as *-suk-inin-*, i.e., with exceptional unconditioned nasality on the suffix.

2. Unconditioned nasality of [un]
   In all, 21 verbs were found that have [un] without a preceding full nasal in the stem. These fall into two roughly equal groups which are distinguished according to the nature of the consonant immediately preceding [un]: either voiceless or [ng]. In what follows I give possibly related forms in Yaka as well as Proto-Bantu reconstructions from Meeussen [1969/1980] which I have been able to determine. I have provided all cases where a phonetically identical verb root exists without [un], even where the gloss suggests homophony rather than relatedness. Where I am sufficiently convinced by the related forms or the reconstruction that [un] is a reflex of the *-ud- 'transitive reversive/separative' suffix, I place a hyphen between it and the preceding root.

2.1 Cases of [un] preceded by a voiceless consonant: /t, k, ts, f, s/
   11 verbs were found in this category, as follows:
   -bukun- 'couper transversalement; abattre un arbre; couper en morceaux (ex. poisson); trancher'
      cf. *-buk-* 'traiter, soigner un malade' [assume not related]
      yi-búku 'morceau, tranche, demi, étape' [related, but direction of derivation not clear]
   -bukunun- 'morceler; recouper; mutiler' [related to preceding]

-hesun- 'couper, prendre un petit morceau (ex. noix de cola, viande seche)'
cf. *n-hésu* 'partie, petit morceau'
yi-hésu 'petit morceau' [direction of derivation not clear]

-huut-un- 'trop raccourcir, couper plus que prevu, prendre trop'
cf. *-huut-* 'couper trop; prendre trop à la fois au repas'

-sokun- 'cueillir (des fruits, mais un à un)'
cf. *-sok-* 'charger (ex. un camion, fusil)' [related?]

-taak-un- 'déchirer'
cf. *-taak-* 'déchirer'

-tafun- 'macher' < PB *-takụn- 'chew, masticate'

-tekun- 'verser (ex. un liquide de sorte qu'il sort à petites quantités)'
cf. *-ték-* (+ *máámba* 'eau') 'puiser de l'eau'
-tek-is- 'vendre, écouler'
< PB *-ték- 'draw water'

-tsootsun- 'enlever, arracher les feuilles d'un arbres les arachides de leurs racines; médire; calomnier'
cf. *-tsoots-* 'tremper du luku dans la sauce' [assume not related]

-zot-un- 'couper un petit morceau (excl.viande); casser en tirant (ex. corde)'
cf. *-zot-uk-* 'être coupé' [=intransitive reversive/separative]

-zyokutun- 'ronger'

2.2. Cases of [un] preceded by [ng]

10 verbs were found which have [un] preceded by [ng]:

-fwoongun- 'ronfler'

-hiingun- 'couper au milieu'
cf. *-hiing-* 'remplacer, relayer, succéder (prendre la place de qqn); attendre qqn' [assume not related]

-kuungun- 'enlever (poussière ou saleté quelconque)'
— *móóko* 'essuyer les mains'
?< PB *-kung- 'fasten, attach'; *-kúng- 'gather'

-saangun- 'se montrer content, se réjouir ouvertement de, exulter'
cf. *-saang-* 'mélanger, meler, mettre en commun (ex. argent); jeter un peu de farine de manioc dans l'eau bouillante, pour voir si elle bout vraiment; danser la danse au couteau de chef' [related?]
?< PB -cang- 'be crazy, furious'; *-cang- 'meet, mix, connect'

-suungun- 'enlever les défenses d'un animal (cornes, griffes)'
cf. *bu-úungu* 'chasse organisée (en groupe)'
n-úungu 'chasseur (en groupe)'
-suung- 'soupeser pour voir, pour essayer (ex. si c'est possible de porter qqch)' [not related?]
?< PB *-cung- 'tend animals'

-taang-un- 'parler d'un absent'
cf. *-taang-* 'lire, compter, énumerer; médire, calomnier'
n-táangu 'discours (il s'agit de plaintes et d'accusations, prononcées par qqn qui parcourt le village de bout en bout, le matin surtout)'
< PB *-táng- 'read'

-teengun- 'ouvrir (ex. une plaie, elle se referme quand on la lache)'

-tongun- 'ramasser par terre'

-tuung-un- 'faire sortir de'
cf. *-tuung-* 'construire, batir, édifier; tresser, coudre, tricoter, confectionner; s'installer, s'établir' [=reversive of last meaning]
< PB -túng- 'plait, sew, build; put or pass through'

-woongun- 'souhaiter du mal'
cf. *-woong-* 'rassembler qqch, grouper, cotiser, économiser, accumuler, entasser, ramasser' [assume not related]

3. Cases of [ul] preceded by [ng]

Since 10 examples of unconditioned nasality involved [un] preceded by [ng], it was decided to see how many verbs show the expected shape [ul] when preceded by [ng]. As seen below, 14 verbs fell into this category.

-buungul- 'coiffer; prendre une grande partie'
cf. *-buung-* 'gaspiller, négliger' [related?]
?< PB *-bung- 'collect, gather'

-heengul- 'chercher'
cf. *-heeng-* 'tamiser, filtrer; vouloir à tout prix, bruler d'envie; se dépecher, être pressé, être haté, se presser, se hater, s'élancer, se précipiter; esquiver' [assume not related]

-huung-ul- 'ramener (ex. une brebis au troupeau, le troupeau au village; qqch qui flotte sur l'eau à la rive)'
cf. *-huung-uk-* 'être ramené'
-huung-ik- 'mettre de coté'
-huung- 'détourner le visage; activer (le feu), tisonner; ventiler
— *mbááwu* 'activer le feu avec un soufflet'
[assume *-huung-* not related]

-kaang-ul- 'ouvrir; frire'
cf. *-kaang-* 'fermer, renfermer; fixer, lier; griller; freiner
— *tsúúnda* 'sourciller'
-kaang-am- 'être lié, fermé, être embourbé'
< PB -kaḍing- H 'roast on coals'

-leeng-ul- 'polir, rendre lisse, retoucher, embellir; regarder d'un mauvais oeil, toiser'
cf. *-leeng-* 'rendre lisse, polir, aiguiser, embellir; étaler (*luku*); se dépecher'
-leeng-uk- 'être acheve, être parfait, être embelli'
?< PB -deng- 'be wet'

-luungul- 'se parer, s'endimancher'
cf. *-luung-* 'attendre, se tenir pret (pendant la chasse)'
—*ye buta* 's'armer' [assume not related?]

-seengul- 'culbuter, changer subitement'
cf. *-seeng-* 'glaner; injurier (fort); creuser légèrement avec une houe (ex. en pourchassant un cri-cri)' [assume not related]

-soong-ul- 'rendre pointu'
cf. *-soong-* 'aiguiser, tailler (ex. crayon, fleche, dents)'
-soong-uk- 'être pointu, être aigu, être taillé'
< PB *-congok- 'be pointed'; *-congok-od- L 'point'

-suungul- 'nommer, parler de qqn, médire de qqn'

-woong-ul- 'détruire, trouer; mettre en pièces détachées (ex. meubles)'
cf. *-woong-* 'rassembler qqch, grouper, cotiser, économiser, accumuler, entasser, ramasser'

-yaang-ul- 'ouvrir une porte'
cf. *-yaang-uk-* 'être ouvert'
-yaang-il- 'fermer une porte'
-yaang- 'mettre à la broche'

-yuungul- 'tamiser'
?< PB *-cung- 'sift'

-zaang-ul- 'soulever, prendre'
cf. *-zaang-ik-* 'placer qqch a une certaine hauteur'

-ziing-ul- 'expliquer, exposer; dérouler (ex. tapis)'
cf. *-ziing-* 'durer, vivre, enrouler'

4. Discussion

As seen, there is a certain amount of "residue" where verbs have [un] sequences that cannot be attributed to NCH. There are even two minimal pairs in the above data: *-suungul-* 'nommer, parler de qqn, médire de qqn' vs. *-suungun-* 'enlever les défenses d'animal' and *-woong-ul-* 'détruire; mettre en pièces détachées' vs.

-woongun- 'souhaiter du mal'. The fact that 10 cases of [un] appear after [ng] is clearly related to our finding that the quasi-suffix *-ung-* always conditions NCH (see (30c)). However, there are more cases of [ul] after [ng] than there are [un]. As can be seen from the above hyphenations, I have felt comfortable identifying *-un-* as a suffix in only 2 out of the 10 cases after [ng]. By way of contrast, *-ul-* can be identified as a suffix in as many as 8 out of the 14 cases after [ng]. It is possible that some cases of unconditioned [un] trace back to *n rather than *d (e.g., *-tákụn- 'chew, masticate'). Involvement of [ng] suggests, however, that these cases of [n] result from NCH. Two interpretations fit the partial data at our disposal. The first is that [ng] used to condition NCH in all environments, but has since become restricted. Under this interpretation we would posit a gradual change from *...ng-un-* to *...ng-ul-*, particularly in cases where [un] was identified as the reversive suffix *-ud-. The second interpretation is that NCH is being spread to new environments by analogy. This must have happened already in the history of these languages in order for NCH to skip over syllables with either voiceless or pre-nasalized consonants. Under the second interpretation NCH has become extended to the suffix *-ung-* and is now gradually coming to be triggered by other cases of [ng]—perhaps retarded in cases where the reversive suffix *-ul-* is clearly segmentable by Yaka speakers. In order to choose between these two scenarios it would be necessary to look at the details from a variety of languages which show such skewing. It is conceivable that the results from such a study would not only bear on NCH, but also on some of the other interesting phenomena that center around the feature of nasality in Bantu languages.

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