

# The morphophonology of nouns in Najamba (Dogon)

Christopher R. Green and Michael C. Dow  
Syracuse University and Université de Montréal

## *Abstract*

In this paper, we draw on the description of Najamba animate and inanimate nouns in Heath (2011). These data are interesting to us, as their patterns of number inflection at first appear haphazard and unpredictable. We aim to show, however, that by considering these inflectional patterns alongside other factors such as the language's phonotactic restrictions on certain syllable margins and its preference to maintain stem rather than affixal faithfulness, the transparency of these inflectional patterns is brought to light. Importantly, we argue that Najamba noun stems can be either consonant-final or vowel-final, rather than one static shape, as previously proposed.

## 1. Introduction

The only existing description of Najamba (Niger-Congo, Dogon, Najamba-Kindigé) is Heath (2011), which is yet unpublished. As such, the language has received little attention in the published linguistics literature besides some brief remarks on certain typologically-unusual phenomena that it exhibits (e.g., Cinque 2013; Heath & McPherson 2013). Importantly, there has been no substantive discussion that we are aware of in the aforementioned grammar or in the published literature concerning its nominal morphophonology. As reported in this description, Najamba nouns fall into three distinct classes based upon their inflection for number by suffixation and/or vowel mutation. Although adjectives behave similarly (Heath 2011: 123), for the purpose of this paper, we focus our attention on nouns. While one class of Najamba nouns realizes number simply via vowel mutation, two other classes (animate and inanimate) encode this distinction via suffixation, although in different ways.<sup>1</sup> Inanimate nouns, on the one hand, are bare stems in the plural but take a suffix in the singular. Animate nouns, on the other hand, are the inverse; that is, they are bare stems in the singular and take a different suffix in the plural.

In this paper, we argue against Heath's (2011) characterization of class-internal patterns of nominal inflection for number in Najamba as unpredictable. Specifically, we contend that the seemingly haphazard nature of these patterns stems from the analysis of all noun stems as underlyingly vowel-final. We propose instead that an analysis allowing for both vowel- and consonant-final noun stems at the underlying level renders the behavior of Najamba nominal morphophonology transparent, especially in light of other factors such as phonotactics and stem vs. affixal faithfulness. As we will show, the underlying nature of a noun stem can effectively be deduced from its suffixed form.

As a brief illustration of our analysis, consider first the representative inanimate nouns in (1) where the singular is marked by the suffix **-ŋgo** and the plural is unmarked.<sup>2</sup> As discussed further below, singular inanimate nouns may also be marked with the suffix **-ŋge**, which behaves identically to those taking the **-ŋgo** suffix.

---

<sup>1</sup> There are a few additional nouns reported in Heath (2009) whose singular and plural forms are identical. Because they exhibit no overt alternations, we do not treat these nouns in this paper.

<sup>2</sup> We assume that the nasal consonant of the inanimate singular suffix **-ŋgo**, as well as the nasal consonant of the corresponding animate plural suffix **-mbo**, is syllabified in a syllable onset with an adjacent stop. No compelling evidence can be found illustrating the consistent presence or absence of compensatory lengthening of vowels preceding these clusters. Triggered compensatory lengthening of pre-NC vowels is an often used diagnostic to motivate the presence vs. absence of coda versus onset nasal consonants in such instances (e.g., Hayes 1989; Downing 2005). We return to further discussion of Najamba syllables in Section 3. Note also that while Najamba is a tonal language, tone plays no apparent role in the phenomena under consideration, and as such, we do not include tone marking in the data presented. There is an outstanding issue also acknowledged by Heath concerning variation in word-final vowel length. There appear to be a variety of factors, some of which may be historical, and others of which may be more idiosyncratic, that may be at play which deserve more detailed attention; for the purpose of this paper, we do not attempt to tease apart this admittedly complicated phenomena.

(1)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>		<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>ɛɛ-ŋgo</b>	<b>ɛɛ</b>	‘peanut’	c.	<b>a:l-ŋgo</b>	<b>a:le</b>	‘rain’
b.	<b>uri-ŋgo</b>	<b>uri:</b>	‘sapling’	d.	<b>bur-ŋgo</b>	<b>huri:</b>	‘tender’

A comparison of (1a,c) to (1b,d) shows that words of nearly identical shapes in their unsuffixed plural form are noticeably different in their respective singular forms. (1a-b) appear to illustrate the simple addition of the singulative suffix, while (1c-d) instead illustrate the apparent loss of a stem vowel upon suffixation. The result of this vowel loss in (1c-d) is a consonant-consonant sequence over a syllable boundary in the singular.

The clear problem encountered is that if one assumes the bare form of the noun to be equivalent to the stem (and even further, that all such stems are underlyingly vowel-final), the vowel loss found in the singular forms of (1c-d) appears unpredictable. That is, there would appear to be no condition by which one could determine why nouns like (1a-b) retain their stem vowel in the singular while nouns like (1c-d) lose their vowel in the same environment. In an alternative analysis, however, where nouns like (1a-b) have a vowel-final stem while nouns like (1c-d) have a stem that ends in a consonant, the noted patterns of suffixation become more transparent. Both vowel- and consonant-final stems would therefore be inflected in the singular via simple suffixation. For the plural form of consonant-final noun stems like (1c-d), the final vowel would be epenthetic and the result of a general dispreference in Najamba for words ending in a closed syllable.<sup>3</sup> Thus, it could be said that the combination of stem shape and phonotactics obscures the true stem shape in these and similar plural nouns.

As we discuss further in Section 2, the pattern described for pairs like those in (1) is found in all *sonorant* noun stems in Najamba, with slightly different outcomes arising in inanimate vs. animate nouns. We will hereafter refer to as “sonorant stems” those whose final syllable contains a sonorant, whether it is followed by a vowel or not. The situation turns out to be much different for *obstruent* noun stems (i.e., stems whose last consonant is an obstruent, whether the stem is vowel-final or consonant-final). We show that it is obstruent stems that are arguably responsible for the seemingly haphazard nature of Najamba number inflection. This is because both vowel-final and consonant-final obstruent stems appear phonetically identical in both the singular and plural owing to an overall ban against obstruent consonants in a syllable coda. Thus, the underlying segmental shape of such noun stems must be gleaned from other evidence; this is discussed in Section 3.

In this paper, we offer an account of Najamba suffixation in two classes of inanimate and animate nouns that draws upon principles of stem versus affix faithfulness, as well as the phonotactics of permissible syllable margins and syllable contact in this language. We do this in order to illustrate that inflection for number in these nouns and their agreeing adjectives is not nearly as haphazard and irregular as previously reported. We illustrate that noted patterns of suffixation in these noun classes are predictable and that their predictability rests in the underlying shape of the noun stem, as evidenced by the phenomena we detail.

## 2. Sonorant stems

In this section, we consider the behavior of suffixing noun stems whose final syllable contains a sonorant, whether stem-final or followed by a vowel in the underlying form. As liquid and nasal stems give rise to different consequences, we examine them separately in Sections 2.1 and 2.2, respectively.

---

<sup>3</sup> We thank Jeff Heath for pointing out that the avoidance of word-final closed syllables is not absolute in Najamba. Rather, there are certain derivational affixes, particles, and function words that end in sonorant (most often a nasal) consonants, as well as a few high-frequency underived nouns (e.g., **kul** ‘belly’) and some inflected verb forms that do so. Some borrowed words are sonorant-final as well.

## 2.1 Liquid stems

As previously mentioned, two of the three major noun classes in Najamba, which we follow Heath (2011) in referring to as inanimate and animate, employ suffixation to inflect for number. These differ from mutating nouns, which we discuss further in Section 5. Suffixing nouns in the inanimate class have a non-suffixed plural and a singular inflected by the suffix **-ŋgo**. Consider the expanded set of *sonorant* inanimate noun stems in (2) where the sonorant of the final syllable of the stem is either the lateral [l] or the rhotic [r].

(2)	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>ila-ŋgo</b>	<b>ila</b>	‘ripe’
b.	<b>ɛɛ-ŋgo</b>	<b>ɛɛ</b>	‘peanut’
c.	<b>dombele-ŋgo</b>	<b>dombele</b>	‘rooster’s crest’
d.	<b>uri-ŋgo</b>	<b>uri:</b>	‘sapling’
e.	<b>a:l-ŋgo</b>	<b>a:le</b>	‘rain’
f.	<b>dendel-ŋgo</b>	<b>dendele</b>	‘round object’
g.	<b>komil-ŋgo</b>	<b>komile</b>	‘dry bark’
h.	<b>bur-ŋgo</b>	<b>buri:</b>	‘tender’

The nouns in (2) illustrate that words of different sizes and shapes generally behave in an identical manner. A closer look at these pairs also shows two distinct patterns of inflection, similar to what was first introduced in (1). For both lateral and rhotic noun stems, a given bare plural noun containing a word-final vowel can have a corresponding singular where its vowel is either present (2a-d) or absent (2e-h) upon suffixation. Under an analysis in which Najamba noun stems are all vowel-final, the instances in which this vowel is retained or lost are wholly unpredictable; such an assertion would leave no conditioning environment requiring the deletion of a final vowel in the (2e-h) singular nouns while requiring its retention in the (2a-d) singular nouns.

An entirely different picture emerges if we leave open the possibility that Najamba noun stems can be either vowel-final or consonant-final. More specifically, we propose that nouns like (2a-d) have stems that are truly vowel-final. Their stem-final vowel is retained when forming the singular, and thus, the singular is formed by a simple combination of stem+suffix. For nouns like (2e-h), we propose that these have stems that are instead consonant-final and, accordingly, that the formation of the singular is once again the result of a simple operation of suffixation.

Importantly, this suffixation resulting in a consonant-consonant sequence over a syllable boundary is possible only because the stem-final consonant of these nouns is a sonorant, and a sonorant is permitted in the coda position of a Najamba syllable, but only word-internally in most instances. Similar clusters can be found stem-internally, as in **kulma** ‘elder’ and **jo:rŋgal** ‘donkey disease.’

We propose that the word-final vowel in the plural nouns in (2e-h) is the result of epenthesis owing to the fact that the phonotactics of Najamba disprefer a closed syllable in word-final position, except in those instances noted in footnote 2. By proposing that Najamba noun stems can be either vowel-final or consonant-final, the patterns of inflection for number described in Heath (2011) become more transparent. Opening up this possibility alleviates the need to posit that the relationship between singular and plural pairs of such nouns is unpredictable. As we discuss in Section 3, the outcome is different for *obstruent* nouns, yet follows from the same principles that we have outlined thus far.

In addition to inanimate nouns like those in (2) that are inflected for singular number by the suffix **-ŋgo**, there exists an analogous set of nouns in this class that take a variant of this suffix, **-ŋge**. There does not appear to be any clear motivation, semantic or otherwise, for the selection of one suffix versus the other; however, what is important for our purpose here is that all nouns in the inanimate class behave similarly, regardless of the particular suffix that they select. That is, the patterns described above for vowel-final vs. sonorant consonant-final stems are identical in nouns

taking either **-ŋgo** or **-ŋge**. The inanimate nouns in (3) are bare in the plural and suffixed with **-ŋge** in the singular.

(3)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>pɛɛ-ŋge</b>	<b>pɛɛ</b>	‘chest’
b.	<b>dule-ŋge</b>	<b>dule</b>	‘pit’
c.	<b>tɛgɛɛ:-ŋge</b>	<b>tɛgɛɛ:</b>	‘side of face’
d.	<b>guli:-ŋge</b>	<b>guli:</b>	‘shed’
e.	<b>tongere-ŋge</b>	<b>tongere</b>	‘shallow hole’
f.	<b>dol-ŋge</b>	<b>dole:</b>	‘hole at base of house’
g.	<b>jel-ŋge</b>	<b>jele</b>	‘high spot near depression’

Like the nouns in (2), the stems of **-ŋge** inanimate nouns in (3) can be either vowel-final (3a-e) or sonorant-final (3f-g). Once again, vowel-final stems retain their final stem vowel in the suffixed singular, while sonorant-final noun stems have no intervening vowel between the stem and suffix in their singular. As above, we propose that the final vowel observed word-finally in plurals of the latter type is epenthetic and is inserted to avoid an impermissible word-final consonant.

The animate class in Najamba, like the inanimate class, inflects for number by suffixation. Nouns in this class are bare in the singular, while the plural is formed by addition of the suffix **-mbo**. An illustrative set of sonorant stem, animate nouns is given in (4), where the sonorant in the final syllable is a liquid.

(4)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>dela:</b>	<b>dela:-mbo</b>	‘elder sibling’
b.	<b>gula:</b>	<b>gula:-mbo</b>	‘axe’
c.	<b>dzalasari</b>	<b>dzalasari-mbo</b>	‘plow’
d.	<b>andasara</b>	<b>andasara-mbo</b>	‘white person’
e.	<b>nale</b>	<b>nal-mbo</b>	‘friend’
f.	<b>tale</b>	<b>tal-mbo</b>	‘hunter’
g.	<b>de:re</b>	<b>de:r-mbo</b>	‘statuette’
h.	<b>bobiri</b>	<b>bobir-mbo</b>	‘reed flute’

Two patterns are once again observed in these noun pairs. Both lateral and rhotic noun stems appear to either retain the vowel found word-finally in the singular form (4a-d) or lose it (4e-h). If all noun stems of this class were to be considered to have a static vowel-final shape, no conditioning environment would motivate the purported instances of syncope. Following such a proposal, vowel loss vs. retention would be unpredictable. As proposed for the inanimate noun class, we again suggest here that nouns of the animate class can be either vowel-final or consonant-final. The plural of both types are formed by simple affixation to the stem, while the singular of consonant-final stems (4e-h) requires epenthesis. Vowel-final stems (4a-d), on the other hand, are realized faithfully in the singular.

One characteristic that we can point out concerning the proposed epenthetic word-final vowel in consonant-final nouns, whether animate or inanimate, is that this vowel is always a front vowel; i.e., either [i], [e], or [ɛ], the choice of which appears to be conditioned largely by the quality of preceding stem vowel, with a handful of exceptions. In most instances, the front high vowel [i] is epenthesized when the preceding stem vowel is another high vowel. For example, following [u], as in /bur-/ → [buri:] ‘tender’ or following another [i], as in /bobir-/ → [bobiri] ‘reed flute.’ Exceptions like /keker-/ → [kekəri:] ‘clitorises’ may be due to dissimilation. When the preceding stem vowel is [o], [e], or [a], the epenthetic vowel is typically [e]. This can be seen in instances like /dendel-/ → [dendele] ‘round objects,’ /a:l-/ → [a:le] ‘rains,’ and /dol-/ → [dole:] ‘holes at

the base of a house.’ Finally, when the preceding stem vowel is [ɛ] or [ɔ], the epenthetic vowel is [ɛ], as in /tɛm-/ → [tɛmɛ] ‘sieve’ and /mɔm-/ → [mɔmɛ] ‘fetishes.’

These same patterns hold for nouns containing stem-final nasal consonants like those discussed in Section 2.2, where either the high or mid front vowel can be epenthesized word-finally. Once again, the selection of a particular vowel is conditioned by the quality of the immediately preceding vowel in the stem. The high vowel is selected when the preceding stem vowel is another high vowel, as in /bin-/ → [bini:] ‘big,’ while the mid vowel is selected elsewhere, as in /gon-/ → [gone] ‘water jar.’ Importantly, the aforementioned generalizations do not apply to vowel-final stems. This is owing to the fact that in such stems, the stem-final vowel is specified and can therefore be of any quality, rather than being limited to front vowels.

There are a few data points that appear to be more exceptional to the generalizations that we have just discussed. For example, words like /dʒalosar-/ → [dʒalosari] ‘plows’ and [butɛl] ‘bottle’ are borrowings from Fulfulde and French, respectively. Others differ between sources, such as **koro/kormbo** ‘chicken/chickens’ (Heath 2011) and **kɔrɔ/korombo** (same gloss; Hantgan 2009). Despite these exceptions, we would argue that they do not detract significantly from the overall phenomena under consideration.

## 2.2 Nasal Stems

Inflection for number is similar for inanimate nouns with *nasal* stems (i.e., stems whose last consonant is a nasal, whether the stem is vowel-final or consonant-final), in that we find evidence for both vowel- and consonant-final stem types based on the principles that we have defined thus far. Furthermore, the suffixed forms of *nasal* stems allow us to discuss another feature of Najamba morphophonology, namely the notion of stem vs. affix faithfulness. Faithfulness here refers to the preference that a language has to preserve and/or retain a particular feature or segment between the underlying and surface forms of a word. Such faithfulness effects have been discussed in detail, for example in Beckman (1998), and have been treated in various ways in different phonological frameworks (e.g., Prince & Smolensky 1993/2004). As we illustrate below, as a repair of an underlying sequence of two consecutive nasal consonants, Najamba prefers to preserve the stem nasal and delete the suffix nasal at the expense of an otherwise impermissible heterorganic NC sequence. Consider the inanimate nouns with nasal stems in (5).

(5)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>kina-ŋgo</b>	<b>kina</b>	‘bone’
b.	<b>bɔnɛ-ŋgo</b>	<b>bɔnɛ</b>	‘fontanel’
c.	<b>gone-ŋgo</b>	<b>gone</b>	‘squash’
d.	<b>tini:-ŋgo</b>	<b>tini:</b>	‘hip’
e.	<b>nɛm-go</b>	<b>nɛmɛ</b>	‘salt’
f.	<b>tun-go</b>	<b>tuni:</b>	‘mortar’
g.	<b>gon-go</b>	<b>gone</b>	‘water jar’
h.	<b>bin-go</b>	<b>bini:</b>	‘ladder’

There are, again, two possible outcomes for these nouns in the singular. Nouns like (5a-d) contain vowel-final stems in which the stem-final vowel is retained, as we have noted elsewhere, upon suffixation. Nouns like (5e-h) instead contain consonant-final stems; they behave in a similar but not identical way to other such nouns. While the vowel-final nouns in (5a-d) follow the expected pattern of suffixation noted in other nouns with *sonorant* stems, the nasal consonant-final noun stems must resolve an impermissible nasal-nasal sequence. In nouns like (5e-h), Najamba chooses to resolve this impermissible sequence of nasal consonants via deletion of the nasal consonant of the singular suffix, in favor of retaining the nasal consonant of the noun stem. The fact that the stem-final nasal is retained, rather than the affixal nasal, is clear from the place of articulation of the nasal consonant found in the resultant singular form of the noun.

Just as with the consonant-final (necessarily alveolar) liquid stems, these nouns show the failure of place assimilation to apply across a morpheme boundary, which is yet another example of stem faithfulness. However, whereas heterorganic liquid + nasal sequences are permissible within stems, NC sequences categorically agree, as the representative examples show in (6).<sup>4</sup>

(6)

- |    |               |                 |
|----|---------------|-----------------|
| a. | <b>komba</b>  | ‘leaves’        |
| b. | <b>pɛndɛ</b>  | ‘sores’         |
| c. | <b>sɔŋge:</b> | ‘mosquito nets’ |

Similar to what we noted above for *sonorant* noun stems, inanimate *nasal* noun stems can take either **-ŋgo** or **-ŋge**. The nouns in (7) illustrate this possibility and show that suffixation occurs in an identical manner as **-ŋgo** nouns, whether vowel-final (7a) or consonant-final (7b,c).

(7)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>da:ni-ŋge</b>	<b>da:ni:</b>	‘thickening syrup’
b.	<b>se:dun-ge</b>	<b>se:duni</b>	‘pounding area’
c.	<b>digin-ge</b>	<b>digini</b>	‘joint’

Again, we see evidence for affix nasal deletion and a subsequent heterorganic NC sequence in the nasal-final stems (7b,c). We see the same patterns in animate *nasal* stems, as illustrated in (8).

(8)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>onane:</b>	<b>onana-mbo</b>	‘smooth’
b.	<b>kɔmɔ:</b>	<b>kɔmɔ:-mbo</b>	‘sickle’
c.	<b>gaŋa</b>	<b>gaŋa-mbo</b>	‘cat’
d.	<b>boni:</b>	<b>bon-bo</b>	‘tomtom’
e.	<b>bane:</b>	<b>ban-bo</b>	‘horse’
f.	<b>bini:</b>	<b>bin-bo</b>	‘big’
g.	<b>kumi:</b>	<b>kum-bo</b>	‘unmarried person’

Stem-internal geminate nasals are peripheral in Najamba, usually arising in Fulfulde loans or probable composites (according to Heath’s grammar), as in **kaŋge** ‘gold’ and **samma** ‘quickly,’ respectively. Among the consonant-final stems (8d-g), we see a reflection of this restriction in (8g), where degemination of underlyingly identical segments is preferred: /**kum-mbo**/ → [**kum-bo**] ‘unmarried people.’ Finally, in the singular, unsuffixed forms of consonant-final stems, epenthesis of [i] or [e] typically repairs the underlying word-final coda. Again, only a few exceptions are found in Heath’s grammar (e.g., **kinu** ‘stone’ vs. **kin-mbo** ‘stones’) and do not detract from the larger phenomena at hand.

### 3. Obstruent stems

As the underlying nature of obstruent stems is somewhat obscured by larger pressures in Najamba, we find it necessary to start our discussion with some general characteristics of the language’s phonology. Most important to our concerns in this paper are phonotactic restrictions in place on the language’s syllable margins (i.e., onsets and codas). In Najamba, and certainly in many other

<sup>4</sup> An exception to this is found in the case of post-alveolar consonants, such as in **mendzu** ‘thin (Pl.),’ which may be due to an inventory constraint against palatal nasals in Najamba. The language assimilates to the nearby alveolar place of articulation instead.

languages, there are specific rules that govern the types of segments that are permitted to occur in a given margin position as well as types of permissible combinations across a syllable boundary.

The syllable shapes permitted in Najamba are CV, CVV, V, VC, and CVC. Of these possibilities, CV and CVV syllables are found in all word positions, while V and VC syllables are restricted to word-initial positions. CVC syllables are found word-initially and word-internally, but they generally do not occur word-finally in monomorphs, especially nominal ones. In some words, NCV syllables are found in which the nasal-consonant sequence is syllabified as a unit cluster in the onset.

Consonants of any type are permitted in the onset of a Najamba syllable; however, there are restrictions on the types of consonants that are permitted in codas (which are necessarily singleton in Najamba). While sonorant consonants are permitted in word-internal codas (as illustrated in section 2),<sup>5</sup> obstruent consonants (i.e., stops, fricatives, and affricates) cannot occupy this position. This sort of discrepancy in distribution falls neatly within sonority-based theories of the syllable, such as the Margin Hierarchy (Prince & Smolensky 1993/2004) and the Split-Margin Approach (Baertsch 2002), where certain syllabic positions prefer segments of different sonorities. The coda, in particular, prefers to be occupied by segments of relatively high sonority, such as sonorants, while the onset tends to prefer relatively low sonority segments. It is not surprising, then, that it is obstruents that Najamba chooses to ban from its codas, preferring instead high sonority consonants like nasals and liquids (except word-finally). As we show below, though, such a ban does not preclude evidence for obstruent-final stems.

As illustrated in (9), obstruent noun stems in Najamba at first glance do not appear all that different from the vowel-final sonorant stems proposed in section 2, in that both the bare and unsuffixed forms demonstrate a stem-final vowel. There is, however, one crucial aspect in which they differ: for some nouns (9a-f), this vowel is always the same, whereas alternations in the vowel quality can be noted between the two forms of others (9g-k). It is not coincidental that vowels of all qualities are observed in the non-alternating pairs, whereas some rather strong restrictions can be observed in the alternating pairs. Namely, the vowel in the suffixed (here, singular) form is limited to either [i, u] while the bare (plural) form is, without exception, [e]. Moreover, no suffixing sonorant stems exhibit this particular sort of vowel alternation; the vowel is either stable (i.e., vowel-final) or is overwhelmingly [e, i] alternating with null (i.e., sonorant-final).

(9)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>simba-ŋgo</b>	<b>simba</b>	‘leaf’
b.	<b>dɔdɛ-ŋgo</b>	<b>dɔdɛ</b>	‘ash’
c.	<b>masaku-ŋgo</b>	<b>masaku:</b>	‘sweet potato’
d.	<b>duɗaŋgɛ-ŋgɛ</b>	<b>duɗaŋgɛ:</b>	‘shack’
e.	<b>miside-ŋgɛ</b>	<b>miside</b>	‘mosque’
f.	<b>na:kindzi-ŋgɛ</b>	<b>na:kindzi:</b>	‘knee’
g.	<b>tebi-ŋgo</b>	<b>tebe</b>	‘plant’
h.	<b>andzu-ŋgo</b>	<b>andze</b>	‘roselle’
i.	<b>niŋgi-ŋge</b>	<b>niŋge</b>	‘green sauce’
j.	<b>mandzi-ŋgo</b>	<b>mandze</b>	‘papaya’
k.	<b>numbu-ŋgo</b>	<b>numbe</b>	‘cow pea’

The non-alternating stems (9a-f), whose vowel qualities span the entire inventory of the language, are analogous to vowel-final sonorant stems. Accordingly, we analyze such obstruent stems as vowel-final. In contrast, the unsuffixed (plural) stems (9g-k) mirror consonant-final sonorant stems in that an epenthetic vowel, limited in quality, repairs an illicit stem-final coda. However, unlike sonorants, which are allowed in coda position word-internally, obstruents may never occur even in

<sup>5</sup> Heath’s (2011) grammar also suggests that glides can occupy a syllable coda; however, we will not discuss these consonants further in this paper.

this position. We argue that the pre-suffixal vowel [i] or [u] is epenthetic as well in response to this restriction (see Section 4 for a discussion of what may motivate this behavior). For instance, the plural /teb-/ is realized [tebi] ‘plants’, versus the singular /teb-ŋgo/ → [tebi-ŋgo] ‘plant.’ We observe the same general patterning for obstruent stems in the animate class of nouns. Consider the examples in (10), where an obstruent is the final consonant of the stem.

(10)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>ganda</b>	<b>ganda-mbo</b>	‘mollusk’
b.	<b>pɛgɛ</b>	<b>pɛgɛ-mbo</b>	‘sheep’
c.	<b>nɔgɔ:</b>	<b>nɔgɔ-mbo</b>	‘husband’
d.	<b>sedzi:</b>	<b>sedzi-mbo</b>	‘aunt’
e.	<b>godze</b>	<b>godzu-mbo</b>	‘concubine’
f.	<b>ja-pande</b>	<b>ja-pandu-mbo</b>	‘widow’
g.	<b>sa:ge</b>	<b>sa:gu-mbo</b>	‘month’
h.	<b>silbe</b>	<b>silbi-mbo</b>	‘folding knife’

Again, we see a division between faithful stems (10a-d) of several vowel qualities and vowel-alternating stems (10e-h) with the same restrictions as in (9g-k). We propose the same analysis as above, namely, that these are underlyingly vowel-final and consonant-final, respectively.

It remains to be explained why different forms (suffixed vs. unsuffixed) prefer different vowels, as well as what factors may influence the selection of [i] vs. [u] as the epenthetic vowel in the suffixed form. As of now, we can identify no phonological factors influencing this choice. There are, however, potential parallels to be drawn elsewhere in Najamba in its mutating, non-suffixing nouns (which we discuss briefly in Section 4.1). A look at the behavior of other nominal suffixes seems to suggest that this sort of [e/ɛ] ~ [i/u] alternation (a) is triggered only by certain suffixes and (b) is limited to obstruent stems (monosyllabic stems aside). For example, we see this alternation before the abstractive suffix **-ge/-go** (e.g., **ɔgɔnde**: ‘rich person’ ~ **ɔgɔndi-ge** ‘richness’ and **godze** ‘concubine’ ~ **godzu-go** ‘illicit sex’) and the deverbal suffix **-le** (e.g., **dɔgɛ** ‘leave’ ~ **dogi-le** ‘act of leaving’ and **tugudze** ‘scrub’ ~ **tugudzi-le** ‘act of scrubbing.’ In contrast, this alternation is not exhibited in sonorant stems, and it is not conditioned by the addition of any suffix. For instance, another deverbal suffix **-nda** fails to condition any alternation; e.g., **dɔgɛ-nda** ‘act of leaving’ and **tugudze-nda** ‘act of scrubbing.’ The [e/ɛ] ~ [i/u] alternation may also be the only significant one in vowel quality exhibited in the suffixing nouns, though this remains to be quantified.

In sum, concerning these stems, we propose that such obstruent stems with alternating vowels are necessarily consonant-final at the underlying level. Whether or not this will need to be re-examined as additional work is done on Najamba remains to be seen. At present, we would argue that an analysis which at the very least allows for obstruent-final stems is far preferable to one that places restrictions *a priori* at the underlying level. That is, we believe the lack of obstruent codas must not be necessarily attributed to their absence at the underlying level, but rather that processes visible elsewhere in the language (i.e., epenthesis) may repair such an underlying sequence, in keeping with principles such as Richness of the Base (e.g., Smolensky 1996, among others).

#### 4. Discussion and conclusion

Taken together, the data that we have presented illustrate distinct patterns of inflection in sonorant and obstruent stems that correspond to whether or not the stem is vowel-final or consonant-final. Based on these factors, one can readily predict the patterns of inflection for different stem shapes. For sonorant stems, both vowel- and consonant-final stems permitted simple suffixation, resulting in a sonorant coda in the case of the latter type. The two stem types were ambiguous, however, in their bare forms, given the general ban on word-final consonants in Najamba.

Consonant-final obstruent stems are less easily identifiable, due to the impermissibility of obstruent codas anywhere in the word. We proposed that underlyingly consonant-final stems are



identifiable by the presence of certain vowel alternations between corresponding suffixed and unsuffixed forms, owing to the fact that these vowels are epenthetic and are only drawn from a subset of the language's vowels. Vowel-final obstruent stems, however, are stable (i.e., never alternating) due to stem faithfulness. Furthermore, the vowels found associated with these stems may be of any type. With this in mind, we turn in the next section to the mutating, non-suffixing nouns as a point of comparison with these consonant-final obstruent stems. We then finish the section with a discussion of how general phenomena in syllable structure may influence the inflectional patterns of nouns in Najamba (Section 4.2).

#### 4.1 Mutating nouns

The third class of nouns in Najamba, which we discuss briefly in this section for the sake of comparison, is inflected for number via mutation of the stem-final vowel. This process is known in the literature as apophony (e.g., Ségéral 1995; Spencer 2001) and refers to morphologically-conditioned vowel alternations that are most often the result of inflection but may, in some instances, also result from derivation. Apophony is found in a number of languages, a well-known case being that of ablaut in Indo-European (e.g., English and German strong verbs) and Semitic (e.g., Arabic, Berber, Hausa) languages, among others. Najamba mutating nouns exhibit two types of apophony, one of which is reminiscent of a classic case of ablaut in which back vowels become front vowels in a defined environment. A second sub-class of mutating nouns in Najamba undergo a quasi-reversal of this process in that front vowels undergo some combination of backing and lowering in a similarly defined environment. Heath (2009) attributes these instances of apophony to featural affixation.

Just as Najamba suffixing nouns comprise two classes based upon their being animate or inanimate, so too can mutating nouns in the language be split into similarly defined categories. Consider first those Najamba animate mutating nouns whose stem-final vowels are low and/or back (i.e., [u], [o], [ɔ], or [a]) in their respective singular forms, but when inflected for the plural, these vowels mutate via fronting and/or raising to front vowels (i.e., [i], [e], or [ɛ]). As per the discussion in Heath (2009), [u] mutates either to [i] or [e], while [o] mutates only to [e]. Both [ɔ] and [a] mutate only to [ɛ]. Illustrative examples of this type of mutation are provided in (11).

(11)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>patu</b>	<b>pati</b>	'goatskin bag'
b.	<b>bindu</b>	<b>binde</b>	'intestines'
c.	<b>giro</b>	<b>gire</b>	'eye'
d.	<b>nɛndɔ</b>	<b>nɛndɛ</b>	'tongue'
e.	<b>numa</b>	<b>numɛ</b>	'hand'

Najamba inanimate mutating nouns behave somewhat differently in that, rather than exhibiting a classic ablaut-like fronting and raising, these nouns instead undergo backing and lowering. More specifically, nouns in this subclass having a stem-final front vowel in their singular form have a back or low vowel in their corresponding plural. Once again, according to Heath's data, stems ending in [e] or [i] mutate to either [u] or [a] in the plural, while stems ending in [ɛ] mutate to [o], [ɔ], or [a] in the plural. Note, though, that alternations with [a] in the plural, especially with [e] in the singular are very rare in the grammar. If this particular alternation is set aside, the inanimate nouns' alternations are the mirror image of those of the animate nouns. Representative nouns from this subclass are in (12).

(12)

	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>
a.	<b>sambe</b>	<b>sambu:</b>	'spear'
b.	<b>ane</b>	<b>ana:</b>	'man'

c.	<b>da:ɣɛ:</b>	<b>da:ga:</b>	‘Tuareg clan’
d.	<b>tɔmbɛ</b>	<b>tɔmbɔ:</b>	‘Tommo’
e.	<b>na:dʒi:</b>	<b>na:dʒu:</b>	‘goat kid’

There is a key difference between the singular to plural mutation effects seen in stem-final vowels (11) and (12) and the relationship between the less transparent stem vowels vs. epenthetic vowels in the suffixing nouns with obstruent stems discussed in Section 3. We have seen in (11) and (12) that in both noun sub-types, mutations affect a subset of possible vowels, translating them into a complementary subset. That is, in (11), stem-final **[u, o, ɔ, a]** mutate to **[i, e, ɛ]**, while in (12), the mutation affects the same subsets of vowels in the opposite direction; **[i, e, ɛ]** mutate to **[u, o, ɔ, a]**. In suffixing nouns with obstruent stems, however, the situation is much different. In those stems that we propose are vowel-final, there is no alternation between the word-final vowel in an unsuffixed form and the pre-suffixal vowel in a suffixed form; both vowels are identical (cf. 10a-d). For those stems that we propose are consonant-final, we find an alternation between the word-final vowel in unsuffixed forms and the pre-suffixal vowel in suffixed forms. Importantly, these alternations involve only a subset of vowels. The epenthetic vowels and their respective alternants are always selected from the subset **[i, e, or u]** (cf. 10e-h).

#### 4.2 Syllable structure

It is helpful to consider and discuss from both descriptive and theoretical standpoints several issues that come to light in the observed distribution of syllable types in Najamba. We have seen that Najamba readily permits open syllables containing a short vowel or long vowel, i.e., CV and CVV, respectively, in all word positions. The language also permits CVC syllables closed by a sonorant consonant, but these are generally restricted to word-internal positions, with a few notable exceptions. In comparison, syllables closed by an obstruent coda are never permitted in any word position. Word-final sonorants are not typically found in nouns and adjectives, but they are accommodated in some instances in loanwords, particles, and some verbs. While it may seem typologically marked for a language to prefer word-internal closed syllables while generally avoiding them word-finally, this is in fact a well-attested cross-linguistic trend. Downing (2005), for example, discusses a similar situation in such typologically diverse languages as Italian, Japanese, and Axininca Campa. Certain languages of the Bantu sub-family also exhibit a similar syllable type distribution. Zec’s (1995) characterization of Pali provides another example of this phenomenon. In this section, we consider other motivations for this particular distribution of syllables in Najamba.

First, it may be tempting to consider that the preference for word-internal closed syllables and the avoidance of word-final closed syllables is a reflex of the principle of *contextual weight* (e.g., Rosenthal & van der Hulst 1999; Morén 2000). In certain languages where contextual weight is at play, CVC syllables found in different word positions have different weights. That is, in one position, they are monomoraic and light, while in other positions, they are bimoraic and heavy. In the case of Najamba, one could argue that word-internal CVC syllables are light but that word-final CVC syllables are heavy, thus necessitating their avoidance. However, this proposition cannot capture the observed syllable distribution in Najamba. Although it captures the general dispreference for word-final CVC syllables, it does not explain the presence of word-final and uncontroversially heavy CVV syllables which are found more abundantly in the language. Najamba, therefore, does not systematically avoid heavy syllables word-finally.

From a different standpoint, one could address the distribution of closed syllables in Najamba by positing that while CVC syllables in the language are generally made heavy via *Weight by Position* (e.g., Hayes 1989), this rule simply does not apply word-finally. This would, of course, have no effect on the status of word-final open syllables, which we have shown are readily accommodated in Najamba. An analogous case wherein syllables of particular types are treated differently in word-internal vs. word-final position is discussed in Ragheb & Davis (2014). These authors report that in certain varieties of Arabic, despite the fact that CVC syllables are heavy word-internally, they are light word-finally and cannot receive stress. Word-final syllables closed by a geminate, however, are treated as heavy in all instances and receive stress accordingly. While

there is no independent evidence that word-internal CVC syllables are heavy in Najamba, we cannot rule out this possibility, but perhaps further inquiry into the details of the language's tonology could provide additional perspective on this proposition. Until such research can be undertaken, we propose that all CVC syllables in Najamba are made heavy, except for in word-final position. In doing so, we argue that weight is not necessarily a factor in the distribution of Najamba syllables, but rather that their distribution is attributable to their shape and constituency.

Two additional points concerning the behavior of nasal consonants remain to be discussed. First, as we have seen in the data presented above, nasal consonants are not restricted in their distribution. They may exist as singleton consonants in a syllable onset and also in homorganic clusters with a following obstruent, as in both the **-ŋgo** and **-mbo** suffixes explored in this paper. In the absence of phonetic data on these NC sequences, the precise details of their syllabification are somewhat unclear. Yet, some preliminary observations can be made; namely, it would appear that their syllabification depends on surrounding factors. In certain cases, one could argue for their syllabification as a unit cluster in a syllable onset (i.e., tautosyllabic). Though somewhat marginal, this is most likely the case in certain native words (according to Heath) beginning with a homorganic NC sequence, such as **ndɛ** 'give,' **ndʒi** 'honey,' and **ŋgwɛ** 'dog.' As there is no independent evidence for complex codas in Najamba, this is also likely to be the case in the suffixed form of consonant-final *liquid* sonorant stems, where the stem-final consonant comes into contact with the NC sequence of the suffix. In such cases, we assume the NC sequences to be syllabified in the following onset.

The syllabification of NC sequences is arguably less clear when the preceding coda position is unoccupied. In such instances, it is reasonable to expect that the nasal consonant is syllabified in the coda of a preceding syllable, especially given that word-internal nasal codas are typologically less marked structures than are NC onset clusters. Downing (2005) provides evidence indicating that homorganic NC clusters may pattern together as a cluster in some instances, yet they tend to have an ambiguous syllabification depending on the context in which they appear. Based on this cross-linguistic observation, we propose that is reasonable in Najamba for the nasal of a homorganic NC sequence to be syllabified in a preceding coda in the absence of a stem-final consonant capable of filling the coda position. Thus, the nasal consonant of suffixes like those mentioned above could be syllabified in a coda position but alternatively syllabified in a following onset if the preceding coda position is already filled by another consonant.

It was also discussed above that Najamba avoids sequences of geminate nasal consonants, and specifically those that result upon the suffixation to a nasal-final stem. In these instances, the illicit geminate sequence is resolved via deletion of one of the two nasal consonant, and we have argued that it is always the nasal of the affix that is removed. This outcome is made clear given that the resolution to such situations, when relevant, is a heterorganic NC sequence. This is markedly different from the homorganic NC sequences discussed just above. Thus, a clear argument can be made that the nasal of these sequences is syllabified in a coda position, as not even a place node is shared with the following obstruent consonant. These are among the strongest illustrations found in the language for the strength with which this language resists alterations to the stem. At present, although these factors reveal more about Najamba's morphophonology, they have little bearing on our overall analysis concerning diagnostics for determining the shape of Najamba noun stems.

## 5. Conclusion

In this paper, we presented a morphophonological account of suffixing nouns in Najamba. In contrast with Heath's (2011) analysis, where syncope appeared to apply unpredictably, we propose that several phenomena reflect a stem's nature as underlyingly vowel- or consonant-final. On one hand, vowel-final stems can be identified by their lack of alternation, regardless of the consonant quality of their final syllable. These stems may also end in any vowel in the language's inventory. On the other hand, consonant-final stems display different behavior depending on the quality of the final syllable's consonant. In general, sonorant-final stems are identified by the alternation of a stem-final vowel in the bare form with null in the suffixed form (regardless of animacy and therefore whether the suffixed form is singular or plural). Nasal-final stems trigger additional

deletion of the initial nasal consonant in the suffix. Meanwhile, the bare form's vowel is limited to [e, i] and largely corresponds with the height of the previous vowel. This final vowel in the bare form we analyze as epenthetic, in response to a ban against word-final coda consonants (which is, though somewhat rare, attested in typologically diverse languages). Finally, due to a general ban in Najamba against obstruent codas anywhere in the word, obstruent-final stems are more difficult to identify but are evidenced by an alternation between a word-final [e] in the bare form with a pre-suffixal [i, u]. The motivation behind this particular alternation, or between the choice of [i] and [u] in the suffixed form, requires further exploration into the phonology of Najamba in general, though points of contact may be found in the mutating (non-suffixing) nouns as well as in nominal suffixes beyond inflection for number. Diachronic changes may also be informative about these phenomena, as we learn more about Najamba and Dogon languages in general.

### References

- Baertsch, Karen. (2002). *An optimality theoretic approach to syllable structure: The Split Margin Hierarchy*. Doctoral dissertation, Indiana University, Bloomington.
- Cinque, Guglielmo. (2013). *Typological studies: Word order and relative clauses*. New York: Routledge
- Beckman, Jill. (1998). *Positional Faithfulness*. Doctoral dissertation, University of Massachusetts, Amherst.
- Downing, Laura. (2005). On the ambiguous segmental status of nasals in homorganic NC sequences. In Marc van Oostendorp & Jeroen M. van de Weijer (Eds.), *The Internal Organization of Phonological Segments*, 183-216. Berlin: Mouton de Gruyter, 2005.
- Hantgan, Abbie. (2009). Bondu-so (aka Najamba-Kindige) lexicon and word list of emotions. Retrieved from <http://dogonlanguages.org/dictionaries.cfm>, August 15, 2016.
- Hayes, Bruce. (1989). Compensatory Lengthening in Moraic Phonology. In John A. Goldsmith (Ed.), *Phonological Theory: The Essential Readings* (pp. 351-364). Malden: Blackwell.
- Heath, Jeffrey. (2011). *A grammar of Najamba*. Retrieved July 1, 2016 from Dogon and Bangime Linguistics, <http://dogonlanguages.org/grammars.cfm>.
- Heath, Jeffrey & Laura McPherson. (2013). Tonosyntax and reference restrictions in Dogon NPs. *Language* 89(2), 265-296.
- Morén, Bruce. (2000). The puzzle of Kashmiri stress: Implications for weight theory. *Phonology*, 17(3), 365-396.
- Prince, Alan & Paul Smolensky. (1993/2004). *Optimality Theory: Constraint interaction in generative grammar*. Malden, MA: Blackwell.
- Ragheb, Marwa & Stuart Davis. (2014). On the L1 development of final consonant clusters in Cairene Arabic. In Reem Khamis-Dakwar & Karen Froud (eds.), *Perspectives on Arabic Linguistics XXVI* (pp. 263-281). Philadelphia/Amsterdam: John Benjamins.
- Rosenthal, Sam & Harry van der Hulst. (1999). Weight-by-Position by position. *Natural Language & Linguistic Theory*, 17(3), 499-540.
- Ségéral, Philippe. (1995). Une théorie généralisée de l'apophonie. Paris: Thèse de doctorat, Université Paris 7.
- Smolensky, Paul. (1996). The initial state and 'richness of the base' in Optimality Theory. *Rutgers Optimality Archive, ROA-154*.
- Spencer, Andrew. (2001). Morphophonological operations. In Andrew Spencer & Arnold M. Zwicky (Eds.), *The handbook of morphology*, 123-143. Hoboken, NJ: Wiley & Sons.
- Zec, Draga. (1995). The Role of Moraic Structure in the Distribution of Segments within Syllables. in Jacques Durand & Francis Katamba (Eds.), *Frontiers of phonology: Atoms, structures, derivations*, 149-179. Longman: London.