

Nasals, Glides, and Complex Onsets in Kirundi

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The Big Puzzle

- Much of the Bantu literature suggests that syllables are underlyingly CV.
- Upon hearing Kirundi, this doesn't *sound* like the case.
 - *imbwa* → [i.**mbga**] 'dog' 
 - *umwana* → [u.**mŋaa.na**] 'child' 
 - *kiramutwara* → [ki.ra.mu.**tkwa.ra**] 'he carried it' 
 - *urwarwa* → [u.**rgwaa.rgwa**] 'banana wine' 
- Early descriptions refer to these onsets as **consonant clusters (N)C(G)V** (Meussen 1959, Kimenyi 1979, Niyonkuru 1983).
- More recent accounts argue that they are **single multiply articulated segments** **^NC^GV** (Sagey 1986, Niyondagera 1993).
 - Prenasalization
 - Secondary articulation of glide/semivowel features
- Phonetic studies disagree on whether articulation is co-occurring or separate...

Breaking the Big Puzzle into Smaller Puzzles

- Based on preliminary research, I suggest that neither representation is exactly right. Instead, we are seeing strings of empty-headed syllables.
- To arrive at this claim, I've split the big puzzle into 3 smaller puzzles.

- ★ Puzzle 1: Can voiceless stops be prenasalized?
- ★ Puzzle 2: Why does the prefix n- sometimes become ny- before a vowel?
- ★ Puzzle 3: Why do we always hear clusters where there are glides?

Overview

1. Background
2. Puzzle 1: NC Clusters
3. Puzzle 2: N-V Glides
4. Puzzle 3: Glides
5. Areas for Further Research

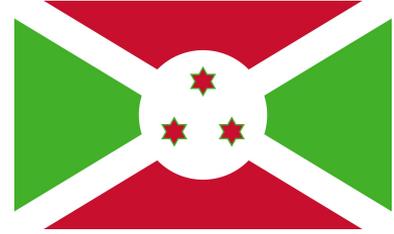
*Thanks to Benilde Mizero, Claire Henderson, Terrance Gatchalian, and Heather Goad!



The Drummers of Burundi (*ngoma* 'drum/throne')

Background on Kirundi

- Kirundi is a **Bantu language**, classified as Zone J (Great Lakes) (Bastin 2003).
- Kirundi is spoken by **~12 million speakers**, primarily in Burundi where it is the national language.
- Kirundi is part of a **dialect continuum** with Kinyarwanda and smaller language communities in Tanzania, Uganda, and the DRC.
- Like most Bantu languages, Kirundi has an extensive system of **affixes** (16 noun classes), **CV syllables**, and **tone**.



Background: Phoneme Inventory (Kochetov 2016)

| | Lab | Cor | | Dor | Lar |
|------------|-----|----------|-----------|-----|-----|
| | | anterior | posterior | | |
| stops | p | t | | k | |
| | b | d | | g | |
| affricates | pf | ts | tʃ | | |
| | | ɬ~z | ɟ~ʒ | | |
| fricatives | f | s | ʃ | | h |
| | v | | | | |
| nasals | m | n | ɲ | | |
| liquids | | r | | | |
| glides | | | j | w | |

| | front | | back | |
|------|-------|----|------|------|
| high | i | i: | | u u: |
| mid | e | e: | | o o: |
| low | | | a | a: |

Of note:

- Voiceless stops/affricates are aspirated.
- /r/ is more of a tap.
- /p/ may have been lost (or nonexistent) and then (re-)introduced.
- [pf]~[f]; [bv]~[v]
- /b/ is most commonly heard as [β] or even [β̞].
- [ɟ] may be phonemic while [c] is an allophone of [k] before high vowels.

Background: Noun Morphology

- The typical noun is composed of augment V + noun class prefix + root.
- Take the root *-rundi* meaning ‘Burundi’.

| Kirundi | Translation | Kirundi | Translation |
|----------------|--------------------------|----------------|---------------------|
| u-mu-rundi | ‘a Burundian’ | a-ka-rundi | ‘a small Burundian’ |
| a-ba-rundi | ‘Burundians (pl.)’ | u-tu-rundi | ‘small Burundians’ |
| u-bu-rundi | ‘Burundi (the country)’ | i-ki-rundi | ‘a big Burundian’ |
| i-ki-rundi | ‘the Burundian language’ | i-bi-rundi | ‘big Burundians’ |

Puzzle 1: *N-* noun class

- Noun class 9 (*N-*) creates nasal complexes across morphemes.
- The homorganic *N-* receives place from the following consonant across the board.
 - in+siguro → [insiguro] ‘explanation’
 - in+boga → [imboga] ‘vegetable’
 - in+goma → [ingoma] ‘drum’
- Many Bantu languages have restrictions on which *N+C* clusters can appear, especially wrt voiceless stops (Hyman 2019).
 - Question 1: what restrictions exist in Kirundi?
- Bantu syllables are generally open and syllables are CV.
 - Question 2: are Kirundi *NC* clusters just prenasalized consonants (vs separate segments or syllabic nasals)?

Puzzle 1: NC Patterns Beyond Place Assimilation

| Consonant | Pattern | Input | Output | Translation |
|---------------------------|--------------------------|-------------|------------|-------------|
| Voiced stops | n/a | in+goma | ingoma | 'drum' |
| Tap | Hardening to voiced stop | in+rimitiro | indimiro | 'field' |
| Voiced bilabial fricative | Hardening to voiced stop | in+βizi | imbidzi | 'stream' |
| Other fricatives | Potential fortition | in+vura | im(b)vura | 'rain' |
| Affricates | n/a | in+tsiinzi | intsiindzi | 'victory' |
| Voiceless stops | De-stopping | in+koko | inghoko | 'chicken' |

Puzzle 1: The Curious Case of Voiceless Stops

- The data
 - intama → [in^haama] ‘sheep’
 - inkoko → [in^hkoko] ‘chicken’
 - impene → [im^hene] ‘goat’
- What’s going on?
 - The nasal gets place from the voiceless stop
 - The stop deletes but its aspiration does not.
 - The result is a nasal and a voiced glottal fricative.
- This aligns somewhat with Demolin & Devaux’s 2001 analysis of Kinyarwanda: "Consonants previously described as voiceless prenasalized stops in Rwanda are in fact whispery voiced nasal stops."
- >> Neither [N^h] nor [N^h] looks like prenasalization; a glottal fricative can’t be prenasalized.
 - How would an underlying /^ht / surface as /n^h/?

QUICK GOAT-RELATED TANGENT ALERT!



Wait a minute...what about that 'p'???

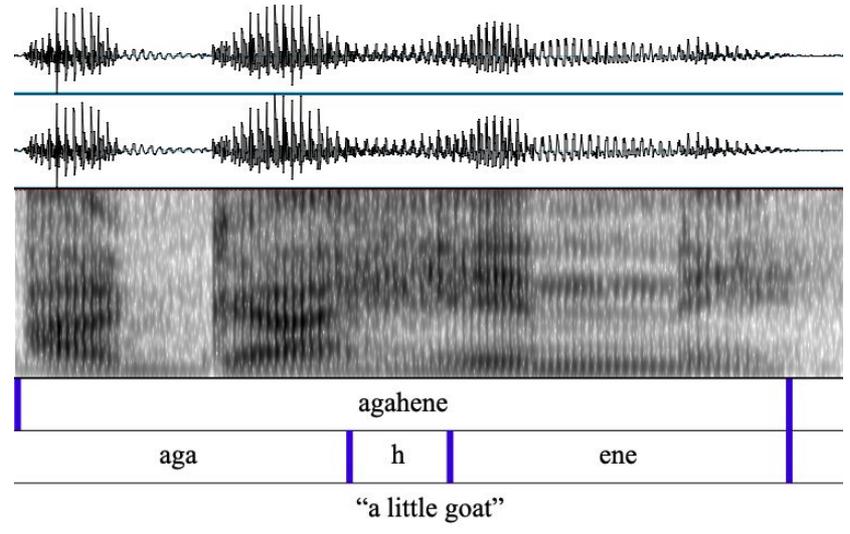
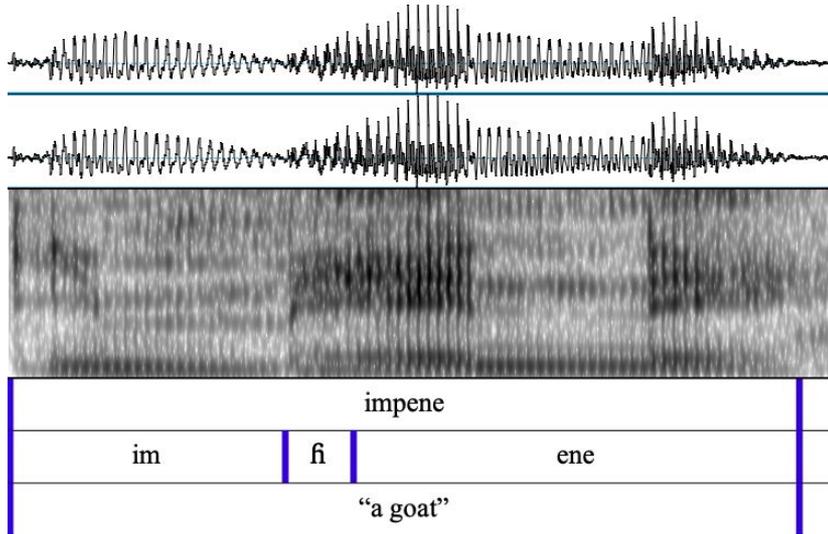
- If you recall, /p/ is lacking in the native Kirundi grammar so why are we seeing it in *impene* 'goat'?
- To confirm the root of class 9 nouns, we can compare them with their diminutive counterparts in class 12 (*aka-/aga-*).
 - *imboga* 'vegetable' vs *akaboga* 'little explanation'
- For 'goat' and many other 'p'-words, we find an 'h' in the diminutive in the orthography.

| Class 9 (orthography) | Class 12 (orthography) | Translation |
|-----------------------|------------------------|-------------|
| impene | agahene | 'goat' |
| impera | agahera | 'end' |
| impuzu | agahuzu | clothing |

- We also see this in verbs after the 1sg obj. prefix *n-* in Kirundi *mpa* 'give me' vs *guha* 'to give'.

Tangent: Goat in Praat*

- And we find a distinction in the voicing of the glottal fricative in the pronunciation.



- Post-nasally, the fricative looks voiced whereas in the root, it looks voiceless.
- The consultant also commented that he could feel a difference between the two sounds.

**Huge thanks to Claire Henderson for the Praat examples!*

Tangent: The Case of the Phantom 'P'

- So...**voiceless** glottal fricatives pattern with **voiceless** stops after nasals?
 - The consultant suggested this may apply to other voiceless fricatives (like /s/) but more data is needed.
- But unlike voiceless stops, /h/ has no place to share with its preceding nasal so how is /in-hene/ becoming [imhene]?
- Proto-Bantu *p frequently weakens to [h] or [w] but that is blocked after a homorganic nasal (Hyman 2019).
 - This would support the claim that /p/ used to exist in the phonology but has been lost.
- Potential next step: test an h-initial and p-initial loan word post-nasally.
 - Would an underlying 'p' manifest the same way as an 'h'?
 - Ex: gu-pacifi-a ('pacifier' Fr.) vs gu-hug-a ('hug' Eng.)

Puzzle 2: Proto-Bantu class 9 *ni-

- Some historical linguists suggest that noun class 9 N- is derived from Proto-Bantu *ni (Hyman 2019).
- This helps explain N+V derivations like:
 - in+eegamo → injeegamo / ijeegamo ‘back of chair’
 - We know the root starts with a vowel because - iki+eegamo → it̪jeegamo ‘back of chair’ (class 7)
- In contrast, the 1sg subject prefix n- joins with a vowel initial verb root without a glide.
- Note: it is very hard to find vowel-initial noun roots because vowel hiatus is always repaired. This leads to dictionary entries like:
 - iny-ondwe / in-yondwe ‘tick’
- More research on vowel-initial noun roots is needed as I suspect some re-lexicalization of roots with an initial [j] is going on.
 - ub-uuki ‘honey’
 - but...uru-juuki ‘bee’ & in-dzuuki ‘bees’

Puzzle 2: N- as an empty-headed syllable

- If N- was originally *ni-, could all nasals of NC clusters be empty-headed syllables instead of prenasalization?
- Maddieson & Sands (2019) note that there is a “marked central vocoid” between the [m] and [g] of words like [imga].
 - Note: This word is more often written as *imbwa* and pronounced [imbga]. Maybe M&S miswrote this.
- Could this be evidence of empty-headedness?

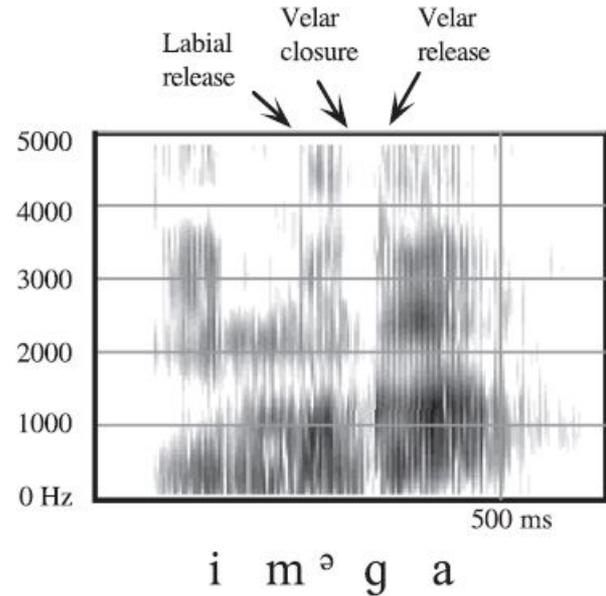


FIGURE 3.14 SPECTROGRAM OF RWANDA JD61 *imwa* [im^əga] ‘DOG’ SPOKEN BY A MALE SPEAKER.

Puzzle 3: Some Quick Context on Glides

- There are two glides in Kirundi: /j/ and /w/.
- Though uncommon, some noun roots seem to exist with an initial /j/
 - As noted before, this could be repair/re-lexicalization.
- Significantly, there are no noun roots in the Philips 2005 Kirundi dictionary that begin with /w/.
- I found 15 entries of post-vocalic /w/ total. All refer to variations of the 1s pronoun *wewe*, greetings/exclamations such as *mwiriwe* ‘good afternoon’ and loanwords like *ikawa* ‘coffee’ (Arabic).
- At the very least, /w/ does not appear to exist in Kirundi outside of vowel hiatus repair.
 - This is supported by Proto-Bantu which also lacks /w/.
- It’s possible /j/ is also only present through derivation.

Puzzle 3: Glide Strengthening/Palatalization

- When glides appear after a consonant, glide strengthening or palatalization occurs.
- This is why we saw [imbga] earlier for /imbwa/ ‘dog’.

| | | | |
|---------|-----------|-------------|---------------|
| Labial | Voiceless | /pw/, /fw/ | [pk], [fk] |
| | Voiced | /bw/ | [bg] |
| | Nasal | /mw/ | [mŋ] |
| Coronal | Voiceless | /tw/, /sw/ | [tkw], [skw] |
| | Voiced | /dw/, /dzw/ | [dgw], [dzgw] |
| | Nasal | /nw/ | [nŋw] |
| | Rhotic | /rw/ | [rgw] |

| | | | |
|---------|-----------|-------------|--------------|
| Labial | Voiceless | /py/ | [fç] |
| | Voiced | /vy/ | [vʝ] |
| | Nasal | /my/ | [mɲ] |
| Coronal | Voiceless | /ty/, /sy/ | [tç/c], [sç] |
| | Voiced | /dy/, /dzy/ | [dʝ], [dʝ] |
| | Nasal | /ny/ | [ɲ] |
| | Rhotic | /ry/ | [rʝ] |

Puzzle 3: Glide Formation

- Following the claim that glides only exist in Kirundi as repair of vowel hiatus, all consonant+glide strings are underlyingly CV+V.
 - ku-aandika → kwaandika ‘to write’
 - ku-iit-u-a → kwitwa ‘to be called’
 - imi-aaka → imyaaka ‘years’
 - iri-iinyo → iryiinyo ‘tooth’
- This looks similar to the construction of vowel-initial nouns in class 9 (assuming PB *ni-).
 - i-ni-eegamo → inyeegamo ‘back of chair’
- Could a similar empty-headed syllable phenomena be happening here as well?

Puzzle 3: Empty-headedness extended to CC?

- Interestingly, Maddieson & Sands (2019) point out a vocoid between [b] and [g] in [akabga] just as they did post-nasally in [imbga].
- We found a similar vocoid between [r] and [ʃ] in [gusarʃa].

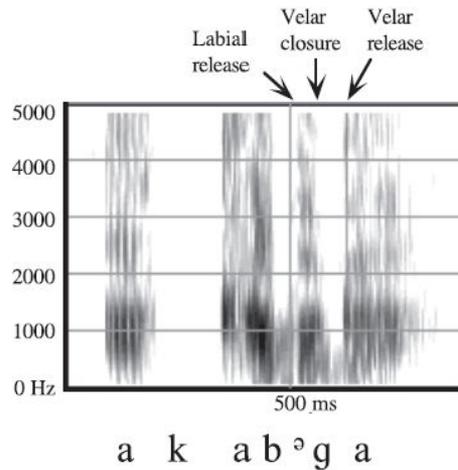
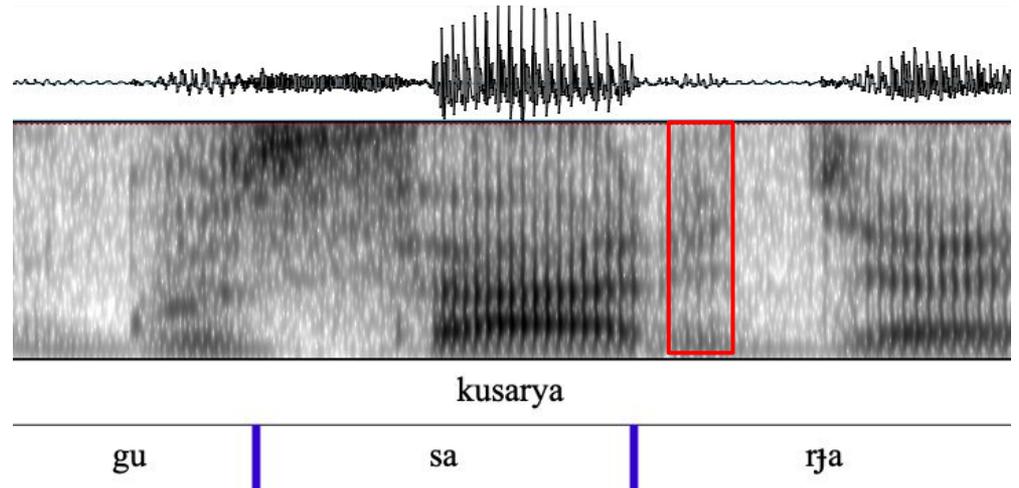


FIGURE 3.15 SPECTROGRAM OF RWANDA JD61 *akabwa* [akab^əgā] 'DOG (DIMINUTIVE)'; SAME SPEAKER AS IN FIGURE 3.14.



Puzzle 3: No Vocoids Between Voiceless Cs

- However, the pattern does not extend to voiceless consonant clusters.
- This is not too surprisingly because it would be strange to have a voiced vocoid between voiceless segments.
- Nevertheless, we do see that articulation of the two stops is not overlapping.
- More data is needed to assess the phonetics of the full range of clusters.

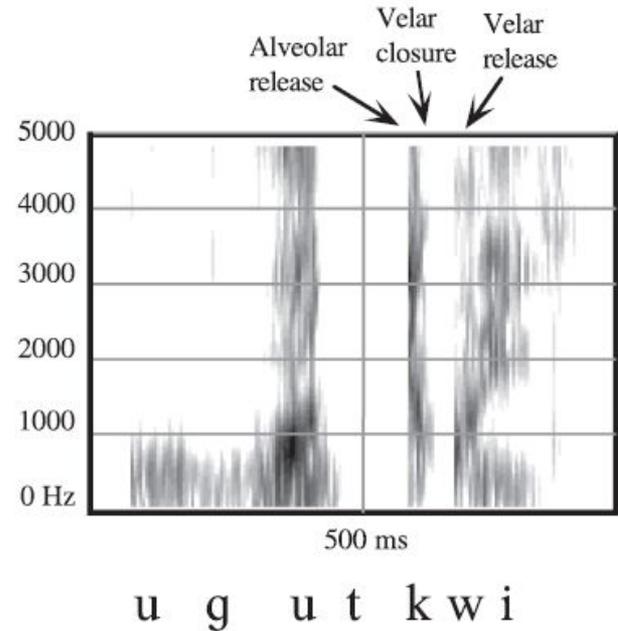


FIGURE 3.16 SPECTROGRAM OF RWANDA JD61 *ugutwi* [*ugutkwi*] 'EAR'; SAME SPEAKER AS FIGURE 3.14.

Putting the Smaller Puzzles Back Together

- Nasals in NC clusters appear to be separate segments at least across morphemes.
 - Evidence: voiceless stops (and maybe fricatives) cannot be prenasalized.
- Some nasals (class 9 prefixes, some verbal prefixes) and all glide segments are underlyingly syllabic.
 - Evidence: when class 9 N- joins a vowel-initial root, a glide appears (i-ni-V → i-ny-V)
 - Evidence: when two vowels are in hiatus, a glide repairs (tu-V → tw-V)
- Spectrogram data suggests that small vocoids appear between nasals and voiced consonants as well as between two voiced consonants, within clusters.
- >>Hypothesis: Instead of complex onsets or multiply articulated single segments, voiced Kirundi clusters are strings of empty-headed syllables.
 - Because some nasals in Kirundi are not underlying ni-, we should not see this pattern when they appear before a consonant.

Future research questions

- Nasals
 - Do other voiceless fricatives change after nasals (like /h/)?
 - If N- is an empty-headed syllable, is it weird that it's getting place from the following consonant?
 - If PB *ni- had place, why does N- not?
- Glides
 - Can we find evidence that /j/ is in the grammar outside of vowel hiatus repair?
 - What is going on with voiceless consonant - glide clusters?
 - In clusters where the [w] is present after strengthening, is this secondary articulation or a separate segment?
- Lots more elicitation and spectrograms!!!

Murakoze cane!



urwarwa 'banana wine'