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**Phonological re-analysis:**
# Classifying a problematic vowel in Nadëb

Mark Simmons
University of Texas at Austin
marks21@utexas.edu

## 1. Introduction

Nadëb is a Naduhup language with "approximately 500 speakers" (Epps forthcoming) who mostly live near the Uneiuxi river and Paraná Boá-Boá region in northwestern Brazil. Limited documentation has been undertaken on it. Barbosa (2005) and Martins (2005) describe Nadëb phonology, and Weir (1986) provides a sketch of the grammar.

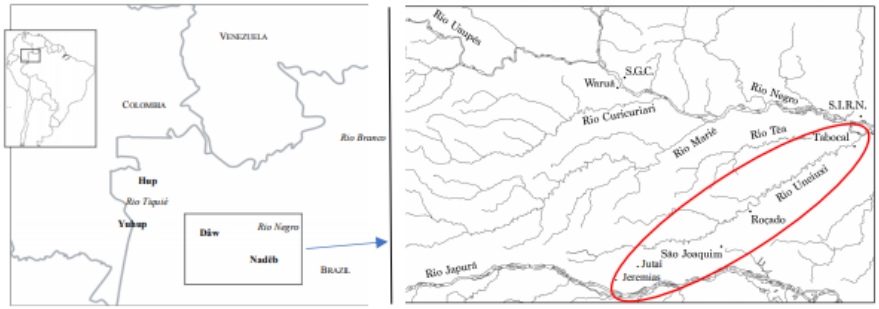


**Figure 1.** The Upper Rio Negro Region; Inset: Contemporary Nadëb communities (2018)

Ongoing fieldwork is still in preliminary stages. So far a single pilot trip has taken place, where limited data was gathered (Epps & Obert 2011).

The vowel inventories of the four Naduhupan languages (Nadëb, Dâw, Hup, Yuhup) bear great similarity with respect to contrastive features. Dâw, Hup and Yuhup share a 9-vowel inventory, and Nadëb adds one vowel to this set, i.e. /ʌ/. All languages possess nasal vowels as well[1], and the distinction between close-mid and mid-low is neutralized in nasal contexts.

[1] In Dâw and Nadëb, nasal vowels are segmentally contrastive. In Hup and Yuhup, nasality is marked on a morpheme-level (Epps forthcoming).

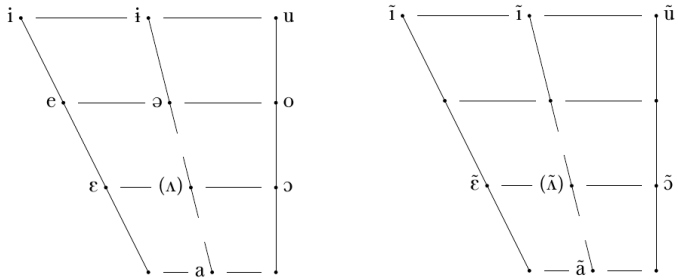


**Figure 2.** Common Naduhup vowel inventory, oral and nasal. (ʌ) and (ʌ̃) alone are specific to Nadëb.

Nadëb also has laryngealization as a phonemically contrasting feature on vowels.

| | | | |
|---|---|---|---|
| (1) | liver | /ho:h/ | [ho:h] |
| | canoe | /hǫ:h/ | [hoʔǫh] |

**Table 1.** Contrastive vowel laryngealization in Nadëb

Nadëb (as well as Dâw) contrasts phonemic vowel length. In Nadëb, vowel length seems to contrast on all vowels save the mid-low series.

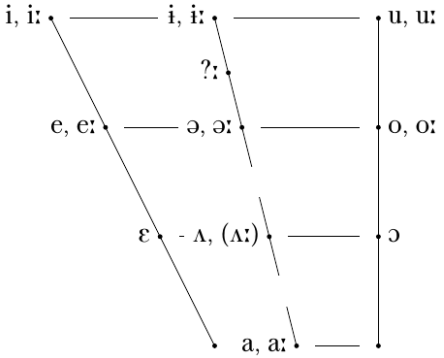


**Figure 3:** Nadëb vowel inventory, excluding nasal and laryngeal segments.

**Nadëb speakers of the Roçado community have recently stated that the current phonemic inventory does not include a vowel they identified occurring in several lexemes, and have asked for an updated analysis and orthography to reflect it.**

- This vowel is (so far) only attested long

- It appears in several words written with either /ɨ:/ or /ə:/ by other sources (Weir 2011 and Martins 2005)
- Minimal pairs suggest phonemicity
- Unclear what orthographic representation should be (community members suggested <ÿÿ>)
- Vowel is represented as /ʔ:/ throughout this paper

| ɨ: / ʔ: | ə: / ʔ: | ʌ / ʔ: |
|---|---|---|
| tɨ:w [tɨ:w]- path | ehə:n [ʔehə:dn]- vomit | tʌg [tʌg]- cow tree |
| tʔ:w [tʔ:w]- filth | eh?:n [ʔeh?:dn]- look for | tʔ:g [tʔ:g]- firewood |

**Table 2.** Minimal pairs for /ʔ:/ with other non-low central vowels

RESEARCH QUESTIONS:

- What phonetic features distinguish this previously unaccounded for vowel?
- Is there an explanation for why it only occurs long?
- What reflexes does it have in other Naduhupan languages?
- What orthographic representation best reflects the phonological reality while also satisfying speakers' understanding of the phoneme?

**In this paper, I propose that this is an instance of near-merger (or perhaps recent merger) of a proto-phoneme **/ʌ:/ and **/ə:/, synchronically equivalent to /ə:/ and /ʔ:/.**

I use phonetic data from recent fieldwork (Epps & Obert 2018) as well as cognate data from various sources (Epps & Obert 2018, Martins 2005, Silva & Silva 2012, Ramirez 2006) to justify my analysis of the phoneme in question.

**As fieldwork efforts are still in preliminary stages, phonetic data is sparse. All formant plots are only representative of one speaker, which severely limits the scope of any claim made on the basis of acoustic measurement.**

## 2. Phonetic realization

The most striking feature of this vowel phonetically is its near-total overlap with /ə:/ in the formant space.

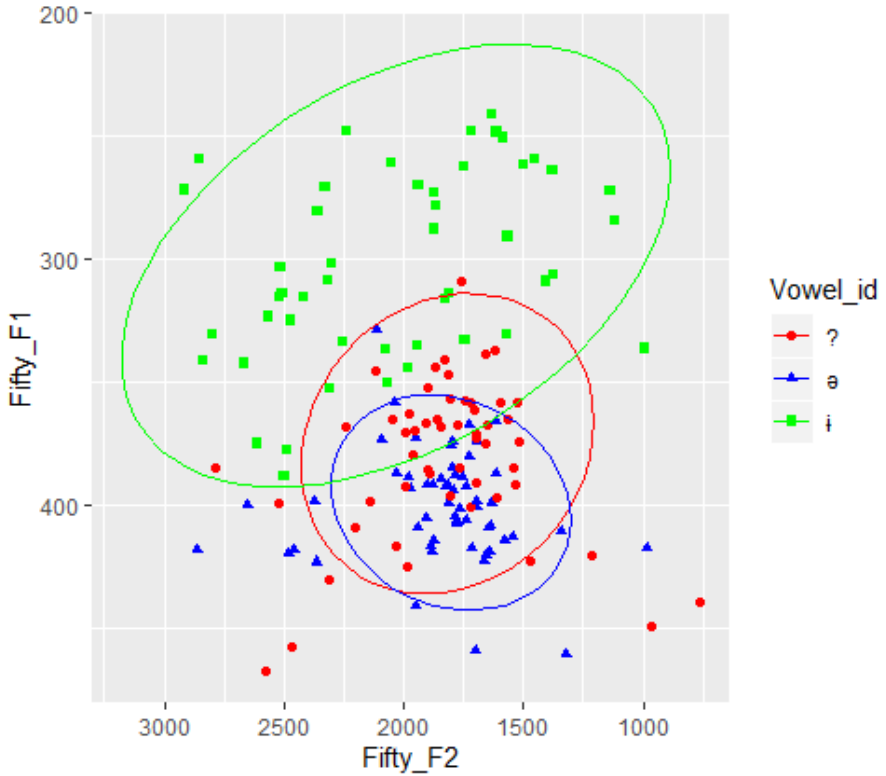


**Figure 4.** Formant plot of long, non-low central vowels

Note that /ɨ:/ has a distinct central tendency from /ʔ:/ and /ə:/, even though it overlaps somewhat.
/ʔ:/ and /ə:/, however, have near-identical central tendencies.

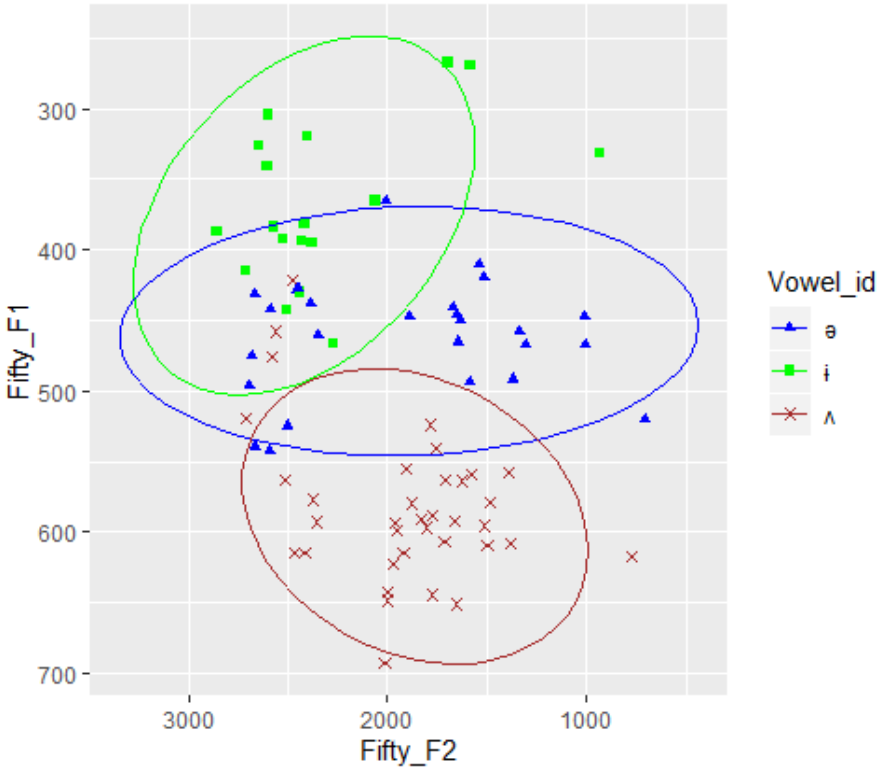


**Figure 5.** Formant values of short non-low central vowels in Nadëb.

Again, there is overlap in the distributions of vowels, but the central tendencies are all distinct.

Suggesting a phonation-related feature as a distinguishing factor between /əː/ and /ʔː/ is problematic, as laryngealization already contrasts on all vowel qualities in question.

| | | | | |
|---|---|---|---|---|
| (3) | /əː/ | what | /hə̰ːd/ | [həʔə̰d] |
| | /ə̰ː/ | vomit | /ehəːn/ | [ehəːdn] |
| | /ʔː/ | achiote | /hʔ̰ːw/ | [hʔʔ̰w] |
| | /ʔ̰ː/ | caiarara | /hʔːw/ | [hʔːw] |

**Table 3.** (Near-)minimal-pairs for laryngealization on /əː/ and /ʔː/

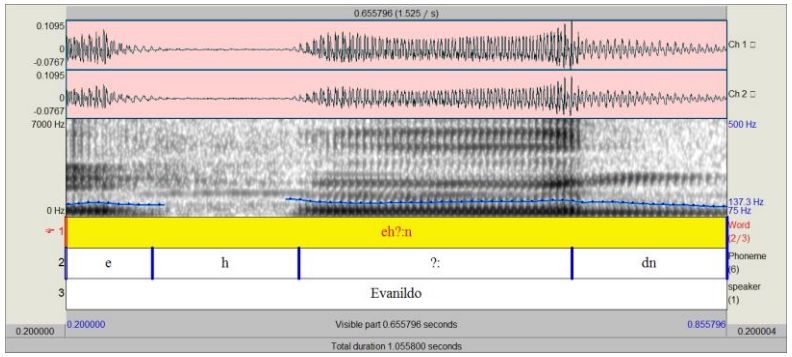


**Figure 6.** Spectrogram of eh?ːn “look for” with pitch tracking

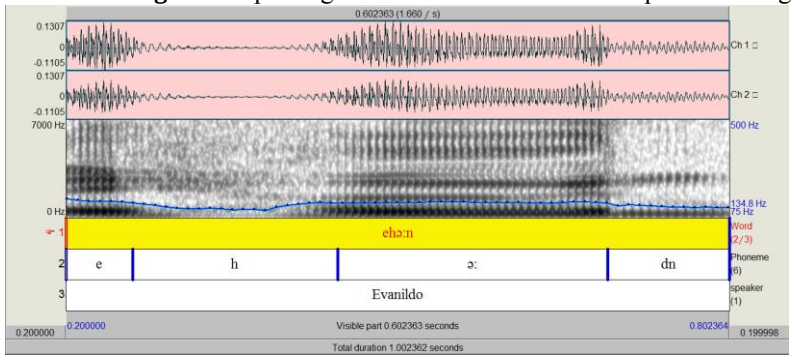


**Figure 7.** Spectrogram of ehəːn “vomit” with pitch tracking

The F0 contours for both vowels also appear to be identical, ruling out pitch distinctions.

Thus, phonetic data so far suggests that the vowels /əː/ and /ʔː/ are phonetically identical for the speaker sampled.

## 3. Cognate Reflexes

Unlike phonetic data, cognate correspondences demonstrate a clear divide between /əː/ and /ʔː/ (as well as /ʔː/ and /ɨː/).

The problem vowel has two common reflex patterns.

Nadëb /ʔː/ > /ə/ in all other langs
Nadëb /ʔː/ > /ə/ in Dâw, > /e/ in Hup, Yuhup

| | /ʔː/ | /ə/ | /e/, /ə/ | /e/, /ə/ |
|---|---|---|---|---|
| **Gloss** | **Nadëb** | **Dâw** | **Hup** | **Yuhup** |
| tree (bound form) | tʔːg | təg | teg | teg |
| long | a-gʔːt | kə̌t | k'et | |
| drink | e-ʔːk | ʔəg | əg | əg |
| achiote; anatto | h'ʔːw | hə̂w | hə̀w | hə́w |

**Table 4.** Reflexes of Nadëb /ʔː/ in other Naduhup langs

Long /əː/, however, most frequently corresponds to /a/ in Nadeb's sisters.

Nadëb /əː/ > /a/ in all other langs

| | /əː/ | /a/ | /a/ | /a/ |
|---|---|---|---|---|
| **Gloss** | **Nadëb** | **Dâw** | **Hup** | **Yuhup** |
| hair | ʃəːn | cân | cán | cãn |
| grow; climb | a-ʃəːk | ʃə̌k | cak | cak |

**Table 5.** Reflexes of Nadëb /əː/ in other Naduhup langs

The correspondence patterns identified above match those of short vowels in interesting ways.

Short /ə/ has similar reflexes as long /ʔː/

Nadëb /ə/ > /ə/ or /e/ in all other langs

| | /ə/ | /ə/, /e/ | /e/, /ə/ | /e/, /ə/ |
|---|---|---|---|---|
| **Gloss** | **Nadëb** | **Dâw** | **Hup** | **Yuhup** |
| bite | e-gəʃ | kəʃ | k'əç | k'əç |
| night | a-ɟəm | cem | c'ə́b | c'əm |
| wing | kəg | xê | ké | ke |

**Table 6.** Reflexes of Nadëb /ə/ in other Naduhup langs

Short /ʌ/ (which, in our current analysis, has no synchronic long equivalent) corresponds to /a/ in other languages.

Nadëb /ʌ/ > /a/ in all other langs

| | /ʌ/ | /a/ | /a/ | /a/ |
|---|---|---|---|---|
| **Gloss** | **Nadëb** | **Dâw** | **Hup** | **Yuhup** |
| be suspended | agʌ | kaʔ | k'ã' | kã' |
| seje palm | wʌng | wax | wáh | wah |

**Table 7.** Reflexes of Nadëb /ʌ/ in other Naduhup langauges

The reflexes for both /ɨː/ and /ɨ/ have no overlap or coincidence with the reflexes of /ə/, /əː/, /ʔː/ or /ʌ/.

Nadëb /ɨ/, /ɨː/ > /i/ or /ɨ/ in all other langs

| | /ɨ/, /i/ | /i/, /i/ | /ɨ/, /i/ | /ɨ/, /i/ |
|---|---|---|---|---|
| **Gloss** | **Nadëb** | **Dâw** | **Hup** | **Yuhup** |
| egg | tɨb | tɨ̌p | tip | típ |
| father | ɨb | ʔɨ̌p | ip | íp |
| bullet ant | wɨːw | wɨ̂w | wɨ̌w | wíw |
| path | tɨːw | tɨ̂w | tɨ̀w | tíw |

**Table 8.** Reflexes of Nadëb /ɨ/ and /ɨː/ in other Naduhup languages

From these data I posit that in an earlier stage of Nadëb, the phoneme */ʌː/ raised and (nearly) merged with /əː/, resulting in the present day system.

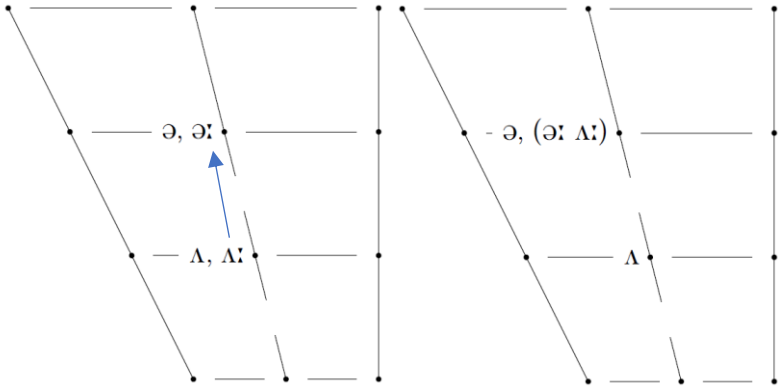


**Figure 8.** Visualization of /ʌː/ raising and merging

| | | | |
|---|---|---|---|
| Current phonemic identity: | /əː/ | /ʔː/ | /ɨː/ |
| Proposed identity: | /ʌː/ | /əː/ | /ɨː/ |

**Table 9.** Proposed revision to long central vowel phonemes

## 4. Morphological Interactions

Nadëb attests an intricate system of vowel alternations in its morphological system. At present, these alternations are poorly understood.

However, one process attested in the SIL dictionary of Nadëb (Weir et al. 2011) appears to be fairly regular, which is the formation of the first singular possessive of a noun.

| (4) Gloss | Lemma | 1st poss |
|---|---|---|
| **High vowels** | | |
| enemy | majt̃ː | majɛ̃ ʔɨ̃ː |
| wife | ɨ̃ːm | ʌ̃m ʔɨ̃ː |
| tobacco | hũːt | hɔ̃t ʔɨ̃ː |
| **Mid-high vowels** | | |
| daughter | toːg | tok ʔɨ̃ː |
| pain | **nahəːh** | **nahʌh ʔɨ̃ː** |
| **Mid-low & Low vowels** | | |
| son | tạːh | tah ʔɨ̃ː |
| hand | mɔ̃ːh | mɔ̃h ʔɨ̃ː |
| **Problem vowel** | | |
| chest | hʔ̰ːb[2] | həp ʔɨ̃ː |

**Table 10.** Vowel alternations associated with the formation of the 1s possessive

There appears to be a consistent pattern of [+long +high +laryngeal] → [-long -high -laryngeal] when nouns are changed from their lemma form to the 1st person singular possessive.

That is, words with long vowels shorten (laryngealization appears to be lost along side this), and high vowels are lowered to mid-high (or mid-low if nasal).

The fact that /nahəːh/ shortens to /nahʌh ʔɨ̃ː/ (and not /nahəh/) suggests that, morphologically, /ʌ/ is the short counterpart of /əː/.

It should further be noted that the word given by Weir as /hɨ̰ːb/ is present in our data with the mystery vowel, as /hʔ̰ːb/. That it shortens to /həp/ cannot be said to support or contradict the claim presented, as both /ɨː/ and /ʔː/ are expected to become /ə/ in the possessed form.

Given the paucity of the data presented, this conclusion should be regarded as tentative at best.

## 5. Conclusion

Phonetic investigation demonstrates that /əː/ and /ʔː/ are phonetically merged at least for the one speaker who had enough recorded data to analyze.

Cognate correspondences suggest disparate historical origins of /ʔː/ and /əː/, suggesting a merger. I posit that historical */ʌː/ merged to /əː/

Speaker's intuition that these are distinct vowels could be motivated by their different morphological patternings, but more investigation will need to be done in that regard.

Future directions:

- Perform perception tests on minimal pairs between /ʔː/ and its neighbors /əː/ and /ʔː/
- Elicit more data on the 1st singular possessive to test current hypothesis

[2] Listed in Weir et al. 2011 as /hɨ̰ːb/

- Gather recordings from wider variety of speakers, particularly from older speakers who are more likely to have some phonetic separation of /ə:/ and /ʔ:/.

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