

Syllable Weight in Dogrib

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1.0 Introduction.

This paper presents both morphophonological and phonetic evidence for a constraint HEAVYPENULT. It is argued that three processes—nasal coalescence, conjunct vowel deletion, and sonorant gemination, all conspire together to create a heavy penultimate syllable. Data are taken from my own fieldwork on the Weledeh dialect of Dogrib.

2.0 Data.

2.1 Morphophonemic Alternations.

- Morphophonemic alternations are source of evidence for HEAVYPENULT.
- The perfective morpheme /whe/ varies between [whe], [wh], and [h], depending on position.
- Also, /ne/ becomes nasalization and lengthening, to create a heavy penult.

Figure 2.1: Perfective of *nà√zè* ‘hunt’; Weledeh Dogrib.

nàwheh _{zè} (nà- whe -h-zè)	nàwhi _{zè} (nà- whi -i-zè)	nàts’eh _{zè} (nà-ts’e- h -zè)
nàwhęę _{zè} ² (nà- whę -ę-zè)	nàwhah _{zè} (nà- wh -ah-zè)	nàwhah _{zè} (nà- wh -ah-zè)
nàh _{zè} (nà- h -zè)	nàgeh _{zè} (nà-ge- h -zè)	nàgeh _{zè} (nà-ge- h -zè)

- /nà-whe-ne-zè/ → nà.whęę.zè ‘you have hunted’
- /nà-whe-zè/ → nàh.zè ‘he/she has hunted’
- /nà-ge-whe-zè/ → nà.geh.zè ‘they have hunted’

·Why does this happen?

- Note that in the above examples, the output form always has a penultimate syllable which is heavy (long), either because it has a long vowel, or it ends in a consonant.
- This assumes that coda [h] is moraic (see Marinakis 2002 for alternative view).

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²Also: nàwhenezè or nàwhıjzè

2.2 Gemination.

- Previous phonological descriptions of Dogrib make no mention of geminates.
- But I could hear them, so I decided to measure them.
- I did a phonetic study using words from morphological paradigms, shown in Figure 2.2.
- I measured approximately 20 tokens of each consonant in each environment.

Figure 2.2: words used for duration measurements.

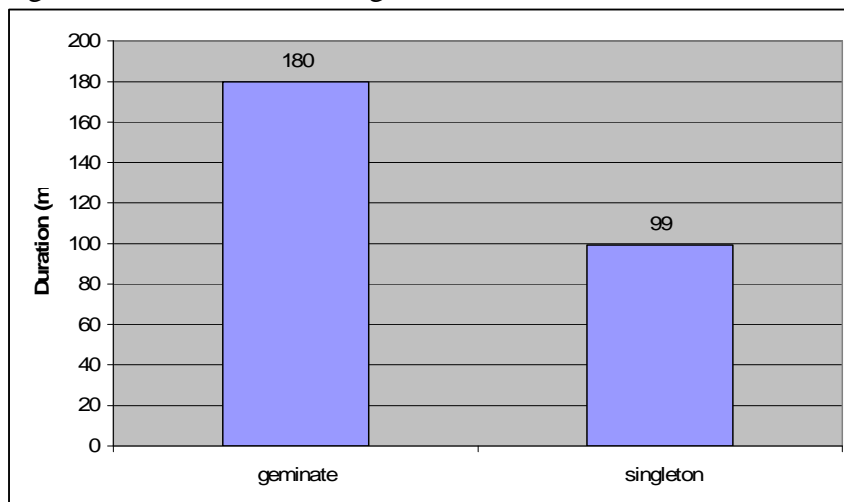
Segment	Alleged geminate	Alleged singleton
l	sɫllà, nɫllà, wellà, naxɫllà, gɫllà, gɔllà	selɫbbà, nelɫbbà, welɫbbà, naxɫɫbbà, gɫɫbbà, golɫbbà
n	sɫnnò, nɫnnò, wɫnnò, gɫnnò, naxɫnnò, ɫnnò	senɫkw'ò, nenɫkw'ò, wenɫkw'ò, naxɫnɫkw'ò, gɫnɫkw'ò, gonòkw'ò
t		seti, neti, weti, naxɫi, gɫi, goti
d	seddè, neddè, weddè, naxɫddè, gɫddè, goddè	
k		sekè, nekè, wekè, naxɫkè, gɫkè, gokè
g	seggò, neggò, weggò, naxɫggò, gɫggò, goggò	
b	selɫbbà, nelɫbbà, welɫbbà, naxɫɫbbà, gɫɫbbà, golɫbbà	

- Hypothesis: 1) sonorants, and 2) voiced obstruents geminate in penultimate position.
- (1) was strongly supported, but (2) yielded mixed results.

2.2.1 Geminate vs. Singleton /l/.

- mean duration for /l/ in pre-final position was 180ms.
- mean duration of /l/ elsewhere was 99ms
- Thus, geminate /l/ has approximately 1.8 times the duration of singleton /l/.
- $p < 0.001$. The results are represented graphically in Figure 2.3.

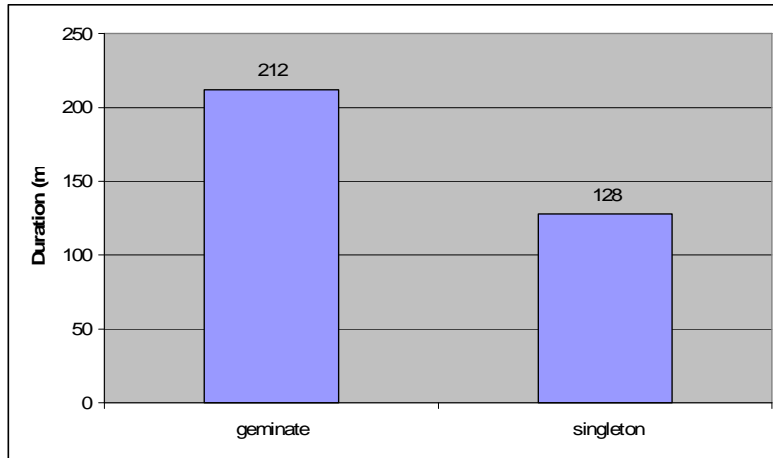
Figure 2.3: Geminate vs. Singleton /l/.



2.2.2 Geminate vs. Singleton /n/.

- mean duration for /n/ in pre-final position was 212ms.
- mean duration elsewhere was 128ms.
- Thus, geminate /n/ has approximately 1.7 times the duration of singleton /n/.
- $p < 0.001$. The results are represented graphically in Figure 2.4.

Figure 2.4: Geminate vs. Singleton /n/.



2.3 Prosodic Morphology and the Template.

The following table is based on Ackroyd 1982, although with names and numbers of template positions adjusted, according to the scheme of Rice 1989 for Slave.

Figure 2.5: The Dogrib Template.

Template Position	Category	Phonological Shape	Examples
00	object of incorporated postposition	CV	se, ne, we, ye
0	incorporated postposition	CV	ghọ, ghò, gha
1	adverbial	CV	k'e, tà, nà
2, 3	quantificational elements	CV	yà, na
4	incorporated stem	CV	shè, shj, te
5	number	CV	h, go
6	direct object	CV	se, ne, we, ye
7	subject number	CV	ge, ts'e
8	qualifier	CV	le, ne, de
9, 10, 11	aspect	CV or C	whe/wh/h
12	subject person	CV, C, or VC	h, ne, ah, wìd
13	classifier	C	d, h, (l)

- Note that, in Figure 2.5, all prefixes are of the shape CV, *except* those that occur in the positions immediately preceding the stem.
- In fact, the classifier (position 13), is *always* next to the stem, and therefore is always of the shape C.
- The purpose of having prefixes of this shape is to close the preceding syllable.

3.0 OT Analysis.

Definitions of Constraints (informal):

CODACON: The only acceptable codas are *h* and geminates.

HEAVYPENULT: The penultimate syllable must have two moras.

MAX(C): Don't delete consonants.

MAX(V): Don't delete vowels.

IDENT(PLACE): Don't change the place of articulation of consonants.

MAX(+NASAL): The feature (+Nasal) must be preserved (not necessarily as part of a nasal consonant).

3.1 Conjunct Vowel Deletion.

Figure 3.1: Conjunct Vowel Deletion.

/nà-whe-zè/	CODACON	HEAVYPENULT	MAX(C)	IDENT(PLACE)	MAX(V)
a. nà.whe.zè		*!			
b. nàwh.zè	*!				*
☞ c. nàh.zè				*	*
d. nàazè			*!		

·The fully faithful candidate, **a**, is ruled out because the penultimate syllable is light.

·**b** is bad because *wh* is not an acceptable coda in Dogrib.

·**d** is ruled out by Faithfulness.

3.2 Nasal Coalescence.

Figure 3.2: Nasal Coalescence.

/nà-whe-ne-zè/	CODACON	HEAVYPENULT	MAX(+NASAL)	MAX(C)	MAX(V)
a. nà.whe.ne.zè		*!			
b. nà.when.zè	*!				*
☞ c. nà.whẹ̃̃.zè				*	
d. nà.whee.zè			*!	*	

·Even though $MAX(C) \gg MAX(V)$, the consonant /n/ deletes while /e/ remains.

·This is because of CODACON and HEAVYPENULT.

·The reason the vowel is nasalized is because of the constraint MAX(+NASAL), which seeks to preserve the nasal feature.

3.3 Gemination.

·I assume something like the following moraicity hierarchy (cf. Zec 1995):

*Obstruent_μ >> *Sonorant_μ >> *Vowel_μ

·This hierarchy says that more sonorous segments are preferred as mora-bearing units.

Figure 3.3: Gemination of Sonorants.

/we-là/	*OBSTRUENT _μ	HEAVYPENULT	*SONORANT _μ
☞ a. we.l.là			*
b. we.là		*!	
/we-kè/			
a. we.k.kè	*!		
☞ b. we.kè		*	

·Thus, under the same constraint ranking, /l/ geminates while /k/ does not, because sonorants are better suited to bear a mora.

4.0 Variation in Geminates.

·Preliminary evidence suggests that, in addition to sonority, both voicing and place of articulation influence gemination.

·Duration of stops was measured from the offset of upper formants of the preceding vowel, to the release-burst.

·Frication noise was not included in stop duration.

·Segments labeled “voiced” were at least partially voiced during closure.

4.1 Penultimate /d/ vs. /t/.

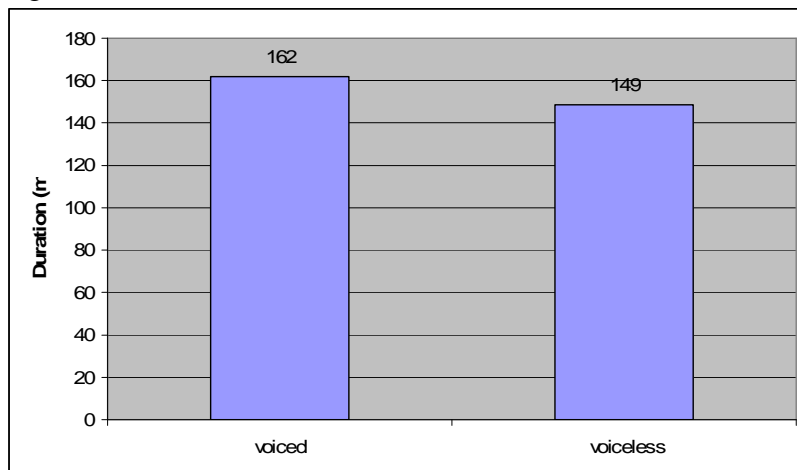
·mean duration for /d/ in pre-final position is 163ms,

·mean duration for /t/ in pre-final position is 150ms.

·Although /d/ is of longer duration than /t/, the result was not significant: $p = 0.157$.

·However, the number of tokens was quite small (only about 15 each), so this still merits further investigation.

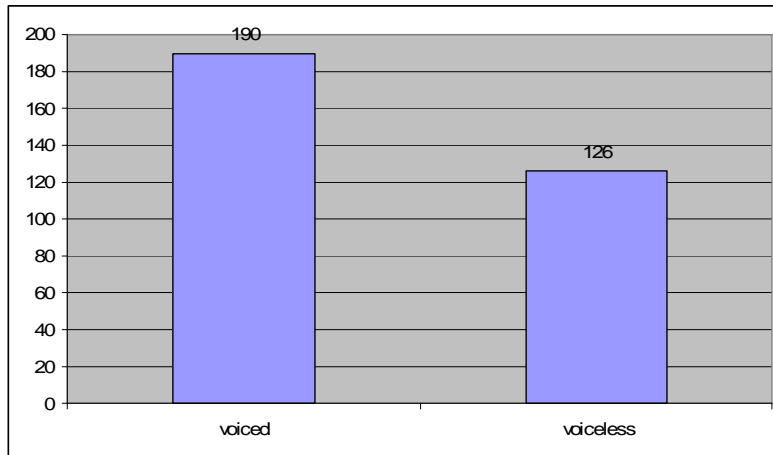
Figure 4.1: Voiced and voiceless alveolars.



4.2 Penultimate /g/ vs. /k/.

- mean duration for /g/ in pre-final position was 190ms,
- mean duration for /k/ was 126ms.
- Thus, voiced velars are 1.5 times longer than voiceless velars in pre-final position.
- $p < 0.001$.

Figure 4.2: Voiced and voiceless velars.



4.3 Status of /b/.

- /b/ was difficult, because there is no /p/ to compare it to, and it only occurs in penultimate position in my corpus. Is it geminate?
- mean duration for /b/ was 200ms; geminate /l/ was 181ms. The difference was marginally significant, $p = 0.045$.
- mean duration of /b/ was, again, 200ms; mean duration of geminate /n/ was 212ms. This difference was not significant, $p = 0.138$.
- In contrast, in comparing pre-final /b/ to non-geminate /l/, the mean duration for /b/ was 200ms, while for non-geminate /l/ it was 99ms, $p < 0.001$.
- Thus, pre-final /b/ is much more like a geminate consonant in Dogrib than a non-geminate.

4.4 Multiple Moraicity Hierarchies?

- Since much of the data is inconclusive, any analysis must be tentative.
- However, the data tentatively suggest that there may be multiple moraicity hierarchies, which express themselves in gemination patterns.

*Obstruent_μ >> *Sonorant_μ >> *Vowel_μ

*Voiceless_μ >> *Voiced_μ

*Coronal_μ >> *Velar_μ >> *Labial_μ

- That is, sonorants like to geminate more than obstruents, voiced stops like to geminate more than voiceless stops, and labials like to geminate more than velars, which geminate more than coronals.

·More data are necessary to test this hypothesis, however.

5.0 Conclusion.

- Several seemingly unrelated phonological processes in Dogrib can be accounted for by the generalization that the penultimate syllable should be heavy.
- These are conjunct vowel deletion, nasal coalescence, and sonorant gemination.
- In addition, it seems that, diachronically, some underlying forms have been restructured to conform to this generalization (cf. Figure 2.5).
- Finally, gemination is variable and seems to be sensitive to multiple factors.

Further Questions...

- Do these processes ever occur simultaneously, e.g. gemination after a syllable that already has a long vowel?
- Do ejectives geminate? What are the phonetic properties of geminate ejectives?
- Why should the penultimate syllable be heavy?

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