

Consonant Length in Monosyllables: Typology, Diachrony, and Phonetics

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Topics

- 1 Consonant length contrasts (/n/ vs. /nn/) tend to occur in polysyllabic words.
- 2 When they do occur in monosyllabic words, they usually also occur in polysyllabic words.
- 3 Could they occur *only* in monosyllables? How?

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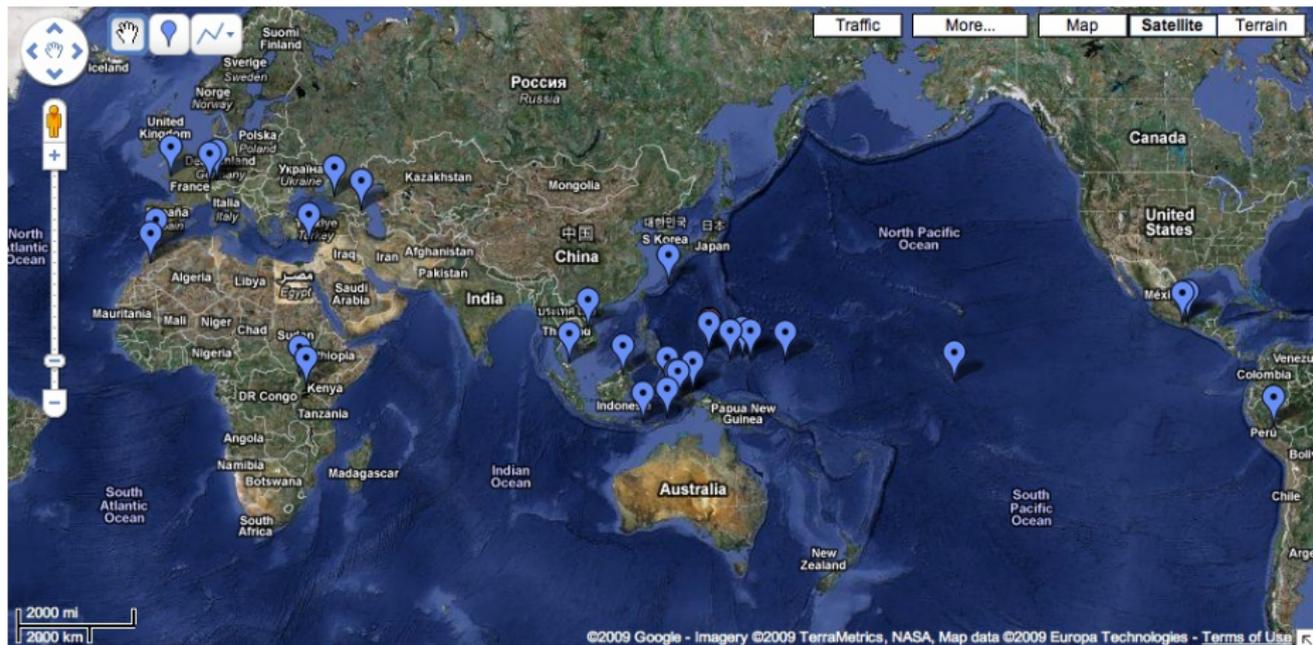
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Typological Perspective

Consonantal length contrasts tend to occur word-medially in languages of the world (Dmitrieva, 2009; Ladefoged and Maddieson, 1996; Maddieson, 1985; Muller, 2001; Thurgood, 1993). Word-initial geminates are rare.

- Of 30 known languages with word-initial geminates, 24/30 (80%) also have a length contrast word-medially (Muller, 2001).
- 6/30 languages have word-initial geminates but not word-medial geminates: Pattani Malay, Sa'ban, Leti, Nahaheun, Yapese, and Itunyoso Trique (DiCano, 2008).
- A large percentage of the languages with word-initial geminates are Austronesian (13/30, 43%).

Languages with word-initial geminates (Google, 2009)



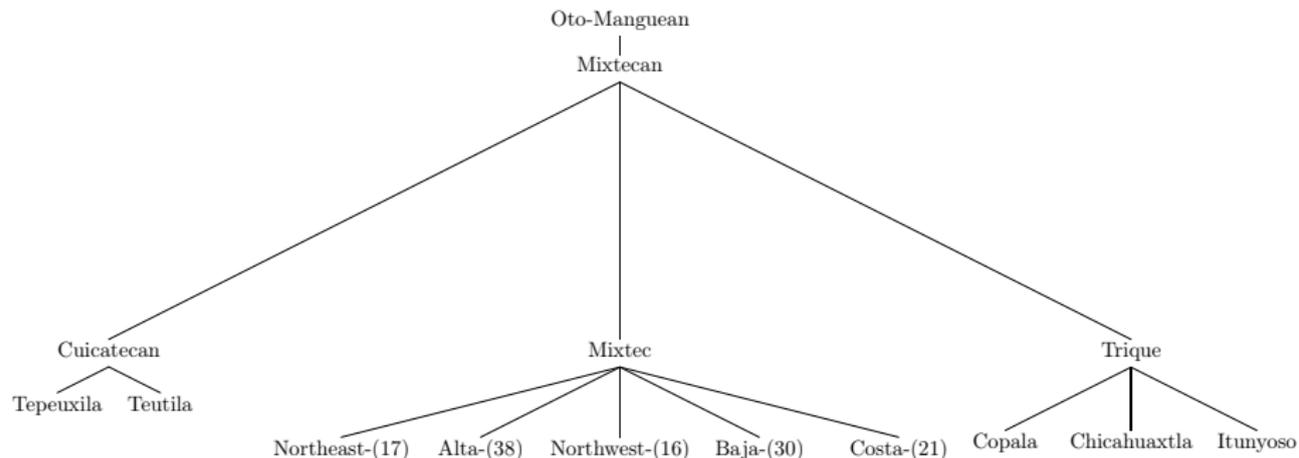
- In 28 of these 30 languages, geminates surface in polysyllabic words.
- Why should we expect geminates more often word-medially in polysyllabic words?
 - ① Vowel shortening before a geminate cues consonant length (Maddieson, 1985; Ham, 2001; Idemaru and Holt, 2007; Port and Dalby, 1982). This cue is unavailable when geminates are word-initial.
 - ② Use of non-durational cues in languages with this contrast (e.g. Pattani Malay (Abramson, 1986, 1991, 2003)) leads listeners to perceive the contrast as non-durational.
 - ③ In Icelandic, */tt/ > /^ht/ (Helgason, 2002).

Geminates in Monosyllables

- Blevins (2004) pathways for the evolution of geminates:
 - consonant cluster assimilation
 - consonant and adjacent vowel/glide assimilation
 - vowel syncope
 - pre-stress lengthening
 - boundary lengthening
 - reinterpretation of voicing contrast
 - reanalysis of identical C+C sequences
- In Itunyoso Trique and Nhaheun, consonant length is *only* contrastive in monosyllabic words. Is there a systematic explanation for this?
- Are Blevins' pathways good enough to explain this rare pattern?
- Historical reconstruction and phonetics

Genetic Relationship

- All Oto-Manguean languages spoken in Southern Mexico (Oaxaca, Veracruz, Guerrero, Chiapas, Mexico)



Language Background

- All Trique languages are tonal with final syllable prominence (vowel duration, more contrasts).
- It is not the case that Trique has only monosyllables, most words are polysyllabic.
- Itunyoso Trique - most words are disyllabic (756/1073, 70.5%).
Monosyllables account for 185/1073 monomorphemic roots (17.1%)
and trisyllables for 133/1073 monomorphemic roots (12.4%).
- Mixtecan bisyllabic/bimoraic couplet structure (Hinton, 1991; Macaulay, 1996; Macken and Salmons, 1997).

- There are 67 words with initial geminates in Itunyoso Trique (36% of all monosyllables).

tta ³	<i>field</i>	ta ³	<i>this (disc.)</i>
kkãʔ ³	<i>pozole</i>	kãʔ ¹	<i>far</i>
kk ^w eh ³²	<i>green (n.)</i>	k ^w eh ²	<i>will jump</i>
nna ³	<i>bed</i>	na ⁴	<i>long ago</i>
mmã ¹	<i>there is/are</i>	mã ³	<i>distal dem.</i>
ββeh ³⁵	<i>straw mat</i>	βeh ⁴	<i>to beat (intr.)</i>
jjū ³	<i>Mentha Polegium</i>	jū ³	<i>palm leaf</i>

- No contrast in consonant length word-medially or word-initially in polysyllabic words.

tu ³ neʔ ³	<i>tail</i>	*ttu ³ neʔ ³
na ^{3h} to ³²	<i>banana</i>	*na ³ tto ³²

Geminates in other Trique languages

- In Copala Trique, the consonant length contrast is absent, but, among obstruents, a cognate voicing/manner contrast is observed: [ð] vs. [t].
- In Chichahuaxtla Trique, the consonant length contrast is present among sonorants, but, among obstruents, a cognate voicing contrast is observed: [d] vs. [t].

Comparative Method

- Reconstruction of Proto-Mixtec roots (Josserand, 1983), reconstructed Proto-Trique roots, and Cuicatec (Anderson and Concepción Roque, 1983).
- Proto-Trique reconstruction from Itunyoso Trique database of 1638 words, dictionary of Copala Trique (Hollenbach, 2007), and dictionary of Chicahuaxtla Trique (Good, 1979).
- Comparison A: data from Proto-Mixtec, Cuicatec, and Proto-Trique.
- Comparison B: data from only Cuicatec and Proto-Trique.

Comparison A

- Out of 188 comparisons, 24 words cognate with geminates in Trique.
- 15/24 have historical disyllabic structure */(j)VCV/ in Proto-Trique, Proto-Mixtec or Cuicatec.

Itunyoso	Chichahuaxtla	Copala	*Proto-Trique	*Proto-Mixtec	Cuicatec	Gloss
nnāh ³	nnāh ³	nāh ³	*/nnāh ³ /	*/jonoʔ/	ja ⁴ na ⁴	<i>bag</i>
nnāh ³²	nnāhāh ³	nāh ³²	*/nnāh ³² /	*/inoʔ/	ju ² nu ²	<i>cigarette</i>
nna ³	nna ³	ja ³ na ³	*/ja ³ na ³ /	*/fito/	ka ² ma ⁴	<i>bed</i>
kk ^w eh ³	k ^w eh ³	k ^w eh ¹	*/kk ^w eh ³ /	*/lak ^w aʔ/	ja ³ k ^w ā ³	<i>pus</i>
tta ³	ta ³	ta ³²	*/tta ³² /	*/josoʔ/	ju ² du ⁴	<i>field</i>
ttūh ²	t̃ih ²	tūh ²	*/tt̃ih ² /	*/one/	ni ³ ni ²	<i>eight</i>
ttfih ²	tfih ²	(i)tfih ²	*/itfih ² /	*/ufe/	ⁿ da ⁴ tja ⁴	<i>seven</i>
ttfiʔ ²	tfiʔ ²	(i)tfiʔ ²	*/itfiʔ ² /	*/ufi/	ⁿ di ³ tfi ²	<i>ten</i>
ββe ³²	wwe ³²	ju ³ ve ³²	*/ju ³ ve ³² /	*/jawiʔ/	ji ⁴ va ⁴	<i>maguey</i>
ββih ²	wwih ²	vih ¹	*/wwih ² /	*/uwi/	u ⁴ vi ⁴	<i>two</i>
ββeh ³⁵	wwe ⁵	ju ³ ve ⁵	*/ju ³ weh ⁵ /	*/juwiʔ/	ji ³ va ³	<i>straw mat</i>
kkā ³	kā ³	kā ³²	*/kkā ³² /	*/j+k̃iʔ/	ju ² ku ⁴	<i>squash</i>
kka ³²	ka ³²	ka ³²	*/kka ³² /	*/jokoʔ/	ja ² mi ⁴	<i>peg, pin</i>
kkoh ³	koho ³	koh ³	*/kkoh ³ /	*/juku/	ja ⁴ ta ⁴	<i>herb</i>
kkih ³	k̃ih ³	kih ³	*/kk̃ih ³ /	*/jukuʔ/	ji ⁴ ku ⁴	<i>hill</i>

Remaining 9/24 geminates

- 5 clear cases where pre-final CV > C and underwent complete assimilation.

Itunyoso	Chichahuaxtla	Copala	*Proto-Trique	*Proto-Mixtec	Cuicatec	Gloss
nne ³²	nne ³²	na ³	*/nne ³² /	*/ ⁿ dute/	nu ⁴ ni ⁴	<i>water</i>
tto ³²	to ³²	to ³²	*/tto ³² /	*/towĩ/	du ⁴ du ⁴	<i>feather</i>
kkāh ³	kāh ³	k ^w āh ³	*/ukāh ³ /	*/ ⁿ difēʔ/	ⁿ dā ³ ku ³	<i>sandal</i>
jjoʔ ³	joʔo ³	joʔ ²	*/jjoʔ ³ /	*/k ^w ija/	ⁿ du ² ju ⁴	<i>year</i>
llih ³	lih ⁴	(ku ¹ ni ¹)	*/llih ³ /	*/luʔu/	lʔĩ	<i>small</i>

- 4 obscure cases, possibly from sound changes related to Proto-Mixtecan */ⁿdj/ or Proto-Trique lexical innovations.

Itunyoso	Chichahuaxtla	Copala	*Proto-Trique	*Proto-Mixtec	Cuicatec	Gloss
nne ³¹	nne ³¹	ne ³¹	*/nne ³¹ /	*/koyō/	ju ² ta ⁴	<i>meat</i>
ttū ³	tū ³	ttō ³	*/ttō ³ /	*/ ⁿ ijjʔ/	jū ³	<i>blood</i>
jja ³	jja ³	na ³ na ¹ ja ¹	*/jja ³ /	*/ ⁿ dife/	ⁿ du ³ du ³	<i>truth</i>
jjeh ³	jeh ³	jaih ³	*/jjaih ³ /	*/juuʔ/	tu ²⁴	<i>stone</i>

Summary: Comparison A

- 20/24 (80%) words with geminates the result of sound changes:
 $*/C_iVC_jV/ > */C_iC_jV/ > C_iC_iV$, or $*/C_iVC_jV/ > C_jC_jV$.
- Two of Blevins' predicted pathways to geminate evolution: consonant and adjacent vowel/glide assimilation, and vowel syncope. **Blevins' explanations work.**
- Comparison B: 44 additional geminates, with no Proto-Mixtec reconstruction as a comparison.

Comparison B

- 22/44 of remaining geminates in Itunyoso Trique have a clear historical origin.
- Proto-Trique disyllable > Itunyoso geminate onset (12 forms):

Itunyoso	Chichahuaxtla	Copala	*Proto-Trique	Cuicatec	Gloss
nna ²	na ² na ²	na ² na ²	*/na ² na ² /	ji ² nu ⁴	<i>slowly</i>
nni ²	a ² ni ²	ja ³ ni ²	*/ja ³ ni ² /	ku ³ vi ²	<i>ugly, gross</i>
mmi ²	mmi ² i ³	ju ³ mi ²	*/ju ³ mi ² /	na ² ma ²	<i>soap</i>
mmi ³¹	mmi ³¹	ju ³ mi ¹	*/ju ³ mi ¹ /	jj ² ko ²	<i>bridge</i>
mmi ³²	mmi ³²	ju ³ me ³	*/ju ³ mi ³ /	m ² i ²⁴	<i>sweet potato</i>
ββe ³	wwe ³	ju ³ va ³¹	*/ju ³ wa ³¹ /	tã ⁴	<i>brave</i>
ββeh ³	wwehe ³	ju ³ veh ³	*/ju ³ weh ³ /	ⁿ de ² de ⁴	<i>boundary stone</i>
βi ³	wwi ³	a ³ vi ³²	*/a ³ wi ³² /	ku ³ vi ²	<i>to be</i>
ttah ³⁵	ta ⁵	(u)ta ²	*/u ³ ta ⁵ /	mnã ³	<i>to be above</i>
ttuh ³⁵	tu ⁵	i ³ tu ⁵	*/i ³ tuh ⁵ /	ja ⁴ tu ⁴	<i>knot, goiter</i>
ttu ³²	si ⁵ tu ²	i ³ tu ³²	*/i ³ tu ³² /	du ³ ku ³	<i>thief</i>
tt̥soh ³	t̥soho ³	ni ³ t̥soh ³	*/ni ³ t̥soh ³ /	NA	<i>female's belt</i>

- Modern Cuicatec suggests an earlier stage there was a disyllabic cognate which underwent syncope/assimilation (10 forms):

Itunyoso	Chichahuaxtla	Copala	*Proto-Trique	Cuicatec	Gloss
nna ³¹	nna ³¹	na ³¹	*/nna ³¹ /	ju ² ndu ⁴	<i>farm field</i>
nneh ³	nnehe ³	neh ³	*/nneh ³ /	jʔa ⁴ⁿ dʔi ⁴	<i>dream</i>
nnih ³	nnih ³	nuh ³	*/nnih ³ /	ji ⁴ ma ⁴	<i>leather</i>
nnu ³²	nu ³²	nu ³²	*/nnu ³² /	ve ³ nu ³	<i>Dysphania ambrosioides</i>
mma ⁴	moʔ ⁴ (du.)	bah ⁴	*/mba ⁴ /	ku ^{3m} ba ²⁴	<i>compadre</i>
βbeh ³	g ^w eʔ ² (POT.du)	g ^w eh ⁴	*/βbeh ³ /	ka ² va ⁴	<i>to jump</i>
ttɕĩ ³	tɕĩ ³ h ³	tɕĩ ³	*/ttɕĩ ³ /	ju ³ ni ³	<i>grass</i>
ttɕũ ²	tɕũ ² (du.)	tɕũ ¹	*/ttɕũ ² /	de ⁴ nu ¹	<i>wise man</i>
ttjuh ³	tɕuh ³	tɕuh ³	*/ttɕuh ³ /	du ³ ti ¹ ti ⁴	<i>egg</i>
kkāh ³	kāh ³	kāh ³	*/kkāh ³ /	n ^d o ³ ku ³	<i>sandal</i>

- Similar to Comparison set A, loss of a penultimate syllable, often of the shape */(j)V/ (13/22 cases), caused the genesis of word-initial geminates in final, now monosyllabic, roots.

Analysis: Historical Reconstruction

- 42/68 (62%) geminates in Trique have clear origin.
- Vowel syncope and assimilation of consonant & adjacent vowel/glide readily account for the origin of most of the geminates in monosyllables in Itunyoso Trique.
- Rare contrast, but with a clear explanation.

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Diachronic (in)stability (Blevins, 2004)

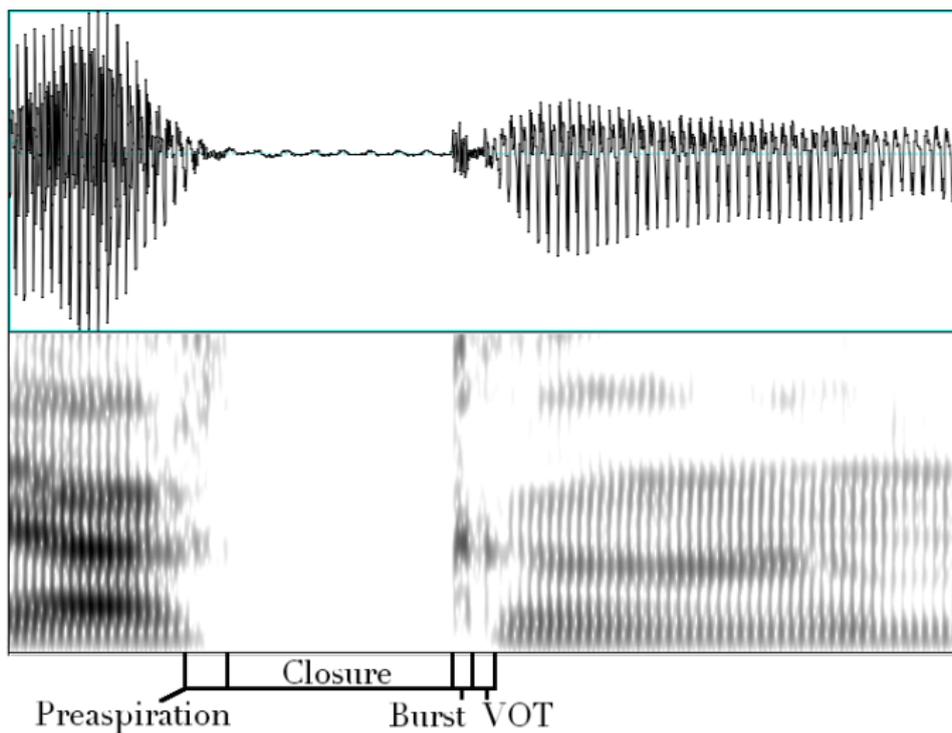
Three diachronic pathways for initial geminates:

- 1 Maintenance: a length contrast remains due to its high functional load, e.g. paradigmatic reinforcement or lexical competition (Blevins and Wedel, 2009). E.g. Leti, Nukuoro.
- 2 Maintenance/Mutation: a length contrast remains but additional, non-durational cues reinforce perception. The contrast may mutate along laryngeal dimensions (voicing, glottal spreading, glottal constriction). E.g. Proto-Icelandic, Pattani Malay, Taba.
- 3 Degemination: the length contrast is neutralized. E.g. Swiss German (some contexts).

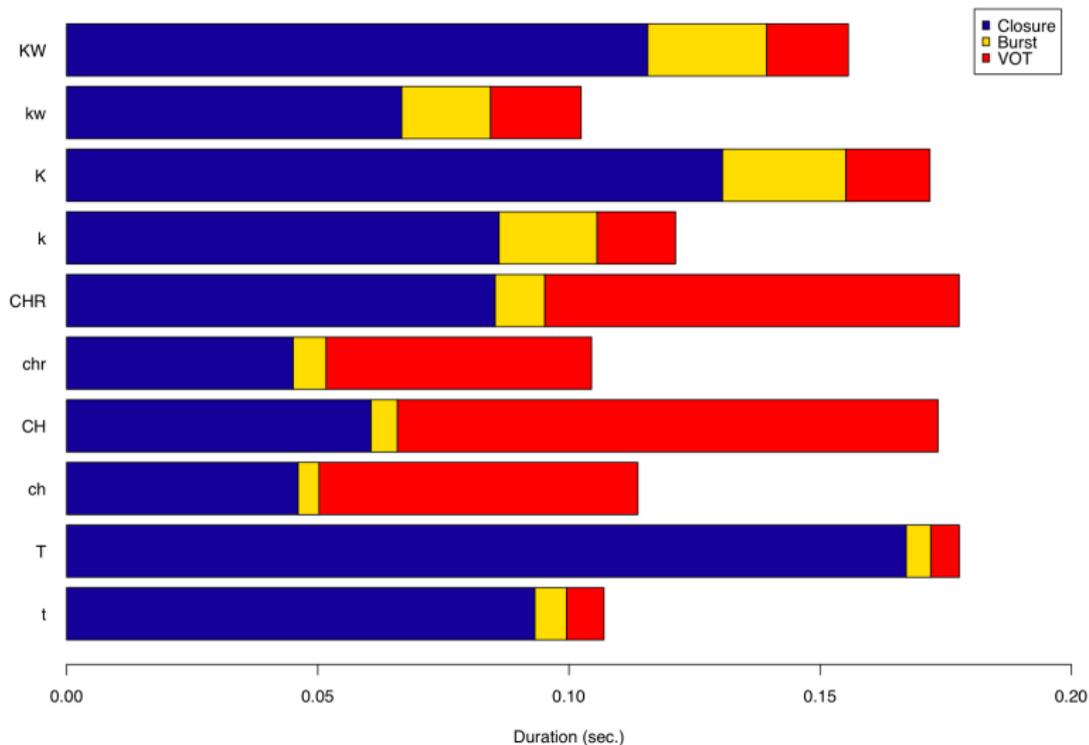
The phonetics of geminates in Itunyoso Trique

- Examination of geminate-singleton contrast among 5 obstruents: /t/, /k/, /k^w/, /tʃ/, /tʂ/, and 2 sonorants: /β/, /j/.
- Acoustic and Electroglottographic (EGG) data.
- Acoustic measures for obstruents: closure duration, burst duration, VOT, adjusted burst amplitude, and preaspiration duration; for sonorants: closure duration.
- EGG measures: VST (voice offset time) in /V #C/ vs. /V #CC/ transition.
- 8 Native Itunyoso Trique speakers (4 female, 4 male).
- 40 monosyllabic words (20 singleton onsets, 20 geminate onsets).
- In carrier sentences, e.g. 'I see X here.', /ni⁴ja⁴³ ___ nã³/.

Acoustic Measures



Results 1: Acoustic data - Obstruents



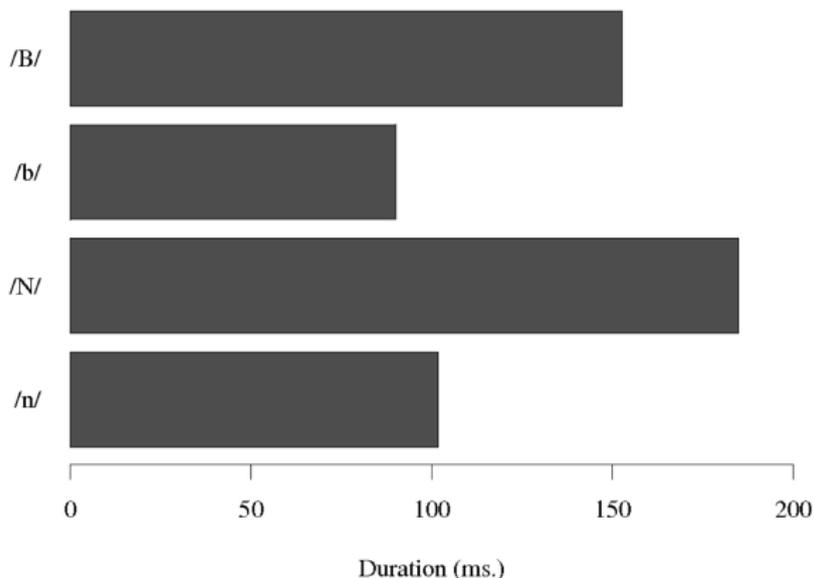
Results, cont.

- Closure duration was significantly different between singletons and geminates, ($F[1,7] = 25.13$, $p < 0.01$) as was VOT ($F[1, 7] = 8.56$, $p < 0.05$), but not burst duration or burst amplitude.

		Closure Duration	Burst Duration	VOT	Total Duration
Stops	Singleton	82.1 ms.	15.6 ms.	13.7 ms.	111.4 ms.
	Geminate	137.8 ms.	17.8 ms.	12.9 ms.	168.5 ms.
Affricates	Singleton	59.2 ms.	8.8	58.1 ms.	126.1 ms.
	Geminate	76.9 ms.	10.6 ms.	95.1 ms.	182.6 ms.

- Average duration ratio for consonantal length contrasts is between 1:1.5 - 1:3 (Ladefoged and Maddieson, 1996; Ham, 2001).
- Without preaspiration: 1:1.51 for stops, 1:1.45 for affricates – low.
- With preaspiration: 1:1.70 for stops, 1:1.61 for affricates.

Results 1: Acoustic data - Sonorants



- Average duration of singleton = 95.9 ms., geminate = 168.8 ms.
Ratio = 1:1.76 ($F[1,7] = 55.9, p < 0.001$).

Summary: Results

- Initial consonant length contrast distinguished by duration.
- For stops: closure duration and preaspiration distinguish the length contrast.
- For affricates, closure duration, frication duration, and preaspiration distinguish the length contrast.
- Presence of preaspiration increases the duration of geminates and may make the contrast easier to perceive. A mutation of a length contrast along a laryngeal dimension (glottal spreading).

EGG Data

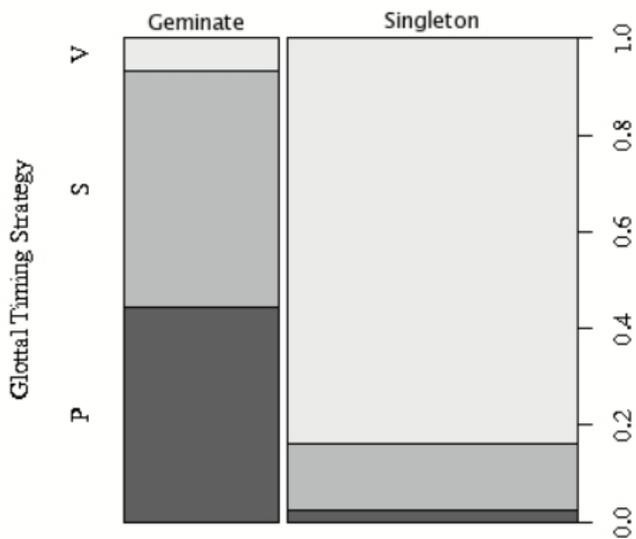
Possible pre-obstruent glottal timing strategies:



- Geminate obstruents devoice before closure (preaspiration). What do singletons do?

Results 2: EGG data - Obstruents

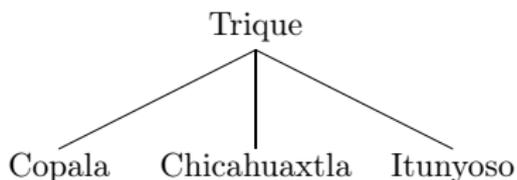
- Singletons undergo **passive voicing** (V) during closure.



Results 2: EGG data - Obstruents

- 84% of singleton obstruents (304/362) realized with devoicing *after* closure, compared with 6.7% of geminates obstruents (13/194) ($G^2[1] = 162.0, p < 0.001$).
- Geminate obstruents realized with devoicing prior to closure (49.4%, 96/194) or devoicing simultaneous with closure (43.8%, 85/194).
- Singletons almost never realized with devoicing before closure (1.9%, 7/162).

Evolutionary hypothesis



- Copala Trique: /t/ vs. /Ǿ/, no sonorant length contrast
- Chichahuaxtla Trique: /t/ vs. /d/, /nn/ vs. /n/; only length contrast among sonorants.
- Itunyoso Trique: /t/ vs. /tt/, /nn/ vs. /n/; length contrast for obstruents and sonorants.

Evolutionary hypothesis

- Presence of partial voicing in singleton obstruents and preaspiration in geminates.
- (Possible) Evolution:
 - singleton vs. geminate contrast
 - > singleton (partial voicing) vs. geminate (devoiced) contrast
 - > voicing contrast
- Presence of laryngeal cue to obstruent length contrast in monosyllables led to mutation.

Main Points

- Evolution of rare contrast explainable diachronically through (pre-tonic) vowel syncope and consonant assimilation when the parent language has both word-final stress and bisyllabic word structure. Incidentally – same pattern in Nhaheun (Pająk, 2009; Sidwell, 2003).
- Contrast realized primarily by duration, but with added cue of preaspiration for geminate obstruents and partial voicing for singleton obstruents.
- Historically, this added laryngeal cue may have been reanalyzed as the primary cue to the contrast in other Trique dialects, resulting in a reinterpretation of initial length contrast as initial voicing contrast.

Discussion

- What factors would lead us to expect neutralization in the Trique length contrast?
 - Rare contrasts are maintained in language when they have a high functional load (Blevins and Wedel, 2009).
 - No functional load in Trique.
- As evidenced by dialectal differences, the word-initial length contrast is *diachronically unstable* in Trique.

Thank you!

- Rarity of contrast is diachronically explained via two structural conditions in Proto-Trique:
 - ① Phonological constraint on word size (bimoraic/disyllabic).
 - ② Final syllable prominence.

Preaspiration

- Preaspiration occurs more often before geminates (235/347, 68%) than before singletons (91/699, 13%).
- Preaspiration duration for geminate obstruents is 37.2 ms., but 21.0 ms. for singletons (affricate pre-frication).
- Common presence of preaspiration increases the duration of geminate obstruents. 114.1 vs. 193.7 ms. for stops; 128.8 vs. 207.8 ms. for affricates.
- Including preaspiration, durational ratios between singletons and geminates are larger for obstruents. 1:1.70 for stops, 1:1.61 for affricates.

Nhaheun?

- Word-initial consonant length contrast found in one other language: Nhaheun (Austro-Asiatic: Bahnaric).
- Word-final stress (iambic).
- Sesquisyllabic word structure.
- Origin of geminates here is the result of the similar set of sound changes described for Trique, with the same structural conditions present in the parent language (Pajak, 2009; Sidwell, 2003).
- Consonant length contrasts are very rare in monosyllables, but have a clear historical origin.

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