A Tricky Phoneme in Trique

Christian T. DiCanio
dicanio@berkeley.edu
UC Berkeley
Conference in Honor of Ian Maddieson

San Martín Itunyoso Trique (Otomanguean: Mixtecan)

- A “hard to perceive” contrast
- Pre-stopped nasal word
  | tone | gloss               |
  | [nɔ̃] | 3      | ‘this (proximal demonstrative)’ |
  | [?nɔ̃] | 43     | ‘my brother’                     |
  | [nakʰ] | 3-3    | ‘atole’                          |
  | [?nakʰ] | 4-4    | ‘opossum’                        |

What is the place of articulation?

- While the nasal following the “?” is alveolar, the place of articulation on the preceding stop is uncertain.
- Either it is:
  - alveolar
  - velar
  - something else?
- Examination of its phonetic properties

Background: Trique Phonology

- Fortis/Lenis consonant contrast, 8 tones that are lexically/morphologically contrastive, laryngeals/laryngealization.
- Syllable final prominence governs many of the distributional asymmetries.
  - Fortis/Lenis consonants contrast only in the onsets of final syllables.
  - Falling tones occur only in final syllables
  - Nasalized vowels occur only in final syllables
  - Laryngeal segment /h/ occurs only as a coda in final syllables.
### Consonant Inventory

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Alveolar</th>
<th>Alveopalatal</th>
<th>Velar</th>
<th>Labiodental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>p</td>
<td>t, tt</td>
<td>k, kk</td>
<td>kw, kkw</td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td>b, p, k</td>
<td>s ~ z, ~, #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasals</td>
<td>m, mm</td>
<td>n, nn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-stopped Nasal</td>
<td>7n</td>
<td>7n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-nasalized Stops</td>
<td>9n, 9g</td>
<td>9g, 9gw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affricates</td>
<td>ts, t, tti, ti, ti</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td>l, ll</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trills</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complex Consonantal Inventory for nasals
1. Geminate/Singleton Nasals
2. Pre-nasalized stops
3. Pre-stopped Nasals

### Questions & Methodology

- **3 questions concern us:**
  - Place of articulation of plosive
  - Timing characteristics of stop and nasal
  - Relationship to other stop types
- **Fieldtrip to Livingston, CA on 4/30/06 with Ian Maddieson**
- **Acoustic Data to answer questions**

### Data & Method

- 5 words in isolation and context recorded, 6 tokens of each word in each context.
- One male speaker, age 22.
- Examination of formant transition of preceding /i/, /a/, and /u/ vowel on following consonant types: /p/, /t/, /k/, /?n1/, and /?n2/.
- Examination of duration of stop closure, presence of burst, and duration of nasal in pre-stopped nasals.

**Examples:**

- [riki pala] 'lizard’s stomach’ x6
- 3-3 2-3 2-3 stomach lizard
- [tʃa pala] ‘lizard’s head’ x6
- 31 2-3 2-3 head lizard
- [siu pala] ‘lizard’s butt’ x6
- 32 2-3 2-3 butt lizard

Same paradigm used for all words in list:
- [pala] 2-3 ‘lizard’; [tʃo?lo] 3-3 ‘rooster’; [kolo] 3-3 ‘turkey’
- [ʔnæ] 32 ‘my brother’ (hn1/tn1);
- [ʔnakih] 4-4 ‘opossum’ (hn2/tn2)
Qualitative Data:

Data (1) Formant Transitions: F1

Small formant transition for high vowel context, large fall for low vowel context.

For ?n, transition from /i/ shows little F1 movement.
For ?n, transition from /a, u/ shows fall.

Data (2) Formant Transitions: F2

Large raising of F2 from /a/ to ?n sequence.
Large raising of F2 from /u/ to ?n1 sequence, like /t/

Falling of F2 from /i/ to ?n1 sequence, like /t/ or /k/.
Falling of F2 from /u/ to ?n2 sequence, like /k/.

Data (3) Formant Transitions: F3

- Least fall of F3 for ?n sequences on /i/ compared to all stops
- In /a/ context, F3 rises before ?n1, but falls before ?n2;
  (but it uniformly falls for ?n2 tokens; not so for ?n1)
- Level F3 on /u/ for all VC transitions.
Summary: Formant Transitions

- ?n1 and ?n2 have the same trajectory of F1 formant transition, showing the most F1 lowering, level in /i/ context.
- ?n1 and ?n2 have the same trajectory of F2 formant transition in /a/ (substantial raising) and in /i/ (high level), but differ for /u/ contexts.
- ?n1 and ?n2 have the same trajectory of F3 formant transition in /i/, showing the least fall compared to other stop types.

Discussion: place of articulation

- Characteristics of “?n” VC transition
  - More lowering of F1 than other stop types.
  - Raising of F2, or level after /i/
  - Least F3 fall compared to other stop types
- The “?” is palatal or alveopalatal; /cn/.

Duration Data (1): closure

- /cn1/ tokens have longer closure duration than /cn2/ tokens
- Recall that /cn1/ tokens are from [cn] and /cn2/ tokens are from [cnakîh]
- Significant effect of place on duration.

Duration Data (2): nasal portion

- Duration of nasal is also much shorter for /cn2/ than for /cn1/.
Summary: Duration Data

- Compared to other stop types, the /cn1/ pre-stopped nasals have a closure duration comparable to the duration of word-initial /t/.
- The /cn2/ ones have the shortest closure duration of all stop types.
- Shorter duration of both the closure and nasal in the pre-stopped nasal.

Discussion: Duration

- The differences in duration between the /cn1/ and /cn2/ tokens suggest that there is a strong positional effect on stop duration.
  - /cn1/ occurs in the onset of a monosyllable
  - /cn2/ occurs in the onset of a disyllable
- A “fortis-lenis” contrast or a positional strengthening effect.
- Recall that the onset of final syllables is the position of prosodic strengthening in Trique.

Conclusion

- Place of articulation of the pre-stopped nasals in the language is palatal/alveopalatal.
- Duration data suggests that there is a contrast between a fortis (geminate) and a lenis (singleton) pre-stopped nasal: /ccn/ and /cn/.

Conclusion

- Since both the closure duration of the stop portion and the nasal duration portion are correlated, their overall duration must be treated as phonologically unitary.
- The pre-stopped nasal is a phoneme, not a sequence.
- Pre-stopped nasals are rare in languages of the world. It is rarer still that a language to treat them as single units and have a fortis-lenis contrast with them.
References


Appendix A: Comparative Perspective

- Present in Itunyoso Trique and possibly in Chicahuaxtla Trique, but not in Copala Trique (Good, 1978; Hollenbach, 1984).
- Chicahuaxtla cognates:
  - naquinjin /3/ ‘atole’
  - jnaquinjin /4-1/ ‘opossum’
  - dinin /4/ ‘brother’
- Cognate with ‘brother’ begins with alveolar stop, but the cognate with ‘opossum’ has a “jn” onset.

Comparative Perspective (2)

- Other Mixtecan languages have what is written as “jn”, notably Yosondua Mixtec (Beaty de Farris et al, 2004) and Atatlahuca Mixtec (Alexander, 1980).
  - “La lengua está en la posición de n, pero el aire escapa por la nariz” (Alexander, p.4)
  - Suggests that this could be a voiceless nasal though.
- In Highland Mixtec languages, there are alveolar pre-stopped nasals, written as “tn” (Hollenbach, p.c.)

Comparative Perspective (3)

- Outside of Otomanguean, pre-stopped nasals have been noted in Russian (and Polish), Diyari, Arabana, Wangganuru, Olgolo, and Arrernte (Ladefoged & Maddieson, 1996).
  - Analyzable as sequences of stop+nasal
- Occur in Yeletnye (Maddieson, p.c.) with nasal plosion.
Appendix B: Vowel & Tone Inventory

- 8 Tones: /1/, /2/, /3/, /4/, /5/, /31/, /32/, /13/ (and possibly another, /43/).
- All contrast on final syllables, but only /2/, /3/, & /4/ contrast in non-final syllables.

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Central</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>Oral</td>
<td>i</td>
<td>u</td>
</tr>
<tr>
<td></td>
<td>Nasal</td>
<td>á</td>
<td>ü</td>
</tr>
<tr>
<td>Close-Mid</td>
<td>Oral</td>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td></td>
<td>Nasal</td>
<td>ə</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>Oral</td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>