Stress and tone in Cushillococha Ticuna

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Northwestern Amazonia is a tone hotspot. But its tone systems are relatively 'simple':

- At most two underlying tone heights -- /H, L, Ø/ (Hyman 2010)
- At most three surface tone heights (Gomez-Imbert 2001)
- Low tone density: not every syllable comes with an underlying tone
Introduction

Tone and stress have a close relationship in many languages of western Amazonia:

- Tone is privative and licensed by stress
  - Hup (Epps 2005:123, 2008)

- Some tones are lexical, others are metrical
  - Iquito (Michael 2011)
  - Kashibo-Kakataibo (Zariquiey Biondi 2011)
Introduction

Ticuna is an outlier among Amazonian tone languages (Anderson 1959; Montes 1995; Soares 2000).

- More contrastive tone heights than any other Amazonian language
- More contrastive contour tones than any other Amazonian language
- Maximal tone density
Key points

I argue that as well as these tone properties, the Cushillococha variety of Ticuna also displays **stress**:

- Stress licenses **additional** tone contrasts, rather than licensing tone.
- Stress **triggers** tonological processes.

The prosodics system as a whole:

- Closely resembles those of Oto-Manguean languages and Southeast Asian tone languages
- Does not closely resemble other Amazonian tone languages (with fewer contrastive tones)
Organization of the talk

1. Background information: language, data, and fieldwork
2. General overview of phonology and morphology, focusing on tone
3. Stress: facts
4. Stress: analysis
5. Conclusions
The Ticuna language

- Spoken by 41,500-70,000 people in Peru, Colombia, and Brazil
  - Peru: ~7,000 (my own calculations)
  - Colombia: 2,000? (Santos 2004)
  - Brazil: between 32,600 (Lewis et al. 2014) and 60,000 (ISA 2017), in Amazonas state

- Classification: isolate (but cf. Carvalho 2009; Seifart and Echeverri 2014)

- Internal classification: at least 3 dialects distinguished by sound changes; 100% mutual intelligibility (Santos 2004; Montes 2004; my own field observations)
Fieldwork and data

Data come from 8 months of my fieldwork in the town of Cushillococha, Loreto, Peru, 2015-2017.

- Cushillococha is an exclusively Ticuna community of ~3,000 people
- Most people in Cushillococha are dominant in Ticuna

I refer to the variety of Ticuna that I study as 'Cushillococha Ticuna' (CT)

- This variety was described by the SIL, supervised by Pike (Anderson 1959, 1962)
- I do not have data or make claims about other varieties. Cf. Montes (1995) (Colombia); Soares (2000), Carvalho (2012) (Brazil)
**Consonant inventory**

**Table:** Surface consonant inventory

<table>
<thead>
<tr>
<th></th>
<th>Labial</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voiceless Stop</strong></td>
<td>/p/</td>
<td>/t/</td>
<td>/tʃ/</td>
<td>/k/</td>
<td>/ʔ/</td>
</tr>
<tr>
<td><strong>Voiced Stop</strong></td>
<td>/b/</td>
<td>/d/</td>
<td>/j/</td>
<td>/g/</td>
<td></td>
</tr>
<tr>
<td><strong>Fricative</strong></td>
<td>[v]</td>
<td></td>
<td>[ʒ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nasal</strong></td>
<td>/m/</td>
<td>/n/</td>
<td>/ɲ/</td>
<td>/ŋ/</td>
<td>/ŋ/*</td>
</tr>
<tr>
<td><strong>Approximant</strong></td>
<td>/w/, /ʍ/*</td>
<td>/ɾ/</td>
<td></td>
<td></td>
<td>/j/</td>
</tr>
</tbody>
</table>

* /ʍ/ and /ŋ/ are involved in sound changes in progress*
Vowel inventory

<table>
<thead>
<tr>
<th>Vowel Inventory</th>
<th>Front</th>
<th>Central</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>i</td>
<td>i</td>
<td>u</td>
</tr>
<tr>
<td>Mid</td>
<td>e</td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>Rising Diphthong</td>
<td>ai</td>
<td></td>
<td>au</td>
</tr>
</tbody>
</table>

All of the vowels can be nasal or oral. Nasality is a segmental feature, not a feature of the syllable or morpheme.
Tone: Introduction

Tone is the fun part of the language:

- **Five level tones** -- written with numbers 1-5; 5 is highest
- **Four contour tones** -- 31, 43, 41, 51
- **My tone numbering** is based on the SIL's system (Anderson 1962)

The distinction between level and contour tones is more phonological than phonetic

- None of the tones is phonetically level
- The 'contour tones' fall while the 'level tones' display slight rises
Tone: Minimal Sets

(1) Level tone contrasts, /\u/ nucleus
   a. 1: \( mu^1 \) 'eat (fruit)'
   b. 2: \( mu^2 \) 'give, animate object'
   c. 3: \( mu^3 \) 'weave'
   d. 4: \( mu^4 \) 'be many'
(2) Level tone contrasts, /a/ nucleus

a. ₁: $p\tilde{a}^1$ 'hug'

b. ₁ (modal voice): $pa^1$ 'be tired'

c. ₂: $\tilde{a}^2$ 'mosquito'

d. ₃: $\tilde{a}^3$ 'give, singular inanimate object'

e. ₄: $pa^4$ 'be a young woman'
Tone 5 (superhigh) does not appear in $1\sigma$ lexical words. It does appear in bound morphemes of $1\sigma$ and in lexical words of $2 + \sigma$.

(3) **Tone 5: Bound morphemes of $1\sigma$**

a. 3 vs. 5: $\tilde{\eta}^3$ 'accusative case' vs. $\tilde{\eta}^5$ 'beneficiary/maleficiary case'

b. 1 vs. 5: $=na^1$ 'dative case' vs. $=wa^5$ 'allative case'

(4) **Tone 5: Lexical words of $2 + \sigma$**

a. 3.1 vs. 3.5: $po^3ri^1$ 'tobacco' vs. $to^3ri^5$ 'turtle species' (TG, $\sim$ Omagua tarikaya)
Tone: Contour Tones

Contour tones 31, 43 and 51 appear on lexical words; 41 only appears on grammatical morphs.

(5)  Contrasts among contour tones, /u/ nucleus
   a.  $mu^{31}$ 'pierce with harpoon'
   b.  $\bar{u}^{43}$ 'come, go, walk, singular subject'
   c.  $tu^{51}$ 'pull'

(6)  Contrasts among contour tones, /a/ nucleus
   a.  $a^{31}$ 'be thin'
   b.  $pa^{43}$ 'be dry'
   c.  $wa^{51}$ 'crawl'

51 appears in very few words.
Tone: Tonemes

Distribution of the tones:

- In $2\sigma$ morphemes, there are attested:
- Three of the five possible level melodies (11, 33, 44; *22, *55)
- 29 of the 40 possible non-level melodies

I analyze all of the level tones, as well as the contours 31 43 51, as phonemic because:

- All of the contrasts survive in morphotonological processes
- All of the contrasts survive in roots of $2\sigma$
  (Roots of $3+\sigma$ not informative because almost all are loans)
- There is no tone spreading or word-external tone sandhi
Laryngealization (a.k.a. creaky voice) is contrastive on syllables with tone 1. It is a feature of the vowel and not due to glottal stop.

(7) Minimal and near-minimal laryngealization pairs

a. /a/: pə¹ 'hug' vs. pa¹ 'be tired'
b. /i/: ɲi¹ 'steal' vs. ɲi⁴ 'get married'
c. /e/: ɲɛ¹ 'drop' vs. ɲe³¹ 'be female'
d. /u/: dʊ¹ru¹ 'tremble' vs. du¹ru¹ 'thunder (verb)'
e. /o/: to¹ 'Night Monkey (Aotus sp)' vs. to¹ 'other'
Morphology

Morphologically relevant word classes: nouns, verbs.

- Nouns are divided into alienable and inalienable nouns
  - Alienable nouns are prosodically and syntactically independent words
    - $q^1i^5$ 'grandfather, old man'
    - $tfos^1ri^3 q^1i^5$ (1SG.POSS old.man) 'my grandfather'
  - Inalienable nouns (a) must be possessed (or incorporated) and (b) behave as NP enclitics with respect to their possessors
    - $*a^1ne^1$ 'garden' unacceptable in isolation
    - $tfau^1 = a^1ne^1$ (1SG = garden) 'my garden'

- Verbs are divided into inflectional classes

Nominal roots are normally disyllabic, verb roots are normally monosyllabic.
Tone is much more conspicuous than stress in this language's phonology.

- Tone inventory: maximal (Maddieson 1978)
- Tone density: maximal
- Many phonological processes conditioned by and/or affecting tone
- Extensive grammatical tone

So why should we care about stress?

- All lexical phonological processes -- segmental and tonal -- are conditioned by stress
Stress on nouns

Nouns display a single stress on the first syllable. There are no other stresses.

- Alienable nouns: First syllable of the noun
  - 'qʰi⁵ 'old man, grandfather'

- Inalienable nouns: First syllable of the possessor
  - 'tfau¹ = a¹ne¹ 'my garden,' not tfau¹ = 'a¹ne¹

Adverbs, interjections and verb stems follow the pattern of (alienable) nouns. Verbal words are more complicated; ask me in Q&A.
Stress on nouns

The stressed syllable displays:

1. Greater duration
2. Resistance to reduction in fast speech
3. Privileged position in phonotactics
4. Privileged position for lexical phonology

Since 1 and 2 interact with sentence-level prosody, I focus on 3 and 4.
Stress: Phonotactics

The stressed syllable of nouns is phonotactically privileged.

- /ʍ/, /d/, /ŋ/, /au/, and /ai/ are allowed only in stressed syllables
- Contour tones are allowed only in stressed syllables

(8) re-displays the inventory, with the phonemes allowed only in stressed syllables highlighted in red
### Stress: Phonotactics

(8) Inventory of segments and tones, by effect of stress

<table>
<thead>
<tr>
<th></th>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nuclei</strong></td>
<td>/a e i o u i/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tones</strong></td>
<td>1̰, 1, 2, 3, 4, 5; 31, 43, 51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stress: Phonotactics

The syllable that immediately follows the stress is also phonotactically privileged.

- The stressed syllable can contain /o/ regardless of its onset
  - *to*₁ 'other,' *do⁵¹wi*₁ 'manioc bread,' *ɡ*¹ 'wound'
- The syllable after the stress can only contain /o/ if its onset is [ʔ] or Ø.
  - *o²ʔo⁴* 'newborn baby,' *ŋo³ʔ*₁ 'fish sp,' *bo²ʔo³* 'plantain grub'
  - *(C₁)oC₂o* if C₂ is supralaryngeal
- After the first 2 syllables, /o/ is banned
Stress: Lexical Phonology

Two lexical phonological processes occur only in stressed syllables.

1. Assimilation of sequences of a non-central vowel + /ɪ/
2. Dissimilation of /ɨ-1/ tone sequences

These are not the only lexical phonological processes conditioned by tone, just the simplest ones.
Stress-Conditioned Processes: /ɨ/ Assimilation

When a non-central vowel (e, i, u, o, au, ai) precedes /ɨ/ in the first two syllables of the prosodic word, the /ɨ/ obligatorily undergoes complete assimilation to the non-central vowel.

(9) Assimilation of /ɨ/: Applies in first two syllables

a. /ɲi⁴³ = ?i⁴ne¹/ (3:V = body) → [(ˈɲi⁴³ʔi⁴)ne¹] 'her body'

b. /ku⁴³ = ?i⁴ne¹/ (2SG = body) → [(ˈku⁴³ʔu⁴)ne¹] 'your body'

c. /to¹ = ?i⁴ne¹/ (other = body) → [(ˈto¹ʔo⁴)ne¹] 'other one's body'
Stress-Conditioned Processes: /ɨ/ Assimilation

When a sequence of a non-central vowel + /ɨ/ appears after the first two syllables, the /ɨ/ fails to undergo assimilation.*

(10) /ɨ/ assimilation: Fails to apply outside first two syllables

a. Syllable 2 + 3: /o¹ʔi⁵=ʔɨ⁴ne¹/ (old.man = body) → [(ˈo¹ʔi⁵)ʔɨ⁴ne¹] 'old man's body'

b. Syllable 3 + 4: /ka³ru¹=ne³=ʔɨ⁴ne¹/ (Carlos = son = body) → [(ˈka³ru¹)ne³ʔɨ⁴ne¹] 'Carlos' son's body'

*Except if the non-central vowel is /u/
Stress-Conditioned Processes: /ɨ/ Assimilation

More about (10c)
/ka³ru¹ = ne³ = ?i⁴ne¹/ (Carlos = son = body) → [(ˈka³ru¹)ne³ʔi⁴ne¹]:

- Shows that this process distinguishes between the first two syllables of the word and the other syllables
- And not simply between even and odd-numbered syllables

If this process applied to all even-numbered syllables, we would predict *[ˈka³ru¹)(ne³ʔe⁴)ne¹].

→ Footing is not iterative
Stress-Conditioned Processes: /1̱-1/ Dissimilation

When tone 1̱ (superlow laryngealized) precedes another tone 1̱, or modal 1, within the first two syllables of the noun, the first tone 1̱ undergoes dissimilation to tone 5 (superhigh).

(11) Tone 1̱ dissimilation: Applies within the first two syllables

a. /1̱1̱/: /kə¹=ʔã̰¹ti³/ (var. fruit = yard) → [(ˈka⁵ã̰¹)ti³] 'yard planted with kə¹ trees'
b. /1̱1̱/: /kə¹=a¹ne¹/ (var. fruit = chacra) → [(ˈka⁵a¹)ne¹] 'chacra of kə¹ trees'
Stress-Conditioned Processes: /˩-1/ Dissimilation

When tone ˩ precedes tone 1 or ˩ after the first two syllables, there is no dissimilation.

(12) Tone ˩ dissimilation: Fails to apply outside the first two syllables

a. /X˩11/: /ko²rẽ¹ = ?ã¹ti³/ (sweet.potato = yard) → [(′ko²rẽ¹)?ã¹ti³] 'yard planted with sweet potatoes'

b. /X˩11/: /ko²rẽ¹ = a¹ne¹/ (sweet.potato = garden) → [(′ko²rẽ¹)a¹ne¹] 'garden of sweet potatoes'

c. /XX˩11/: /tʃau¹ = e³ja¹ = a¹ne¹/ (1SG = sister = garden) → [(′tʃau¹e³)ja¹a¹ne¹] 'my sister's garden'

(12c) shows that this process is also specific to the first two syllables and not to all odd-numbered syllables. Otherwise, *[′tʃau¹e³)(ja⁵a¹)ne¹]
We saw data about three phenomena:

- Segmental phonotactics and tonotactics
- Lexical phonology affecting segments - /i/ assimilation
- Lexical phonology affecting tones - /¹-1/ dissimilation

All of these show that the first two syllables of the noun have a different phonological status than the other syllables.
Interim summary

The language also displays many other stress-conditioned phonological and morphological processes.

- Assimilation of /oa/ sequences
- Insertion of [ʔ] /CV¹
- Stress-conditioned allomorphy of suffixes and enclitics
- Morphotonology of subordinating enclitics

In fact, there is not even one lexical phonological process that is clearly not conditioned by stress.
Analysis of stress on nouns

With the foot notation in the examples, we have already seen the heart of the stress analysis.

- Every word of $2 + \sigma$ has a disyllabic foot at its left edge.
- The stressed syllable is the head of this foot.
- Stress-conditioned processes only apply within the foot.
- They do not apply in syllable 3 and later because those syllables are not parsed into feet.
Analysis of stress on nouns

Generalizations which the formal analysis should capture:

- All words have exactly one stress.
- The stress is always initial.
- Monosyllabic words are allowed and have stress (for phonotactic purposes).
- There is no evidence of stress or of any metrical structure beyond the first two syllables.
Analysis of stress on nouns

(13) Metrical stress rules for nouns
   a. All words must contain a stress foot.
   b. The foot must be a trochee (left-headed foot).
   c. The left edge of the word must align with the left edge of a foot.
   d. The ideal foot contains exactly 2 syllables, but degenerate monosyllabic feet are allowed.
   e. Footing is not iterative.

Syllables not dominated by a stress foot are dominated directly by the Prosodic Word (Ito and Mester 2003 [1992]).
(14) (13) produces the correct facts for nouns

a. One foot at the left edge of a $2\sigma$ word:
   \[ \text{/ko}^2\text{r}^\zeta^1/ \rightarrow [(\text{'ko}^2\text{r}^\zeta^1)] \text{ 'sweet potato'} \]

b. One foot at the left edge of a $2 + \sigma$ word:
   \[ \text{/ko}^2\text{r}^\zeta^1 = a^1\text{ne}^1/ \text{'garden of sweet potatoes'} \ (12c) \rightarrow [(\text{'ko}^2\text{r}^\zeta^1)a^1\text{ne}^1] \]

c. One degenerate foot for a $1\sigma$ word:
   \[ \text{/t}^\zeta^1/ \text{'Night Monkey (Aotus sp.)'} \rightarrow [(\text{'t}^\zeta^1)] \]
Cushillococha Ticuna displays robust tone and robust evidence for stress. And stress and tone interact:

- Stress controls the phonotactics of segments and **tones**
- Stress conditions lexical phonology, including lexical **tonology**
Conclusions

The prosodic system of CT is most similar to those of Oto-Manguean languages

- Stress licenses a larger number of tone contrasts on the stressed syllable -- Trique (DiCanio 2008), narrow Mixtec
- Unstressed syllables undergo (synchronic) reduction, leaving behind their tones -- Chatino and Zapotec languages

Equally useful comparisons with languages of Southeast Asia (Tai-Kadai, Tibeto-Burman, and others).
Conclusions

Yet the system does have some properties in common with other Amazonian languages:

- Stress licenses tone: cf. Hup
- Laryngeal complexity (Silverman 1997) (orthogonal voice quality and tone features): cf. Tukanoan languages

But other languages 'as tonal as' Ticuna tend to be analyzed without tone -- e.g. Bora (Thiesen and Weber 2012:98), neighbor to Ticuna
Thanks

mo³ē²ʔi⁵tsi²!
Thanks

- Many thanks to all of my Ticuna consultants and friends, especially Deoclesio Guerrero Gomez and LWG, the main sources of data for this talk.

- For comments on this data, thanks to Lev Michael, Larry Hyman, Sharon Inkelas, and audiences at the 2017 LSA and at UC Berkeley.

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- Thanks for funding to NSF/DEL DDRIG; NSF Graduate Research Fellowship; and 2015, 2016, and 2017 Oswalt Grants for Endangered Language Research.

- All mistakes and omissions are my own.


Tone: Phonetics

Figure: F0 tracks for 'level tones'

Comparison of smoothed pitch contours

Data: monosyllabic verbs of form [Ta], modal voice portion of vowel. Speaker LWG, 36-year-old woman.
Tone: Phonetics

Figure: F0 tracks for 'contour' and 'level' tones combined

Comparison of smoothed pitch contours

Data: Monosyllabic verbs of form [Ta], modal voice portion of vowel. Speaker LWG, 36-year-old woman.