The ten tonemes of Ticuna, an Amazonian oddity
Special thanks!

Loida Ángel, James Gregorio, **Javier Sánchez**, and all the collaborators in my project (San Martín de Amacayacu, Colombia)

María Montes, Ana María Ospina, Abel Santos (Universidad Nacional de Colombia)

Denis Creissels, Antoine Guillaume (DDL, Lyon)

Larry Hyman, Lev Michael, Nicholas Rolle, Amalia Skilton (UC Berkeley)

Amazónicas organizers and reviewers
Main claim

San Martín de Amacayacu Ticuna (Western Amazonia) features:

- 10 tonemes in stressed syllables
- 5 tonemes in unstressed syllables

N.B.: claim as to phonological (NOT just phonetic) items

→ Typologically rare, areally unique
Introduction
Some phonological background
Analysis—Stressed syllables
Analysis—Unstressed syllables
Discussion
Conclusion
INTRODUCTION

LANGUAGE, LITERATURE, DATA
Language

- ≈50,000–60,000 speakers (Peru, Colombia, Brasil), vital as a whole (Ethnologue 2018)

- some dialectal variation (Montes 2004-2005, Santos 2005)

- San Martín de Amacayacu variety ≈550 speakers, heterogeneous (linguistically in particular)

Previous descriptions

- Doris and Lambert Anderson (SIL, CTic) (N.B.: 1=highest 5=lowest)

- María Emilia Montes Rodríguez (Los Andes–Paris VIII, mostly SMAT) (Marília Facó Soares (Museu Nacional/UFRJ, Brazilian varieties) has a somewhat similar analysis; e.g. Soares, 1996)
Previous descriptions

  - “five phonemic levels of pitch”: 1, 2, 3, 4, 5 (p.80)
  - “presence of [compound?] glides”: 15, 23, 35, 12, 21, 25, 45… (p.92)
  - “laryngealization” is “phonemic”; observed with different “tones and glides” (→ orthogonal to pitch); unclear (p.96-98)
Previous descriptions

- Anderson D. (1962) and Anderson & Anderson (2017): a language course and a dictionary (phonetics? phonology?)
  - “cinco niveles de tono”: 1, 2, 3, 4, 5  
    (2017:vii)
  - “cuatro ligaduras” → “una sílaba puede tener más de un tono”: 15, 23, 35, 25 (25 found in one context only)  
    (2017:vii)
  - “laringaliza[ción]”: orthogonal to tones? In fact almost only found in syllables with tone 5
Previous descriptions

- Anderson D. (1962) and Anderson & Anderson (2017): a minimal phonetic reading—9 tones in single syllables
  - 1, 2, 3, 4, 5
  - 15, 23, 35 (25 is easily shown to be disyllabic)
  - 5~

+ a handful of marginal “anomalies”
Previous descriptions

  - “un sistema tonal complejo desde el punto de vista fonético [10 tones] pero relativamente simple fonológicamente hablando” (p.75-77)
  - “Voz laringalizada” is phonetic (p.69)

→ “tres tonemas alto, medio y bajo, junto con un sistema de reglas de alofonía” related to:
  • “adyacencia de tonos” (tone sandhi)
  • “tipos de sílaba” (e.g. short/long)
  • “terrazas” (p.75-77)
Today’s data

- 6 months fieldwork in SMA (PhD, 2015-2017) + work from Leticia

- most phonological work with Javier Sánchez, some with Loida Ángel and James Gregorio (headset mic Shure Beta 53)

- extensive transcription of productions by 10 more speakers (+ recordings from 10 more speakers) supports analysis

- basic methodology: **minimal pairs**; no computerized, statistical analysis
SOME PHONOLOGICAL BACKGROUND
Structure of SMAT syllable

[toneme] [nasality] [syllable-final ?] 

σ

(C) V

---

p t tɕ k kʷ~ʍ
b d dz g w
η
i u

e o

əɪ a aʊ̯
Structure of SMAT syllable

- Privative features
- Strictly orthogonal to tonemes
  (one single incompatibility: toneme 1+?)

Diagram:

```
  σ
 /\  
(C) V
```

- [toneme]
- [nasality]
- [syllable-final ?]
Structure of SMAT syllable

Stress is demarcative (NOT contrastive): automatically on 1\textsuperscript{st} syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

→ Often higher intensity; frequent vowel lengthening; exclusive locus of “expressive emphasis”
Structure of SMAT syllable

Stress is demarcative (NOT contrastive): automatically on 1st syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

\[\text{[ku}^3=\text{'}\text{ta}.^43\text{-ka}^1\text{]} \quad \text{vs} \quad \text{[ku}^3=\text{ta}^4=\text{'}\text{ka}^{21}\text{]}\]

\(2\text{SG.SBJ=be.big-liver}\) \quad \(2\text{SG.OBJ=3CLASSI.SBJ-awake}\)

‘you have a big liver’ \quad ‘she awoke you’
Structure of SMAT syllable

Stress is demarcative (NOT contrastive): automatically on 1st syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

Apart from stress, a number of differences between stressed and unstressed syllables (e.g. poorer segments inventory in unstressed syllables)
Structure of SMAT syllable

All syllables bear one (except epenthetic syllables)

Primarily lexical (although also some morpho-syntactically conditioned alternations)

**N.B.:** domain of tone is the syllable (no spreading across syllables)

→ today’s question: **how many values?**
A word on monosyllabicity

- Monosyllabic morphemes are extremely common in the lexicon (especially verbs) → favorable for strict tonal minimal pairs

Ex: //~a^toneme/ [ʔä²] ‘mosquito’
    /par^toneme/ [par^31] ‘(religious) father’ (< port.)
    /tu^toneme/ [tu^52] ‘to drag’
    /-gw^toneme/ [-gw^4] ‘PL’
A word on monosyllabicity

- Although monosyllabic phonological words are rare in discourse: often morphosyntactict complexity within the phonological word (esp. verbs)

Ex: $/\text{tea}^{\text{toneme}}=\sim\text{da}^{\text{toneme}}=\text{tu}^{\text{toneme}}=\text{ta}^{\text{toneme}}/$

1SG.SBJ=3CII-V(.OBJ)=to.drag=FUT

‘I will drag it’
ANALYSIS
STRESSED SYLLABLES
Stressed syllables: **phonetic sample A**

<table>
<thead>
<tr>
<th>phoneme</th>
<th>base form</th>
<th>stress</th>
<th>pronunciation</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>pa(36)</td>
<td>-ka(^1)</td>
<td>to.cling-liver</td>
<td>‘to clinging at so’s liver’</td>
<td></td>
</tr>
<tr>
<td>tu(52)</td>
<td>=ta(^4)</td>
<td>to.drag=FUT</td>
<td>‘to drag (fut.)’</td>
<td></td>
</tr>
<tr>
<td>pa(43)</td>
<td>=ta(^4)</td>
<td>to.be.dry=FUT</td>
<td>‘to be dry (fut.)’</td>
<td></td>
</tr>
<tr>
<td>pa(34)</td>
<td>=ta(^4)</td>
<td>to.be.nubile=FUT</td>
<td>‘to be nubile (fut.)’</td>
<td></td>
</tr>
<tr>
<td>?u(33)</td>
<td>=ta(^4)</td>
<td>to.say=FUT</td>
<td>‘to say (fut.)’</td>
<td></td>
</tr>
<tr>
<td>?a(31)</td>
<td>=ta(^4)</td>
<td>to.burn=FUT</td>
<td>‘to burn (fut.)’</td>
<td></td>
</tr>
<tr>
<td>ka(22)</td>
<td>=ta(^4)</td>
<td>to.stab=FUT</td>
<td>‘to stab (fut.)’</td>
<td></td>
</tr>
<tr>
<td>pa(21)</td>
<td>=ta(^4)</td>
<td>to.be.tired=FUT</td>
<td>‘to be tired (fut.)’</td>
<td></td>
</tr>
<tr>
<td>pa(_)</td>
<td>=ta(^4)</td>
<td>to.cling=FUT</td>
<td>‘to clinging (fut.)’</td>
<td></td>
</tr>
</tbody>
</table>

(bar\(^{15}\) ‘not even’)  
(pa\(^{33}\) ‘dad!’)  
(pu\(^{31}\) ‘to get used’)  
(po:\(^{22}\) (ra\(^4\)) ‘power’)
Stressed syllables: **phonetic sample A**

<table>
<thead>
<tr>
<th>Phoneme</th>
<th>Stressed Syllable</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pa:</code>³⁶</td>
<td>-ka¹</td>
<td>to.cling-liver ‘to cling at so’s liver’</td>
</tr>
<tr>
<td><code>tu:</code>⁵²</td>
<td>=ta⁴</td>
<td>to.drag=FUT ‘to drag (fut.)’</td>
</tr>
<tr>
<td><code>pa:</code>⁴³</td>
<td>=ta⁴</td>
<td>to.be.dry=FUT ‘to be dry (fut.)’</td>
</tr>
<tr>
<td><code>pa:</code>³⁴</td>
<td>=ta⁴</td>
<td>to.be.nubile=FUT ‘to be nubile (fut.)’</td>
</tr>
<tr>
<td><code>ʔu:</code>³³</td>
<td>=ta⁴</td>
<td>to.say=FUT ‘to say (fut.)’</td>
</tr>
<tr>
<td><code>ʔa:</code>³¹</td>
<td>=ta⁴</td>
<td>to.burn=FUT ‘to burn (fut.)’</td>
</tr>
<tr>
<td><code>ka:</code>²²</td>
<td>=ta⁴</td>
<td>to.stab=FUT ‘to stab (fut.)’</td>
</tr>
<tr>
<td><code>pa:</code>²¹</td>
<td>=ta⁴</td>
<td>to.be.tired=FUT ‘to be tired (fut.)’</td>
</tr>
<tr>
<td><code>paː</code></td>
<td>=ta⁴</td>
<td>to.cling=FUT ‘to cling (fut.)’</td>
</tr>
</tbody>
</table>
Stressed syllables: phonetic sample A

Stress: 27
Stressed syllables: phonetic sample A

- **pa**:36 - **ka**¹  to.cling-liver  ‘to cling at so’s liver’
- **tu**:52  =**ta**⁴  to.drag=FUT  ‘to drag (fut.)’
- **pa**:43  =**ta**⁴  to.be.dry=FUT  ‘to be dry (fut.)’
- **pa**:34  =**ta**⁴  to.be.nubile=FUT  ‘to be nubile (fut.)’
- **ʔu**:33  =**ta**⁴  to.say=FUT  ‘to say (fut.)’
- **ʔa**:31  =**ta**⁴  to.burn=FUT  ‘to burn (fut.)’
- **ka**:22  =**ta**⁴  to.stab=FUT  ‘to stab (fut.)’
- **pa**:21  =**ta**⁴  to.be.tired=FUT  ‘to be tired (fut.)’
- **pa**:  =**ta**⁴  to.cling=FUT  ‘to cling (fut.)’
Stressed syllables: **phonetic** sample A

<table>
<thead>
<tr>
<th>Stressed Syllable</th>
<th>Stress</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>paː</code></td>
<td>36</td>
<td><code>ka¹</code></td>
<td>to.cling-liver</td>
</tr>
<tr>
<td><code>tuː</code></td>
<td>52</td>
<td><code>=ta⁴</code></td>
<td>to.drag=FUT</td>
</tr>
<tr>
<td><code>paː</code></td>
<td>43</td>
<td><code>=ta⁴</code></td>
<td>to.be.dry=FUT</td>
</tr>
<tr>
<td><code>paː</code></td>
<td>34</td>
<td><code>=ta⁴</code></td>
<td>to.be.nubile=FUT</td>
</tr>
<tr>
<td><code>ʔuː</code></td>
<td>33</td>
<td><code>=ta⁴</code></td>
<td>to.say=FUT</td>
</tr>
<tr>
<td><code>ʔaː</code></td>
<td>31</td>
<td><code>=ta⁴</code></td>
<td>to.burn=FUT</td>
</tr>
<tr>
<td><code>kaː</code></td>
<td>22</td>
<td><code>=ta⁴</code></td>
<td>to.stab=FUT</td>
</tr>
<tr>
<td><code>paː</code></td>
<td>21</td>
<td><code>=ta⁴</code></td>
<td>to.be.tired=FUT</td>
</tr>
<tr>
<td><code>paː</code></td>
<td>21</td>
<td><code>=ta⁴</code></td>
<td>to.cling=FUT</td>
</tr>
</tbody>
</table>
Stressed syllables: phonetic sample A
**Stressed syllables:** phonetic sample B

<table>
<thead>
<tr>
<th>Stressed Syllable</th>
<th>Transcription</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ʨa³=nã³=</td>
<td>۴۰:۳۶</td>
<td>1sg=3=to.bite-liver</td>
</tr>
<tr>
<td>tɯ:³⁵</td>
<td>=taʔ¹</td>
<td>1sg=3=to.drag=too</td>
</tr>
<tr>
<td>mũ:³¹</td>
<td>=taʔ¹</td>
<td>1sg=3=to.encircle=too</td>
</tr>
<tr>
<td>mũ:³³</td>
<td>=taʔ¹</td>
<td>1sg=3=to.weave=too</td>
</tr>
<tr>
<td>mũ:²²</td>
<td>=taʔ¹</td>
<td>1sg=3=to.harpoon=too</td>
</tr>
<tr>
<td>ȵa:²¹</td>
<td>=taʔ¹</td>
<td>1sg=3=to.free=too</td>
</tr>
<tr>
<td>mũː</td>
<td>=taʔ¹</td>
<td>1sg=3=to.scold=too</td>
</tr>
<tr>
<td>ʔɯː</td>
<td>=taʔ¹</td>
<td>1sg=3=to.eat=too</td>
</tr>
<tr>
<td>ʔɯː</td>
<td>=taʔ¹</td>
<td>1sg=3=to.boil=too</td>
</tr>
</tbody>
</table>

‘I bite its liver’
‘I drag it too’
‘I encircle it too’
‘I weave it too’
‘I harpoon it too’
‘I free it too’
‘I scold it too’
‘I eat it too’
‘I boil it too’
Stressed syllables: \( \sigma \)-initial vs \( \sigma \)-final creaky-voice-ness

- A number of SMAT speakers display another type of creaky-voiced syllables

- 1 vs 2 types of creaky-voiced syllables: dialectal distribution?

- Diachronic hypothesis: 2-types varieties are more conservative (1-type varieties have merged the other type with tone 22)
Stressed syllables: σ-initial vs σ-final creaky-voice-ness

'to be white'

'to open (a canoa)'
Stressed syllables: phonological analysis

- These tones and phonation types are (all of them) tonemes
  - main phonetic features are essentially maintained across varying contexts (e.g. no sandhi, no downdrift, etc.)
  - systematically contrastive (in underived monosyllables in particular)
  - NO case for allophony between any of them (e.g. no segmental or suprasegmental conditioning, no relation to prosody, to word classes, etc.)
Stressed syllables: phonological analysis

- Pitch-related and phonation-related sets of phonetic properties form a single phonological paradigm: “tonemes” (BUT Skilton, pers. com., 2018 on CTic)

  - complementary distribution: creaky voice cannot combine with, or overwrite, tonal specifications as if an independent feature

  - pitch is essentially irrelevant in syllables that display creaky voice (although to be further tested with the creaky-to-modal phonation type)

  - creaky voice behaves like any tone in morphotonological processes
### Stressed syllables: sets of tonological minimal pairs

<table>
<thead>
<tr>
<th>Segments</th>
<th>36</th>
<th>52</th>
<th>34</th>
<th>43</th>
<th>33</th>
<th>31</th>
<th>22</th>
<th>21</th>
<th>Lcreaky.voice</th>
<th>Lcreaky.voice</th>
</tr>
</thead>
<tbody>
<tr>
<td>pa</td>
<td>‘to be full’</td>
<td>‘to be dry’</td>
<td>‘dad!’</td>
<td>‘to be tired’</td>
<td>‘to cling on’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mā</td>
<td>‘to chop up’</td>
<td>‘to be sad’</td>
<td>‘mum!’</td>
<td>‘to sprout’</td>
<td>‘to kill’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mû</td>
<td>‘to be numerous’</td>
<td>‘to weave’</td>
<td>‘to spear’</td>
<td>‘to send’</td>
<td>‘to eat (a fruit)’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tʂ</td>
<td>‘to plant’</td>
<td>‘to fetch’</td>
<td>‘to sit’</td>
<td>‘other’</td>
<td>‘kinkajou’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ŭu</td>
<td>‘to drag’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nāfi</td>
<td>‘other’</td>
<td>‘to be hot’</td>
<td>‘to be spicy’</td>
<td>‘tree’</td>
<td>‘other’</td>
<td>‘to tie’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ʨi</td>
<td>‘to stand’</td>
<td>‘to chew’</td>
<td></td>
<td></td>
<td></td>
<td>‘tree sp.’</td>
<td>‘to be tasty’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tɕi</td>
<td>‘to hang’</td>
<td>‘to stay’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>‘to be white’</td>
<td>‘to open’</td>
</tr>
<tr>
<td>ŋu</td>
<td>‘owl sp.’</td>
<td>‘to arrive’</td>
<td>‘to fall’</td>
<td>‘tree sp.’</td>
<td>‘to ferment’</td>
<td>‘to learn’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>?q</td>
<td>‘to vanish’</td>
<td>‘to die (a fire)’</td>
<td>‘to be lazy’</td>
<td>‘to fruit’</td>
<td>‘to be wounded’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Stressed syllables: conclusion

**10 tones = 10 tonemes**

<table>
<thead>
<tr>
<th>Tone</th>
<th>36</th>
<th>34</th>
<th>33</th>
<th>22</th>
<th>52</th>
<th>43</th>
<th>31</th>
<th>21</th>
</tr>
</thead>
</table>

- **modal-to-creaky**
- **(creaky-to-modal)**

(exact labels unimportant)
Stressed syllables: conclusion

Roughly coincides with Andersons (1962, 2017)’s phonetic (?) categories:

| 36  | 52  |
| 34  | 43  |
| 33  | 31  |
| 22  | 21  |
| modal-to-creaky | (creaky-to-modal) |
Stressed syllables: conclusion

Roughly coincides with Andersons (1962, 2017)’s phonetic (?) categories:

<table>
<thead>
<tr>
<th>Number</th>
<th>Arrow</th>
<th>Number</th>
<th>Arrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>→ 5</td>
<td>52</td>
<td>→ 51</td>
</tr>
<tr>
<td>34</td>
<td>→ 4</td>
<td>43</td>
<td>→ 43</td>
</tr>
<tr>
<td>33</td>
<td>→ 3</td>
<td>31</td>
<td>→ 31</td>
</tr>
<tr>
<td>22</td>
<td>→ 2</td>
<td>21</td>
<td>→ 1</td>
</tr>
<tr>
<td>modal-to-creaky</td>
<td>→ ₁⁻</td>
<td>(creaky-to-modal)</td>
<td>→ (Ø)</td>
</tr>
</tbody>
</table>

(N.B.: Andersons’ numbers inverted here!)
Stressed syllables: conclusion

Virtually coincides with Amalia Skilton’s (UC Berkeley) independent phonological analysis for CTic (pers. com., 2018) except for the 2 units with creaky-voice
ANALYSIS
UNSTRESSED SYLLABLES
## Unstressed syllables: phonetic sample

<table>
<thead>
<tr>
<th>Syllable</th>
<th>Phonetic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>pe³³?</td>
<td>-wa⁵</td>
<td>‘at you (pl.)’</td>
</tr>
<tr>
<td>pe³³?</td>
<td>-te⁴</td>
<td>‘your (pl.) husband’</td>
</tr>
<tr>
<td>pe³³</td>
<td>-mã³</td>
<td>‘your (pl.) path’</td>
</tr>
<tr>
<td>pe³³</td>
<td>-ga¹</td>
<td>‘your (pl.) rib’</td>
</tr>
<tr>
<td>tčau²¹</td>
<td>-pa~</td>
<td>‘my skirt’</td>
</tr>
</tbody>
</table>
Unstressed syllables: phonological analysis

- AGAIN: these tones and phonation type are (all of them) tonemes
  - main phonetic features are essentially maintained across varying contexts
  - systematically contrastive
  - NO case for allophony between any of them
Unstressed syllables: sets of tonological minimal pairs

- Fewer minimal pairs than in stressed syllables

<table>
<thead>
<tr>
<th>Segments</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>1</th>
<th>creaky</th>
</tr>
</thead>
<tbody>
<tr>
<td>nã</td>
<td>3CLASSII-IV.SBJ=</td>
<td>3CLASSII-V=</td>
<td>PRED.CLASSna¹=</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ta</td>
<td>3CLASSI.SBJ=</td>
<td>1PL.SBJ=</td>
<td></td>
<td>-VICIOUS.HABIT?</td>
<td></td>
</tr>
<tr>
<td>pe</td>
<td>2PL.BEN=</td>
<td>2PL.SBJ=</td>
<td></td>
<td>-bait</td>
<td></td>
</tr>
<tr>
<td>ṭuĩ</td>
<td>-BEN</td>
<td>-NMLZ.CIV</td>
<td>-ACC</td>
<td>-TRANSFORMATIVE</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>PROG=</td>
<td></td>
<td>PRED.CLASSi³=</td>
<td>PRED.CLASSi¹=</td>
<td></td>
</tr>
</tbody>
</table>
Unstressed syllables: conclusion

5 tones = 5 tonemes

5
4
3
1
creaky
Unstressed syllables: conclusion

Narrowly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

5
4
3
1
creaky
Unstressed syllables: conclusion

Narrowly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

| 5  | →5 |
| 4  | →4 |
| 3  | →3 |
| 1  | →1 |
| creaky | →1̰ |

(N.B.: Andersons’ numbers inverted here!)
Unstressed syllables: conclusion

Narrowly coincides with Skilton’s phonological analysis for CTic (pers. com., 2018) except for the one unit with creaky voice

BUT

Andersons (1962, 2017) have one more tone: 2

Skilton (pers. com., 2018) has one more toneme: 2

→ NOT in SMAT (?)
DISCUSSION
Stressed syllables: attempt at a perceptual experiment

- 2016, 5 speakers (♂/♀, 15-40 y/o), 42 words from sets of minimal pairs: words are played one by one several times, speakers are asked to write down meaning

- Surprisingly low success at task (43-50% → not random but does not support analysis)
Stressed syllables: attempt at a perceptual experiment

- BUT experiment very far from optimal (unnatural and rare monosyllabic items, recordings’ quality, room’s acoustics, etc.) → results at best hard to interpret

- Inventory is too large → ambiguity without a tonal context, methodology is irrelevant for its purpose

- Future work: same task with a tonal frame (e.g. \( \text{tea}^3=\text{nā}^3=\text{mū:xx}=\text{taʔ}^1 \)) and better conditions would most certainly yield near-perfect scores
Distributional assymetry of tonemes

- **Lexical (NOT textual) frequency**
  - 52 and Creaky-to-Modal: relatively rare (only a few cases in underived monosyllables in particular)
  - 36: frequent but exceptional in underived monosyll. (one/two cases?)
  - these are mostly secondary (as a result of tonological alternations)
Distributional asymmetry of tonemes

- One (marginal) combinational gap

  [syllable-final ʔ] + toneme 1 not found in unstressed syllables
Typological perspective

- Uncommonly rich toneme inventory cross-linguistically
  - a handful of (South) East Asian languages reach strictly speaking 9-fold (or more?) inventories:
    - Kam (Tai-Kadai) (Tang, 2008:87; Yang & Edmondson, 2008:514)
    - some Hmongic languages (?)
Typological perspective

- Uncommonly rich toneme inventory cross-linguistically
  - most striking typological parallels (in both richness and configuration of inventory): some Oto-Manguean subgroups (under some analyses)
    - Palantla Chinantec (Merrifield & Edmondson, 1999)
    - Xochistlahuaca Amuzgo (Bauernschmidt, 1965:473-474)
    - ...

→ future work: detailed comparison
Areal perspective

- **Hyman (2010):** typology of tonal systems in Amazonia (=South America in this case), 50 languages surveyed

  “most of the South American languages which have been analyzed with tone occur in the Western Amazon”  
  (p.377)
Areal perspective

(p.378)

≥ two-way contrast
Areal perspective

- **Hyman (2010)**: typology of tonal systems in Amazonia (=South America in effect), 50 languages surveyed

  “*most of the South American languages which have been analyzed with tone occur in the Western Amazon*”

  (p.377)

  → areal consistency
Areal perspective

- BUT richest inventories known: “three”-way inventories

  H vs L vs Ø Yagua, Mundurukú, Baniva, Piapoco (?)
  H vs M vs L Ticuna (according to Montes, 1995)

→ Ticuna’s toneme inventory is not only peculiar for the (even Western) Amazon region, but highly peculiar

- How to make sense of this areal uniqueness?
CONCLUSION
## SMAT toneme inventory

<table>
<thead>
<tr>
<th></th>
<th>in stressed syllables</th>
<th>in unstressed syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36  pitch</td>
<td>5  pitch</td>
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<td>52  —</td>
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<td>33  —</td>
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<td>31  —</td>
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<tr>
<td>creaky voice</td>
<td>phonation</td>
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</table>
References


References


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mō’è’ũchì
An analysis of what underlies the surface contrastive tones
Tonemes whose distinctive feature is pitch: stressed syllables
(→ no creaky voice)

WARNING: in these diagrams, 5=lowest; 0=highest!
Tonemes whose distinctive feature is pitch: stressed syllables

(→ no creaky voice)

WARNING: in these diagrams, 5=lowest; 0=highest!
Tonemes whose distinctive feature is pitch: stressed syllables
(→ no creaky voice)

WARNING: in these diagrams, 5=lowest; 0=highest!
Tonemes whose distinctive feature is pitch: UNstressed syllables
(→ no creaky voice)

4 level(-ish)

WARNING: in these diagrams, 5=lowest; 0=highest!
Tonemes whose distinctive feature is pitch: UNstressed syllables
(→ no creaky voice)

4 level(-ish)

WARNING: in these diagrams, 5=lowest; 0=highest!
Hypothesis

Underlyingly:

• **5 distinctive articulatory targets:**
  - Pitch (default modal voice): LOW
    MID
    HIGH
    EXTRA.HIGH
  - Phonation (pitch mostly irrelevant): CREAKY.VOICE

• **Unstressed syllables** have only 1 “alignment” for these targets
  ➔ 5 contrasts (slightly problematic, see 2 tonemes linked to unstressed syllables w/ glottal stop)

• **Stressed syllables** have 2 “alignments”: target “aligns” to the left or to the right
  ➔ 10 contrasts on the surface
Remaining issues

What does “alignment to the left/right” mean?

- *moraic interpretation*: 2 moras in stressed syllables; 5 tonemes; toneme links to one mora

- *Q-theoretic-like interpretation*: vocalic segments are subdivided in at least two phases *in stressed syllables*; 10 tonemes; tonemes are defined by two orthogonal features (height and phase alignment)

- *“ballistic/controlled accents” interpretation*: two types of stress (cf. SIL tradition for Oto-Manguean languages)
Remaining issues

If true, why apparently no detectable effect of this underlying system in the morphotonology?

In particular, this analysis apparently fails to make sense of the morphophonological “tone circle” (see later)
Unstressed syllables: phonetic sample

kuː⁴³ -ga¹ ‘your (sg.) rib’
tɕau²¹ -ga¹ ‘my rib’
pe³³ -ga¹ ‘your (pl.) rib’
kुː⁴³ -nē³ ‘your (sg.) son’
tɕau²¹ -nē³ ‘my son’
pe³³ -nē³ ‘your (pl.) son’
kुː⁴³ -te⁴ ‘your (sg.) husband’
tɕau²¹ -te⁴ ‘my husband’
pe³³ -te⁴ ‘your (pl.) husband’