Pitch Accent in Karitiana[•]

Luciana R. Storto & Didier Demolin*°*

*Linguistics Department/Museu de Arqueologia e Etnologia, Universidade de São Paulo**
Phonology Laboratory, Université Libre de Bruxelles°

1. Introduction

Our goal is to describe phonetic and phonological characteristics of pitch accent in Karitiana, an indigenous language of the Arikém family, Tupi stock, spoken today by approximately 350 people in the state of Rondônia, Northwestern Brazil. The language shows interesting interactions between stress and pitch, in a system in which both are predictable, and where the distribution of pitch is dependent on stress.

Karitiana is the first fully described pitch accent system inside the Tupi stock (Storto 1999). Tupi languages have an important contribution to make to a better understanding of tone typology and universals, because inside the stock there are tonal languages, pitch accent languages, and toneless languages (Moore 1998). It is an open question whether Proto-Tupi was a tonal language or not. Tonal systems (combinations of level H and L tones) have been reported in two out of the ten Tupi families: Mondé (Moore 1984, 1998), and Munduruku (Crofts 1985, Picanço 1999, 2003). In Ramarama tone and stress interact, but in an unpredictable way (Gabas Júnior 1999). In a fourth family, Juruna, tone has been reported as being unpredictable (Fargetti 1992), with stress depending on tone. Since these four families of languages are not more closely related to each other than to other Tupi languages, one could imagine that tone is not a recent development inside the Tupi stock. Languages in which tone is reported as unpredictable are underlined in the diagram below[1]:

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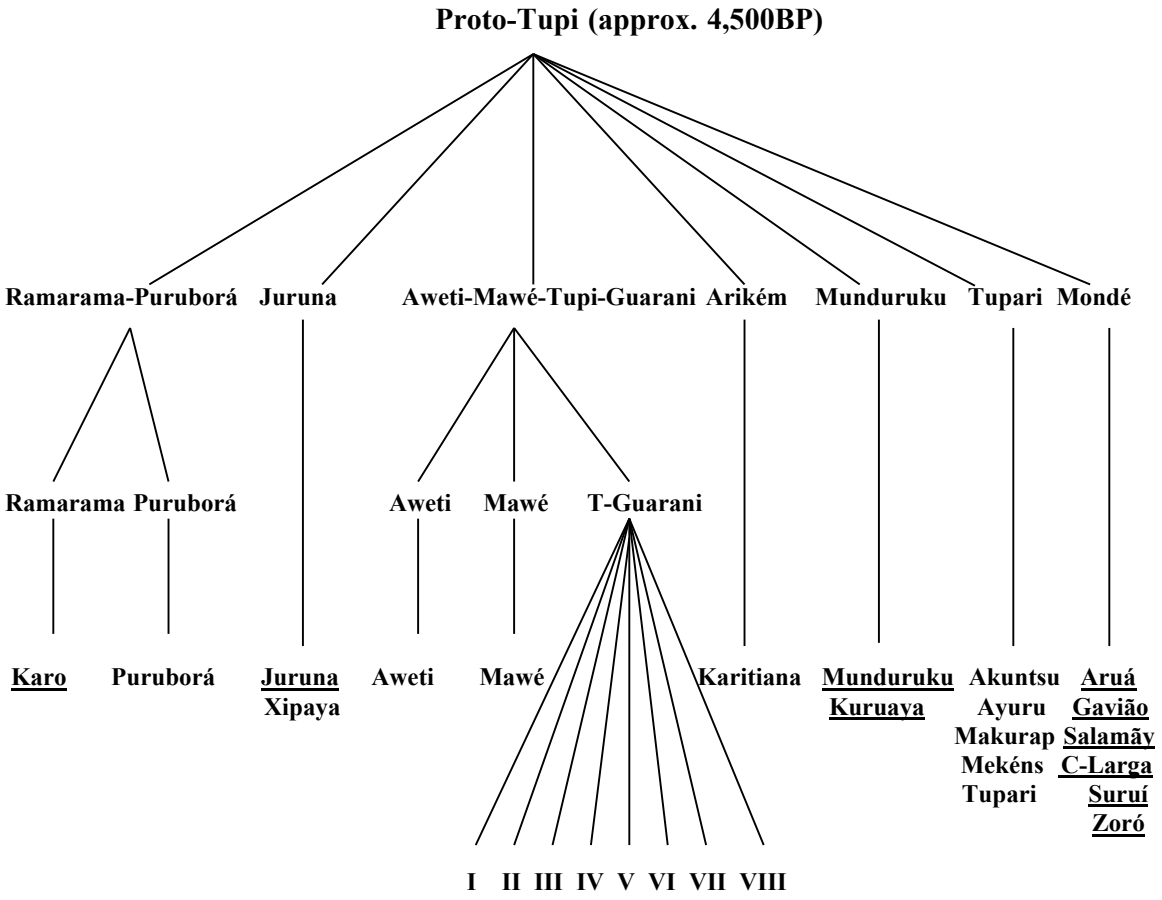
[1] Gavião differs from Zoró, Cinta-Larga and Aruá mainly in tonal patterns. These four dialects could be classified as a single language since they are intelligible (personal communication, Denny Moore).



The Mawé-Aweti-Tupi Guarani macro-family does not have any tonal languages (Rodrigues, A. 1964, 1985, 1986, 1999, 2000, Lemle 1971, Jensen 1999, Schleicher 1998, Mello 1992, Franceschini 1999). Puruborá is an incognita, because the language has not been used for more than 50 years, and the remaining speakers have not reported any minimal pairs. Xipaya certainly displays pitch contours (Rodrigues, C. 1990, 1995), in what seems to be a pitch accent system, but it may be the case that this system will never be described, given that there are only 2 speakers remaining. The Tupari family has a few descriptions (Alves 1991, Braga 1992, Galúcio 2001), and none so far have mentioned tonal phenomena. However, in his fieldwork on Ayuru (a Tupari language spoken by 7 people), Didier Demolin has registered tonal patterns. It is yet unclear whether the language is tonal or pitch accent. To conclude, the only grouping inside the Tupi stock that certainly does not display any tonal phenomena is the Mawé-Aweti-Tupi Guarani macro-family. All of the others have either unpredictable tone (Mondé and

Munduruku), unpredictable pitch accent (Ramarama and Juruna), or predictable pitch accent (Arikém). This picture is consistent with the hypothesis that Proto-Tupi was a tonal language and that the Mawe-Aweti-Tupi-Guarani macro-family was the only one in which pitch was lost completely. It remains to be determined whether any Tupari language has tone or pitch accent.

Most Tupi languages display another interesting suprasegmental phenomenon possibly related to tonogenesis: glottalization. Demolin & Storto (2004) have reported that in Tupi languages glottal stops (and related sounds such as laryngalized vowels and voiced glottal approximants) often have a marginal status as segments, in that their distribution is dependent on larger phonological units such as the syllable or the prosodic word. Since these larger units are the units to which supresegmentals such as stress and tone are assigned, it is possible that glottalization plays a role in tonogenesis in Tupi. It is necessary to investigate all of the languages before we understand the implications of such facts to the reconstruction of Proto-Tupi. However, there is strong indication that Proto-Tupi may have used degrees of glottal constriction to mark suprasegmental phonological distinctions. Both families of languages that have glottal stops in their inventory and those that arguably do not show glottalization phenomena linked to structures higher than the segment. In the first group are, at least, Aweti, Mawé, Puruborá, Ramarama, and Munduruku, and in the latter are, at least, Arikém, Tupari, and Mondé.

2. Descriptive Aspects of Pitch Accent in Karitiana

Material and method

Recordings of Karitiana words and sentences have been made with three speakers. The data, based on the material presented in Storto (1999), have been collected with a s*enhiszer* head microphone in order to avoid intensity variations due to possible movements of the speakers' heads. Then the data were processed with the *Signal Explorer* software. Fo curves have been made with the *Comb* method.

2.1. Stress

The assignment of stress in Karitiana is predictable based on phonological and lexical information. The stressed syllable in a root is always the rightmost, unless a heavy syllable is present (that is, a syllable with a long vowel), in which case, it will bear stress, as in (2). In case a root has more than one heavy syllable, as in (4), the rightmost heavy syllable is stressed[2] (Storto 1999):

```
1.          *    line 2                    'grasshopper'
           *)    line 1
        (*  *     line 0
         pa**en**

2.        *       line 2                    'alligator'
         *)       line 1
        (*) *     line 0
        **saa**ra

3.          *     line 2                    'to see'
           *)     line 1
        (*   *)   line 0
        so**'oot**

4.            *   line 2                    'owl'
        *      *)  line 1
        (*)    *)  line 0
        pyy**pyyp**
```

The grid representations given in this paper are descriptive devices of our phonological analysis. They represent stress prominent syllables with an asterisk in line 1, and show primary stress in line 2.

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[2] Karitiana has twenty distinctive vowels, but only five different vowel qualities: i, e, a, o, ɨ (long and short, oral and nasal). The consonantal inventory is: p, t, k, m, n, ɲ, ŋ, β, ɾ, s, h. The transcription used in this paper is orthographic. It differs from the phonemic transcription in a few aspects, namely: the high central vowel ɨ is represented as y; long vowels are represented as two vowels of the same quality; glottal stops, which are not considered phonemic for being limited to the onset of stressed syllables, are represented as '; the oral and nasal allophones of /ɲ/ are represented as j and j̃ , respectively; nasal vowels contiguous to nasal consonants are not marked with a tilde; pre and/or post oralized allophones of nasal consonantsare represented as preceded and/or followed by voiced stops with the same point of articulation as the nasals; /ŋ/ is represented as ng; the tap is represented as r and β is represented as w. Stressed syllables are marked here by bold. Syllables are formed minimally of a short nucleus, and maximally of an onset, a long nucleus and a coda. The onset of a syllable has no restrictions as to the quality of the consonants allowed, but codas do not allow any of the following segments: s, ɾ, β and h.

5. * line 2 *'gnat (mosquito)'*
*) line 1
(* line 0
kyr<y>k

Example (5) is representative of a class of disyllabic roots with word initial stress. This class of roots at first sight seems exceptional in terms of stress, since the language usually assigns stress to the last syllable in a root. However, on closer inspection, it is possible to describe these examples as involving epenthesis of the final vowel (marked henceforth by <v>). Evidence in favor of this hypothesis comes from the fact that all disyllabic roots with initial stress, without exception, have the same vowel quality in the first and last syllable. Also, there is prevalent use of vowel epenthesis elsewhere in the language (between a root and its affixes, and in lexical compounds and other complex nuclei formed by a lexical and functional item) driven by resyllabification and restrictions on syllable well-formedness (Storto 1999). Therefore, we will assume that (5) is to be represented phonemically as /kyrk/.

Derived and inflected words may involve more than one accented unit, because affixes may be inherently stressed. Compounds are always formed by at least two roots, all of which are stressed. In case more than one stressed lexical item is present in a word, primary stress is assigned to the rightmost stressed unit without exception.

2.2. Tone

Tone is predictable based on stress according to the following assignment conventions: from right to left (R→L), a tone is assigned to a syllable nucleus and spreads (leftward) only if that nucleus in unaccented (Storto 1999). That is, if a tone is associated to a stressed nucleus, it cannot spread. In this case, a different tone is assigned to the nucleus to the left of a stressed syllable, and spreads until an accented nucleus gets a tone, and so on, until the end of the word. For descriptive purposes, we will refer to the syllables through which a single tone spreads as a "tone domain". Words in isolation

always bear a declarative boundary L (L%) at the end, unless they are affirmative imperatives, in which case the boundary tone is H (H%):

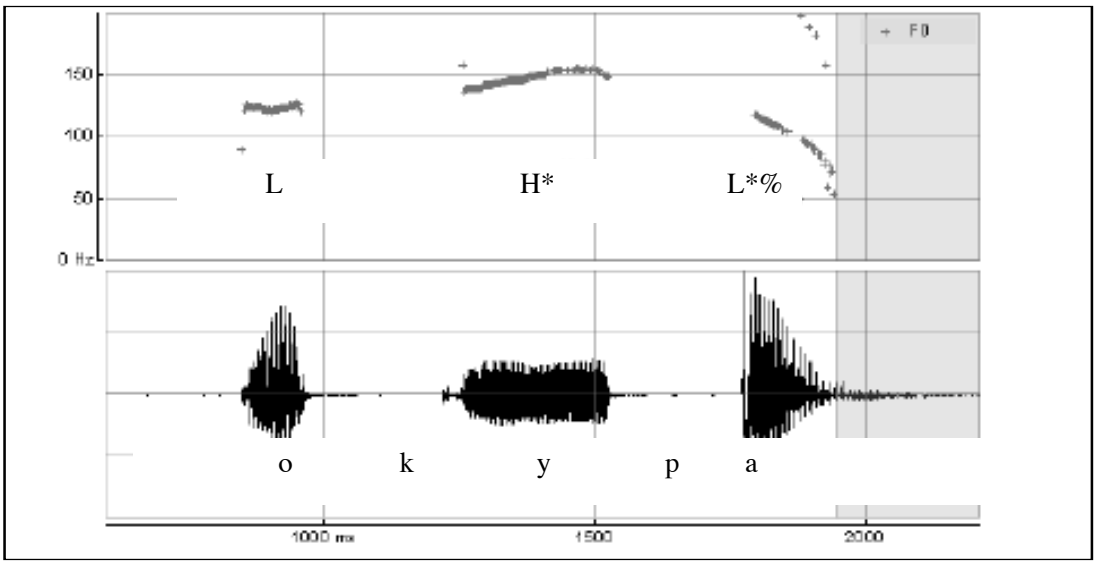


Figure 1. Fo contour and audio waveform of the word o**kypa** ‘killing instrument’

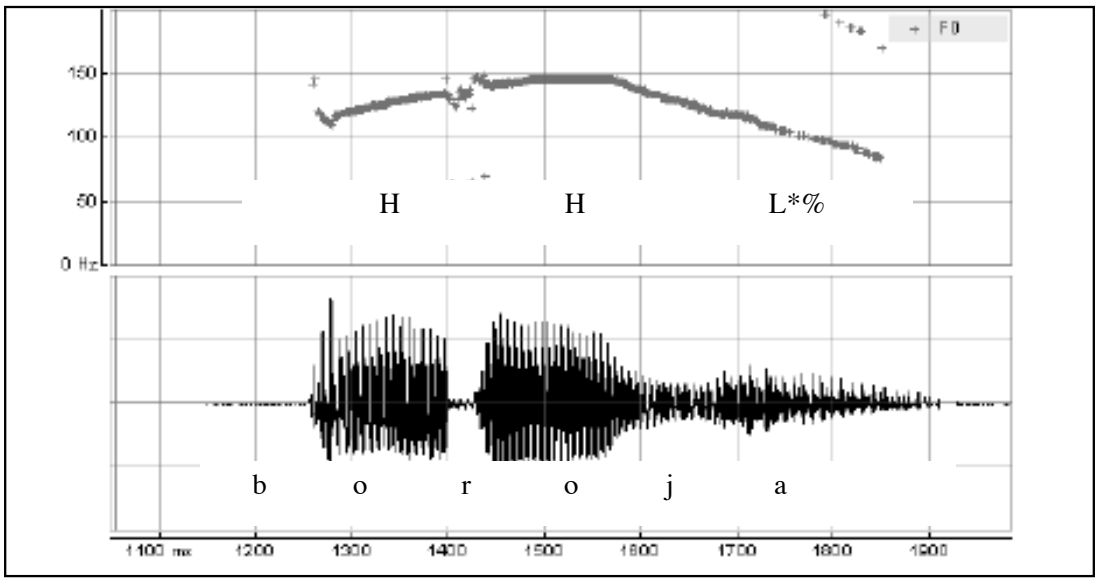


Figure 2. Fo contour and audio waveform of the word boro**ja** ‘snake’.

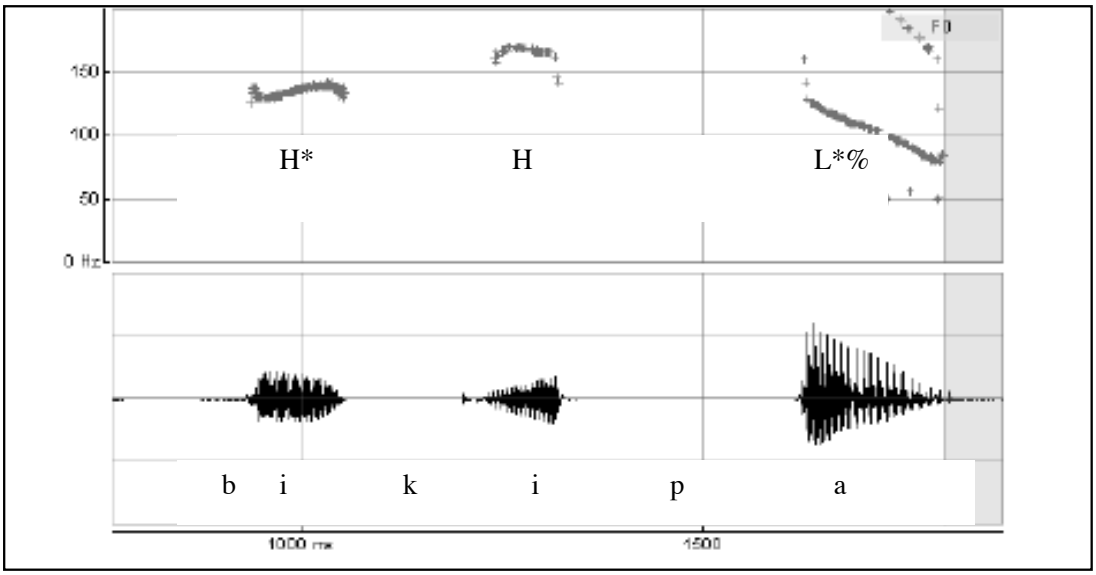


Figure 3. Fo contour and audio waveform of the word **bik**i**pa** ‘bench’.

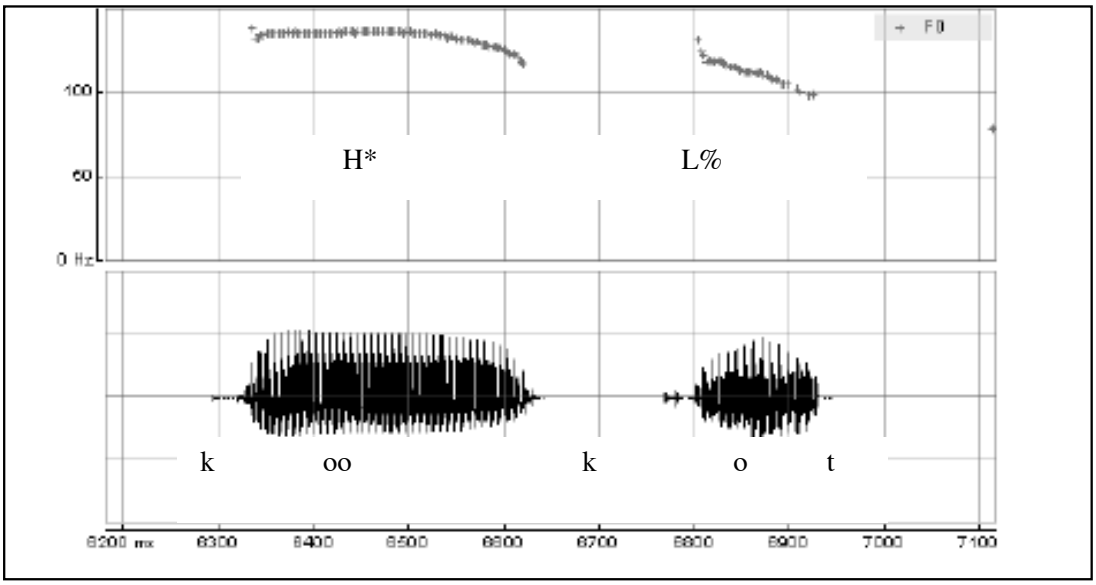


Figure 4. Fo contour and audio waveform of the word **koo**kot ‘to pass’.

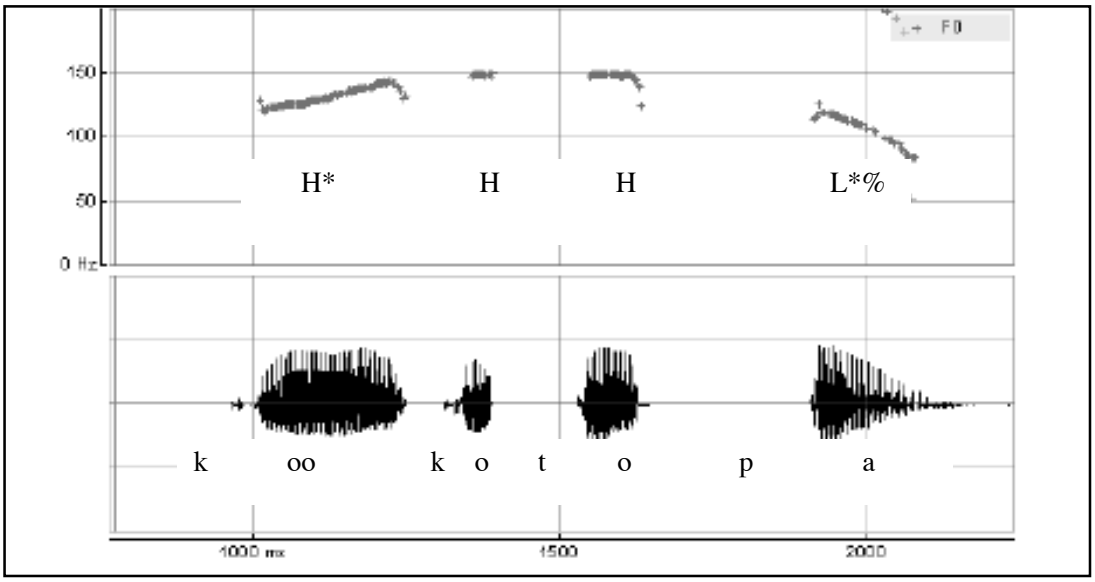


Figure 5. Fo contour and audio waveform of the word **koo**koto**pa** ‘bridge’.

Nouns derived with the suffix “–pa” have two stresses: one from the nominalizing suffix and one from the verb root. Primary stress falls on the suffix, and secondary stress falls on the stressed syllable of the root. The tonal effects of such stress facts are: words like “**koo**koto**pa**” (HHHL) (Figure 5) and “**bik**<i>**pa**” (HHL) (Figure 3) have a L boundary tone at the end, and then a H tone spreads right-to-left through all other syllables, ending in the stressed syllable. In the case of the monomorphemic word “boro**ja**” (Figure 2), a word with a single final stress, the pattern is the same HHL. In words like “o**kypa**” (Figure 1), where the second syllable of the root oky is accented, we have a change in tone pattern from the second to the first syllable, generating LHL, because a tone cannot spread leftward if it is linked to a stressed syllable. In figure 6 below we have two unstressed affixes; the imperative suffix “–a” and the second person singular agreement prefix “a-“ . As such, they do not affect the tone patterns of the final word, which is LHH, because the only stressed syllable present comes from the root. The last tone is H because affirmative imperatives have a H boundary tone. It spreads until it reaches a stressed syllable, and the tone assigned to the following tone domain is a default L.

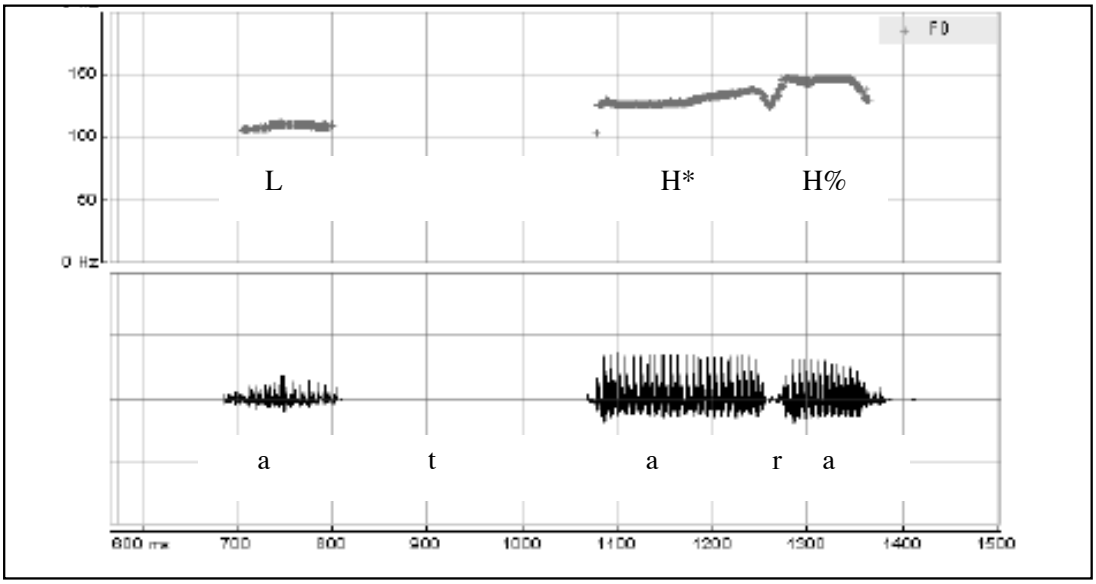


Figure 6. Fo contour and audio waveform of the word a**ta**ra ‘go!’.

We assume that a H tone is always available for each root, associated to the stressed syllable (H*). When a L boundary tone is available and links to the last syllable, which is usually stressed (L* %), the H tone associated to that syllable becomes available to associate to other syllables in the next adjacent tone domain to the left. All L tones other than the L boundary tone are given by default. There is no need to posit any other H tones than the ones which are required lexically in the stressed syllables of roots and stressed affixes.

Disyllabic words pronounced in isolation (Figures 7, 8, 9, 10) are somewhat exceptional, in that they do not follow the conventions described above. In such words, tone is always HL, regardless of the stress pattern. This can be explained if we assume that all declarative utterances must necessarily realize the L boundary tone (L%) at the end, as well as the H tone linked lexically to the stressed syllable of every root (H*). Note that the prohibition of spreading a tone linked to a stressed unit is respected even in these cases.

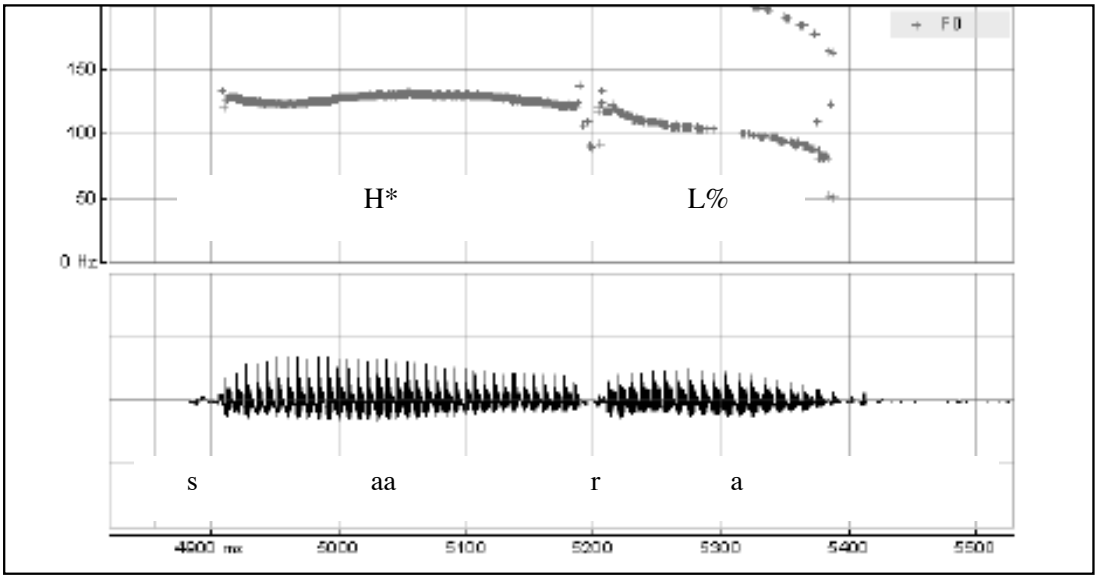


Figure 7. Fo contour and audio waveform of the word **saa**ra ‘alligator’.

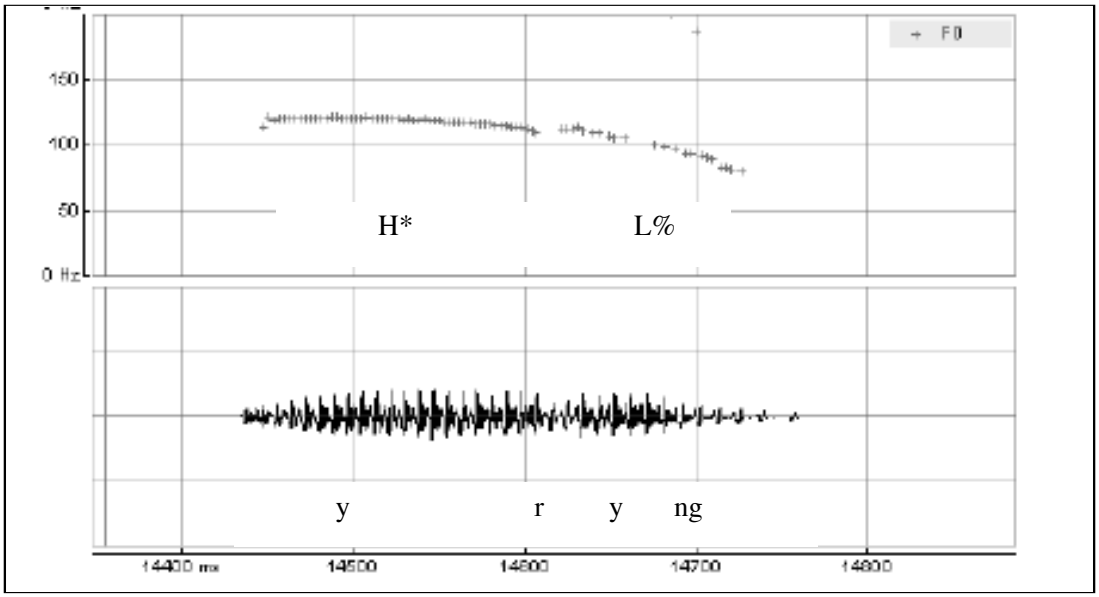


Figure 8. Fo contour and audio waveform of the word **y**ryng ‘cicada’.

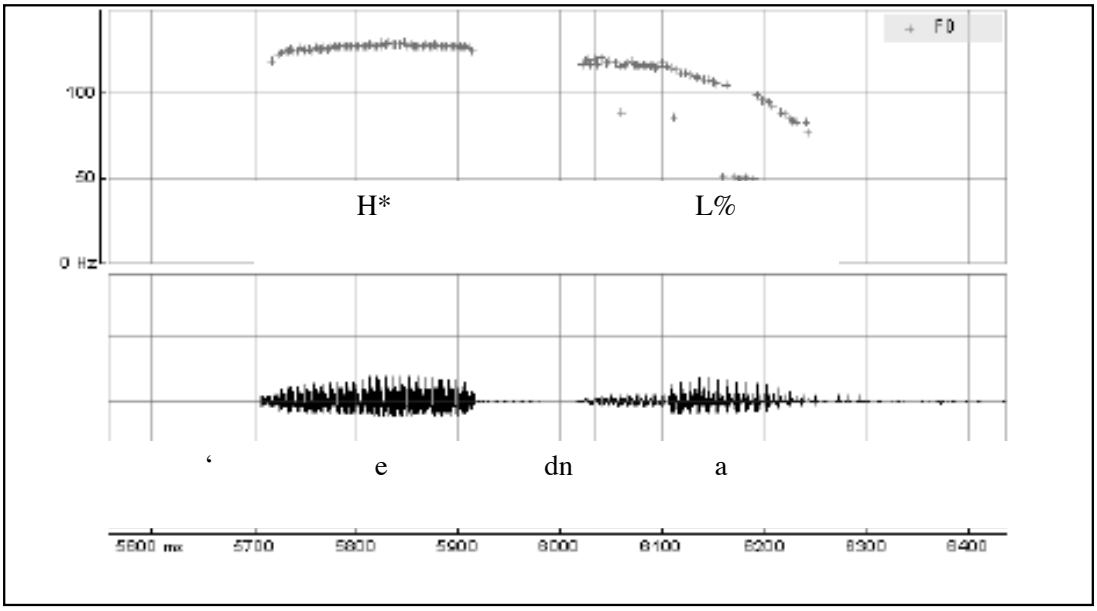


Figure 9. Fo contour and audio waveform of the word **'e**dna 'pregnant'.

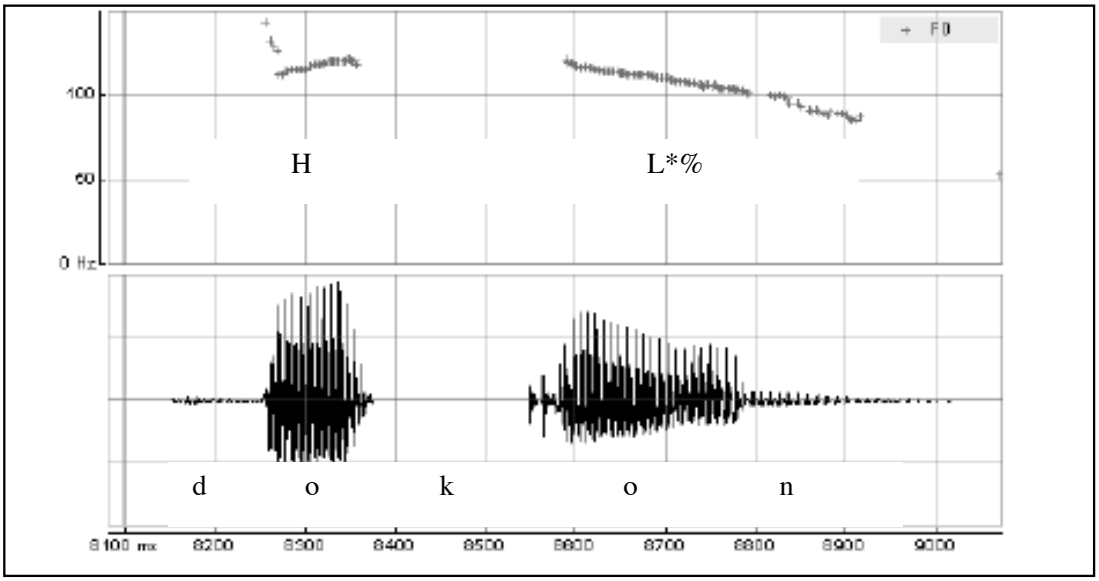


Figure 10. Fo contour and audio waveform of the word do**kon** 'skunk'.

3. Pitch Accent Patterns in Sentences

Inside sentences, words usually have a final H tone[3]:

[3] Abbreviations used in this paper: decl = declarative mood; ind.evid = indirect evidential (hearsay);1s = 1st person singular agreement; 2s = 2nd person singular agreement; 3 = 3rd. person agreement or cliticized pronoun; neg = negation; impfve = imperfective aspect; aux = auxiliary; nfut= non-future tense (present

```
6.        na+ambo        saryt      gokyp
          decl-raised    ind.evid.  sun
          'the sun raised (to the sky), they say'

      *     *     *                  *    *      *
      *)    *)    *)                 *)   *      *)
*  (*  *  (*  *  (*  *     →    ( *  *  * (*  *  (*   *
      |     |     |                 \/   |  |  |  |    |
      H     H     H                 L    H  L H  L    H
  naambo  saryt  Gokyp           naambo  saryt  gokyp
```

In this excerpt from a sentence taken out of a text entitled "Gokyp" ('the sun'), each word has a H tone at the end, and the tone associated to that last syllable does not spread because all of the words in question have final stress. As we have seen above, a tone associated to a stressed syllable does not spread, and a default L tone is inserted is the tone domain to the left of the H tone domain.

Alternatively, when the stress of a word falls in a non-final syllable, as in "padni" ((7) below), all syllables to the right will have the same tone value as the stressed syllable:

```
7.        iaoky     padni                    i+a+oky          padn+i
          \| /  |     |  |                   3-passive-kill   neg-suffix
           L   H*   H* H                     'He wasn't killed'
```

Words end in L tone when a boundary L tone is present at the end of a sentence (L in declaratives, interrogatives, negative imperatives and H in affirmative imperatives): For instance, the sentence from which excerpt (6) above was taken has a L boundary tone at the end:

8.

```
morasong, naambo saryt Gokyp, atoop, iri'aj
  \/    |    \/   |  |  |  |   |    |  |   \/ |
   L    H*   L   H* L H* L   H*   L   H* H  L* %
```

'Then, the sun raised up to the sky (they say) up it went'

---

and past); 2pron = pronoun of 2nd person singular; aff.imp = affirmative imperative; neg.imp = negative imperative; caus = causative; refrtl = referential aspect; obl = oblique Case; wh = interrogative wh word; vblzr = verbalizer.

The following example (Figure 11) makes explicit the presence of a L boundary tone in sentence final position:

9.

ta**so** na+o**pĩ+t** omba**ky** ‘the man cut the jaguar’
man decl-cut-nf. jaguar

```
   *        *          *
   *)       *)         *)          →
(* *  * (* *     (* *  *
   |        |          |
   H        H          H

   *        *         *
   *)       *)        *)
(*   *  * (* *    (* * *
 |   |   \ / |     \ /   |
L   H   L H     H   L
```

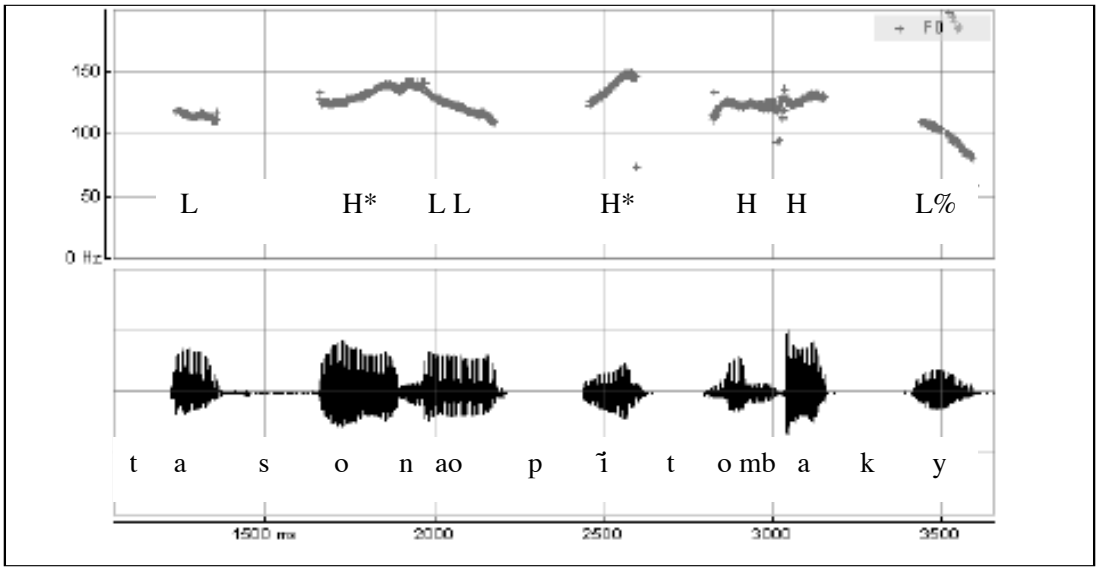


Figure 11. Fo contour and audio waveform of the sentence taso naopit ombaky ‘the man cut the jaguar’

4. A Phonological Processes involving Pitch Accent: Destressing

The example below (Figure 12) is a case of stress deletion, or destressing, an optional phonological process taking place between two words that may form a prosodic unit together, such as a verb and an aspectual auxiliary ("i'a tykat" in (10) below).

10.

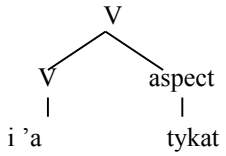
yj**xa** pi**tat**	i**'a**	ty**kat,**	**irikãraj̃**
yjxa pitat	*i+**'a***	*ty+**ka+t***	***i+ri+k**a)raj)*
human really 3-be		impfve-aux-obl	3-cit-think

'"He was really human", he thought'.

```
     *      *                *          *      *          *
     *)     *)     *)        *          *)     *          *)
(*   *   (* *   * (*    (*   *  →  ( *   *  (*  *      *  ( *  (*    *
     |      |       |        |       |   |  |  |      |   |     \ /
     H      H       H        H       L   H  L  H      L   H      L
yjxa      pitat    i'a      tykat    yjxa     pitat     i'a    tykat
```

The result of destressing is that the verb ("i'a") keeps its stress and the aspectual auxiliary ("tykat") looses it. This causes the loss of the H tone associated to the stress of the destressed unit. A boundary L tone then spreads throughout the destressed word "tykat", because when the stressed syllable is lost, the restriction against spreading a tone is also lost.

The explanation for stress deletion seems to be that in the new prosodic unit [verb+aspectual auxiliary], the verb is the nucleus of the syntactic constituent and it keeps its stress (Storto 1999):



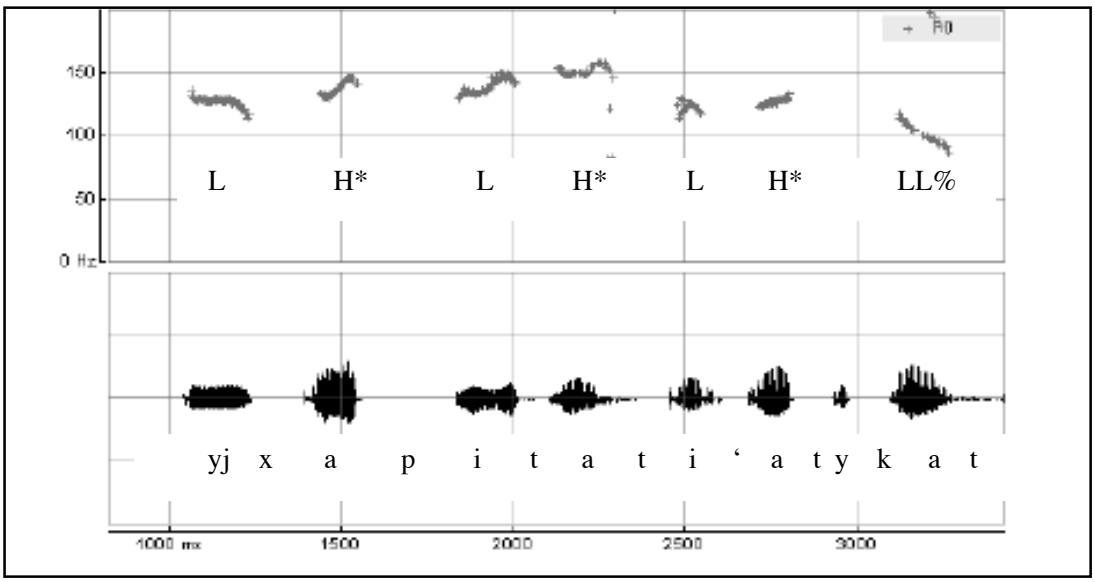


Figure 12. Fo contour and audio waveform of the sentence yika pitat ila tykat ‘he was really human’

The syntactic environments in which destressing was found in the data presented by Storto (1999) are: between two heads in compounds, or between a clitic and its host in the following environments: verb-negation, verb-evidential, verb-aspect, noun-postposition, noun-adverbial, wh-word and adjacent word, and between a verb and an oblique object. In the data digitally recorded for this paper we have no examples of destressing between a verb and an evidential or between a noun and a postposition, but Storto (1999) has recorded examples of such cases. The process of deletion is optional because these syntactic units are mapped into the phonology as phonological phrases just in case the speaker chooses to pronounce them as a unit. Alternatively, in case the pronunciation is carried out in a word by word basis, the tonal patterns of each word in the unit are kept and destressing does not take place.

Interrogative sentences in Karitiana do not impose a H boundary tone as in many languages, but have a L instead. The cases of stress deletion in interrogatives available in our data set are limited to two syntactic environments: between wh-words and an adjacent word in (11) (Figure 13) and in polar questions, as in (12), between a verb and the negative polarity item “mini”:

11.
ti+hoo+t a+aka an+o 'Where do you live?'
wh-aux-obl. 2s-aux 2pron-emph.

```
    *       *  *          *             *
    *)      *) *)         *)            *)
* (*   (* *  (*  →  * (*    *  (*   (* *
   |       |  |       |     \ | /      \/
   H       H  H       L       H        L
tihoot  a ka  ano    ti hoot  a ka     a no
```

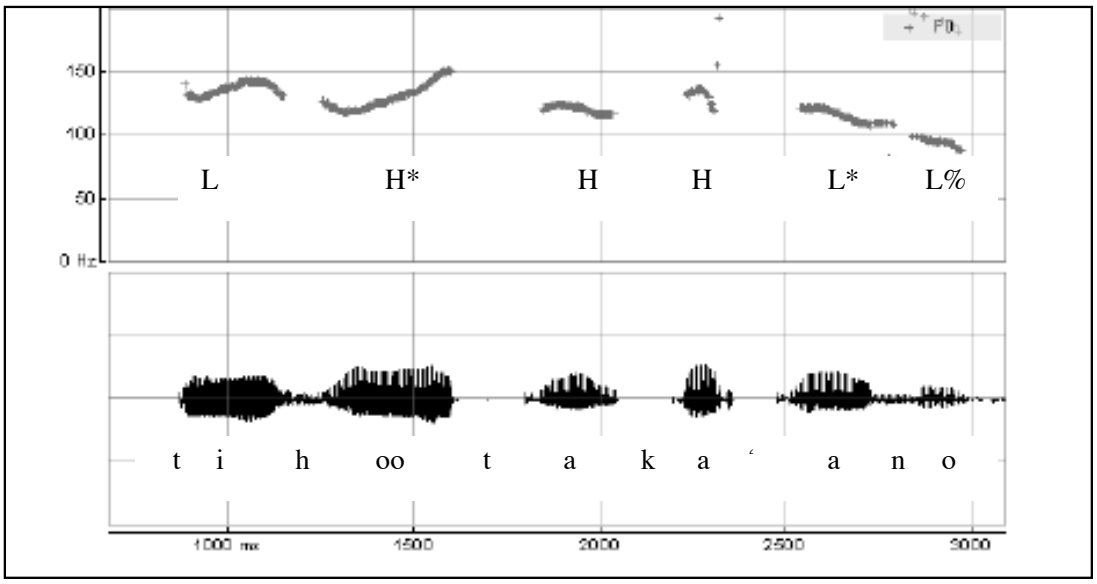


Figure 13. Fo contour and audio waveform of the sentence tihoot aka ano 'where do you live?'

In (11) above, the loss of a stressed syllable in the auxiliary "aka" results in a HH configuration. We have argued above that the H linked to the destressed syllable was lost in the process of stress deletion. The HH tone of aka seems to have resulted in this case from another source, namely from the rightward spreading of a H tone attached to the wh-word "tihoot". There are restrictions on what kind of H can spread rightward in destressing environments. It seems to be a fact of the language that when a stressed syllable is lost, you only get spreading of the H linked to a preceding syllable if that syllable bears the main stress of that phonological phrase.

In the following example, we also have a change in the expected tone patterns. Instead of getting a HH pattern in "mini", we get a LL. The explanation is that "mini"

looses its stress when it becomes one prosodic unit with the verb, and because of this the H tone is lost. As in the case discussed above, the default L is inserted. There is no spreading of a preceding H because the preceding H is not linked to a stressed syllable:

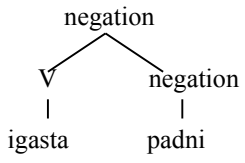
12

```
a+tat<a> min+i        an  yj+[a+kan]          'You are going to the village, aren't you?'
2s-go    neg.pol-suff. 2s  1p-[there-place]

                        *
   *     *     *     (* *          *             *        *  *
   *)    *)    *)     *)*)         *)            *)      (*  (*
* (*  * (* * (*   * (*(*   →   (*  *  *   (* *   (*   ( * (* ( *
   |     |     |      | |         |  \  /     \/    |    |    | |
   H     H     H      H H         L   H      L     H   L    H L
atata  mini   an    yjakan
```

Note that the compound word "akan" is formed by two roots, and for that reason has two stressed syllables, what accounts for the LHL pattern.

In the next two examples, we have evidence of the optionality of stress deletion. In the same syntactic environment, that is, between a verb and the negative word "padni" we have stress deletion in the verb in one case (13a) (Figure 14) and no deletion in the other (13b) (Figure 15). The reason why the verb is destressed is the same as the one given for the [verb-aspectual auxiliary] unit in figure 12: the syntactic head of the unit keeps its stress. The syntactic unit in this case is one in which the verb moves syntactically to adjoin to the functional category negation:



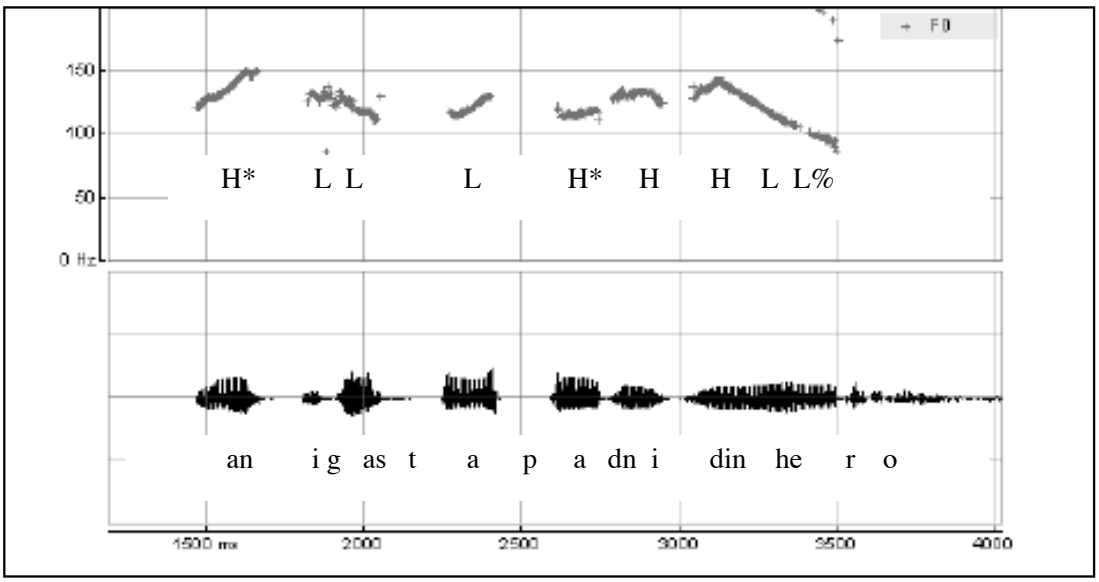


Figure 14. Fo contour and audio waveform of the sentence an igasta padni dinheiro ‘don’t spend the money’

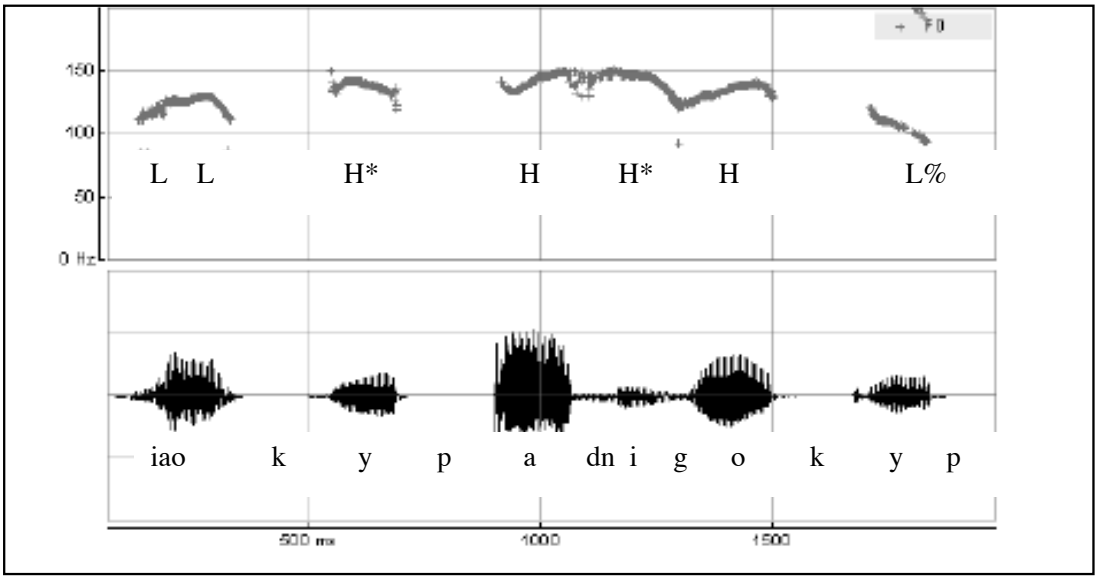


Figure 15. Fo contour and audio waveform of the sentence an iaky padni gokyp ‘gokyp was not killed’

13a.

```
        an        i-gas**ta**   **pa**dn-i     di**nhei**ro                 'Don't spend money'
        2pron     3-spend  neg.-suff    money

 *        *   *      *         *            *         *
 *)       *)  *)     *)        *)           *)        *)
(*  * (*  *  (*   (*  *  *  →  *   *  (*  *  (*  *   (*  *  *
 |        |   |      |         |     \ | /   \ /    |   \ /
 H        H   H      H         H      L      H     H   L
an   igasta padni dinheiro      an   igasta   padni  dinheiro
```

13b.

```
        iao**ky**    **pa**dni    Go**kyp**          i+a+o**ky**        **pa**dn+i          Go**kyp**
        \| /  |      \  /         |  |               3-passive-kill     neg-suffix
         L   H*      H*           H L*%             'Gokyp wasn't killed'
```

In Karitiana, affirmative imperatives end in H tone, whereas negative imperatives end in L tone. The differences in pitch in the examples below comes from the fact that the affirmative imperative ends in a H boundary tone, whereas the negative imperative ends in a L boundary tone. Note that the stressed syllable is the same in both cases:

14.

```
a+tat+a                    'Go'
 2s-go-aff.imp.

    *                *
    *)               *)
*  (*  *    →    *  (*   *
 |                |   \ /
 H                L   H
a  ta ra         a ta   ra
```

15.

```
a+tat<y>                   'Don't go'
2s-go-neg.imp.

    *                  *
    *)                 *)
*   (*   *   →      *   (*   *
    |               |     \  /
    H               H      L
 a   tat  y         a    ta   ty
```

Negative imperatives are formed by a verb inflected with absolutive agreement (subject agreement if intransitive, object agreement if transitive), and followed by the negation word "padni", which is often omitted, as in (15) above. When the verb root ends in a voiceless stop, an epenthetic vowel is inserted between the verb and the negation

word by the application of epenthesis. The quality of the vowel in this case is not determined by assimilation of the features of a preceding vowel, as in other epenthesis cases, but is listed in the lexicon as the high central vowel, orthographically represented as <y>. Note that even when the negation word is dropped, the epenthetic vowel remains. This occurs in all [verb-padni] units in the language if the verb ends in a voiceless stop, because there is a prohibition in the language against clusters of voiceless stops word internally and inside compounds. If the verb root of a negated imperative ends in a nasal consonant or in a vowel, predictably, no epenthesis takes place, and the verb stem is unmarked for imperative mood.

16.

```
an        y+mi                ‘Don’t hit me’
2pron     1s-hit

 *        *        *          *
 *)       *)       *)         *)
(*   *   (*   →   *    *    (*
 |        |        |    |     |
 H        H        H    H     L
an   y mi         an    y    mi
```

Examples (16) to (19) are negated imperatives. The negation morpheme “padni” is elided in (16) and present in (17). No epenthesis takes place in those examples between the verb and the negation morpheme negation because the verb ends in a vowel. In (18) and (19) the epenthetic vowel is present because the root ends in a voiceless stop. Note that even when the negation word is elided the epenthetic vowel <y> appears. This is evidence that when a negation morpheme is not visible in a negative sentence in Karitiana, it has been present and subsequently it was elided.

17.

```
a+piso padn+i                ‘Don’t step on it’
2s-step  neg-sufix

     *    *              *    *
     *)   *)             *    *)
*(* *    (* *  →   * (*  *   ( *   *
   |      |          \ /   |     \ /
   H      H           L    H     L
api so  padn       a  pi  so   pa dni
```

18.
an i+m+sembok<y> ‘Don’t get wet’
2pron 3-caus-wet-neg.imp

```
 *          *            *           *
 *)         *)           *)          *)
(*   * * ( *  *    → (*     * (* *   *
 |          |            |       \ /   \ /
 H          H            H       H     L
an  imsemboky
```

19.
an i+atot<y> ‘Don’t take it’
2pron 3-take-neg.imp

```
 *           *           *           *
 *)          *)          *)          *)
(*    * * (* *  → (*    * ( * *   *
 |           |           |       \ /   \ /
 H           H           H       H     L
an    iatoty
```

Affirmative imperative verbs are marked by the suffix “–a”, which occurs with a consonant-final root. When the root ends in a vowel, there is no morphological mark for the imperative. It is interesting to notice that negated imperative verbs ending in a vowel would be phonetically indistinguishable from affirmative imperatives ending in a vowel (such as (16)) if it weren’t for the intonation difference between them.

Examples (20) to (23) are affirmative imperatives. All of the roots involved end in a consonant, and in that phonological environment the affirmative suffix is the allomorph “–a”.

20.
y+hit+a ‘Give it to me’
1s-give-aff.imp

```
    *                *
    *)               *)
* (* *   →   *   (*   *
 |              |     \ /
 H              L     H
yhira
```

21.
a+pom+a andyk+a ‘Go play!’
2-play-aff.imp refrtl-aff.aff.imp

```
    *        *          *          *
    *)       *)         *          *)
* (*  * * (* *  →  * (* *  (*  *  *
   |        |         |  \ /   |   \ /
   H        H         L  H    L   H
 a poma andyka
```

22.
a+pongyp+a ‘Shut up’
2-be.quiet-aff.imp

```
        *                    *
        *)                   *)
* (*   *   *  →    *  (*   *   *
        |              \ /     \ /
        H               L      H
apongywa
```

23.
bawak a+haadn+a ‘Speak low’
Low 2s-speak-aff.imp

```
 *      *          *          *
 *)     *)         *)         *)
(*   * (* * →  (*  *    *  (*   *
 |      |          \ /     |    \  /
 H      H          H      L     H
bawak ahaadna
```

Examples (24) and (25) are cases of imperatives with verb roots formed by compounding, and for that reason the bracketing shows two stressed units to begin with. The rightmost syllable in the compounds gets main stress because destressing deletes secondary stress in these cases. For that reason, the tone linked to the second syllable can spread to the first:

24.
a+pyt+’y ‘Don’t eat’
2s-something-eat

```
        *
   (*  *                  *
    * )*  )                *)
* (* (*     →    *  (*  (*
   |    |           \ /     |
   H    H           H      L
apyt  ’y
```

25.
a+py+so ‘Don’t touch it (literally, ‘don’t be hand-aware’)’
2s-hand-aware

```
          *
   * (*   *                *
   *   *)  *)               *)
(  * (* (*  →    *  (*   (*
     |            \ /     |
     H             H      L
a py so
```

In (27) (Figure 16) the verb is followed by an oblique object and in the phonological phrase formed by these two units the verbs gets destressed.

26.

a+amy ka+t y+hot ‘Buy me this’
2s-buy this-obl. 1s-to

```
     *    *     *                *         *
     *)   *)    *)               *)        *)
(*   *    (*   * (*  →   (*   *   (*     *  (*
     |     |     |          \  /   |     |  |
     H     H     H           L     H     L  H
a   my   kat  y hot        a  my  kat   y  hot
```

27. **õwã** **ho**r<o>t taka+**’oot** sa**ryt** Go**kyp**
child like decl-inceptive aux. ind.evid

‘Gokyp began like a child, they say’

```
    *   *                *              *          *
    * )  *)               *)             *)         * )                    →
(*   *  (*   *       *   *  ( *         (*    *      (*   *
    |   |                  |              |          |
    H   H                  H              H          H


        *                  *              *          *
        *)                 *)             *)         * )
(*   *  (*   *       *   *  ( *         (*    *      (*   *
   \ /    \ /          \  /   |          |   |       |   |
    L     H            L    H          L   H       H   L
```

This final example of destressing is one in which a noun and the adverbial “hor<o>t” form a phonological phrase. The unit that looses its stress in such a case is the noun. As

we have seen before, when destressing takes place, the H tone attached to the stress syllable is deleted and a default L tone is inserted.

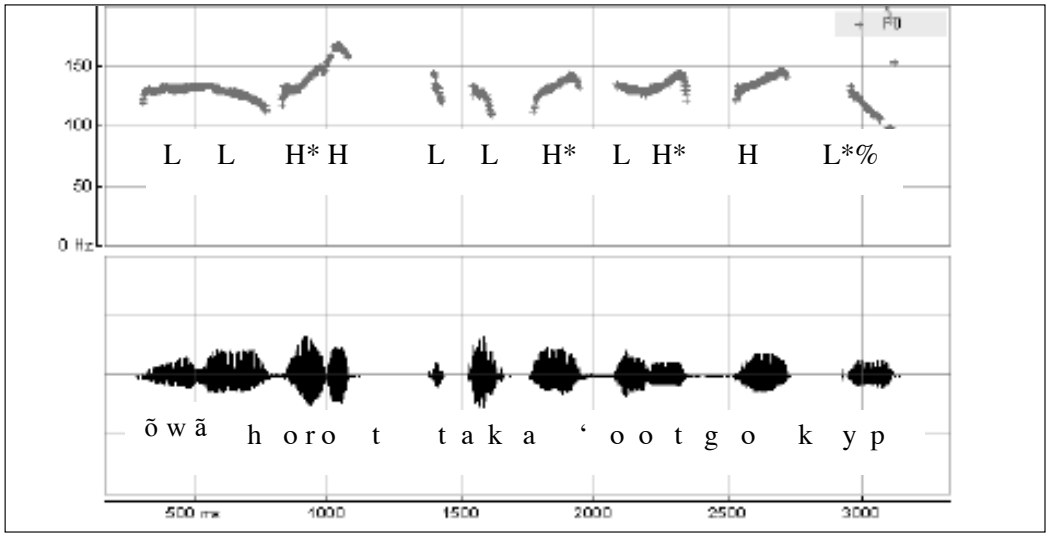


Figure 16. Fo curve and audio waveform of the sentence owa horot taka‘oot saryt Gokyp ‘Gokyp began like a child, they say’.

5. Observations on pitch realization in Karitiana

Although a more systematic account of the realization of pitch in Karitiana remains to be done, some observations can already be made with the data upon which this work has been done.

When initial and not stressed, a high tone (H) is slightly rising (Figures 2 and 10). When stressed in initial position a H is rather stable (Figures 4, 7, 8, 9), sometimes with a short falling end (Figures 4 and 7). In this position, it can also be rising but in this case its duration is shorter. A H with a rising contour can also be observed when it is in non-initial position. An interesting observation for H tones is that when there are sequences of H tones (2 or more), the last tones of the sequence are always higher than the first (Figures 2, 3, 5, 6, 11, 13, 14, 15). However after a H in a stressed syllable, there is occasionally a downstep of the pitch (Figures 11, 13, 15).

When initial, a low (L) tone has a level contour (Figures 1, 6, 11, 12, 13). When final there is always a sharp falling contour, whether it is in a stressed syllable or not. Sequences of L tones show a clear downdrift effect but in initial position (Figures 11, 13, 14). After a H tone, a L always has falling contour. When followed by an H in a stressed syllable a low tone is always raised and can have various contours (Figures 12, 12, 14). This effect of L rising seems to be quite frequent in the language and should be explored more systematically.

6. Conclusion

This paper described the pitch accent system of Karitiana, the last surviving language of the Arikém family, Tupi stock. It was shown that both stress and tone are predictable in Karitiana, and that both phenomena interact, the latter depending on the former. One phonological process was shown to operate inside prosodic units larger than words: destressing. We have provided acoustic data showing that stress is realized as length or intensity, and pitch is realized as a difference in fundamental frequency with an ambitus ranging from 80 to 170 Hz. Pitch curves show that downdrift acts on sequences of L tones in Karitiana.

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