

An intonational analysis of Iñapari pitch-accent

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Abstract: This paper was originally written in 1997 while I was a student in a class taught by Lisa Selkirk at the University of Massachusetts Amherst. I account for the tonal system of Iñapari, a moribund Peruvian language, using Optimality Theory.

1. Introduction

In Parker (1999) I sketch a basic analysis of the tonal system of Iñapari in a classical autosegmental and derivational framework. In that paper I characterize Iñapari from a typological perspective as a pitch-accent language with a basic LHL melody associated with each phonological word. My purpose in this paper is to re-analyze those data in the context of sentence-level intonational patterns (Pierrehumbert 1980, Pierrehumbert and Hirschberg 1990) and show how such facts can be formally captured in terms of violable constraint ranking and interaction, or Optimality Theory.

Iñapari is a Maipuran Arawakan language currently spoken by only four siblings in the Amazonian lowlands of southern Peru. The basic source of data for this study is Parker (1995). The phonemic inventory of Iñapari consists of the following segments: /p t ? s h m n ñ r w y i e a o u i/. The vowel /i/ is high, back, and unrounded. Each vowel can also be contrastively lengthened and/or nasalized. The canonical underlying maximal syllable template is *CVV*. The morphosyntax of Iñapari is highly agglutinative.

2. Word-level tonology

2.1 Tonal phonotactics

In this section I list the basic facts of Iñapari tone on individual prosodic words pronounced in isolation. Although some lexical items in Iñapari are distinguished solely by tone, it does not in general exhibit the characteristics of a language in which the distribution of tone is completely free (some illustrative examples will be provided shortly). Rather, the occurrence of its two register tones (high and low) are subject to some rather extreme distributional limitations, particularly the high tone. In the following points I describe these patterns:

- a. At the underlying level, every word must have at least one high-toned syllable; no major category lexical word consists only of low tones.
- b. Conversely, in underlying forms each word must also contain at least one low-toned syllable; no word ever consists entirely of high tones.¹

¹As we might naturally expect, nouns which contain only one vowel melody, such as [tɛ́ɛ́] ‘white seagull’, can violate this generalization. Such counterexamples are quite rare in Iñapari. Forms such as [tɛ́ɛ́] might be analyzed as containing a single, short underlying vowel which is lengthened in order to

- c. *Within a morpheme* all high tones must fall on adjacent moras; no sequence of HLH syllables is ever found within a word unless the two high tones are contributed by different morphemes (see examples below). In contrast to this, a sequence of LHL syllables is clearly permitted and in fact constitutes one of the default, unmarked patterns in morphemes of this size.
- d. In words containing three or more syllables, the first syllable is always low, never high. The only words with an initial high tone are those which contain precisely one or two syllables. Thus if a word contains exactly three moras, for example, its tonal melody *cannot* be *HLL nor *HHL.
- e. With the exception of words ending with long vowels (such as /apíí/ ‘coati’), it is very marked for an Iñapari word to end with high tones on both of the last two moras.² The only such monomorphemic form which I have discovered to date is /iwáná/ ‘river’.
- f. The majority of Iñapari words, especially those which contain only one morpheme, contain only one high tone. There are also many monomorphemic forms which contain two high-toned syllables, a handful with three, and two examples with four high-toned moras. Again, in all of these cases the high tones must fall on adjacent syllables, per item (c) above. (In multimorphemic words we do encounter non-adjacent high tones. See (6) below.) In contrast to this pattern, there appears to be no theoretical limit on the number of low-toned moras in a row which may occur at the beginning of a word in Iñapari, provided of course that at least one high-toned syllable appears before the end of the word (cf. (3) below).
- g. In polysyllabic words, at least one of the last four syllables/moras must be high-toned; no Iñapari word ever ends with four low tones in a row (see (4) below). In contrast to this, there is no parallel constraint which requires at least one high-toned syllable to occur within a certain distance from the *beginning* of the word; see point (f) above and example (3) below.

As stated in point (f) above, among monomorphemic words (most of which are nouns), normally only one mora/syllable bears a high tone in the unmarked case; all other syllables receive a default low tone. Furthermore, the location in which these high tones occur is for the most part unpredictable (especially in nouns). As the term *high tone* implies, the primary physical correlate of this suprasegmental feature is relatively high pitch, but greater loudness or amplitude also accompanies these

fulfill a prosodic constraint of bimoraic minimality. Faithfulness constraints will then ensure that both moras of the vowel surface with a high tone.

²Forms such as [mapaá] ‘beehive’ show that the two moras of long vowels do not always bear the same tone. Thus we cannot appeal to a high-ranked NoContourSyllable constraint as an independent explanation for this fact.

accented syllables. When one of these high tones occurs on the last syllable of a word pronounced in isolation, it is normally realized phonetically as a falling pitch (high to low). This glided tone is entirely predictable and never occurs in any other environment (i.e., non phrase-final). Furthermore, no rising (low to high) pitch is ever found on a single vowel mora anywhere in the language, so from a typological perspective Iñapari is clearly not a “contour” tonal language. As a matter of fact, given some of the strong restrictions on high tones which were listed above, one might be inclined to conclude that Iñapari is not really a tonal language at all, but rather that it should be classified as having an accentual or stress system of some type. This characteristic is confirmed by the fact that Iñapari does exhibit perceptible patterns of constraint-governed stress. However, there is one aspect of Iñapari which clearly distinguishes it from prototypical stress languages, and this is the fact that many words contain more than one high tone, whereas in most accentual languages, words containing more than one primary stress are either systematically prohibited or at most quite rare. Furthermore, Iñapari also allows (and in fact requires) that all tautomorphic high tones “pile up” on adjacent moras or syllables (per items *c* and *f* above). In contrast to this, most stress languages tend to arrange accented syllables into obligatorily alternating binary feet which produce a characteristic rhythmic effect superlayered upon an utterance.³ For these reasons I categorize the tonal system of Iñapari in Parker (1999) as being “pitch-accent” in nature. The conclusion, then, is that Iñapari is both a stress language and a tone language since (a) it requires the underlying specification of at least some tones, and (b) each prosodic word has a characteristic tonal pattern.

I now provide lists of words which exemplify and illustrate the tonal patterns discussed above. In the transcriptions below (as well as others in this paper), I use an acute accent (´) to indicate high tone; low-toned syllables are unmarked. The following contrastive forms demonstrate that the location of high tones or accents is in most cases unpredictable:

(1)	/ahíri/	‘black’	vs.	/ahiri/	‘fruit’
	/mára/	‘people; person’	vs.	/mará/	‘outside’
	/úna/	‘species of palm tree (<i>Astrocaryum huicungo</i>)’	vs.	/uná/	‘great mullein’
	/hipítei/	‘sand; beach’	vs.	/hipiteí/	‘species of monkey (<i>Chrysothrix</i>)’
	/anáwa/	‘they’	vs.	/anawá/	‘canoe’
	/ahetíri/	‘wooden steps, stairway’	vs.	/ahetíri/	‘orphan (masculine)’

The last form in (1) above (/ahetíri/) demonstrates that a word may have lexical high tones on two adjacent syllables rather than just one. The following examples

³Iñapari does have alternating *secondary* stresses which iterate backwards from the leftmost high tone in words of sufficient size. For the most part I will ignore secondary stress in this paper.

further illustrate the fact that up to four consecutive high tones may occur in the same morpheme, always falling on adjacent moras:

- | | | |
|-----|-------------------|---------------------------------|
| (2) | /aáwírí/ | ‘flower’ |
| | /aiwáhíro/ | ‘catfish’ |
| | /etípúni/ | ‘first’ |
| | /iteimápíre/ | ‘six’ |
| | /íipíá/ | ‘bank; shore (of a river)’ |
| | /ipú?úri/ | ‘ash; town, village; place’ |
| | /ha?ápére/ | ‘black seagull’ |
| | /hapísíri/ | ‘annatto tree’ |
| | /henímáři/ | ‘cedar tree’ |
| | /heti?ama?áritei/ | ‘black ocelot’ |
| | /rīto?aréhía/ | ‘dew’ |
| | /uná?ápi/ | ‘mirror’ |
| | /utiteáwána/ | ‘species of non-venomous snake’ |
| | /períá?ari/ | ‘thick’ |
| | /unamáá?ári/ | ‘wide’ |
| | /rī?úú?áma/ | ‘he or she has jumped’ |
| | /iapiró?ráma/ | ‘he is twisting’ |
| | /aparé?áánári/ | ‘similar, alike; equal’ |
| | /rīrīínáári/ | ‘his or her uncle’ |

In point (f) above I claimed that in principle there is no upper limit on the number of consecutive low-toned moras or syllables which may occur together at the beginning of Iñapari words. The following examples, taken from recorded texts, illustrate this phenomenon:⁴

- | | | |
|-----|------------------------------|--|
| (3) | /nari?atearamateareteíni?a/ | ‘when I finished skinning it (a jaguar)’ |
| | /ayupateimīnarapirateiámiya/ | ‘in order to sink posts (for a house) into the ground’ |
| | /ahapahīnimatunohatinamájtū/ | ‘I have nothing more to tell you.’ |

On the other hand, every Iñapari word must contain at least one high tone somewhere within the last four moras; see point (g) above. The following cases thus exemplify the maximal distance between the last high tone and the end of the word:

- | | | |
|-----|----------------|------------------------|
| (4) | /ahíperiri/ | ‘harsh; rough’ |
| | /amáteniri/ | ‘wild; savage; fierce’ |
| | /i?uteápe?ama/ | ‘he is laughing’ |
| | /itápéhīpīri/ | ‘post (of a house)’ |
| | /ma?áwapiri/ | ‘centipede’ |

⁴The forms in (3) are potential cases of a default epenthetic high tone.

Another clarification which bears mentioning is that there is no evidence that the tone or accent system of Iñapari is quantity sensitive in nature. Rather, as we might expect in a language which is at least partially tonal, the alternating primary and secondary stresses can regularly skip over and be undisturbed by intervening heavy syllables (those containing geminate vowels). The following examples illustrate this claim:

(5)	/aateíni/	[aačíniti] ⁵	‘footprint; footstep’
	/ahépiima/	[ahépiima]	‘species of fish (<i>achacubo</i>)’
	/tearaaréti/	[tʰàraaréti]	‘to skin (an animal)’
	/ihirʰaʰtíri/	[içìrʰaʰtíri]	‘he is drowning’
	/ihĩʰanaamári/	[ixĩʰànaamári]	‘he is breaking it’
	/imeeriʰamári/	[imɛeriʰamári]	‘he is collecting or gathering it up’
	/imiriiwáre/	[imìriiwáre]	‘fin (of a fish)’
	/itjíráma/	[itjíráma]	‘he is cursing or swearing’
	/hĩpĩrí/	[xĩpĩrí]	‘bitter’
	/meʰaniiróti/	[meʰànuróti]	‘daughter-in-law’
	/miiníre/	[miiníre]	‘chameleon’
	/paateí/	[paačí]	‘one (numeral)’
	/puuhé/	[puuhé]	‘day; daytime’
	/reeríma/	[reeríma]	‘hurt; wounded’
	/rĩteaamĩnimári/	[rĩtʰaamĩnimári]	‘he is permitting or allowing it’
	/rumĩʰĩráma/	[rumĩʰĩráma]	‘he or she is following, continuing’

Finally, in forms containing more than one morpheme, it is possible to have non-adjacent high tones. The following words exemplify this pattern:

(6)	/aʰáre-má-ri/	‘It is noon.’
	noon-indicative-masculine	
	/imateáʰa-tí-ri/	‘flat’
	flat-absolutive-masculine	
	/meʰááhĩ-tí-ro/	‘sister-in-law’
	sister.in.law-absolutive-feminine	
	/awáhihe-tí-ri/	‘noise’
	noise-absolutive-masculine	
	/n-eʰúnuʰa-má/	‘I turned around.’
	1st.person-turn.around-indicative	

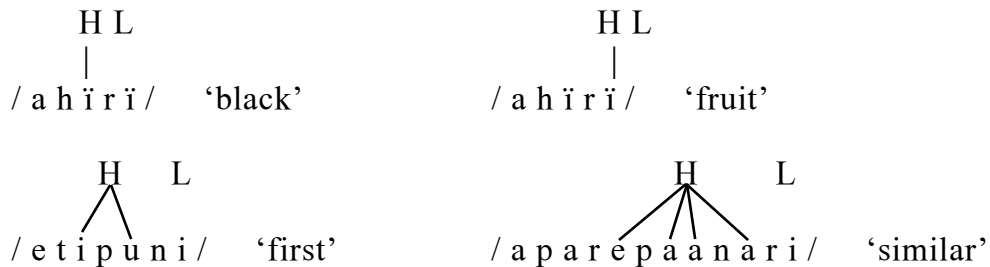
⁵In Iñapari the underlying sequence /tei/ coalesces to [çi]. Similarly, /tea/ is pronounced as [tʰa].

2.2 Word-level analysis

In this section I will begin to piece together a formal account of Iñapari intonation, limiting myself to individual phonological words pronounced in isolation. In keeping with the Headedness condition of the Strict Layer Hypothesis (Selkirk 1984 and 1995), we know that when an utterance consists of a lone prosodic word, any phonological features associated with intonational phrases are simultaneously laid upon it as well. Thus we can account for the phonetic falling tone on a word-final accented syllable by positing a low boundary tone which obligatorily docks with that mora. This intonational “toneme” corresponds to the universally unmarked default pattern for simple declarative utterances. Furthermore, since virtually my entire corpus of data is restricted to this one pragmatic parameter, I will limit my attention in this paper to this intonational paradigm alone. That is, I will not deal at all with sentences involving high boundary tones, if such elements in fact even exist in Iñapari at all.

As I have implied above, the “accentual” high tone of Iñapari must be lexically specified in underlying forms since there is no way to predict where it will fall in a given word. That is, every accented mora must be pre-linked with a high tone in the lexicon. In words which contain more than one adjacent high tone, I assume that there is a single high tone which is multiply linked, in deference to the OCP. Furthermore, in order to produce the drop in pitch which immediately follows the last high tone in a word, I will posit a high-low accentual melody. We can thus recast some of the previous examples in terms of these underlying representations:

(7)



As I imply in (7) above, there is no need for the low tone of the lexical pitch accent to be pre-linked. Nevertheless, given the Richness of the Base principle of OT, we cannot a priori exclude such a possibility, so my constraint system will have to be set up in such a way that it could potentially handle both cases. In order to specify *HL* as the only pitch accent type, I assume the following Tone-Prosodic Structure Prominence Hierarchy, which calls for a prosodic prominence to be aligned with the best tonal prominence (Selkirk 1997b):⁶

⁶I discuss the possibility of a LHL accent below.

- (8) $\begin{array}{cccc} *μ' & \gg & *μ' & \gg & *μ' & \gg & *μ' \\ | & & | & & | & & | \\ L & & H & & LH & & HL \end{array}$

This ranking says that the worst stressed mora is associated with a sole low tone, and the best stressed mora is left-aligned with a high-low sequence. For the purposes of our analysis of Iñapari it is only necessary that the prohibition against **HL* accents be at the bottom of the hierarchy. Nevertheless, based on universal patterns of markedness, I assume the explicit meta-ranking above. Now all that we need to add in order to complete the account is the language-specific stipulation that Max(Tone) dominates **HL* but none of the other pitch-accent melodies:

- (9) $\begin{array}{ccccccc} *μ' & \gg & *μ' & \gg & *μ' & \gg & \text{Max(Tone)} & \gg & *μ' \\ | & & | & & | & & & & | \\ L & & H & & LH & & & & HL \end{array}$

This ranking will then filter out all pitch accents in Iñapari surface forms except for *HL*.

As the constraints above imply, my claim is that this *HL* pitch accent is aligned within each prosodic word with the mora which bears primary stress. It seems natural to assume that in a sequence of adjacent high tones, it is the last mora in the string which bears this metrical prominence. We can thus assume the following representations in terms of interaction between tone and primary stress:

- (10)
- | | | | |
|---|---------|--|-----------|
| $\begin{array}{c} HL \\ \\ a\ h\ \acute{i}\ r\ \ddot{i} \end{array}$ | ‘black’ | $\begin{array}{c} HL \\ \\ a\ h\ \ddot{i}\ r\ \acute{i} \end{array}$ | ‘fruit’ |
| $\begin{array}{c} H\quad L \\ \diagdown\ \diagup \\ e\ t\ \acute{i}\ p\ \acute{u}\ n\ \ddot{i} \end{array}$ | ‘first’ | $\begin{array}{c} H\quad L \\ \diagdown\ \diagup \\ a\ p\ a\ r\ \acute{e}\ p\ \acute{a}\ a\ n\ \acute{a}\ r\ \ddot{i} \end{array}$ | ‘similar’ |

The constraint which enforces this situation is the following (Selkirk 1997b):

- (11) Align [HL]_{AccL}, L; μ'_{PWd}

Align the left edge of every pitch accent with the (segment dominated by) the prominent mora (μ') of some Prosodic Word, i.e., with the DTE of some Prosodic Word.

In order to correctly locate the metrical foot structure within prosodic words, we need some additional constraints:

(12) Align Ft, R; PWd, R (AllFeetRight)

Align the right edge of every foot with the right edge of some Prosodic Word.

Constraint (12) above ensures directional right-to-left foot formation.

(13) FootForm: Trochee (left prominence)


(14) ParseSyllable: A syllable must be parsed into a foot.

(15) Ident-σ¹_{PWd}(Tone)

A segment S' dominated by the DTE of a Prosodic Word in the output must have the same tonal specification(s) as its correspondent segment S in the input.

This brings us to our first tableau, in which I use parentheses to highlight foot structure. The word under consideration is [atáperi] ‘root’:

(16)

UR H L ataperi	Identσ ¹ _{PWd}	Trochee	AllFeetRight	Parseσ
a.  H L a(tápe)ri			*	**
b. H L (àta)(péri)	*!		**	
c. H L (àta)(péri)	*!		**	
d. H L (atá)(perí)		*!*	**	

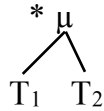
In tableau (16) above, the only critical ranking is that Parseσ must be at the bottom of the hierarchy. This is because the winning candidate, (a), violates this constraint while all of the other contenders satisfy it completely. Candidate (b) fails since it does not put the primary stress on the high-toned syllable. Candidate (c) “shifts” the accent to the right and thus also violates Identσ¹_{PWd}. In this tableau I have glossed over the association of the low tone, a point which I will deal with now. Let us posit a constraint which seeks to align every tone with the syllable bearing primary stress:

(17) Align Tone; σ^1_{PWd}

Align any tone with the DTE of some Prosodic Word.

This constraint will ensure that the low tone of the pitch accent melody docks to the syllable immediately following the high tone. It is prohibited from associating with the syllable bearing primary stress due to a higher-ranked prohibition against contour tones on a single mora:

(18) NoContour μ



I illustrate the interaction between these two constraints in the following tableau:

(19)

UR	H L	NoContour μ	Align Tone; σ^1_{PWd}
	ataperi		
a.	atáperi		*
b.	atáperi	*!	
c.	atáperi		**!

The result is that the accentual low will dock as closely as possible to its sister H, except that it cannot form a falling tone on the stressed syllable.

We also need to ensure that in words with a stretch of adjacent high-toned syllables, the rightmost syllable is the one which bears the primary stress. The following constraint will enforce this result:

(20) Align σ^1_{PWd} ; H, R

Align the DTE of every Prosodic Word with the right edge of some high tone.

I illustrate the influence of this constraint in the analysis of the word

[aparépaánári] ‘similar’ from (10) above:

(21)

UR	<p>arepaanari</p>	Align σ^1_{PWD} ; H, R
a.	<p>arepaanari</p>	
b.	<p>arepaanari</p>	*!

I now consider the limits on the leftward spreading of the accentual high tone. As we observed in the data in (2), the maximal expansion of this plateau is three syllables. Thus if we assume that the primary stress is on the rightmost syllable of this span, the generalization is that the high can spread backwards only to the preceding binary foot. I therefore posit the following locality constraint:

(22) HighBinary

A high tone can be dominated by at most two metrical feet.

I illustrate the application of this filter in the following tableau for the hypothetical input /aparépaánári/ (cf. the word for ‘similar’ in (2), (7), and (10)):

(23)

UR	<p>aparepaanari</p>	HighBinary	Ident(Tone)
a.	<p>(apa)(repaá)(nári)</p>	*!	
b.	<p>(apa)(repaá)(nári)</p>		*

As tableau (23) above demonstrates, HighBinary dominates the general Ident(Tone) faithfulness constraint in Iñapari. Thus a hypothetical input with a high accent spread over more than two metrical feet will never survive in a surface form.

Another restriction on the high component of Iñapari’s lexical pitch accent is that in forms containing more than two syllables, the word-initial syllable must bear a

low tone (cf. point (d) in section 2.1). I will deal with this fact by positing a constraint which calls for an initial low tone in all Iñapari words:

(24) Align PWd, L; Low

Align the left edge of every Prosodic Word with a low tone.

An alternative treatment which might be considered is to change Iñapari’s lexical pitch accent to LHL. However, this increase in accentual inventories to melodies consisting of three tones is dangerous since we would then need to explain why no language has ever been observed to have a *HLH* pitch accent. And if we allow for three tones in the melody, why not four? I thus prefer to follow the more conservative route of assuming that constraint (24) is active in Iñapari phonology. Furthermore, a constraint very analogous to this one has been posited previously for Japanese. This constraint must be ranked higher than Ident(Tone) in Iñapari since it must delink an association with a high tone on a word-initial syllable if one is present underlyingly. Consider the hypothetical input /tátátáta/ in the following tableau:

(25)

UR H L tatatata	NoContour μ	AlignPWdL;Low	Ident(Tone)	Dep(Tone)
a. H L tatatáta		*!	*	
b. L H L tatatáta	*!		**	*
c. \rightarrow L H L tatatáta			**	*
d. L H L tatatáta			***!	*

In tableau (25) above, candidate (a) is the most faithful one yet it fatally violates AlignPWdL;Low. Candidate (b) attempts to “fix” this by inserting the low edge tone but it creates an undesirable contour on the initial syllable. Candidate (c) delinks the high from this syllable and replaces it with the epenthetic low. This violates both Ident(Tone) and Dep(Tone). However, by ranking these two constraints at the bottom of the hierarchy in Iñapari, we achieve the desired result that candidate (c) wins. Candidate (d) spreads this initial epenthetic low onto the second syllable as well. Since there is no other constraint which requires that this happen, the third accrued violation of the faithfulness constraint Ident(Tone) proves fatal. The result is

thus a typical TETU effect: lower-ranked constraints can be violated in order to satisfy higher-ranked constraints, but gratuitous violation of any constraint will never lead to an optimal result.

Consider now the case of a form with a span of unaccented syllables at the beginning of the word, e.g., /utiteáwána/ ‘species of snake’ (cf. (2) earlier). Here the constraint calling for the alignment of all tones with the DTE will cause the initial edge low tone to spread to the right. However, this spreading will stop when the low encounters a syllable which is pre-linked to an accentual high. That is, the left-aligned low tone can only replace a word-initial high, and no others. This indicates for us that the general Ident(Tone) constraint outranks AlignTone; σ^1_{PwD} . The following tableau illustrates this interaction:

(26)

UR utiteawana	NoTonelessTBU	Ident(Tone)	AlignTone; σ^1_{PwD}
a.	*!*	**	*****
b.		****	***
c.		****	*****!*
d.		*****!	**

In tableau (26) above, candidate (a) falls to the undominated NoTonelessTBU constraint because it fails to spread the initial low tone. Candidate (d) spreads this left edge tone as far as it can to the right in order to maximally satisfy AlignTone; σ^1_{PwD} . However, this necessitates a delinking of the high with respect to the antepenultimate syllable and thus violates Ident(Tone) one more time than candidates (b) and (c). Candidate (c) satisfies NoTonelessTBU by spreading the accentual high to the left. This result does not increase the satisfaction of any constraint more than for candidate (b). Consequently, since (b) fares better than (c) on AlignTone; σ^1_{PwD} , candidate (b) correctly emerges as the winner.

The final detail which we need to confront in this section is the case of phonetic contour tones on word-final accented syllables when pronounced in isolation. As I mentioned earlier, this fact will be accounted for by positing a default low boundary tone ($L\%$) which surfaces on the final mora of its respective prosodic constituent, a universally unmarked scenario. There is no evidence to suppose that Iñapari has independent Major Phrase tonal morphemes separate and apart from this Intonational

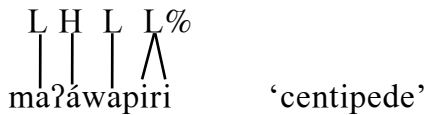
Phrase boundary tone. We thus only need to allow for a single intonational edge tone:

(27) Align ([T]_{BIP}, R; IP, R)

Align the right edge of every morpheme of class BIP (boundary of an Intonational Phrase) with the right edge of some Intonational Phrase.

When an Iñapari word has its rightmost accented mora in a non-final syllable, this low intonational tone straightforwardly docks to the final mora. Furthermore, the constraint which calls for all tones to be aligned with the primary stress will compel it to spread leftward:

(28)



A more interesting challenge is provided by words which end on a lexical accent, where we need to derive a falling tone. The obvious solution is to rank AlignBIP above the prohibition against contour tones:

(29)

UR H L L%	AlignBIP	NoContour μ	NoFloatingTone
 mara			
a. mará		*	*
b. mará	*!		**
c. mará	*!	*	*
d. mará		**!	

In the analysis of the word /mará/ ‘outside’ above (cf. (1) earlier), the high rank of AlignBIP forces the L% boundary tone to dock to the accented final syllable, in violation of NoContour μ (candidate (a)). However, this falling pitch association is not required for the low which forms part of the pitch accent melody (candidates (c) and (d)), so it is left floating in the optimal form, (a). The strategy which Iñapari employs here, then, is that marked structures (contour tones) are generally avoided, except in

the special situation of intonational boundary tones, which have to dock somewhere. This explains why forms such as /mará/ surface with only a high tone on the final syllable, and not a falling contour, when they are pronounced *inside of* an Intonational Phrase, rather than phrase-finally (which includes in isolation).

3. OCP interactions

In this section I will examine the behavior of an epenthetic high tone which Iñapari exhibits in certain syntactic contexts. Many verbal forms which end with a series of low-toned syllables when pronounced in isolation surface instead with a high tone on the final mora when they are followed by another word in the same Intonational Phrase. This behavior is illustrated in the following sets of examples:


(30)

- | | | |
|----|---------------------------------|---|
| a. | [nɛɛrumánama] | ‘I was tired’ |
| | [apetʰá] | ‘yesterday’ |
| | [nɛɛrumánamá apɛtʰá] | ‘Yesterday I got tired.’ |
| b. | [nuʃamaarápama] | ‘I went hunting’ |
| | [nĩnoʔáma] | ‘I killed’ |
| | [çimení] | ‘snake’ |
| | [nuʃamaarápamá nĩnoʔáma çimení] | ‘When I went hunting, I killed a snake.’ |
| c. | [itumaámanona] | ‘they called me’ |
| | [nuʃapuráma] | ‘I am going to go’ |
| | [itumaámanoná nuʃapuráma] | ‘Since they called me, I am going to go.’ |
| d. | [ripinámana] | ‘they died’ |
| | [nĩrí] | ‘my father’ |
| | [nĩniró] | ‘my mother’ |
| | [ripinámaná nĩrí nĩniró] | ‘My father and my mother died.’ |
| e. | [napúʔátʰama] | ‘I arrived’ |
| | [aputuʔarímiya] | ‘stream + locative’ |
| | [napúʔátʰamá aputuʔarímiya] | ‘I arrived at or came to a stream.’ |
| f. | [retʰámana] | ‘they found’ |
| | [awáʔa] | ‘animal’ |
| | [retʰámaná awáʔa] | ‘They found animals.’ |

As the above examples demonstrate, a verb which surfaces with this epenthetic final high tone must end with low tones on at least the last two syllables when pronounced in isolation. In those phrasal contexts in which this high tone surfaces, the verb being affected may be followed by virtually any type of syntactic category: an adverb (30a), another verb (b-c), a noun functioning as subject (d), a postpositional phrase (e), or a direct object noun phrase (f). Let us analyze this phenomenon as a dissimilatory effect triggered by the OCP. That is, when the lexical low accentual tone at the end of one word comes into contact with the low initial edge tone at the

beginning of the following word, the OCP is violated. Consequently, in such instances Iñapari inserts a high tone on the last mora of the first word in order to separate these two low tones. The fact that it is the first word which is affected, rather than the second one, can be ascribed to the action of the constraint which requires a left-aligned low tone at the beginning of each word:

(31)

UR	H L HL	OCP	AlignPWd,L;Low	Dep(Tone)
neerumanama apetea				
a.	L H L L HL neerumanama apetya	*!		**
b. 	L HLH L HL neerumanama apetya			***
c.	L H L HL HL neerumanama apetya		*!	***

The repair strategy which motivates this epenthetic high tone is a very limited, local effect. That is, this particular high tone shows no inclination to spread leftwards toward the metrically prominent syllable of the word to which it docks.

As the data in (30) above illustrate, the contexts in which this dissimilatory high tone surfaces are verbs which do not have a lexical accent on either of their final two syllables. However, the following contrastive forms demonstrate that when a verb bears a primary stress on its penultimate syllable, this epenthetic tone does not appear. Rather, those final moras surface with a low tone instead, even though the verbs in question are followed by another word in the same Intonational Phrase (cf. also (30) above):

(32)

- | | | |
|----|------------------------------|-----------------------------|
| a. | [iʔuraamáni] | ‘he went’ |
| | [rjápama] | ‘ahead’ |
| | [antónio iʔuraamáni rjápama] | ‘Antonio went on ahead.’ |
| b. | [rjāamiĵána] | ‘they came’ |
| | [pamírina] | ‘the others’ |
| | [rjāamiĵána pamírina] | ‘The others came (behind).’ |
| c. | [iĵamána] | ‘they went’ |
| | [huínimiya] | ‘far (away)’ |
| | [iĵamána huínimiya] | ‘They went far away.’ |
| d. | [ahamamána] | ‘we heard (them)’ |
| | [anáwa] | ‘they; them’ |
| | [ahamamána anáwa] | ‘We heard them.’ |

e.	[riçuraáma]	‘he drowned’
	[ituríxĩ]	‘his son’
	[riçuraáma ituríxĩ]	‘His son drowned.’
f.	[arĩ]	‘that (demonstrative)’
	[exĩ]	‘man’
	[raniʔapamáno]	‘he took me’
	[ripináma]	‘he died’
	[arĩ exĩ raniʔapamáno ripináma]	‘The man who took me died.’


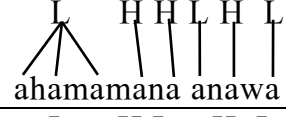
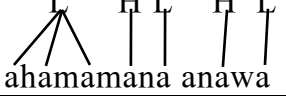
Hence, one of the conditions which a verb must meet in order for the epenthetic H tone to dock to its final vowel is that its penultimate syllable cannot bear a primary stress. If the penultimate syllable of a verb is lexically accented, its final vowel can only bear a low tone. This is in keeping with the constraint mentioned earlier according to which virtually no words in Iñapari ever end with high tones on both of the last two syllables. Furthermore, a second condition which is also fulfilled by all of the example verbs in (30) is that the following word always begins with at least one low-toned vowel. This is confirmed by the following example, in which the final syllable of /pamírina/ ‘another’ remains low-toned when it is followed by the word /mára/ ‘person’, which begins with a lexical accent and thus a high tone. On the other hand, when /pamírina/ is immediately followed by the form /himeʔáte/ ‘manioc’, which begins with an unaccented syllable and hence a low tone, the final vowel of the former word surfaces with the dissimilatory high tone:

(33)	[pamírina]	‘other; another’
	[mára]	‘person’
	[himeʔá]	‘manioc’
	[himeʔáte]	‘manioc, possessed (someone’s manioc)’
	[pamírina mára]	‘another person’
	[pamíríná himeʔáte mára]	‘the manioc of another person’

The form [pamíríná] in (33) above is one of the few non-verbal words in my data which exhibits this epenthetic high tone. I am not aware of any cases in which this edge tone surfaces on a prototypical nominal form.

To summarize, recall the two cases in which the dissimilatory high tone does not appear: when there is already a high tone either on the preceding (penultimate) syllable of the target word (32), or else when the following word starts with an accented syllable (and thus a high tone), as in (33). I suggest that this is simply another case of OCP blockage. That is, a situation of contiguous low tones across a word boundary leads to the insertion of a dissimilatory high tone, *except* when this would produce a sequence of adjacent high tones. In order to account for these facts in an OT framework, I propose that we parametrize the OCP in terms of which tone it is scanning for and establish a critical ranking between the two subconstraints:

(34)

UR	H L H L	OCP(H)	AlignPWd,L;Low	OCP(L)	Dep(Tone)
	ahamamana anawa				
a.				*	**
b.		*!			***
c.			*!		*

As tableau (34) above shows, the most harmonic outcome in a case such as [ahamamána anáwa] ‘We heard them’ in Iñapari is to associate all non-accented syllables with a low tone, even though this violates OCP(L) (candidate (a)). Insertion of a dissimilatory high tone, as in candidate (b), would be even worse since it would violate a more dominant constraint, OCP(H). Leaving the initial syllable of [anáwa] unassociated is likewise not an acceptable outcome since it violates the requirement for a left-aligned edge tone (candidate (c)). We have thus observed an interesting situation in Iñapari tonology in which a repair strategy triggered by one OCP constraint is itself subject to another OCP constraint. Incidentally, as I close this section I note that the appearance of this dissimilatory high tone at word junctures confirms my claim that all non-accented moras are in fact associated with a phonological low tone. If these TBUs were simply left unspecified and filled in by phonetic interpolation, there would be no motivation for a dissimilatory high tone to be inserted in such cases.

4. The Twin Peaks constraint

In this final section I discuss a type of tonal sandhi rule which involves “de-accenting” the lexical high tone of certain words. The targets of this process are forms which consist of exactly two syllables and which bear an inherent primary stress on the last syllable. The trigger is any immediately preceding lexical word which ends with a high tone. Thus, in the following examples, observe that words which have an LH tonal melody when pronounced in isolation surface instead as LL when following a word which ends with a high tone:⁷

⁷Actually, in isolation these words would end with a falling contour on the last mora due to the low boundary tone. Since this point is not crucial to the present discussion, I will largely ignore it here.

(35)

- | | | |
|----|-------------------------|----------------------------------|
| a. | [abé] | ‘dog’ |
| | [iʃamá] | ‘he/it goes’ |
| | [ʃehéti-miya] | ‘cultivated field + locative’ |
| | [iʃamá abe ʃehéti-miya] | ‘The dog is going to the field.’ |
| b. | [utí] | ‘rat’ |
| | [rinamá] | ‘he/it comes’ |
| | [rinamá uti] | ‘The rat is coming.’ |
| c. | [huní] | ‘water’ |
| | [netʰamarí] | ‘I saw (it)’ |
| | [netʰamarí huni] | ‘I saw the water.’ |
| d. | [purí] | ‘stick; branch’ |
| | [títí] | ‘fire’ |
| | [títí puri] | ‘firewood’ |

Basically, then, the input to this de-accenting process is a string of syllables having the expected structure [...H # L H #], where the last syllable of the second word surfaces with a low tone instead, despite its lexical accent. An interesting condition on the operation of this process is that it does not take place when the targeted high tone is followed by another syllable in the same word. That is, it appears that this rule only affects words which consist of exactly two syllables, as the following contrastive forms demonstrate:

(36)

- | | | |
|----|--------------------|----------------------------|
| a. | [ayáči] | ‘paca rodent’ |
| | [netʰamarí] | ‘I saw (it)’ |
| | [netʰamarí ayáči] | ‘I saw the paca.’ |
| b. | [matíra] | ‘spider monkey’ |
| | [netʰamarí matíra] | ‘I saw the spider monkey.’ |
| c. | [awáʔa] | ‘animal(s)’ |
| | [retʰámana] | ‘they found’ |
| | [retʰámaná awáʔa] | ‘They found animals.’ |

Furthermore, the high tone which is targeted to be de-accented can only fall on the second syllable of its respective word. Thus, observe that in the following cases accentual high tones are not blocked but rather surface intact when they are associated to either the first or the third syllable of the second word:

(37)

- | | | |
|----|------------------|-----------------------|
| a. | [mému] | ‘snail’ |
| | [netʰamarí mému] | ‘I saw the snail.’ |
| b. | [áŋti] | ‘tooth’ |
| | [netʰamarí áŋti] | ‘I saw the tooth.’ |
| c. | [túi] | ‘parakeet’ |
| | [netʰamarí túi] | ‘I saw the parakeet.’ |

- d. [honorí] ‘rubber’
 [netʰamarí honorí] ‘I saw the rubber.’
- e. [anawá] ‘canoe’
 [netʰamarí anawá] ‘I saw the canoe.’

Another detail which must be accounted for is that the word which triggers de-accenting must have a high tone on its final syllable; the following examples show that if the word preceding an LH target ends with a low tone rather than high, the process does not take place:

(38)

- a. [hamá] ‘tapir’
 [nĭpĭtaxĭprári] ‘I am going to shoot it (with an arrow)’
 [nĭpĭtaxĭprári hamá] ‘I am going to shoot the tapir.’
- b. [naʔú] ‘thorn’
 [rríʔama] ‘it fell’
 [rríʔama naʔú] ‘The thorn fell.’

Thus bisyllabic words which contain an underlying accent on their second mora behave differently depending on whether the preceding word ends with a high tone or a low tone. Observe this result in the following contrastive pair of sentences:

(39)

- a. [mĭxĭ] ‘chestnut’
 [netʰamarí mĭxĭ] ‘I saw the chestnut.’

vs.

- b. [rríʔama mĭxĭ] ‘The chestnut fell.’

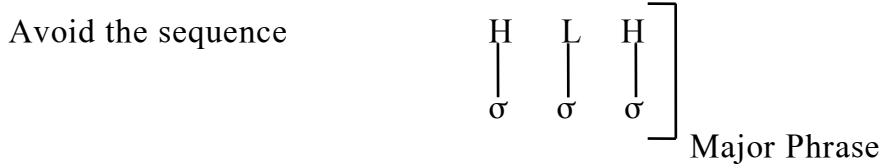
A final detail to note is that the high tone which conditions this process (the one which falls on the final mora of the first word) does not need to be an accentual H associated with a primary stress; the de-accenting rule is observed to operate just as regularly when the trigger is the epenthetic dissimilatory high tone discussed in the previous section. This is demonstrated by the following examples:

(40)

- a. [abé] ‘dog’
 [atumaámari] ‘we are calling (it)’
 [atumaámari abe] ‘We are calling the dog.’
- b. [hamá] ‘tapir’
 [ĭpaprámaróna] ‘he is going to give to them (feminine)’
 [ĭpaprámaróná hama] ‘He is going to give them tapir.’

In order to account for this observed de-accenting effect, I posit the following constraint:

(41) Twin Peaks



In my formulation of constraint (41) above I have avoided reference to syntactic structure by positing that this process occurs at the right edge of a Major Phrase. This is in keeping with Inkelas’ (1989) Indirect Reference Hypothesis, which says that phonological rules refer only to prosodic constituent structure. It is necessary to invoke a prosodic Major Phrase in order to account for example (35a), in which the TwinPeaks environment occurs in the middle of a sentence, i.e., internal to an Intonational Phrase. At the end of a sentence there will of course be a Major Phrase boundary as well. It is also worth noting that this process takes place only across words, never within the same lexical item (cf. the data in (6) earlier). It should be clear that this TwinPeaks constraint is relatively high ranked in Iñapari. In particular, it must dominate the faithfulness constraints Max(Tone) and Ident σ^1_{PwD} (Tone) as well as those of the general “prominence” family: Align[HL] $_{\text{AccL},\text{L};\sigma^1_{\text{PwD}}}$ and Align $\sigma^1_{\text{PwD};\text{H},\text{R}}$. Furthermore, in order to achieve the result that the second high tone delinks, rather than the first one, I will invoke a low ranked prohibition against final high tones:



This then leads us to our final tableau:

(43)

UR	HL	HL	TwinPeaks	Faith(Tone)	Tone:Prom	FinalH
rĩnama	uti					
a. $\left. \begin{array}{ccc} \text{L} & \text{H} & \text{L} \\ \diagdown \quad \diagup & & \diagdown \quad \diagup \\ \text{rĩnama} & & \text{uti} \end{array} \right\}$		*	*			
b. $\left. \begin{array}{ccc} \text{L} & \text{H} & \text{LH (L)} \\ \diagdown \quad \diagup & & \quad \\ \text{rĩnama} & & \text{uti} \end{array} \right\}$	*!					
c. $\left. \begin{array}{ccc} \text{L} & & \text{LH (L)} \\ \diagdown \quad \diagup & & \quad \\ \text{rĩnama} & & \text{uti} \end{array} \right\}$		*	*	*!		

In tableau (43) above I have “abbreviated” the two faithfulness constraints and the two prominence constraints for the sake of conciseness. The low-ranked FinalH constraint is at the bottom of the hierarchy since we want its effect to be felt only in this situation, i.e., when TwinPeaks is at issue. In (43) FinalH is the only factor which distinguishes between candidates (a) and (c). The perseverance of the low portion of the two pitch accents into the surface forms is a potentially complicating detail which I have glossed over here.

5. Conclusion

In this paper I have sketched the most prominent aspects of Iñapari tonology, both at the word and phrase level. Several details of the analysis are typologically significant and interesting: a ban on HLH sequences within a morpheme, an epenthetic high tone which is both triggered by and sensitive to the OCP, and a TwinPeaks constraint which has several rather intricate restrictions on its application.

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