The Prosodic Structure of Carib

Travis Fricke

This paper seeks to provide a unified account of stress and related processes in Carib (Hoff 1968) by making use of prosodic phonology and Optimality Theory. Previous prosodic analyses of Carib (Visch 1996, van der Hulst and Visch 1992, Inkelas 1989, and van de Vijver 1998) have attempted to explain its complicated prosodic processes, but not only do these accounts conflict with each other, none have succeeded in unifying the stress assignment phenomena with a single, concise explanation. Central to the discussion in this paper is the idea of the “stress window”, where stress assignment and various related processes are limited to a particular subpart of the word. These processes can be limited to the appropriate domain in Carib if Carib prosodic structure contains a colon layer between the foot and prosodic word layers. This allows for a single explanation for several related processes of Carib phonology.

1 Introduction

In this paper I will propose an account of the distribution of stress in Carib, a member of the Cariban language family of South America. The particular dialect of Carib that I will be discussing is spoken in Suriname, and is thoroughly described by B.J. Hoff (1968).¹

The theoretical tools that I will utilize in this paper are primarily those of metrical phonology as proposed by Hayes (1995), Prince (1990), and Kager (1989), and Optimality Theory of Prince and Smolensky (1993) and McCarthy and Prince (1993). In order to account for Carib’s stress distribution, including the effects of the stress window, I will be making extensive use of the colon layer in the prosodic hierarchy, as described in Green (1997) and Hayes (1995). This is the layer that falls between the foot layer and prosodic word layer in the prosodic hierarchy, as shown in (1).

¹ I would like to thank Draga Zec and Abigail Cohn for their help and support.

¹ The Cariban language family also includes Macushi, Hixkaryana, and Panare, among others. At the time that Hoff wrote his grammar of Carib, there were approximately 2000 speakers of Carib, and he reports (page 15) that this number was increasing slowly. However, because of the rapid social and economic development of South America, Hoff says that it is likely that the Caribs will cease to exist as a separate ethnic group, “possibly even in the course of this century” (page 22). Thus, it is possible that today there are no native Carib speakers alive, though I have no data on the current situation.
(1) Prosodic Hierarchy

Prosodic Word (PrWd)

<table>
<thead>
<tr>
<th>Colon (κ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot (ϕ)</td>
</tr>
<tr>
<td>Syllable (σ)</td>
</tr>
<tr>
<td>Mora (μ)</td>
</tr>
</tbody>
</table>

The colon has been used, for example, by Green (1997) to explain the stress window in Munster Irish. I will show that, by making reference to the colon layer, it is possible to provide a unified analysis of Carib to explain many of the problems presented by its complex metrical system.

In Section 2, I will present the relevant background information about the phonology of Carib, including segment inventory, syllable structure, and the distribution of stress. In Section 3, I will present a brief analysis of Carib stress along the lines of those made by other researchers (e.g. van de Vijver 1998, van der Hulst and Visch 1992, and Visch 1996), showing the shortcomings of these analyses. In Section 4, I will give a detailed analysis of Carib that solves many of the problems encountered in previous prosodic analyses of Carib. Finally, in Section 5 I will show how my analysis improves on four previous analyses. In Section 6, I conclude by giving a summary of some questions that are raised by my analysis.

2 The Phonological System of Carib

In this section I will provide a description of the phonological properties of Carib word forms. I begin in 1.1 with the Carib segment inventory, followed in 1.2 by a description of Carib syllable structure and various restrictions on the distribution of segments. In Section 1.3 I will give a full description of the distribution of stress in Carib, including both primary stress assignment and the distribution of phonological vowel length, which is viewed here as a product of the same general phenomenon.
2.1 Carib Segment Inventory

Hoff (1961) lists seventeen distinctive consonants for Carib:

(2) Consonant Inventory of Carib (Hoff 1961)

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Labio-Dental</th>
<th>Apical</th>
<th>Laminal</th>
<th>Fronted Dorso-Velar</th>
<th>Dorso-Velar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>p, b</td>
<td>t, d</td>
<td></td>
<td></td>
<td>k, g</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Flap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>fi</td>
<td></td>
</tr>
<tr>
<td>Nasals</td>
<td>m</td>
<td>N</td>
<td></td>
<td>ŋ̃</td>
<td>ŋ̃</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glides</td>
<td>w</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These symbols for the most part represent their standard IPA values. The phoneme /fi/ is notable simply because it is the only voiced fricative. The phoneme /ŋ̃/ is exceptional because of its unusual articulation, being “produced by the tongue making contact at the border area of the hard and the soft palate (Hoff 1961, p. 405).”

Hoff (1968) lists eighteen distinctive vowels in Carib. There are six monophthongs, with an underlying short and long version for each sound, and there are six diphthongs. The vowel inventory for Carib is given in (3):

(3) Monophthongs: i, i: ði, ði:, u, u:
e, e: o, o:
a, a:

Diphthongs: au, ai, ei, oi, ði, ui

In order to be consistent with Hoff’s notation, I use the symbol /ði/ to represent a high back unrounded vowel (standard IPA /u/).
2.2 Syllable Structure

2.2.1 Coda Consonants

Though closed syllables are common in Carib, not all consonants can close a syllable. Using data from Hoff (1968), the consonants listed in (4) can be shown to be the only possible coda consonants in Carib.

(4) Possible Coda Consonants

/m/, /n/, /ŋ/, /ŋ/, /x/, and /ʔ/

From this list, which includes all sonorant non-continuants plus /x/, only /ŋ/, /ŋ/, and /m/ may come at the end of a word, as may the sequence /ʔm/. However, /m/ and /ʔm/ only appear in this position in one word each: am ‘some, somebody, something;’ roʔm ‘otherwise, consequently, therefore’ (Hoff 1968, 45). Excluding the anomalous /m/ and /ʔm/, we can say that only back nasals can occur word-finally.

It should also be noted that syllables in Carib respect the bimoraic restriction of syllable weight. That is, no syllable may have more than two moras. Since syllables of the form CVVC and CViVcC are almost non-existent in Carib, we can conclude that coda consonants are weight-bearing.

2.2.2 Distribution of Vowel Length

Turning now to vowels, the most interesting distributional fact is that no long vowel may appear in the final syllable of a word (Hoff 1968, 70). This is similar to Italian, where stressed vowels are lengthened in every position except word-finally (Kenstowicz 1994, p. 297). Examples of this restriction in Carib are given in (5) and (6).

(5) Shortening of Underlyingly Long Final Vowels

a. wó ‘to beat, strike, kill’  woː kepɨ ‘to stop beating’ (from /woː+kepi/)  
b. kâ ‘to take out, away’  kaːno ‘he removes it’ (from /kaː+no/)

[2] There is a small set of words that seems to violate this syllable weight restriction. Words such as auxto ‘house’ and aixtə/aixtə ‘whining’ have a diphthong and coda consonant in the initial syllable. However, most of these words can be explained by various derivations, where the initial diphthong is underlyingly two vowels from adjacent syllables (see Fricke 1999, pp. 19-21) for a more complete discussion of these facts.]
Iambic Lengthening Blocked Word-Finally

a. oːɾuko ‘worm’
    yoːɾukoːɾi  ‘worm’ (from /y+oːɾuko+ɾi/)
b. aːɾabo  ‘eel-like fish’
    yaːɾaboːɾi  ‘eel-like fish’ (from /y+aːɾabo+ɾi/)

In (5), the final vowel of the root is underlyingly long, and in (6) the final vowel of the root is underlyingly short, but it is in a position where iambic lengthening should occur. Since the final vowel of each unsuffixed root in all of these words surfaces as short, we can see that long word-final vowels are not allowed.

Though it is possibly the case that vowel length in Carib is contrastive only in the initial syllable of a word (van der Hulst and Visch 1992), phonological and morphological processes may act on short vowels to produce long vowels in essentially any position in the word.

Distribution of Vowel Length in Disyllabic Words

a. uːwa  ‘to dance’
    /uwa/
b. toːpu  ‘stone’
    /toːpu/

Distribution of Vowel Length in Words with More than Two Syllables

a. kureːwako  ‘green parrot’
    /kurewako/
b. wːtopoːsainə  (no gloss given)
    /wːtopoːsainə/

One important thing to notice in (7) and (8) is that disyllabic words always surface with a long initial vowel whether the length is underlying or derived. This is a very peculiar fact of Carib which I will discuss in detail in Section 4.

2.3 Stress

Hoff (1968) states that accent in Carib is regular, and surfaces as variations in pitch on the stressed syllable. Placement of stress depends on “the number of long vowels, diphthongs, and VCC-sequences occurring in the word (p. 96).” Another way of stating this is that stress placement is determined by the number of heavy syllables in the word. The regular pattern that Hoff describes is the following. In all monomorphemic words, whenever there is more than one heavy syllable in the surface form of a word, stress falls
on the syllable that is second from the left, as in (9e-g, i-k). In monomorphemic words that surface with only one heavy syllable, stress falls on the final syllable, as in (9a-d, h).

(9) Stress Placement in Monomorphemic Words

Two-Syllable Words
a. aimá    ‘to smoke’
b. a?mò    ‘to begin something’
c. e:ró    ‘this’

Three-Syllable Words
d. tono:ro  ‘large bird’
e. i?nó:rí  ‘her smell’

Four-Syllable Words
f. po:tombome  ‘abnormally large’
g. kíne:ka:no  ‘he bites him’
h. kure:wakó  ‘green parrot’

Five-Syllable Words
i. mo:níñùgoro:po  ‘the day after tomorrow’
j. wi:topo:saine  (no gloss given)
k. asa:pará:pi  ‘species of fish’

The words in (9) represent the entire scope of regular stress assignment in Carib. Along with the prohibition on initial stress (and final stress in five-syllable words), we have the complete inventory of possible stress placement in monomorphemic forms, as well as a good illustration of the stress window that I alluded to in the introduction. Recall that disyllabic words always have a heavy initial syllable. Thus, there is never a Carib word of the form LL (where L represents a light syllable). Moreover, the first syllable of a word is never stressed. This can be seen in two-syllable words such as those in (9a-c). The examples in (9d-j) further show that stress only falls on the second, third, or fourth syllables in monomorphemic words.

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3 There are a few words, such as ye:ma:mí:natake ‘I’ll work,’ that have stress beyond the second heavy syllable. However, these words are not only infrequent (approximately 44 out of 5000 words in Hoff’s (1968) glossary), they are always polymorphemic. I will assume that such words are lexically marked for stress and can thus be ignored in a discussion of the regular stress rules of Carib.
Another peculiar fact of Carib word forms is that iambic lengthening seems to be limited to roughly the same domain as stress assignment. In particular, iambic lengthening does not occur beyond the fifth syllable in a monomorphemic word, as shown in (10).

(10) The Domain of Iambic Lengthening

wego:pó:tomo?me  ‘for me to be a chief’ (from /yopo:tó/)

The form in (10a) shows that iambic lengthening is limited to the same domain as stress assignment. Thus, no syllable after the stressed syllable is lengthened by iambic lengthening.4

This interesting fact raises questions such as how a phonological process, whatever form it may take, could be restricted to the first few syllables of a word. It cannot be the case that such lengthening is limited to the base of a word, with vowels in prefixes and suffixes never undergoing this type of lengthening. That is, phonological lengthening occurs in affixes just as it does in bases, as long as the affix falls within the domain of the stress window.

(11) Phonological Lengthening in Affixes

<table>
<thead>
<tr>
<th>Underlying Forms</th>
<th>Root Surface Form</th>
<th>Gloss</th>
<th>Surface Form with Affixation</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /wo:miʔ-yakoʔ/</td>
<td>[wo:miʔ]</td>
<td>‘to enter’</td>
<td>[wo:miʔá:koʔ]</td>
<td>‘I went in then’</td>
</tr>
<tr>
<td>d. /uxku-potí/</td>
<td>[uxkú]</td>
<td>‘to try’</td>
<td>[uxkúpó:tí]</td>
<td>‘to try again and again’</td>
</tr>
</tbody>
</table>

4 Though certain processes may induce lengthening near the end of words with certain suffixes, these processes are entirely morphological in nature and do not interact with the phonological lengthening being discussed. Because of this I will not dwell on them here, but see Fricke (1999, 26-28) and Gildes (1995) for further discussion of these facts.
Given these word forms and those in (9), we can conclude that the stress window plays a very important role in determining the surface forms of Carib words. There seems to be a single phenomenon that limits the domain of both stress assignment and iambic lengthening to the first five syllables in monomorphemic words.

2.4 Summary

We now have a list of generally agreed-upon observations concerning Carib stress assignment and syllable structure, repeated in (12).

(12) Carib Stress in Monomorphemic Words

a. Long vowels are not allowed at the right edge of a word, whether stressed or not.

b. i. The first syllable of a word is never stressed, unless it is monosyllabic.
   ii. The last syllable in words with at least five syllables is never stressed.

c. Phonological vowel lengthening does not occur beyond the stressed syllable.

3 Tentative Analysis

In this section, I demonstrate the difficulties encountered in any prosodic analysis of Carib. To do so, I will make several assumptions that are not entirely uncontroversial. However, the purpose of this section is not to rigorously defend a particular analysis, but to show that any prosodic analysis of Carib is inherently problematic. The assumptions that I will be making are given in (13) and illustrated in (14).

(13) Assumptions about Carib

a. Carib makes use of *iamb*.

b. Words are parsed into feet beginning at the left edge of the word.

(14) Iamb vs. Trochees

i. **Iamb Parsed from the Left Edge**

a. *(tono):(ró)* from */tonoro/ ‘large bird’

b. *(asa):(pará):pi* from */asaparapi/ ‘species of fish’
ii. Trochees Parsed from the Left Edge
   a. *(tono)(ró)
   b. *(asa)(para)pi

iii. Iambs Parsed from the Right Edge
   a. *(to:)(noró)
   b. *(a:)(sapa:)(rapi)

iv. Trochees Parsed from the Right Edge
   a. *(to)(nóro)
   b. *(a)(sápa)(rapi)

As shown in Section 2, stress always falls on the second heavy syllable. Thus, in (14.ii) and (14.iv) stress placement can be derived correctly, but vowel length patterns are incorrect since we cannot make use of iambic lengthening of foot heads (when using trochees in these examples, I assume that stress falls on the second foot head in the word, not the second heavy syllable, since there are no heavy syllables in these words when they are parsed into trochees). In (14.iii), incorrect length patterns are derived when Carib words are parsed into iambs starting at the right edge. Iambic lengthening applies to foot heads, and in this case the syllables that get lengthened do not correspond to observed patterns in Carib. Only (14.i), which corresponds to the properties in (13), correctly derives both stress and vowel length. Recall also that only LL, LH, and H constitute well-formed iambs. Thus, in (14.i.b) the final syllable is left unfooted, since long vowels are not allowed at the end of a word.

3.1 Words with More than Two Syllables

I have already discussed the importance of the stress window in Carib (Section 2.3). The critical question is: How can we account for the effects of the stress window with the tools at hand? Recall that stress only falls on the second, third, or fourth syllable, and iambic lengthening only occurs on one of the first four syllables. This suggests two constraints: one against stressing the initial foot of a word, and one that prevents vowels from being lengthened if they occur after the stressed syllable.
(15) Constraints on Carib Word Forms
   a. *InitStress(ϕ): never stress the initial foot of a word.
   b. *Length: No syllable beyond the stressed syllable may be lengthened

These constraints must be undominated, since they are never violated in monomorphemic forms. Using these constraints, we can derive the correct forms. In order to do so, we need to make use of End-Rule Left (ER-L). If *InitStress(ϕ) outranks ER-L, then stress is optimally assigned to the second foot of a word.

Tableau 1:

<table>
<thead>
<tr>
<th>/asaporapi/ ‘species of fish’</th>
<th>*InitStress(ϕ)</th>
<th>ER-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (asaː)(paraː)pi</td>
<td>*!</td>
<td>***</td>
</tr>
<tr>
<td>⇒ b. (asaː)(paráː)pi</td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>c. (asaː)(paraː)(pi)</td>
<td></td>
<td>***<em>!</em></td>
</tr>
</tbody>
</table>

Note that the constraint against initial stress cannot be a constraint against initial syllable stress (*InitStress(σ)). If this were the case, then the optimal form in Tableau 1 would be (a), since it would satisfy both ER-L and *InitStress(σ). Note also that Carib words must use ER-L, and not End-Rule Right (ER-R). If ER-R were being used, then the optimal form would be (c).

Now that we have a model for stress assignment, the application of *Length, as defined in (15), is trivial. As long as we know where the stressed syllable is, *Length prevents iambic lengthening from applying to any syllable beyond the one that is stressed.

3.2 Disyllabic Words

Disyllabic words in Carib are peculiar in that when the initial syllable is open, they always have long initial syllables. That is, all disyllabic words seem to have two feet, as in (16).
(16) Foot Assignment in Disyllabic Words

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>(u:)</td>
<td>‘to dance’</td>
<td>from /uwa/</td>
</tr>
<tr>
<td>b.</td>
<td>(o:)</td>
<td>‘hammock line’</td>
<td>from /owa/</td>
</tr>
<tr>
<td>c.</td>
<td>(to:)</td>
<td>‘stone’</td>
<td>from/to:pu/</td>
</tr>
<tr>
<td>d.</td>
<td>(ra:)</td>
<td>‘to turn something’</td>
<td>from /ra:ma/</td>
</tr>
</tbody>
</table>

In words with underlyingly long initial syllables, this foot assignment is straightforward, since a heavy syllable constitutes a well-formed iamb. However, since a single light syllable cannot constitute a well-formed iamb, disyllabic words with light initial syllables will require constraint interaction to force the creation of a foot on the first syllable, which can then be lengthened to make a well-formed iamb. This interaction is shown in Tableau 2, where Faith is a general constraint against altering the underlying form of a word.

Tableau 2:

<table>
<thead>
<tr>
<th></th>
<th>*InitStress(Ø)</th>
<th>ER-L</th>
<th>Faith</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

The optimal form in (b) violates ER-L and Faith (because of the lengthened initial vowel), but satisfies the undominated constraint *InitStress(Ø). We must create two feet because otherwise it would be impossible to assign stress to any foot other than the initial foot, which would violate *InitStress(Ø).

Another interesting fact about disyllabic words is that they are apparently the shortest content words allowed in Carib, with the only exceptions being those shown in (17).

(17) Monosyllabic Content Words

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>wó ‘to beat, strike, kill’</td>
<td>a’. wo:kepî ‘to stop beating’</td>
</tr>
<tr>
<td>b.</td>
<td>kâ ‘to take out, away’</td>
<td>b’. ka:nô ‘he removes it’</td>
</tr>
<tr>
<td>c.</td>
<td>sê ‘liking, wishing’</td>
<td>c’. se:pâ ‘not liking’</td>
</tr>
<tr>
<td>d.</td>
<td>nô ‘to leave’</td>
<td>d’. noxpômbo ‘having been left’</td>
</tr>
<tr>
<td>e.</td>
<td>kê ‘to rasp’</td>
<td></td>
</tr>
</tbody>
</table>
I could find no affixed words with k哈佛, but given that every other monosyllabic word is underlyingly heavy, it is reasonable to assume that k哈佛 is as well.

In order to explain this fact, we can make use of *InitStress(φ) in much the same way that we used it to explain lengthening of initial short vowels in disyllabic words. Since a word with only one syllable cannot have more than one foot, monosyllabic words would always violate *InitStress(φ). In order to avoid this violation of *InitStress(φ), Carib has a minimum word requirement of at least two syllables.

3.3 Problems with the Analysis Presented So Far

The analysis presented so far in this section has accounted for all of the facts, but it still seems somehow unsatisfactory. The most unpleasing aspect of this analysis is that it lacks a unifying force. We need the constraint *InitStress(φ) because without it we cannot derive the correct surface forms, but there is no particular reason for choosing *InitStress(φ) over, for example, a constraint that requires monomorphemic words to have two feet. Thus, there is no solid motivating factor that forces us to choose one set of constraints over another. In addition, under this analysis we need the stipulative constraint *Length, as defined in (15). However, there is a way to reconcile the stress assignment and vowel lengthening facts by positing another level in the prosodic hierarchy — the colon layer — as suggested in the introduction. I will now show how such an analysis unifies all of the facts that we have seen so far in a single, concise analysis.

4 Colon-Based Analysis of Carib

Green (1997) lists several constraints that apply to the colon layer. These constraints, listed in (18), are similar to constraints that apply to other levels in the prosodic hierarchy, shown in (1).
(18) Colon Constraints
a. ParseFt: Feet are parsed into Cola.
b. ColonFormRight/Left: Cola are right/left headed (iambic/trochaic).
c. All-κ-Right/Left (Align(κ, R/L; PrWd, R/L)): Aligns cola with the either the
right or the left edge of the prosodic word.
d. ColonBinarity: Cola are binary (over feet and syllables).

I begin with a discussion of the form that the colon in Carib should take in terms of
these constraints. I will also show that, by giving all of these constraints a very high
ranking in Carib, we can predict the surface forms of Carib words. Specifically, I will
show how the stress window and the problems discussed in Section 3.3 can be explained
using a right-headed colon layer.

4.1.1 Properties of the Colon in Carib

In terms of Green’s constraints listed in (18), I propose that Carib has a single right-
headed colon (ColonFormRight) aligned with the left edge of the word (All-κ-Left). As
with all cola, it is binary with a foot as its head.  

(19) Properties of the Colon in Carib
a. All-κ-Left: cola are aligned with the left edge of the word.
b. ColonFormRight: Cola are right-headed.
c. ColonBinarity: Cola are binary on feet.

Since these constraints are never violated in Carib, I will assume from here on that they
are undominated.

4.1.2 The Stress Window

In previous metrical analyses, the restriction of Carib stress to the second, third, and
fourth syllables could only be stipulated, for example by limiting a prosodic word to a
maximum of two feet (van de Vijver, 1998). Now, however, we have a very
straightforward way of assigning stress so that it can only fall on one of these syllables.
Given that the constraints in (19) are undominated, we predict that stress will only be

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5 I will also argue that cola in Carib can have only feet as their constituents. In this respect, Carib differs
with Munster Irish, which according to Green (1997) can be binary with one foot plus one syllable.
assigned to these three syllables. That is, if stress assignment is limited to the domain of the colon, stress could never fall on the first syllable of a word (because of ColonFormRight) and it could never fall more than four syllables from the left edge of the word (because of All-κ-Left). This is exactly the observed pattern.

\[(20)\]

\begin{align*}
\text{a. } & /\text{asaparapi}/ \ ‘\text{species of fish}' & \text{b. } & /\text{ka:rawasi}/ \ ‘\text{rattle}' \\
\text{PrWd} & ( & * & ) & ( & * & ) \\
\text{Colon} & ( & * & ) & ( & * & ) \\
\text{Foot} & ( & * & )( & * & ) & ( & * & )( & * & ) \\
\text{asa: } & \text{pará: pi} & \text{ka: } & \text{rawá: si} \\
\text{c. } & /\text{to:rirä}/ \ ‘\text{story}' & \text{d. } & /\text{wo:m-yako}/ \ ‘\text{I went in then}' \\
\text{PrWd} & ( & * & ) & ( & * & ) \\
\text{Colon} & ( & * & ) & ( & * & ) \\
\text{Foot} & ( & * & )( & * & ) & ( & * & )( & * & ) \\
\text{to: } & \text{rirä} & \text{wo: } & \text{myá: ko} \\
\end{align*}

The forms in (20) show how stress is assigned using the colon. (20a) shows a five-syllable word with stress on the fourth syllable; (20b) shows a four-syllable word with stress on the third syllable; and (20c) shows a three-syllable word with stress on the third syllable; and (20d) shows a three-syllable word with stress on the second syllable (note that this is also the only polymorphemic word in this table). Under the assumption that the constraints in (19) are undominated, these are the only syllables that stress can fall on in these words. The colon must be aligned with the left edge of the word, must be binary on feet only, and must be right headed. These three constraints conspire to always place stress on the head of the second foot of a word.

By viewing the colon as the domain of the stress window, we get an immediate improvement over the analysis presented earlier in this section. Recall that in Section 3.1 we had to stipulate the constraint *InitStress(ϕ) that prevented stress from falling on the initial foot. However, with a right-headed colon this is no longer a problem. The geometry of the new hierarchy, along with the Continuous Column Constraint, which says that “a grid containing a column with a mark on layer n+1 and no mark on layer n is ill-formed” (Hayes 1995), derives correct stress placement automatically. It is now
impossible to stress the initial syllable of a word because doing so would result in a violation of the Continuous Column Constraint, since the colon layer is right-headed.

(21) \(/asaparapi/  \text{'species of fish'}\)

| Word Layer: | a. ( * ) b. ( * ) c. ( * ) |
| Colon Layer: | ( * ) ( * ) ( * ) ( * ) ( * ) |
| Foot Layer: | ( * ) ( * ) ( * ) ( * ) ( * ) |

The form in (21b) is ungrammatical because it violates the undominated constraint ColonFormRight, and (21c) violates the Continuous Column Constraint. Notice that we now have no need of the constraint *InitStress(\(\phi\)). Stress cannot fall on the initial foot because this would violate ColonFormRight. (21a) is grammatical because it satisfies this constraint by placing stress over the head of the second foot. The second syllable still receives phonological length as the head of a foot, but the head of the second foot will always receive main word stress. Notice that it is impossible to tell if End-Rule Right or End-Rule Left is being employed since only one colon layer is formed, and in order to satisfy the Continuous Column Constraint, the grid mark in the word layer will always fall directly above the grid mark in the colon layer.

We can now also straightforwardly account for the fact that iambic lengthening does not occur in any syllable beyond the stressed syllable. All we need to say is that iambic lengthening is limited to the domain of the colon. However, we can be even more general than this. If we limit foot assignment to the domain of the colon, then we implicitly limit iambic lengthening in the same way. Iambic lengthening cannot occur if there are no feet, since it only applies to foot heads. It seems that the only requirement on the number of feet in a word is that there must be two in order to satisfy ColonBinarity, and once ColonBinarity is satisfied, footing stops. Given this, ColonBinarity can be seen not as a minimum number of feet per word, but as the exact number of feet required in a word. Any word with fewer than two feet will be ill-formed because ColonBinarity will not be satisfied, and any word with more than two feet will have unnecessary feet. We can
capture this fact by reference to a specialized version of McCarthy and Prince's (1993) constraint *Struc, which says simply "avoid structure".

(22) *Struc(ψ) (McCarthy and Prince, 1993, p. 22)
    Avoid foot structure.

If *Struc(ψ) is a highly ranked constraint, a word will be parsed into feet only when necessary to satisfy another constraint. That constraint is ColonBinarity. By ranking ColonBinarity above *Struc(ψ), only two feet will be formed.

Tableau 3:

<table>
<thead>
<tr>
<th>/weyopotato?me/ ‘for me to be a chief’</th>
<th>ColonBinarity</th>
<th>*Struc(ψ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (weyo:)(potó:)(toma:)(to?)me</td>
<td>*<strong>!</strong></td>
<td></td>
</tr>
<tr>
<td>b. (weyo:)(potó:)(toma:to?me</td>
<td>***!</td>
<td></td>
</tr>
<tr>
<td>⇒ c. (weyo:)(potó:tomato?me</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>d. (weyó:)pototomato?me</td>
<td>*!</td>
<td>**</td>
</tr>
<tr>
<td>e. wetopototomato?me</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

*Struc(ψ) is highly ranked, but ColonBinarity must dominate it to derive the correct forms. Since *Struc is violated once for every foot that is formed, the candidates in (a-b) are sub-optimal because they have more feet than the optimal candidate (c). Candidates (d-e) are sub-optimal because they violate the undominated constraint ColonBinarity. Thus, the optimal candidate (c) violates *Struc(ψ) with the minimum number of feet needed to satisfy ColonBinarity.

4.1.3 The Colon in Disyllabic Words

As in the case of words with more than two syllables, there is no way to tell which End-Rule is used to derive stress in disyllabic words. But since ColonBinarity and ColonFormRight are undominated, we can derive the observed length and stress patterns with the colon layer.
(23) ColonBinarity in Two-Syllable Words

/uwa/ ‘to dance’

Word Layer: a. ( ) b. ( * ) c. ( * )
Colon Layer: ( ) ( ) ( )
Foot Layer: ( ) ( ) ( ) u: wá *ú: wa *uwá

(23b) is ungrammatical because stress surfaces on the initial syllable, violating ColonFormRight, and we know that (23c) is incorrect because the initial syllable surfaces as short, which never happens in disyllabic words. Only in (23a) is the correct surface form derived. Here, each syllable constitutes a single foot, resulting in phonological lengthening of the initial syllable, and stress is placed correctly on the final syllable. These results are summarized in Tableau 4.

Tableau 4:

<table>
<thead>
<tr>
<th>/uwa/ ‘to dance’</th>
<th>ColonBinarity</th>
<th>ColonFormRight</th>
</tr>
</thead>
<tbody>
<tr>
<td>⇒ a. (u:)wá</td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td>b. (ú:)wa</td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td>c. (uwá)</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

These forms correspond to the examples given in (23). Tableau 4 shows that ColonBinarity and ColonFormRight, which I have proposed to be undominated, rule out a word with stress on the initial syllable, and a disyllabic word with a short initial syllable. The form in (b) is ungrammatical because it violates ColonFormRight, and the form in (c) is ungrammatical because it violates ColonBinarity. The only surface form that satisfies both constraints is (23a). Here, the initial syllable is long because it is the head of a foot, which must be formed in order to satisfy ColonBinarity, and stress falls on the second syllable in order to satisfy ColonFormRight. Another possible way to satisfy ColonBinarity would be through some sort of epenthesis, but this is ruled out by a high ranking constraint (DepIO) against insertion of segmental material. Thus, forms that contain partial or complete reduplication, such as *uwa:-uwa, *u-u:wa, or *uwa:wa, which satisfy ColonBinarity, are dispreferred because of high ranking of DepIO (see McCarthy and Prince (1993) for a discussion of Axininca Campa, in which similar
reduplication is common). The result is that both syllables in a disyllabic word must each be parsed into a foot. Initial open syllables always contain a long vowel in these words because they are foot heads, so iambic lengthening applies to underlying short vowels, neutralizing the length contrast in surface forms. Of course, insertion of a mora in vowel lengthening can be seen as a type of insertion in violation of DepIO, which I just argued against. However, we can use a specialized version of DepIO, which I will call DepIO(μ), that says “do not insert moras.” By making this constraint ranked below constraints against degenerate feet, iambic lengthening can still occur without violating the higher ranking DepIO.

This part of the analysis contrasts with the analysis given in Section 3. Specifically, we can now do away with the constraint *InitStress(ϕ), since ColonFormRight and ColonBinarity are undominated. Now restrictions on the geometry of the colon layer allow us to straightforwardly derive the correct forms without making any additional stipulations. There are two feet in two-syllable words because ColonBinarity is undominated, and stress falls on the second syllable in two-syllable words because ColonFormRight is undominated. Both of these constraints are needed for the description of the colon regardless of whether they affect the surface forms of words, but by making reference to them we make certain predictions about the forms that words will take. The data shows that these predictions are borne out.

4.2 Summary

I have shown in this section that a single right-headed colon can be used to efficiently derive Carib word forms. We know that there is only one colon per word because of vowel length patterns, where iambic lengthening does not occur beyond the stressed syllable. In addition, I claimed that All-κ-Right, ColonFormRight, and ColonBinarity are undominated constraints in Carib. In this respect Carib contrasts minimally with Munster Irish. Munster Irish employs a right-headed colon layer (ColonFormRight), just as Carib does, but in Munster Irish ColonFormRight is not undominated. Thus, in forms like \( \tilde{u} : d\text{e} : r\tilde{a} : s \) ‘authority,’ which gets the foot structure (\( \tilde{u}:)d\text{e}\tilde{r}(\tilde{a}:s), \) the colon surfaces as left-headed since a single, unfooted syllable counts towards colon binarity in Munster Irish. Thus, the first two syllables in this word make up the colon, which must surface as left-headed since this is the only footed syllable in the colon.
the colon allows for marked improvements over a prosodic analysis that does not make reference to the colon. In the next section I will compare this analysis to several that were made by other authors. I will show how the colon-based analysis is an improvement on these analyses, as well.

5 Previous Analyses

In this section I will give brief explanations of four previous analyses of Carib. These are the analyses of van de Vijver (1998) and Inkelas (1989), who analyze Carib as a trochaic stress system, and van der Hulst and Visch (1992) and Visch (1996), who analyze Carib as an iambic stress system. I will first present the summaries of these analyses, and then show how the colon analysis of Carib is an improvement over the previous analyses.

5.1 Trochaic Analyses

Van de Vijver's primary claim is that iambs can be derived through constraint interaction and a basic quantity-insensitive trochaic pattern. Crucial to his analysis of Carib is the observation that there is a strong preference in Carib for word roots (i.e. unaffixed word forms) to be two, three, or four syllables long.
(24) Structure of Carib Unaffixed Content Words (van de Vijver 1998, 58)

<table>
<thead>
<tr>
<th>Number of Syllables</th>
<th>Number of Tokens</th>
<th>Percentage</th>
<th>Examples</th>
</tr>
</thead>
</table>
| 1                   | 6                | .8%        | wo ‘to kill, strike, beat’  
kī ‘to rasp’           |
| 2                   | 261              | 34%        | na:na ‘pineapple’  
e:pī ‘stick’          |
| 3                   | 356              | 46.5%      | paka:mu ‘species of fish’  
aki:ma ‘to tease’       |
| 4                   | 122              | 15.9%      | a:paka:ni ‘bird of prey’  
epi:sa:mī ‘to give a wink’ |
| 5                   | 20               | 2.6%       | aka:ripo:to ‘proper name’  
eta:si:pō:ti ‘moustache’ |
| 6                   | 1                | .1%        | ika:ri:kana:ri ‘cinnamon wood’ |
| Total = 766         |                  |            |          |

This list includes only the unaffixed words listed in Hoff (1968). It shows a clear preference for words that are two, three, or four syllables long, which comprise 95.6% (739/766) of the total. As an explanation for this fact, van de Vijver suggests the following constraint.

(25) Align (Foot, Prosodic Word) (van de Vijver 1998, 60)

Some edge of every foot coincides with some edge of the prosodic word.

Crucially, van de Vijver claims that roots can only have one to two quantity insensitive feet, and that a root constitutes a prosodic word. Therefore, (25) can be restated as “some edge of every foot coincides with some edge of the root, which can only be one to two feet long.” Thus, if an affix is added to a word, it is not included in the domain of the prosodic word. Van de Vijver claims that this definition of prosodic word along with the Align constraint can be used to account for the preference for two, three, and four syllable words.
(26) Foot Structure of Two, Three, and Four Syllable Words (van de Vijver 1998)
   a. (na:na)  ‘pineapple’
   b. (paka:)mu  ‘species of fish’
   c. (a:pa)(ka:ni)  ‘bird of prey’

Notice that each form in (26) satisfies Align for every foot in the word. That is, there is no foot that does not have at least one edge aligned with an edge of the prosodic word. But in longer words this is not the case.

(27) Foot Structure of Words Longer than Four Syllables
   a. (aka:)(ripo:)to  ‘proper name’
   b. (ika:)(rika)(nari)  ‘cinnamon wood’

In both examples in (27), the second foot violates Align. This, according to van de Vijver, is why longer roots are “somehow exceptional (p. 58),” i.e. they are far less common than two to four syllable words. Thus, roots are limited to a maximum of two feet because only these roots satisfy Align.

The alternating length pattern observed in Carib is explained by van de Vijver primarily through the interaction of two constraints: *Edgemost and Trochee. Van de Vijver says that “rhythmic vowel length is thought to be the result of some degree of stress (p. 67).” That is, syllables with rhythmic vowel length (in terms of the current analysis, iambic lengthening) can be considered prominent because they bear “some degree of stress.”

(28) *Edgemost
   Edge-adjacent elements may not be prominent.

(29) Trochee
   Within a foot, a ‘*’ is followed by a ‘.’.

---

7 However, the fact that there are so few monosyllabic words, which also satisfy Align at both edges, is not captured by this analysis. Van de Vijver simply says that monosyllabic words “could perhaps be the result of some historical attrition of the second syllable (p. 58).”
By interaction of these two constraints, a quantity-insensitive, word-initial foot in a word with more than two syllables receives final prominence because *Edgemost outranks Trochee, and in disyllabic words, which will always violate *Edgemost, Trochee shows itself, and the foot receives initial prominence (page 68).

Tableau 5:

<table>
<thead>
<tr>
<th>/tonoro/ ‘large bird’</th>
<th>*Edgemost</th>
<th>Trochee</th>
</tr>
</thead>
<tbody>
<tr>
<td>(to:no)ro</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>⇒ (tono:)ro</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Tableau 6:

<table>
<thead>
<tr>
<th>/uwa/ ‘to dance’</th>
<th>*Edgemost</th>
<th>Trochee</th>
</tr>
</thead>
<tbody>
<tr>
<td>⇒ (u:wa)</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>(uwa:)</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

By further constraint interaction, length is derived on alternating syllables. Specifically, van de Vijver proposes the constraint FootHarmony, which says that every foot must have the same prominence pattern as the first foot in the word. He accounts for the restriction of lengthening to the first four syllables of the word by stipulating that such lengthening may only occur in the root, which is equal to one prosodic word. That is, vowels within affixes may not undergo lengthening. Though the details of the analysis are more complicated, this explanation captures the essentials of van de Vijver’s proposal.

One major drawback of van de Vijver’s analysis is that he focuses only on monomorphemic forms. While it is true that phonological vowel lengthening does not occur beyond the fifth syllable in essentially all Carib words, it is not the case that such lengthening never occurs outside the root as van de Vijver suggests. Recall from Section 2.3, that when suffixes are added to two-syllable words with an underlyingly heavy initial syllable, lengthening occurs on the third syllable just as it would in a longer root with no suffixes. Thus, the polymorphemic word /pi:na+topo/ ⇒ [pi:na+tó:po] ‘way, means of getting’ and the monomorphemic word /ka:rawasi/ ⇒ [ka:rawá:si] ‘rattle’ both have length on the third syllable, even though this underlyingly short vowel is part of the
suffix in pi:na:to:po. In these relatively common cases, van de Vijver’s analysis makes the incorrect prediction that phonological lengthening will not occur in the suffixes. However, in my analysis, where ColonBinarity determines the scope of iambic lengthening, no such prediction is made. Affixed words are parsed into feet just as unaffixed words are, and foot heads are lengthened whether they occur in the root or in the suffix.

(30) Foot Structure in Mono- and Polymorphemic Words
a. Monomorphemic Words
   i. (ka:)(rawa:):si ‘rattle’
   ii. (ix)(pori:):ri (no gloss given)

b. Polymorphemic Words
   i. (wo:)(mi:Ya:):ko:ŋ
   ii. (pi:)(na-to:):po
   iii. (u:)(na-to:):po
   iv. (ux)(ku-po:):tī

In each of the cases in (30b), the second foot straddles a morpheme boundary and the correct length pattern is observed, but the second foot also violates van de Vijver’s Align constraint. This suggests that it is in fact ColonBinarity, not Align, that is involved in deriving the correct word forms.

Another drawback to van de Vijver’s analysis of Carib involves disyllabic words. Recall that length on the initial syllable of disyllabic words is the result of interaction between *Edgemost and Trochee, and that van de Vijver assumes that rhythmically lengthened vowels have some degree of stress, i.e. they are prominent. Recall also that *Edgemost prohibits a prominent syllable from being adjacent to any edge. From these facts, the constraint interaction in Tableaux 5-6 derives length correctly in disyllabic words. However, there is one fact that van de Vijver has overlooked: primary stress in disyllabic words surfaces on the final syllable. This is a violation of Trochee, which says
that within a foot the initial syllable is prominent. Given this, Tableau 6 can be rewritten as follows:

Tableau 7:

<table>
<thead>
<tr>
<th>/uwa/ ‘to dance’</th>
<th>*Edgemost</th>
<th>Trochee</th>
</tr>
</thead>
<tbody>
<tr>
<td>(u:wá)</td>
<td>**!</td>
<td>*</td>
</tr>
<tr>
<td>⇒ (ú:wa)</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>(uwá)</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

In this tableau, the optimal form is *ú:wa. Since the observed surface form is actually u:wá, these constraints cannot be used to determine which forms will surface in Carib. Since van de Vijver’s analysis hinges on the interaction of *Edgemost and Trochee, the failure of these constraints to determine the correct surface forms is a very serious problem.

Given these problems with van de Vijver’s analysis of Carib, it is not difficult to show that the colon-based analysis presented in Section 4 is a marked improvement. In addition to the drawbacks just discussed, van de Vijver has no good explanation for the almost complete lack of monosyllabic words in Carib, while in my analysis this result is expected since every word contains a colon that must be binary (i.e. have two feet). Since a foot is minimally one bimoraic syllable, we predict that monosyllabic words will be highly marked for the simple reason that there are not enough syllables to construct two feet. Colon binarity can also be used to explain why words with five syllables are less optimal (and therefore less common) than words with two, three, or four syllables. Since a foot has a maximum of two syllables, any syllable beyond the fourth is not needed to make the colon binary, and because of this, roots with more than four syllables, while possible, will be less optimal than roots with fewer syllables. This prediction can be derived by making reference to the Strict Layer Hypothesis, as in Green (1997) in the case of Munster Irish. Since only one colon is formed per word, any material outside the scope of the colon must be included in a higher level of the prosodic hierarchy. By viewing strict layering as a violable constraint instead of a rigid requirement, such inclusion is possible, but it follows that it is not optimal. That is, the Strict Layer
Hypothesis can be seen as a preference for elements in one level of the prosodic hierarchy to be included in the level immediately dominating it, but this is not a requirement.

(31) Prosodic Hierarchy in Roots with More than Four Syllables

\[
\text{PrWd} \\
| \\
\text{Colon} \\
| \backslash \\
\text{Foot} \quad \text{Foot} \\
| \quad | \\
(aka:) (ripo:) \quad \text{to} \quad \text{`proper name'}
\]

In OT terms, the final syllable in words such as that in (31) constitutes a violation of the Strict Layer Hypothesis, and every syllable after the fifth will result in another such violation. Thus, the longer the root, the less optimal it will be. We therefore see that words that are longer than four syllables are sub-optimal, becoming less optimal the longer the word gets, and we make the (correct) prediction that words with more than four syllables will be less common than words with four or fewer syllables. However, words longer than four syllables are not completely disallowed, only sub-optimal. This accounts for the occurrence of the five syllable words listed in (24).

Inkelas’s (1989) analysis of Carib is similar to that of van de Vijver in that she analyzes it as a trochaic language. But there are differences between her analysis and Van de Vijver’s. First, she proposes that the initial mora is extrametrical. The observed lengthening pattern would be derived from trochaic footing plus the invisibility of the initial mora.

(32) Derivation of Lengthening (Inkelas 1989, 165-166)

a. 

\[
\phi \quad \phi \\
\backslash \quad \backslash \\
\text{s w s w} \\
[asaparapi] \Rightarrow \text{a[sparapi]} \Rightarrow \text{a[ saa pa raa pi]}
\]
b. \[ \phi \]
   \[ / \backslash \]
   s w
   \[ [kuriyara] \Rightarrow ku[riyara] \Rightarrow ku[rii ya ra] \]

c. \[ \phi \quad \phi \]
   \[ / \backslash \quad / \backslash \]
   s w s w
   \[ [aarawata] \Rightarrow a[aarawata] \Rightarrow a[aa ra waa ta] \]

By assuming that all strong vowels (marked with an ‘s’) are foot heads, and that all foot heads are lengthened, the alternating pattern of vowel length is derived. Inkelas also proposes that stress assignment is cyclic, so that after stress is first assigned, it is computed again in each successive cycle. It may be the case that the cycle will be necessary in a complete analysis of Carib, but since this part of Inkelas’s analysis is not crucial in the current discussion, I will leave out the details for the sake of brevity.\(^8\)

One of the biggest drawbacks of any trochaic analysis of Carib, including those of both Inkelas and van de Vijver, is that we seem to have “trochaic lengthening,” where a short vowel that is the head of a trochee is lengthened. Though this is not unheard of (see Hayes 1995 for a discussion of Chimalapa Zoque, Icelandic, and Mohawk, among others), it is less common than iambic lengthening. In addition, according to Hayes (1995), trochaic lengthening is typically phonetic in nature and often limited to only the main stressed syllable. In contrast to this, iambic lengthening is generally seen as a phonological process, and it typically happens in every foot, not just the one with main stress. Thus, though trochaic lengthening does occur, it seems to be more marked and less common than iambic lengthening. In the analysis of Carib presented in Section 4, the use of iambic allows us to explain vowel lengthening as iambic in nature, thus avoiding reference to trochaic lengthening.

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\(^8\) Inkelas shows that when a root of the form CVCV:CV is given a CV prefix, the resulting form is of the form CV-CV:CV-CV, where ‘-‘ marks the morpheme boundary. Length on the second syllable of the unaffixed form is retained, while the second syllable of the affixed form is also lengthened as if it were a foot head. But this is not the case with suffixation, where no suffix changes the lengthening patterns. Thus, the root CVCV:CV, when suffixed with CV, surfaces as CVCV:CV-CV. The effects of affixation can be derived by assuming that suffixification precedes foot assignment, which precedes prefixation.
Another drawback of Inkelas's analysis is that it crucially relies on extrametricality of the leftmost mora to derive the pattern of alternating vowel length. But according to Hayes (1995), the left edge is the marked edge for extrametricality. Thus, an analysis that derives the correct forms without making reference to left-edge extrametricality would be an improvement on this analysis. By including a binary colon layer and iambic feet in the prosodic hierarchy, exactly this result is obtained. Under this analysis, the first segment bearing a mora in a word is included in the first foot of a word, which is itself contained in the colon. As discussed in Section 4, this configuration in the prosodic hierarchy, under the assumption that feet are quantity-sensitive iambs, accounts for the distribution of stress and the observed vowel length patterns. All of this is obtained without reference to left-edge extrametricality. Thus, the colon-based analysis has the advantage that left-edge extrametricality is avoided.

5.1.1 Iambic Analyses

Two other notable analyses of Carib are those of van der Hulst and Visch (1992) and Visch (1996). These analyses differ from those discussed earlier in this section in that they analyze Carib as iambic, and both resemble the analysis of Carib presented in Section 3. That is, both analyses require quantity-sensitive iambs, but neither analysis takes into account the colon. Because of this, they both suffer from many of the drawbacks discussed for such an analysis in Section 3.3. But before raising any objections, I will outline the specific claims made in each of these analyses.

Van der Hulst and Visch propose the following framework for Carib:

(33) Properties of Carib (Van der Hulst and Visch, 1992)
   a. Length is distinctive on the first syllable only.
   b. The foot is a quantity-sensitive iamb.
   c. V₁, VC, and VI,VE count as heavy.
   d. The final syllable is extrametrical.
   e. Degenerate feet are not allowed.
   f. Vowels in strong position are lengthened, but not in final vowels.

In addition to these properties, van der Hulst and Visch note that "if length is due to an alternation, the alternation never results in more than two long vowels (p. 114)." That
is, iambic lengthening never occurs beyond the fourth syllable, as discussed earlier. However, van der Hulst and Visch offer no explanation for this restriction.

Crucial to this analysis is the extrametricality of the final syllable, which van der Hulst and Visch use to derive length on the first vowel in disyllabic words. (Recall that the underlying length contrast in the initial syllable is neutralized in disyllabic words. In open syllables in this position, the vowel always surfaces as long.) They say that “a foot must be assigned to a word which would otherwise remain unfooted (p. 115).” That is, in a disyllabic word with an underlyingly short initial vowel, such as /api/ ‘red, ripe,’ length is derived on the initial syllable because the word must contain at least one foot, and if the final syllable is extrametrical, the initial syllable must be footed. When this happens, the initial vowel is lengthened through iambic lengthening.

(34) Derivation of Length in Disyllabic Words (van der Hulst and Visch 1992)

\[ a<\text{pi}> \Rightarrow (a)<\text{pi}> = (a):\text{pi} \]

The initial light syllable is footed by itself, and iambic lengthening neutralizes any length contrast that exists underlyingly in disyllabic words.\(^9\)

One improvement over the analysis of van der Hulst and Visch involves the length pattern of disyllabic words. Van der Hulst and Visch rely on final-syllable extrametricality to derive length on the initial syllable. But there is an immediate problem with this solution. If the final syllable is extrametrical, it cannot, by definition, be altered by metrical processes such as stress assignment. But in disyllabic words the final syllable always receives main stress. Since a syllable cannot be both extrametrical and stressed, we have to assume that extrametricality is removed at some point before stress assignment occurs but after foot assignment has occurred. Footing would then have to apply again in order to include the final syllable in the metrical structure so it could receive stress.

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\(^9\) Van der Hulst and Visch also discuss affixation and its effects on stress and vowel length. They suggest that the cycle may be involved in derivation of affixed words, but do not make any claims about how the cycle would operate in Carib. Since this discussion is not crucial to the arguments being made in this paper, I will not go into detail on it, but I refer the reader to van der Hulst and Visch (1992) and Inkelas (1989) for a good discussion of how the cycle operates in Carib.
Such a process is very ad hoc. It seems as if it has been tailored to fit the observation that the initial syllable in disyllables is always heavy, but it is unclear how extrametricality and the complicated derivation just described applies to other processes of the language. But with the colon we have a very simple explanation for these facts without resorting to extrametricality. Because the colon must be binary on feet, each syllable in a disyllabic word must be a foot head. Once a foot has been formed on each syllable, the general processes of iambic lengthening and stress assignment occur just as they do in every other word. We do not need to make any stipulations about disyllabic words in order to derive the observed stress and vowel length patterns. We only need to make reference to processes and constraints that apply uniformly across all word forms.

The most notable improvement that the colon-based analysis offers over the analysis of van der Hulst and Visch (1992) is that we now have a way of explaining the stress window phenomena. For example, van der Hulst and Visch do not offer any explanation for the restriction of iambic lengthening to (maximally) the first four syllables of a word. But in the colon-based analysis this result is easily explained. Recall that in the colon-based analysis exactly two feet are formed in every word, since this is the number required to make the colon binary. Crucially, no feet are formed outside the scope of the colon, and because of this iambic lengthening (and stress assignment) cannot occur outside the scope of the colon. We thus have a good explanation of these facts in the colon-based analysis, while van der Hulst and Visch offer no explanation for them at all.

A second iambic analysis of Carib is made by Visch (1996), who attempts to improve on the analysis of van der Hulst and Visch (1992) by analyzing Carib using Optimality Theory (OT). He proposes several constraints whose interaction produces a word with stress on the second foot and prevents a word from having more than two feet.

(35) Constraints on Carib Words (Visch 1996)
  a. UNS: The left edge of the prosodic word is aligned with an unstressed syllable
  b. Noninitiality: The head of the prosodic word is not the leftmost foot
  c. Align(Ft, L, PrWd, L): All feet must be aligned with the left edge of the word
  d. Parseσ: Syllables are parsed into feet

By ranking Noninitiality >> Align(L) >> Parse σ, we obtain the desired pattern.
(36) Exactly Two Feet in a Word (Visch 1996)

\[
\begin{array}{cccc}
\text{NonIni} & \text{Align(L)} & \text{Parse}\sigma \\
\hline
\text{a. (tīkú):riyararākonīmbo} & \ast & & \ast \\
\text{b. tī(kurī):yararākonīmbo} & \ast & \ast & \ast \\
\text{c. (tīkú):(riyā):(rarr)(konīmbo) bo} & \ast & \ast \ast \ast \ast & \ast \\
\Rightarrow \text{d. (tīku):(riyā):rārākonīmbo bo} & \ast & \ast & \ast \ast \ast \ast
\end{array}
\]

In (36), the head of the prosodic word is indicated in bold print. Given these constraints with this ranking, the correct form ((36d) surfaces with exactly two feet.

This analysis is parallel to the analysis presented in Section 3 in that it requires a constraint (Noninitiality), which is analogous to *InitStress(\phi) from Section 3, that explicitly prevents the initial foot from bearing main word stress. Because of this similarity, Visch’s analysis is subject to the same objections to such an analysis raised in Section 3.3, namely that it is very stipulative. The colon-based analysis therefore offers several improvements over Visch’s analysis. Foremost among these is that we can do away with constraints such as Noninitiality/*InitStress(\phi) and UNS by referring to the structure of the colon. Specifically, since ColonFormRight is undominated, stress must surface on the head of the second foot, and since ColonBinarity is undominated, there must be at least two feet in a word. The intersection of these constraints produces exactly the results that Noninitiality and UNS are meant to produce, with the advantage that ColonFormRight and ColonBinarity are independently needed to explicitly define the form of the colon. Therefore, using them to explain other phonological processes is inherently less stipulative and more general than explaining the same processes without making reference to the colon, but instead by making reference to constraints such as Noninitiality/*InitStress(\phi) and UNS. Thus, the colon-based analysis is more general than the analysis presented by Visch (1996), and because of this it is an improvement on Visch’s analysis.

6 Conclusion

In this paper I have shown that it is possible to describe Carib phonological structure using a single, concise description. In doing so, I relied heavily on the notion of the
colon layer in the prosodic hierarchy, and I showed how making reference to this prosodic layer allows for great simplifications over previous analyses that relied on a prosodic hierarchy that did not make use of the colon. Thus, with this analysis of Carib we now have another language to add to the list of languages that relies on the colon layer in derivations of word forms (other such languages include Hungarian, Passamoquoddy, Eastern Ojibwa, Asheninca, and Munster Irish, all of which are described in Green 1997). Though this list is small, with each additional language that is shown to employ the colon we are better able to determine what role the colon plays in the world’s languages. For example, how does the colon delimit the scope of phonological processes, such as stress assignment and vowel lengthening? What parallels can be drawn between the structure of the colon and that of other levels in the hierarchy such as the syllable and foot? Is the colon a universal structure, one with no obvious surface effects in most languages, or do we only need to make reference to it in languages that have processes that cannot be described well without reference to the colon? These are not trivial questions, and by expanding the set of languages that make use of the colon we become more able to determine meaningful answers to these and other questions concerning structures allowed in the world’s languages.

7 References


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