

# **Discontinuous Nasal Spread In Yaminahua**

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## Contents

Abstract

1. The nasalization hierarchy
2. The underlying feature content of Yaminahua nasals
  - 2.1 The Panoan constraint against stop consonants as syllable codaSyllabification affects nasal codas
3. Leftward nasal spread within stems
  - Discontinuous nasal spread
  - Stem-final spread of nasalization
  - Nasal spread rightward over glides

4. Conclusion

Appendix

Peculiarities of certain suffixes

References

## Abstract

Rachel Walker's (1998) analysis of the universal characteristics of nasal spread provided a unified account of nasal spread that enabled the formulation of predictable spread patterns. The present analysis presents a new type of data not included in Walker's account: Yaminahua (Panoan) diverges significantly from hitherto identified patterns of nasal spread by allowing nasalization to skip over intervening nasalizable segments. By positing nasal autosegments this paper provides a rationale for the Yaminahua exceptions to Walker's universal pattern.

## 1. The nasalization hierarchy

Yaminahua has several patterns of nasal spread, one of which includes the spread of nasalization from a nasal consonant in a final coda of a noun or verb stem to the first syllable of the stem.<sup>1</sup> An intervening syllable may be skipped over in the nasal spread. To show why this is remarkably atypical, I will summarize the key points of Walker's foundational analysis.

Based on a survey of nasalization in a wide variety of languages, Rachel Walker (1998) refined the concept of a segmental hierarchy based on resonance (the well-known "sonority hierarchy") already observed by others (Schourup 1972, Piggott 1992, Cohn 1993a,b, Pulleyblank 1989, all cited by Walker 1999). The hierarchy forms a tightly constrained pattern that permits or hinders nasal spread. The segment classes in the hierarchy are arranged according to their resonance-defining features, the most resonant segments at one extreme and the least resonant at the other; in between, the other segments are graded and positioned according to their relative degree of resonance (Walker 1999). The most compatible with nasalization are the vowels, being the most resonant, and the least compatible are the stops. I omit from the scale here the nasal consonants because they are basically nasal rather than potentially nasalizable:

(1) The resonance hierarchy, nasal consonants omitted

Vowels	Glides	Liquids	Fricatives	Obstruent Stops
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With regard to the above scale, the following observations can readily be made:

1. The farther to the left that a segment falls in the above arrangement, the more compatible it is with nasalization. This compatibility is directly related to the spread of nasalization; the more compatible segments are the most likely to bear spreading nasalization. Significantly, Walker found that in the language data she surveyed, the presence of nasalization in the most compatible segments (the vowels) did not imply anything about the nasalization possibilities of the other segments, but if glides are targets of nasal spread, vowels also will certainly be candidates for the spread. This means that if a vowel intervenes between a nasal source and the target glide, and the glide is nasalized from the nasal source, the vowel will also be nasalized. The same principle holds for each class of segments as one moves rightwards along the hierarchy.
2. There is an implicature arising from the hierarchy beyond that of predicting spread over intervening adjacent segments. If liquids of any language are nasalizable, vowels and glides will also be; if fricatives can be nasalized, so also will vowels, glides, and liquids.

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<sup>1</sup> Yaminahua dialects are found in eastern Peru, western Brazil, and northern Bolivia. The data for this study is from the dialect of the Sheshea and Yurua rivers of Peru. I am indebted very much to Lucy Eakin, Ivagene Shive, Mary Ann Lord, and Thelma Schoolland for tape recordings and transcriptions on which this analysis is based. I am also indebted to Richard Hyde for extensive recordings of Amahuaca and to Marie Scott for recordings of Sharanahua.

3. If nasal spread is obstructed by a class of segments, all higher segment classes (to the right in the hierarchy) will also obstruct the spread. Obstruent stops are the most likely to block nasal spread, but they do not always do so. Walker accounted for this by positing that any of the classes in the hierarchy may either block or participate in the nasal spread; if obstruents do not block, it is because they are behaving as transparent segments. That is, nasalization is not blocked by them though acoustically they do not manifest a nasal feature.
4. The spread of nasalization can be in either direction, rightwards, leftwards, or in both directions.
5. Crucial to this concept of nasal spread along the hierarchy is the understanding that nasal spread never skips over a segment to affect a target segment more removed from the nasal source. Viewed in terms of association lines to connect a nasal feature with associated segments, Optimality Theory (OT) posits a NOGAP constraint to prevent skipping. Crossing of association lines is thereby excluded.
6. Walker does not utilize association lines and avoids assuming a NOGAP constraint (the presumption that there is a constraint that prevents skipping) by assuming strict locality in nasal spread. Strict locality means that nasality spreads from one segment or source to an adjacent one, and from that one to the next, until a blocking segment or a prosodic word border blocks the spread.
7. For languages in which nasalization spreads over voiceless consonants but leaves the consonants unaffected, Walker assumes such consonants to be transparent segments. Transparent segments are a problem for Optimality Theory because the constraints should reject a phonetically non-nasalizable segment in a situation requiring a nasalized one. In Walker's analysis, to accept otherwise rejected forms the theory is patched by accepting assumptions regarding sympathy, whereby output that does not satisfy the constraints are allowed as "close calls," close enough so that they are not rejected as a match.

Yaminahua (of Peru) does not conform to all aspects of the claims of how nasal spread moves along the hierarchy because Yaminahua nasal spreading may skip segments. This phenomenon cannot be accounted for by a theory based on assumptions that support observations 5, 6, and 7 above.

## 2. The underlying feature content of Yaminahua nasals

The present analysis claims that a syllable-final nasal consonant is the source of Yaminahua nasalization.<sup>2</sup> We have found no Yaminahua morphemes that display a nasal feature on vowels except those that at some point can be argued to have a nasal consonant in syllable final position, hence we argue that there is no support for assuming that there is a floating nasal feature in the input form unassociated with a consonant.<sup>3</sup> The source of nasalization therefore must be a nasal consonant, but the consonant might be unconventional in some way, depending on how one defines the input forms of the nasal consonants. In traditional Panoan descriptions, the features of the nasal consonants involved have been assumed to be those of simple resonants, [m] and [n]. To account for Yaminahua nasalization and the peculiar behavior of nasal consonants in syllable codas, there are four conceivable feature options from which nasalization might spread from a source consonant in the input:

- inputs are pre-nasalized oral plosives, [ᵐb, ᵑd];

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<sup>2</sup>Nasalization is a widely recognized characteristic of most Panoan languages. In Northern Panoan such as Capanahua and Shipibo-Conibo, it is readily apparent that nasalization arises from syllable-final nasal consonants and spreads to adjacent vowels and glides; in Central Panoan such as Cashinahua and Sharanahua, stem formation constraints obscure stem-final consonants so that analysts who used the principles of traditional phonemics were led to postulate a phoneme of nasalization (in addition to the nasal consonants), but without claiming that such nasalization was a floating feature identified with a stem morpheme rather than being part of the phonemic string.

<sup>3</sup>To simplify the formatting of quasi-phonetic Yaminahua data, where possible, I use the Yaminahua vernacular orthography. The vowels are a, e, i, o; the consonants are p, t, k, ch, ts, s, sh, m [ᵐb], n [ᵑd], r, f, x, w, y. The vowel e represents the high, back, unrounded [ɨ]; x represents the retroflexed alveopalatal sibilant [ɣ].

- inputs are nasal consonants with a plosive release, [m<sup>b</sup>, n<sup>d</sup>];
- inputs are non-nasal voiced consonants [b, d], which contextually acquire nasalization;
- inputs are non-plosive nasals [m, n] which contextually acquire a plosive release.

In word-initial position the Yaminahua voiced consonants in open syllables tend to have a nasal onset but often do not. The nasal and oral alternates may vary from speaker to speaker, with the bilabial more likely to be completely oral. At this point, the choice of which element should be written as superscripted is not critical, so without prejudicing the question of the exact nature of these consonants, yet show the essential unitary nature of the grapheme, in citing data when both nasal and voiced stop features are present, I transcribe the segment with the nasal on the line and the voiced plosive part superscripted: [m<sup>b</sup>]. A comparison of the initial consonants in the first column of table 1 shows that word-initial voiced consonants in open syllables may be nasal or non-nasal. (In column 2 of tables 1, 2, and 3, “M” and “N” are used for the underlying nasal consonants to avoid seeming to assume the answer to the question of the consonant feature structure.)

Table 1. The phonetic value of word-initial nasal consonants

Phonetic form	Source morphemes	Gloss
[n <sup>d</sup> aʔakĩn <sup>d</sup> ]	/Naka-kiN/	he chews
[n <sup>d</sup> apafwaida]	/Na-pake-faiN-a/	knocked it into it
[n <sup>d</sup> apaʔebea]	/Na-pake-Me-a/	spilled itself
[dapaʔebeba]	/Na-pake-Me-a/	spilled itself
[daisfaida]	/Na-is-faiN-a/	he looked into it
[n <sup>d</sup> aisfaida]	/Na-is-faiN-a/	he looked into it
[ʔẽ batsibei]	/eN Matsi-Me-i/	I'm cold
[be:sharatiro]	/Me-shara-tiro/	good to touch
[be:yabawe]	/Me-yaMa-we/	don't touch it
[bara]	/Mara/	shotgun shell

In intervocalic position the (nasal) consonants are non-nasal plosives [b, d] that may have a nasal onset only when preceded by a nasalized vowel.

Table 2. Word-medial plosive voiced consonants

Phonetic Form	Source Morphemes	Gloss
[pĩãxidi]	/pi-aN-xiN-i/	eats hers up at night
[pĩã <sup>b</sup> ashĩ]	/pi-aN-Ma-shiN-i/	makes eat hers up at night
[pibai]	/pi-Ma-i/	makes eat it
[pí:banõ]	/pi-Ma-NoN/	after making him eat it
[fĩba]	/fi-Ma-a/	made him take it
[piyabaiʔai]	/pi-yaMa-ka-i/	goes away not eating
[pĩã <sup>b</sup> a]	/pi-aN-Ma-a/	made him eat it
[pĩã <sup>b</sup> aʔĩ]	/pi-aN-Ma-kiN/	making him eat it

Non-plosive variants [m, n] occur only when followed by a nasalized (or nasalizable) vowel.

Table 3. Non-plosive variants [m, n]

Phonetic Form	Source Morphemes	Gloss
[õñĩ , õñi]	/oNi-N/	man (ergative form )
[nãmĩ , nãmi]	/NaMi-N/	meat (ergative form)

Our concern is to determine the source of Yaminahua spreading nasalization. If there were no nasal feature in the input form of the consonants, we would find no phonetic motivation for the spreading nasal feature that appears in the output. An oral consonant in word-initial position provides no phonetic conditioning to introduce a nasal feature. Oral consonants [b, d] are therefore unlikely candidates to cause nasal spread.

In intervocalic position, the oral nature of contiguous vowels could be viewed as conditioning nasal consonants towards an oral stop. Assuming that a nasal feature is present (in the input form) of Yaminahua voiced stops (i.e., the nasal feature is present in the input and constraints are needed to govern the appearance or disappearance of the plosive feature), the underlying consonants must include a nasal feature; they would be *m* and *n*, *m<sup>b</sup>* and *n<sup>d</sup>*, or *<sup>m</sup>b* and *<sup>n</sup>d*.

Stops are excluded from coda position, but continuant obstruents (stridents) are allowed. Note that if the input forms of the consonants were nasal continuants /m, n/ (resonants), a constraint excluding them from coda position would be quite unexpected because we would look for the prevailing exclusion of stops from coda to be the influencing factor, that is, we would use the existing constraints rather than complicate the description with a special constraint to handle resonant exclusion. It would be logical, therefore, to find that the voiced consonants are nasal stops.

Acoustically, the consonants [m] and [n] are continuants (in the nasal cavity); articulatorily, they are stops (in the oral cavity). To help decide which of the two perspectives is to be chosen, i.e., whether the Yaminahua input segments are /m, n/ or /m<sup>b</sup>, n<sup>d</sup>/, let us check cognate languages to see if we can draw inferences from them. In northern Panoan (Shipibo, Iskonahua, Huariapano, and Capanahua), the nasal consonants never have a plosive release in the output; they surface only as [m, n]. Yet, in those languages, too, they function like the obstruent stops [p, t, k] in that they are always excluded from coda. In the Amahuaca and Sharanahua languages (more closely related to Yaminahua) the nasal consonants in initial or intervocalic position are plosively released [m<sup>b</sup>, n<sup>d</sup>] freely alternating with non-plosively released [m, n], but also always excluded from a coda.

Since the voiced consonants of those Panoan languages all have a [+nas] feature in some context, a reconstruction of protopanoan input forms makes it reasonable to assume that diachronically or synchronically the corresponding bilabial and alveolar consonants in Yaminahua include a [+nas] feature in the input form. The fact that they function like stops in being excluded from coda position is an indication that the input has a stop feature; they are underlyingly either nasal stops having a plosive release, i.e., /m<sup>b</sup>, n<sup>d</sup>/, or oral stops having a nasal onset, i.e., /<sup>m</sup>b, <sup>n</sup>d/.

## 2.1 The Panoan constraint against stop consonants as syllable coda

If a stem in Yaminahua has a nasalized syllable, usually the Capanahua cognate for the form will have a nasal consonant, particularly when the nasalizing source is in the final consonant of the stem. We might therefore conclude that the Yaminahua form also has a nasal consonant as its final stem consonant. Unfortunately, stems in Yaminahua never reveal that consonant in any inflection.

Therefore, if the spread of all Yaminahua nasalization arises from a nasal consonant in coda position even though that nasal consonant never appears in the output, we are hard pressed to show that the presumed consonant was ever there. We need evidence that the consonant indeed survives in some output form. To see that, we turn now to derivations where a non-coda nasal consonant in the input form actually appears derivationally in a coda position, though it does not survive there as a consonant.

Like other Panoan languages, Yaminahua has a strong tendency to reduce polysyllabic stems to a disyllabic structure. This reduction of a polysyllabic noun or verb stem is achieved by the elision of a final unstressed stem vowel that trails after a foot. One way to see this is in noun incorporation. A portion of certain nouns (usually terms for body parts) may be incorporated and attached like a prefix to verb, adjective, or noun stems. Usually, the portion to be incorporated is the first syllable of the incorporative noun. For convenience, I will refer to that syllable as a prefix. When a prefix such as *m<sup>b</sup>e-* ‘hand’ is attached to a verb stem such as *pexa* ‘to break, crush’, the total input *m<sup>b</sup>e-pexa* has the prefix fused to the stem to form a single polysyllabic stem, which is reduced by suppression of the final vowel to *m<sup>b</sup>epex*, as in table 4.

I will use some optimality jargon, but I am not undertaking here an Optimality Theory analysis of Yaminahua grammar. Instead, I limit the presentation of data to relevant derivational information.

Table 4. Derivations showing elision of a trailing vowel

Form	Explanation
<i>m<sup>b</sup>efi</i>	The noun ‘hand’ to be incorporated
<i>pexa-kin<sup>d</sup></i>	Verb ‘crush-pres’ (‘He crushes it.’)
<i>m<sup>b</sup>efi-pexa-kin<sup>d</sup></i>	‘Hand-crush-pres’
<i>m<sup>b</sup>epexa-kin<sup>d</sup></i>	Incorporation of a syllable of the noun
<i>m<sup>b</sup>epexkin<sup>d</sup></i>	Deletion of the trailing stem vowel
<i>m<sup>b</sup>epexki</i>	Output form: ‘crushes his hand’
<i>mapo</i>	‘head’ the noun to be incorporated
<i>taxa-kin<sup>d</sup></i>	‘pound-pres’
<i>m<sup>b</sup>apo-taxa-kin<sup>d</sup></i>	‘Head-pound-pres’
<i>m<sup>b</sup>ataxa-kin<sup>d</sup></i>	Incorporation of a syllable of the noun
<i>m<sup>b</sup>atax-kin<sup>d</sup></i>	Deletion of the trailing stem vowel
<i>m<sup>b</sup>ataxki</i>	Output form: ‘he pounds it on the head’
<i>pacho</i>	ear
<i>pesa-kin<sup>d</sup></i>	‘perforate-pres’
<i>pacho-pesa-kin<sup>d</sup></i>	‘ear-perforate-pres’ (input morphemes)
<i>papesa-kin<sup>d</sup></i>	Incorporation of the noun as prefix
<i>papes-kin<sup>d</sup></i>	Deletion of the trailing stem vowel
<i>papeski</i>	Output form: ‘she perforates the ear’

As seen in table 4, a continuant consonant is permitted as coda, so the stem consonants *x* in *mbepexki*➤ and *x* and *s* in *mbataxki*➤ and *papeski*➤ are retained. By contrast, if vowel elision has left a stop as coda, the stop consonant is filtered out by the constraint against stops in coda. For example, the verb stem *chiko-* (to pour) prefixed by *n<sup>d</sup>a-* (interior) results in both the loss of the final vowel of the stem and the loss of the resulting final consonant of the stem, shown in table 5.

Table 5. Elision of an obstruent in a coda

Form	Explanation
<i>n<sup>d</sup>apo</i>	‘interior’ (becomes a prefix)
<i>chiko-kin<sup>d</sup></i>	pour-pres ‘He pours.’
<i>n<sup>d</sup>apo-chiko-kin<sup>d</sup></i>	interior-pour-pres (combined input)
<i>n<sup>d</sup>achiko-kin<sup>d</sup></i>	incorporation of the noun as prefix
<i>n<sup>d</sup>achik-kin<sup>d</sup></i>	elision of the final stem vowel
<i>n<sup>d</sup>achi-ʔi</i>	elision of the final obstruent of the stem foot
<i>dachiʔi</i>	Output form: ‘he pours into a container’

The incorporation of the noun into the stem as a separate step in the derivation requires a rule or constraint to account for it. However, because it is marginal to the discussion to follow, I will not go into defining the details of how the portion of the noun is preserved as a prefix. The important thing to notice

in table 5 is that the *k* which began the second syllable of the stem becomes the final consonant of the preceding syllable by the elision of the final stem vowel. The *k* is then a candidate for elision because it is in coda position, stem-final.

Only continuants may function as the coda of a syllable. A stop cannot. With the constraint requiring the loss of the final vowel of a trisyllabic stem, the remainder of the stem in table 5 would be *n<sup>d</sup>achik* ‘pour’, with a stop *k* as coda. However, such a form never surfaces in Yaminahua because even if a vowel-initial inflectional suffix is added to the verb, the *k* is lost. The result is that the form of the stem is still CVCV, a foot, as in table 6.

Table 6. Derivation of *n<sup>d</sup>achii*

Input form	<i>n<sup>d</sup>apo-chiko-i</i>	interior-pour-pres
Incorporation	<i>n<sup>d</sup>achiko-i</i>	Pour.in-pres
Vowel elision	<i>(n<sup>d</sup>achik)-i</i>	Conform to foot pattern
Consonant elision	<i>(dachi)i</i>	He pours (it) into (the vessel).

Limiting stems to foot structure does not by itself require the dropping of the final stem vowel; theoretically, the constraint could be satisfied by not incorporating the noun as prefix into the verb stem. We need only note that incorporating the prefix into the stem and limiting stems to foot structure are standard Yaminahua conditions that take care of the trailing vowel of the stem, thus preserving foot structure in stems.

Those two conditions do not affect a final **consonant** of the stem. An additional constraint prevents stops from appearing in codas in the output.

What happens when the candidate for coda is a **nasal** consonant in a verb stem? The result is similar to that of other consonants: the stem loses its final vowel and its final (formerly medial) consonant, but there is a nasal spread on the stem vowels and if there is an initial nasal consonant, it loses its plosive release. Table 7 uses the verb stem *tsom<sup>b</sup>a* ‘to squeeze.’

Table 7. *m<sup>b</sup>efi-tsom<sup>b</sup>a* ‘to squeeze the hand’

Input morphemes	<i>m<sup>b</sup>efi-tsom<sup>b</sup>a-kin<sup>d</sup></i>	hand-squeeze-pres
Incorporation	<i>m<sup>b</sup>etsom<sup>b</sup>a-kin<sup>d</sup></i>	handsqueeze-pres
Delete trailing vowel	<i>(m<sup>b</sup>etsomb)-kin<sup>d</sup></i>	handsqueeze-pres
Delete coda consonant	<i>(m<sup>b</sup>etsō)-kī</i>	handsqueeze-pres
Surface form	<i>m<sup>b</sup>etsōĩ</i>	to take by the hand

## Syllabification affects nasal codas

Our focus is on the fact that the foot structure constraint on stems affects the pattern of nasal consonants in a stem coda in a peculiar way, different from the way nasal consonants behave in suffix strings outside the stem. The result of shaping stems in the form of a foot is that in foot structure a nasal consonant as coda triggers nasalization.<sup>4</sup> It is important to note that even when the next suffix attached to the stem begins with a vowel, if the **final syllable of the stem** has a coda, syllabification includes the consonant as coda of the final stem syllable rather than associating the consonant as onset of the next syllable. In other words, when the stem is syllabified, the loss of the final vowel puts the final consonant in coda position and as a result, a stop in a stem coda is always filtered out; the stop never becomes the onset of a following vowel-initial syllable.

<sup>4</sup> Lest I seem to be claiming that in Yaminahua a verb stem always consists of only one foot, here is an example showing two metrical feet. No segment loss takes place if the stem can be regrouped with its prefix and suffixes into two complete feet. For example, if the prefix *ka-* ‘back’ with the verb stem *pake* ‘to fell’ is followed by the close-knit suffix *-m<sup>b</sup>e* ‘reflexive’ and the recent past *-a*, the result *ka-pake-m<sup>b</sup>e-a* has two feet [ka-pa][ke-m<sup>b</sup>e], *kapakebea*. Cases of stems with more than one foot are marginal to the issue of nasal spread.

For example, note the position of the *k* in the input form of the morpheme *chiko-* ‘to pour’ in the previous table 6. If the final vowel of the stem were retained when prefixed, *n<sup>d</sup>a-chiko* ‘pour into’, the form of the morpheme would fail to conform to stem requirements. If only the vowel is lost, the form retains the *k* as coda but fails to conform to the limitation against coda stops. The pruned form *dachii* permits the initial nasal consonant to be realized as an oral plosive and satisfies the requirements.

We have accounted for the way a medial oral stop gets to coda position and is lost. Like any other stop, a nasal consonant as coda in a stem is filtered, but its nasal feature is not lost. To see that there truly is a nasal consonant in the input form, let us examine some cases in which stem shortening is blocked.

Certain inflectional morphemes attached to noun or adjective stems block the shortening process described above, with the result that “long forms” of the stems surface in the output. The Yaminahua morphemes that block stem shortening are the ergative, instrumental, location, time, augmentative, vocative, possessive and diminutive. It is worth taking a short digression here to alert the reader of Panoan grammars. Due to a greater frequency of occurrence, in the surface string the shortened forms of stems far outnumber the underlying longer forms, with the result that descriptions of Panoan languages have often treated the short forms as **basic** and assigned the “left-over” portions as **variants of the inflectional suffixes**. For example, compare the words for ‘head’ and ‘clay’ in table 8. Apart from nasalization, in each case the analyst is presented with two likely possibilities when deciding on the basic form of the ergative marker. Note particularly the alternatives given for the hypothetical underlying ergative form of ‘clay’.

Table 8. Comparison of nominative and ergative forms of ‘head’ and ‘clay’

**Nominative forms:**

Gloss	<b>head</b>	<b>clay</b>
Phonetic form	bapo	bapo

**Ergative forms:**

Phonetic	mãpõ	mãpopã
Analysis	m <sup>b</sup> apo-n <sup>d</sup>	m <sup>b</sup> apo-pan <sup>d</sup> / m <sup>b</sup> apopa-n <sup>d</sup>

If the ergative marker is taken as *-n<sup>d</sup>*, the stem for /mapo/ ‘clay’ has an allomorph *mãpopã*; otherwise the stem is /mapo/ and the ergative marker *-n<sup>d</sup>* has variants *-tan<sup>d</sup>*, *-pan<sup>d</sup>*, and many other forms. However, with the latter choice there is no phonological explanation available to explain why *-pan<sup>d</sup>* is added to some stems, *-tan<sup>d</sup>* to other stems, and *-n<sup>d</sup>* to other stems. The profusion of allomorphs of the ergative suffix and the other suffixes that block shortening would lack phonetic motivation for their shape. Also, in a comparative study the Yaminahua short forms would lack reflexes for their easily established proto-Panoan longer forms. We therefore take *kapete* and *m<sup>b</sup>apopa* as the basic forms of these stems.

The stem is adapted to foot structure by suppression of the final (third) stem vowel only in case that vowel is unstressed and in an open syllable. An example is the trisyllabic stem *iam<sup>b</sup>a* ‘lake’. The phonetic form of the nominative is disyllabic, *ĩã*. Nominative stems receive no closely bonded suffixes. In contrast, if the stem is agentive, it receives the ergative suffix *n<sup>d</sup>*, and then suppression of the of the third syllable’s vowel to make the stem conform to foot structure is blocked by the suffix because the vowel of the stem’s third syllable is no longer a trailing vowel, i.e., it is no longer in an open syllable. Yet the ergative’s nasal consonant itself, *n<sup>d</sup>*, is missing in the surface form because of the constraint against stops in a coda, but nasalization spreads to the vowels preceding the deleted consonant.

Table 9. Nominative and ergative forms of *iam<sup>b</sup>a* ‘lake’

	<b>Nominative</b>	<b>Ergative</b>
Input form	iam <sup>b</sup> a	iam <sup>b</sup> a-n <sup>d</sup>
Vowel elision	iam <sup>b</sup>	iam <sup>b</sup> a-n <sup>d</sup>
Nasalization	ĩãm <sup>b</sup>	ĩãmbã-nd
Surface form	ĩã	ĩãmã

### 3. Leftward nasal spread within stems

Walker (1998) codes the constraint for leftward nasal spread as SPREAD-L[F], which I assume has topmost rank.<sup>5</sup>

With only the amount of Yaminahua data presented thus far, Walker's account of nasal spread would cover Yaminahua adequately, but there are four conditions of nasal spread in Yaminahua: leftward within a stem; rightward from a stem; leftward within a suffix, and rightward from a suffix.

Table 10 displays nasal spread in a stem leftward from the ergative suffix *-n<sup>d</sup>*. The eight groupings show that Yaminahua nasal spread is not blocked by vowels, glides, nasal consonants, strident continuants, resonants, stops, affricates, or consonant clusters. There are significant variations, however, especially with speaker 2, a female who is younger than male speaker 1. Groups 7 and 8 shows that speaker 2 is more likely to spread nasalization by skipping over the vowel adjacent to the nasal suffix and target the left edge of the prosodic word, whereas speaker 1 does so only occasionally. (The alternation between [f], [fw], and [w] is not relevant to our discussion.)

Table 10. Nasal spread on ergative nouns

Stem-Ergative		Spkr 1	Spkr 2
Group 1: Nasal spread on vowels			
ee -n <sup>d</sup>	pucacuro (ant)	ēē	ēē
eo -n <sup>d</sup>	frog	ēō	ēō
nea -n <sup>d</sup>	trompetero (bird)	nēã	nēyã
chai -n <sup>d</sup>	cousin		chãĩ
Group 2: Nasal spread on glides			
aya -n <sup>d</sup>	(a type of) bird	ãyã	ãyã
ewa -n <sup>d</sup>	mother	ēwã	ēwã
fawa -n <sup>d</sup>	grandson	fwãwã	fwãwã
nawa -n <sup>d</sup>	foreigner	nãwã	nãwã
Group 3: Nasal spread affecting nasal consonant releases			
nam <sup>b</sup> i -n <sup>d</sup>	meat	nãmĩ	nãmĩ
im <sup>b</sup> i -n <sup>d</sup>	blood	ĩmĩ	ĩmĩ
xom <sup>b</sup> a -n <sup>d</sup>	breast	xõmã	xõmã
rom <sup>b</sup> e -n <sup>d</sup>	tobacco	lõmẽ	lõmẽ
fẽn <sup>d</sup> e -n <sup>d</sup>	husband	fẽnẽ	fwẽnẽ
in <sup>d</sup> o -n <sup>d</sup>	feline	?ĩnõ	ĩnõ
man <sup>d</sup> o -n <sup>d</sup>	bee	mãñõ	mãñõ
on <sup>d</sup> o -n <sup>d</sup>	boar	?õno	õno

<sup>5</sup>Walker (...) defines the spread as follows:

(20) SPREAD-L/R([F], D)

Let *f* be a variable ranging over occurrences of a feature specification *F*, and *S* be the ordered set of segments *s*<sub>1</sub> ...*s*<sub>k</sub> in a domain *D*. Let Assoc(*f*, *s*<sub>*i*</sub>) mean that *f* is associated to *s*<sub>*i*</sub>, where *s*<sub>*i*</sub> ∈ *S*.

SPREAD-R([F], D) holds iff

i.  $(\forall s_i \in S) [[\exists f (\text{Assoc}(f, s_i))] \rightarrow [(\forall s_j \in S) [j > i \rightarrow (\text{Assoc}(f, s_j))]]]$  where  $1 \leq i, j, \leq k$ .

ii. For each feature occurrence *f* associated to some segment in *D*, a violation is incurred for every *s*<sub>*i*</sub> ∈ *S* for which (i) is false.

SPREAD-L([F], D) holds iff

iii.  $(\forall s_i \in S) [[\exists f (\text{Assoc}(f, s_i))] \rightarrow [(\forall s_j \in S) [j < i \rightarrow (\text{Assoc}(f, s_j))]]]$  where  $1 \leq i, j, \leq k$ .

iv. For each feature occurrence *f* associated to some segment in *D*, a violation is incurred for every *s*<sub>*i*</sub> ∈ *S* for which (iii) is false.

on <sup>d</sup> i -n <sup>d</sup>	man	õní	õni
fan <sup>d</sup> a -n <sup>d</sup>	nutria	fwãñã	fwãñã
chon <sup>d</sup> o -n <sup>d</sup>	golondrina (bird)	chõñõ	chõñõ
chan <sup>d</sup> a -n <sup>d</sup>	caseek (bird)	chãñã	chãñã
ron <sup>d</sup> o -n <sup>d</sup>	snake	lõñõ	lõno
xan <sup>d</sup> o -n <sup>d</sup>	grandmother	xãno	xãno

Group 4: Nasal spread over strident consonants

moxo -n <sup>d</sup>	balsa	mõxõ	mõxo
nexo -n <sup>d</sup>	turtle	nẽxõ	nẽxo
fasa -n <sup>d</sup>	red monkey	wãsa	fãsa
chaxo -n <sup>d</sup>	deer	chãxõ	chãxõ
moxa -n <sup>d</sup>	thorn	mõxã	

Group 5: Nasal spread over resonants

era -n <sup>d</sup>	enemy	ẽra:	ẽra
mari -n <sup>d</sup>	agutí	mãri	mãri

Group 6: Nasal spread over stops

chapo -n <sup>d</sup>	cricket	chãpo	chãpo
chipi -n <sup>d</sup>	older sister	chĩpi	chĩpi
chata -n <sup>d</sup>	grandfather	chãtã	chãtã
fake -n <sup>d</sup>	son	wãʔẽ	
make -n <sup>d</sup>	piranha (a fish)	mãʔẽ	mãʔẽ

Group 7: Nasal spread over an affricate

achi -n <sup>d</sup>	aunt, daughter	ãchĩ	ãchi
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Group 8 Nasal spread over consonant clusters

chospe -n <sup>d</sup>	toayo (a bird)	chõshpẽ	chõshpe
maspa -n <sup>d</sup>	carachama (fish)	mãspa	mãspa
mexko -n <sup>d</sup>	huasaco (fish)	mẽxkõ	mexko

Significantly, with the exception of *mexko* in group 8, the first syllable of the stem is always nasalized. Nasalization of the vowel of the second syllable is optional. Furthermore, if there is a nasal consonant as onset of either syllable, the consonant is still affected by the nasal spread. This is shown by the fact that otherwise it would be plosive, [*m<sup>b</sup>*] not [*m*], or [*n<sup>d</sup>*] not [*n*].

A theory of nasal spread restricted to the assumptions of strict locality is incapable of accounting for the above data because adherence to strict segmental locality would prevent nasalization from “leaping” from the source nasal consonant of the suffix to the first syllable, bypassing the immediately adjacent vowel.

Assuming that nasalization spreads locally from segment to segment, a description of the skipping pattern in a traditional generative description would presumably require ordered rules such that an optional denasalizing rule ordered after a nasalizing rule would denasalize part of the output of the nasalizing rule. In a constraint-based system, there are no ordered rules; to account for how nasal spread skips over the vowel we would presumably need a constraint that derives a nasal autosegment that arises from a syllable-final nasal consonant and another constraint that aligns the autosegment leftwards to a stressed syllable or to the left edge of the stem. Preservation of the nasal feature via an autosegment must outrank the exclusion of a nasal consonant from coda, else the feature would be lost. I assume that the preserving constraint is one of a family of IDENTITY constraints represented by IDENT-IO[F] (Kager 1999:250) or MAXσ.

A specific member of the family, presumably IDENT-IO[+nas], ensures the preservation of the nasal autosegment. The nasal autosegment resides in the domain of the morpheme but needs to be aligned so that its presence will be felt on the leftmost edge of the stem, with optional extension to the right. We substitute the aligning constraint for the spreading constraint because showing nasal spread from an

autosegment uses different assumptions about the spreading mechanism. Aligning is key to explaining how segments are affected by positing an additional constraint which associates the autosegment to segments. Aligning must be ranked with respect to the restriction against stops in codas so that the latter does not remove the source consonant.

My view of nasal spread from a nasal autosegment is analogous to the way a tone autosegment “resides” on a syllable, e.g., Bickmore (1996). Spread results from establishing the leftward extent of the autosegment by a constraint, but that constraint only identifies the left edge of the stem as its leftmost border; it does not say anything about how it affects the segments within its scope. The segments within the nasal autosegment’s scope will be determined by associating the nasal autosegment to segments, but not necessarily to all the segments between the left and right alignments of the autosegment. I assume that associating is sensitive to the alignment edges.

Since Yaminahua word stress (in terms of amplitude, duration, or pitch) is usually, but not obligatorily, on the first syllable, it might at this point be a moot question whether it is the left edge of the stressed syllable or the left edge of the stem that the autosegment is associated to. The question naturally arises, Is stress defined by amplitude (loudness), duration, or pitch? I digress briefly to examine some stress data.

Instrumental readings show that whether stress is defined as amplitude or duration, stress can vary considerably over repetitions of the same word. Nevertheless, the first syllable of a CVCV word form typically has longer duration than subsequent ones and may optionally have greater amplitude (loudness).

Syllable stress in a sentence is often more or less uniform, but sometimes the noun will have a stressed syllable beyond which nasalization does not spread. An example is /kapepan pia/ [*kapepá̃ pia*] ‘The alligator ate it’. We tentatively conclude that leftward alignment of the autosegment is at least partially conditioned by stress, though stress is not fully analyzed.

The choice of fixing the left edge of the autosegment at the left edge of the stem or the left edge of the leftmost stressed syllable does not affect the need for a nasal autosegment. For convenience only, I will refer to the left edge of the stem (prosodic word) as the alignment parameter.

Thus far, we have speculated that something like the following constraints are needed:

- A constraint that prevents consonant loss.
- A constraint that prevents nasal consonants from surfacing as coda.
- A constraint that filters a trailing -n suffix so that it is bonded to the stem. It must outrank the foot-defining constraint, otherwise the consonant would fail to be incorporated into the stem foot.
- A constraint that assigns foot structure to stems by removing from stems a trailing vowel that would be outside a disyllabic foot’s measure. Thus disyllabic stem syllabification resulting from the foot definition includes stem-final nasal consonants as coda.
- The constraint that derives a nasal autosegment from a nasal consonant in the coda of stems and must outrank the constraint that prevents nasals from surviving in a coda.
- A constraint that aligns the left edge of the nasal autosegment with the left edge of the stem.

Still needed would be constraints that define the rest of the scope of the autosegment:

- align the right edge of the autosegment with the proper segment of the stem, thus defining the extent of the autosegment’s scope,
- associate the autosegment to the segments of the first syllable of the stem that is within the scope of an autosegment, resulting in nasalization of the syllable,
- filter the plosive feature from any nasal consonant that is within the scope of an autosegment.

## Discontinuous nasal spread

I have not yet shown that Yaminahua nasalization is truly discontinuous. The data above show that nasalization can be separated from its source; now let us consider cases where a single source nasalizes in discontinuous fashion.

Like other disyllabic stems, there are verb stems of the form CVCVN or CVCVM that may be expanded by noun incorporation. When such a disyllabic stem with a nasal coda in the second syllable is expanded in this way, the expanded stem is trisyllabic and resists the foot forming constraint. Why is the stem not thereby reduced to disyllabic form? The vowel of the third syllable is not a trailing vowel, being in a closed syllable, and therefore resists the constraint. An example is the verb stem *tsikin<sup>d</sup>* ‘to push on’ with a nasal consonant as coda of the second syllable. This consonant is filtered out by the constraints which I have indicated to be needed. When such a stem is given, the abilitative suffix *-tiro* ‘to be able to’, the resulting surface form has nasalization on the first syllable, shown on line 2 of table 11. The effect is similar to the pattern seen earlier in the nouns of table 2. Notice where the nasalization resides. Then if a prefix like *pe-* (back) is added, the nasalization moves to the prefix because by incorporation the prefix (incorporative noun) becomes part of the stem, shown on the other even numbered lines of table 11.

Table 11. *tsikin<sup>d</sup>* ‘push’

	<b>Stem-tiro</b>	
1	tsikin <sup>d</sup> -tiro	push-able
2	tsiʔitiro	able to push
	<b>Stem-ma</b>	
3	petsikin <sup>d</sup> -m <sup>b</sup> a-a	back.push-caus-comp
4	pĩtsiʔiba	caused to push him on the back
	<b>Stem, -ma, -ita</b>	
5	petsikin <sup>d</sup> -m <sup>b</sup> a-ita	back.push-caus-past
6	pĩtsiʔibaita	caused to push him on the back yesterday
	<b>Stem, -ma, -ka, -i</b>	
7	petsikin <sup>d</sup> -m <sup>b</sup> a-i-ka-i	back.push-caus-to-go-prog
8	pĩtsiʔibaiʔai	go to make him push it on the back
	<b>Stem, -kin<sup>d</sup></b>	
9	petsikin <sup>d</sup> -kin <sup>d</sup>	back.push-inf
10	pĩtsiʔikĩ	to push on the back of it

## Stem-final spread of nasalization

Nasalization may be spread to the final syllable of the stem when a syllable with a stop onset follows the nasal-final stem, but more often there is no spread to the final syllable, as line 10 in table 11 above indicates. However, if a **terminal** suffix beginning with a vowel or a glide follows the nasal-final stem, nasalization is retained on the final stem vowel and spreads rightward to the suffix as shown in table 12. Both the progressive *-i* and the imperative *-we* belong to the terminal set of verb suffixes. Non-terminal suffixes such as *-waid* (going) begin with a glide but do not usually promote nasal spread rightward, as seen in lines 8 through 11 of table 12.

Table 12. Terminal suffixes attract nasalization

1	<i>pe-tsikind-i</i>	back-push-prog
2	<i>pĩtsi?i</i>	he pushes on the back of it
3	<i>pĩtsi?i</i> *	
4	<i>yatan<sup>d</sup>-we</i>	grab-impv
5	<i>ñātāwē</i> **	Grab him!
6	<i>yatan<sup>d</sup>-i</i>	grab-prog
7	<i>ñātāi</i>	He grabs it.
8	<i>shin<sup>d</sup>an<sup>d</sup>-waid-i icho-i</i>	think-going-pres run-prog
9	<i>shīnāwaidi ichoi</i>	runs thinking
10	<i>oin<sup>d</sup>-waid-i icho-i</i>	see-going-pres run-prog
11	<i>ōiwaidi ichoi</i>	He runs looking.

\*The geminate vowels left by the removal of the final nasal consonant of the stem have coalesced. Often this coalescence results phonetically as a long vowel.

\*\*When word-initial *y* is nasalized, it is realized as *ñ*.

As may be expected because of the agglutinative characteristic of Panoan languages, multiple suffixes may be concatenated. Some suffixes with a coda consonant precede a suffix with an initial glide or vowel. Unlike the coda consonant of stems, the coda consonant of a suffix may be syllabified as onset to the next syllable. This inclusion as onset prevents deletion of the consonant, as seen in table 13. No nasal spread arises.

Table 13. Coda consonant of a suffix included as onset of the next syllable

<i>pibashidi</i>	pi-m <sup>b</sup> a-shin <sup>d</sup> -i	eat-caus-noct-prog	makes him eat at night
<i>pibashida</i>	pi-m <sup>b</sup> a-shin <sup>d</sup> -a	eat-caus-noct-comp	made to eat at night
<i>pĩāxidi</i>	pi-an-xin <sup>d</sup> -i	eat-detr.obj-noct-prog	eats hers up at night
<i>di?ashidi</i>	dika-shin <sup>d</sup> -i	listen-noct-prog	listens at night
<i>di?ashida</i>	dika-shin <sup>d</sup> -comp	listen-noct-comp	listened at night

At other times the coda is not syllabified to onset; the coda is lost and nasalization is spread rightward as seen in table 14. Syllable count makes the difference between the way the coda is syllabified, indicating that foot structure is relevant to at least some suffixes. If the syllable with the coda is even numbered beginning from the stem's left edge, the coda is incorporated into the foot.

Table 14. Coda consonant of a suffix subject to deletion

<i>pĩshĩā</i>	pi-shin <sup>d</sup> -a	eat-noct-comp	ate at night
<i>pĩshĩĩ</i>	pi-shin <sup>d</sup> -i	eat-noct-prog	eats at night
<i>pĩābashĩĩ</i>	pi-an-m <sup>b</sup> a-shin <sup>d</sup> -i	eat-detr.obj-caus-noct-prog	makes to eat detrimentally at night
<i>ni?atanō</i>	n <sup>d</sup> ika-tan <sup>d</sup> -n <sup>d</sup> on <sup>d</sup>	listen-dist-hort	let us go and listen

Nasal spread rightward on suffixes in Yaminahua depends on the terminal nature of the target suffix as well as on the fact that its initial segment must be a vowel or glide. The constraint that controls this spreading must specify the terminal feature inherited from the morpheme of the target syllable.

In any case, it is apparent that nasal spread is not determined **only** by the following segment's phonological features as would be required if nasal spread is segmentally defined and universally strictly local, from segment to segment.

To make the presentation of some of the foregoing examples understandable, I should mention that there are three anomalously resistant suffixes: *-ba[ba/-bad]* ‘causative’, *kawad-*, and *-waid* ‘to go along’.<sup>6</sup> They are anomalous in that their *d* never nasalizes and never reverts to a nasal with plosive release [n<sup>d</sup>], and the onset of *-waid* is resistant to nasalization.

Most Yaminahua suffixes are monosyllabic; a few are disyllabic. I am not aware of any disyllabic suffixes that have a nasal consonant coda in the first syllable. If a monosyllabic suffix having a nasal coda is attached to a monosyllabic stem, the suffix is included in the foot structure of the stem. Nasalization from the suffix usually, but not always, proceeds as it would if it were an integral part of the stem. This conformation to foot structure is reasonably the result of the foot-defining constraint that accounts for both the loss and the gain of segments in stems.

Table 15. Monosyllabic stems

1	<i>píxõ ea õxõã</i> pi-xon <sup>d</sup> ea o-xon <sup>d</sup> -a	<i>after eating he came for me</i> eat-having me come-ben-past
2	<i>õxo piwaidita</i> o-xon <sup>d</sup> pi-waid-ita	<i>After coming he ate it on the way</i> come-having eat-going-past
3	<i>pĩãbawaishidi</i> pi-n <sup>d</sup> -ba-waid-shin <sup>d</sup> -i*	<i>He is making him eat hers all up at night.</i> eat-detr.obj-caus-going-noct-prog
4	<i>pĩ ishíya**</i> pi-shin <sup>d</sup> -a	<i>He ate all night recently</i> eat-noct-past

\* The *a* vowel of the detrimental object marker pi-(a)-n<sup>d</sup> is epenthetic, appearing when the detrimental is appended to a monosyllabic stem.

\*\* The *y* is epenthetic, appearing between an *i* vowel and an adjacent heterorganic vowel. The vowel of the stem pi (eat) is usually detected as long and written as geminate vowels in the sources, but for syllable counts it functions as a single syllable. I have retained the usual transcription here. Apparently, adjacent vowels do not contrast in nasality, though I have not sought exceptions.

Unlike stems, suffixes do not incorporate other suffixes. They also respond to foot structure differently. Nasalization from a suffix that is not incorporated into the foot structure of the stem does not spread leftward to the stem or to prefixes. Leftward nasal spread from the coda of a suffix is optional but limited to the suffix in scope.<sup>7</sup> Evidence is lacking that might determine whether it is the syllable onset or the left edge of the suffix that blocks leftward spread from suffix to suffix; no vowel-initial suffixes having a nasal coda are among the series of suffixes that may occur following other suffixes.

For Yaminahua suffixes not included in the stem foot, the localist assumptions that are listed at the beginning of this article seem to hold: leftward nasal spread in the suffix string shows no clear evidence of discontinuity with the source of nasality. Of course, if those assumptions are used, the rightward spreading constraint would have to be ranked with respect to the constraint that prevents consonants from appearing in a coda, otherwise there would be no nasal coda to serve as source of the spread. But since in this analysis a nasal autosegment is already proposed, we expect to ask why such nasal autosegments are not used to explain other spread in suffixes. One caution is that stems have already been seen to behave peculiarly; that could mean that stems are fully idiosyncratic and autosegmental nasals should therefore be limited in occurrence to stems.

If it is assumed that a nasal autosegment is the source of the rightward spread, we could simply reformulate the constraint that gives rise to the autosegment so that nasal spread is not limited to stems. Rather, the autosegment would have the morpheme as its locus. Then the autosegment’s right alignment

<sup>6</sup> The causative marker [ba/bad] is written as /ma/ in the sources.

<sup>7</sup> As a test, when a nasalized suffix was pronounced for Yaminahua speakers and they were asked for a critique of the pronunciation, they seemed to accept the nasalization as an attempt to make a form particularly perspicuous, but apparently regarded it as tainted, for one Yaminahua upon hearing the interlocutor pronounce a fully nasalized form said, “The Shipibos talk that way.”

would be extended to include the terminal morpheme to define nasal spread, as is the case with *-shin<sup>d</sup>* (nocturnal action) when followed by the progressive *-i*.

Table 16. Nocturnal *-shin<sup>d</sup>* followed by the progressive *-i*

1	<i>pīābashī</i> pi-an <sup>d</sup> -b <sup>b</sup> ad-shin <sup>d</sup> -i	causes him to eat the other one's (food) at night eat-detr.obj-caus-noct-prog
2	<i>pīābawaishidi</i> pi-an <sup>d</sup> -bad-waid-shin <sup>d</sup> -i	goes eating the other's (food) at night eat-det-caus-going-noct-pres
3	<i>di?abawaishia</i> or <i>di?abawaishīā</i> n <sup>d</sup> ika-bad-waid-shin <sup>d</sup> -a	went letting them hear at night listen-caus-going-noct-comp
4	<i>di?awaishida</i> n <sup>d</sup> ika-waid-shin <sup>d</sup> -a	went listening at night listen-going-noct-comp
5	<i>di?awaishidi</i> n <sup>d</sup> ika-waid-shin <sup>d</sup> -i	goes listening at night listen-going-noct-prog
6	<i>pīāwaishidi</i> pi-an <sup>d</sup> -waid-shin <sup>d</sup> -i	goes eating the other's (food) at night eat-detr.obj-going-noct-prog

In lines 1 and 2 the coda was incorporated into the foot structure with resultant optional nasalization, but in lines 4, 5, and 6 above the coda of *-shind* has become the onset of the following syllable. There are no minimal pair contrasts for *shind/shī/-shi*, so the loss of nasalization, meaning violation of the constraint that prevents loss of the nasal feature, causes no problem for comprehension. Comprehension apparently depends on the preservation of the distinctiveness of morphemes; if the morpheme remains distinctive the violation of a constraint is more easily tolerated or even promoted.

### Nasal spread rightward over glides

Nasal spread rightward from a suffix is the same as that of the rightward spread from a stem, except that not all suffixes participate equally in causing the spread. The nasal coda of the suffixes *-kan<sup>d</sup>* (plural) and *-tan<sup>d</sup>* 'distantive' (Faust and Loos 2002) only nasalize when they are followed by one of the terminal suffixes that have a glide as onset, as in table 17. When followed by a non-terminal suffix, no nasalization is spread rightward. (See line 6 of the table.)

Table 17. Nasal spread over terminal suffixes that begin with a glide

1	<i>n<sup>d</sup>apatāwē</i> n <sup>d</sup> a-pake-tan <sup>d</sup> -we	Go and knock it into it. interior-fell-dist-impv
2	<i>foba?āwē</i> fo-m <sup>b</sup> a-kan <sup>d</sup> -we	Make them go. go-caus-pl-impv
3	<i>fotadaho</i> fo-tan <sup>d</sup> -a-fo	those who went go-dist-comp-pl

This analysis assumes that the right edge of the nasal autosegment is aligned at the right edge of the morpheme it "resides" in, or the right edge of the autosegment may be extended to include an adjacent terminal suffix. Assuming that the associating constraint modifies some of the features of segments to reflect the autosegment's presence, it would seem that associating at the left edge is a separate constraint from associating at the right edge, thus the right associating constraint can be violated while the left remains intact.

Associating has the following effects that make it seem evident that in reality it is a family of constraints, probably not all equally ranked:

- Nasal consonants associated to the autosegment lose their plosive release.
- The vowel of the syllable at the left edge of a nasal autosegment is nasalized.
- The vowel of an open syllable at the right edge of an autosegment is nasalized.
- Nasal consonants not associated to an autosegment but preceding an oral vowel lose their nasal feature, thus becoming voiced plosives.
- Nasalization spreads from a nasalized open syllable at the right edge of an autosegment to adjacent terminal suffixes if the suffix has no blocking onset.

I leave open the issue of whether nasal spread within and between suffixes is also due to an autosegment's presence.

#### **4. Conclusion**

The discontinuous nature of nasal spread in Yaminahua is not explained by the strictly local, segment-to-segment universal constraints for nasal spread sustained in Walker (1999). Yaminahua nasal spread can be explained by a modification of her assumptions by positing a nasal autosegment arising from a nasal consonant; the nasal autosegment may be aligned to the left edge of morphemes to spread nasalization limitedly by associating the autosegment to the segments at the edges of the autosegment. The autosegment may also spread nasalization leftward to adjacent syllables, and also rightward to adjacent syllables if followed by a vowel or glide of an emphatic suffix. However, the constraints proposed by Walker (1998, 1999) are sufficient to explain Yaminahua nasal spread in and among suffixes, but once the presence of an autosegment is acknowledged, the assumptions regarding strict locality are challenged.

## Appendix

### Peculiarities of certain suffixes

Counter to expectations, the suffix or particle) *waid* does not participate in nasalization.

Table A1. The non-nasalizing suffix *-waid* ‘to go along (doing)’

1	<i>pibaxowaida</i> pi-ba-xon <sup>d</sup> -waid-a	went feeding him for me eat-caus-ben-along-comp
2	<i>di?awaishidi</i> dika-waid-shin <sup>d</sup> -i	listens while going at night listen-along-noct-prog
3	<i>di?awaishidi</i> n <sup>d</sup> ika-waid-shin <sup>d</sup> -i	listens while going at night listen-along-noct-prog
4	<i>di?awaishida</i> n <sup>d</sup> ika-waid-shin <sup>d</sup> -a	listened while going at night listen-along-noct-comp
5	<i>di?awaishidita</i> n <sup>d</sup> ika-waid-shin <sup>d</sup> -ita	went listening at night yesterday listen-along-noct-past
6	<i>daisxowaiya</i> n <sup>d</sup> a-is-xon <sup>d</sup> -waid-a	went looking inside while going inside-see-ben-along-comp
7	<i>di?abawaishiya</i> dika-ba-waid-shin <sup>d</sup> -a	went listening along at night listen-caus-going-noct-comp
8	<i>pi?abawaishidi</i> pi-an <sup>d</sup> -ba-waid-shin <sup>d</sup> -i	goes eating hers at night eat-detr.obj-along-noct-prog
9	<i>wiwõãwaidi ?itfoi</i> wi-woan <sup>d</sup> -fain <sup>d</sup> -i icho-i	runs snatching it away snatch-over-away-and run-prog
10	<i>pibaxowaida</i> pi-m <sup>b</sup> a-xon <sup>d</sup> -waid-a	went feeding them eat-caus-ben-going-comp

It is possible to swap the sequential order of *-yam<sup>b</sup>a* and *-waid* so that nasalization is seen to be absent when a non-emphatic suffix follows as in table A2.

Table A2. Swapping the order of *-yamba* and *-waid*

1	<i>ĩ?õyabawaiwe</i> ikon <sup>d</sup> -yam <sup>b</sup> a-waid-we	Go without embracing him. embrace-neg-going-impv
2	<i>ĩ?õwaiyabawe</i> ikond-waid-yamba-we	Do not go embracing him. embrace-going-neg-impv
3	<i>ĩ?õwaidiowe</i> ikon <sup>d</sup> -waid-i-o-we	Come and embrace him before going. embrace-going-to-come-impv
4	<i>ĩ?õxobawaida</i> ikon <sup>d</sup> -xon <sup>d</sup> -bad-waid-a	He made him embrace him. embrace-ben-neg-going-comp

The nasal coda of the verb *ikon<sup>d</sup>* ‘to embrace’ nasalizes the stem (Table A3), but does not spread over the suffix *-waid* nor does the coda of *-waid* spread nasalization over the non-emphatic present and completive tense suffixes or the negative *-yam<sup>b</sup>a* (63). My data do not contain evidence to show whether the stem may be *iko-nd* instead of *ikond*. The analysis of the nasal consonant here as part of the stem is a conjecture based on the cognates of the verb in Capanahua *ikok* and Shipibo *ikó*, but this conjecture is not pertinent to the analysis of the suffixes.

Table A3. The verb *ikon*

1	<i>ĩ?õkĩ</i> ikon <sup>d</sup> -kin <sup>d</sup>	to embrace him embrace-inf
2	<i>ĩ?õwaidi</i> ikon <sup>d</sup> -waid-i	He embraces him. embrace-going-pres
3	<i>ĩ?õwaida</i> ikon <sup>d</sup> -waid-a	He embraced him. embrace-going-comp
4	<i>ĩ?õbawaida</i> ikon <sup>d</sup> -m <sup>b</sup> a-fain <sup>d</sup> -a	He made him embrace him. embrace-caus-going-comp
5	<i>ĩ?õwaiyabawe</i> ikon <sup>d</sup> -waid-yam <sup>b</sup> a-we	Don't embrace him and depart. embrace-going-neg-impv

The morpheme *-ita* is peculiar in that it sometimes functions as a suffix that shares in nasalization (table A2, lines 1, 2), and sometimes as a separate particle unaffected by nasalization (lines 3, 4). It never surfaces as *-itã*.

Table A4. The suffix or particle *-ita* 'past tense'

1	<i>pĩshĩta</i> pi-shin <sup>d</sup> -ita	He ate it during the night. eat-noct-past
2	<i>piax ea õxo ita</i> pi-ax ea o-xon <sup>d</sup> ita	After eating he came for me. eat-having me come-ben-past

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