NASALIZATION IN NORTHERN PAME

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Abstract: Northern Pame nasal stops manifest a [-nasal] secondary feature (i.e. prestopping and poststopping) in the environment of an oral vowel. Specifically, nasal stops following an oral vowel have two phases, an oral closure and a nasal release, while nasal stops preceeding and oral vowel loose their nasal distinction completely. In this paper, I propose an aperture analysis where a segment's closure and release may come into play in the linking of a [-nasal] feature. In addition, I suggest that Northern Pame oral vowels may be better specified as underlyingly [-nasal] while nasal vowels remain unmarked for nasality, deriving their feature specification through default rules. Finally, it is shown that the phenomenon of [-nasal] spreading is productive typologically in a similar pattern to that of Northern Pame.

1. Introduction

Northern Pame is one of two Pame languages spoken in the state of San Luis Potosi, Mexico.[1] Its most southern affiliate, Central Pame, is predominantly spoken in south central San Luis Potosi state in and around the town of Santa Maria Acapulco where the highest concentration of speakers live (Chemin-Bässler 1984: 229). Other dialects of Central Pame are attested for in the villages of Santa Catarina, Lagunitas, Las Jaritas, Paso de Botello, Tanlu and Chacuala. Finally, Northern Pame, which is sometimes referred to as *Pame de La Palma* or *Chichimeca Pame de Alaquines*, is spoken on the eastern frontier of what is known as the *Zona Alta* in San Luis Potosi. Northern Pame is spoken in the small farming villages that surround the towns of Ciudad del Maiz and Alaquines, with the highest concentration of speakers living in and around the town of La Palma. The data collected for this paper are representative of a sub-dialect of Northern Pame spoken in the village Agua Puerca, which is located just south of La Palma.[2]

One interesting aspect of Northern Pame phonology that deserves attention is that of nasalization. Up to the present, this process has been described as one that contrasts on vowels (for either Northern or Central Pame, the process will be shown to be basically the same) with the question left unanswered as to how this oral/nasal contrast on vowels plays out with respect to other consonants or multiple syllables.

Gibson (1956: 258) states that in Central Pame there is a phonemic process of nasalization in Central Pame that covers a 'stem' and will spread to a suffix. Likewise, in describing the same process in Northern Pame, Avelino (1997: 72)

recognizes phonemic nasalization as basically a contrast on the root that can spread to any other affix. As the previous research indicates, the consensus has been that nasalization in Pame languages is underlyingly only contrastive on the root of a word, with surface spreading to other affixes late in a derivation.

One additional note is that there has been some ambiguity regarding the segmental sequences of *bm, dn,* and *gŋ* after an oral vowel in the Pame languages. Gibson (1956: 260) makes an interesting observation writing, "Voiced stops are lost when occurring with the phoneme of nasalization. In fact, no sequence of v̄b, v̄d or v̄g occurs in the language." She cites the following derivation for 'corn' and 'hearts' concatenated to the morphemes of first person plural, both inclusive and exclusive.

(1) Nasal or oral vowels followed by a nasal consonant in Central Pame.

	Stem	Suffix	Derived Form	
a.	rothwā¹n	-bm?	rothwā¹m?	'our-excl.corn'
b.	rothwā¹n	-dn	rothwā¹n	'our-incl.corn'
c.	ta'wa²	-bm?	ta'wa²bm?	'our-excl.hearts'
d.	ta'wa²	-dn	ta'wa²dn	'our-incl.hearts'

Identical to (1), Northern Pame has a similar pattern as illustrated in the words *gutə²bmp* 'my lion', *gutə²dndat* 'lions', and *gutə²gŋ* 'lion.' The claim as illustrated in (1) is that the voiced stops /b, d/ in the suffixes are phonemic segments that are not allowed to follow a nasalized vowel. In addition, it is maintained that these segments are only allowed to follow an oral vowel.

To summarize, it is claimed that 1) nasalization is limited to the root of a word and 2) that voiced segments are prohibited from following a nasalized vowel. Both of these assumptions deserve careful attention since such a pattern would be considered somewhat unusual. With regard to the first assumption, if a vowel can be shown to be underlyingly contrastive in one context, then assuming all other things are equal, it is preferable to postulate that nasalization can distribute on vowels in other morphemes as well. With regard to the second assumption, the data in (1) are suspicious since the voiced obstruent in question is followed by a nasal consonant and preceded by an oral vowel. Clearly there is an issue at stake regarding whether or not those segments are underlyingly really voiced stops. With that, if such sequences of voiced obstruent-nasal are underlying, we would presume that voicing is allowed word finally, thus making Pame an exception to a laryngeal constraint prohibiting laryngeal features syllable/and or word finally. Such a situation would be marked and would need to be well supported by the language facts.

This paper investigates both of these claims in the context of Northern Pame phonology. It will be shown that the oral/nasal contrast on vowels motivates subsequent oralization of nasal consonants by a process of [-nasal] (from here on [-nas]) spread, an underlying feature of an oral vowel. This process of spreading is predicated on an understanding of aperture position (Steriade 1994). Second, by allowing for [-nas] spreading we can account for the nasal/oral distinction on vowels other than those of the root morpheme where it will be shown that such a distinction is likewise productive on inflectional morphology. In addition to Northern Pame, two other languages, Yuhup (Brazil) and Bukar-Sadong (Malaysia) will be discussed in the context of [-nas] spreading. Both languages show similarity to that of the Northern Pame case, indicating that what is at work is not a language specific process per se, but rather one that is common in other languages around the world.

2. Phonemic Inventory

Below are the contrastive phonemic segments of Northern Pame.

(2) Northern Pame phonemic inventory.

Consonants			
p	t	k	ʔ
		k'	
b	d	g	
	ts		
m	n	ŋ	
	s		h
	l	l'	
w		j	

Vowels			
i	u	ĩ	ĩ
	ə	ə̃	
ɛ	a	ɛ̃	ã

I leave open the possibility that Northern Pame has contour segments other than *k'*, *ts*, and *l'*. For the purposes of this paper, any other combinations of laryngeal features are considered a phonemic sequence, not a unit. Likewise, laryngeally complex vowels (VhV, VʔV) abound in Pame, and thus far there is no definitive claim whether these vowels are better interpreted as units or sequences. Here, laryngeally complex vowels are considered sequences (and bisyllabic) for the following reasons: 1) vowels that flank the laryngeal feature may be identical or different, 2) these vowels only distribute on the root, rather than throughout the word, 3) morphological alternations can be found for one of the vowels while the

other remains constant, 4) other vowel clusters are allowable where there is not interruption by a laryngeal feature, and 5) the speakers of the language are able to easily pronounce and write each vowel separately. This evidence leads me to believe that there is some additional factor at work other than a laryngealization process on a single vowel.

Northern Pame has two tones which only contrast on the stressed syllable of a word. A high tone is a rapidly falling pitch, while a low tone is an ascending low to high pitch with noted compensatory lengthening. There is discussion that Northern Pame has a descending tone as well (Avelino 1997: 153), but my interpretation is that such a tone is always predictable since it only ever surfaces over a laryngeally complex vowel (see above), never contrasting over a vowel in modal voice. Therefore, for the purposes of this paper, tone will be represented as /^{2}/ for a high tone and /^{12}/ for an ascending tone. In the case of the Central Pame examples, I will indicate a low level tone as /^{1}/ and a descending tone as /^{21}/.

The maximum well formed syllable in Northern Pame is $(C_3)C_2C_1V_1V_2C_1(C_2)$. C_3 only contains morphology, some of which are clearly clitics. Likewise, word medially syllable onsets never have a cluster that includes C_3. Therefore, I consider this class to be extrasyllabic. There is word final exceptionality where the consonants *p, t, k* or *k'* surface in addition to the canonical single coda. These segments are considered exceptional because 1) they never surface as codas in word medial clusters and 2) they are pronominal clitics which freely distribute among verbs adjectives and nouns. Also, Northern Pame may contain a glottal stop word finally, which when coupled with *n* or *s*, forms the only licensed coda clusters.

(3) Northern Pame syllable constituents.

Position	Class	Segments
C_3	Continuants (clitics)	s, n, m, l
C_2	All, (voiceless obstruents only following C1)	p, t, k, k', ts, b, d, g, m, n, s, l, l'
C_1	Laryngeals and glides	ʔ, h, w, j
V_{1-2}	Sonorants ([+cons] may be syllabified)	m, n, l, l', i, ɛ, ə, u, a
C_1	Continuants (underlyingly voiceless)	ʔ, n, l', s
C_2	Stops (clitics)	p, t, k, k'

(4) Examples of syllable types.

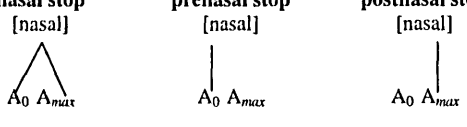
CCCVC	skhə²l'	'belt'
CCCVC	skwa²n'	'clothing'
CCVCC	kw̃a²ʔs	'he sets it'
CCVV	sɻ'wɛ²	'pen'
CVC	hũ²l'	'he sets it (hard object)
V.CV	anu¹²	'it is raining'
CN	sɳ²	'a greeting'
...CVV...	ikau²gan	'we-incl.'
CVC.CV...	sinhu¹wa²	'nose'

3.

4. Aperture Positions

In order to account for Northern Pame nasalization, I will refer to aperture positions as those outlined in Steriade (1994). Aperture positions are defined in terms of the 'degree of oral aperture' associated with either the closure, release or both of a given segment. Stops have closure and release, while continuants are said to have only release. The aperture for a consonant can be one of three degrees: closure (A_0), fricative (A_f) and approximant (A_{max}). Thus, stops and affricates are represented by having A_0 or A_f associated to their respective closure phases, while continuants are defined as A_{max} or A_f associated to a release position only. Below, aperture is illustrated by representing a nasal stop, a prenasalized stop and a postnasalized stop.

(5) Nasality and aperture positions (adapted from Steriade 1994: 206).



A nasal stop has no difference of nasality from closure to release. Thus, the feature nasal is associated to both. Prenasalized stops, by definition, do not have nasalization on the release portion of the stop, and therefore, we account for this by only attaching the feature [nasal] to the closure. Just the opposite is true for a postnasalized stop.

Since stops are not known to contrast for release, the redundancy has been done away with by positing the Release Projection, which states that underlyingly stops are only distinctive for closure. By rule, the release of the stop is projected according to language specific constraints (the default being no release in rimes, see Hayes 1989).

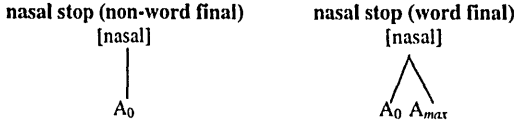
Now, the concept of a release projection for Northern Pame is an important notion, for unlike many languages it allows release word finally for all stops.[3] Word medially, rimal release is prohibited.

(6)

nɛ̄²p	[nɛ̄p^{h}]	'what'
mā²n	[mān^{h}]	'he wants'
mɛ²ʔɛt	mɛ²ʔɛt^{h}]	'he urinates'
mpa²k	[mpak^{h}]	'I am hot'

Thus, the Release Projection is operative for nasal stops word finally and thus we expect them to surface with both closure and release as illustrated in (5). However, word medially and word initially, these segments will only surface with closure.

(7) Surface nasal stops.



In the discussion below, I will claim that the spread of [-nas] to nasal consonant as onsets and codas varies specifically because of this difference of release in the language. Thus, where a *dn* surfaces word finally through spreading of the feature [-nas], onsets lose their nasality completely.

5. Nasalization[4]

Nasalization as a feature is operative in Northern Pame on both vowels and consonants as in (8)and (9).

(8) Oral vs. nasal stops.

p	t	k
b	d	g
m	n	ŋ

(9) Examples of oral versus nasal vowels.

ba-sa^{2}	'corn (plural)'
ba-sã^{2}	'itch'
n-thu^{12}s	'house'
n-thũ^{12}s	'salt'
n-the^{2}ʔɛ	'flue, medal'
n-thẽ^{2}ʔɛ̃	'tamale'

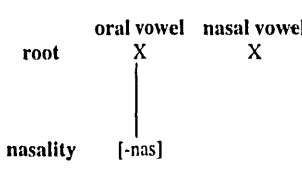
I assume that nasal stops are distinctively marked [+nas] which sets them apart from oral stops. In addition, these stops typically spread their nasality over an adjacent vowel, and so their nasal distinction is operative phonologically. In contrast, oral consonants do not usually spread their *orality*. The distinction between oral vowels and nasal vowels is another matter entirely. Here, we see a dissimilatory like process involved where in practical terms, the language appears to be maximizing the contrast so that nasal spreading does not occur from a nasal consonant to an oral vowel. The following types of combinations are given below.

(10) Oral/nasal combinations.

a.	**Rimes**	modification
	<nasal vowel><nasal consonant>	nasal linking (OCP)
	<oral vowel><nasal consonant>	prestopped nasal
b.	**Onsets**	
	<nasal consonant><nasal vowel>	nasal linking (OCP)
	<nasal consonant><oral vowel>	nasal loss

A look at (10) reveals an interesting point. Oral vowels cause nasal consonants to change phonologically, while nasality on a vowel does not affect oral stops in any significant manner. Thus, I suggest that oral stops be distinctively marked as [-nas], while nasal vowels may remain unmarked.

(11) Underspecification of oral and nasal vowels.



Nasal consonants that follow a nasal vowel are hardly perceptible to the human ear and for a good reason. They both share the feature nasal with only the place specification on the nasal consonant to validate its existence. Below are some examples.

(12)	nkwã²n	'tree'
	mã²n	'he wants'
	gətũ¹²n	'nut'
	maʔũ²n	'held'
	utsã²hũn	'flies'
	tũ²hũn'	'saves'

The data in (12) are good examples of an OCP effect. The OCP (Obligatory Contour Principle) states that consecutive identical segments are prohibited. In this case, the specification for nasal will be shared by the vowel and consonant.

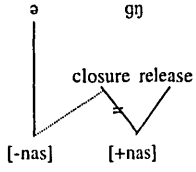
The following data illustrate the alternations that occur when a nasal consonant follows an oral vowel in Northern Pame.

(13)	nkhwadnt	'caterpillar'
	mbugŋ	'gives birth'
	tsɛʔɛgŋ	'he cuts sugar cane'
	ntsa²hudnt	'he is carving wood'
	tə²gŋ	'much'
	gəta²bmp	'his lion'

In the cases in (13), a nasal consonant becomes [-nasl] on the front portion of the consonant only, while the place features for the entire segment remain in tact. I prefer to view such consonants as 'oralized' or 'prestopped' (Kenstowicz and Kisseberth 1979: 147) because of their nasal origin. By allowing for oral vowels to be underlyingly marked as [-nas], we can easily account for this process as that of spreading by the oral vowel.

In addition, it was stated above that Northern Pame segments release word finally. We can account for the 'two segment' nature of any word final prestopped nasal by allowing for [-nas] spreading to occur after the Release Projection (where [+nas] will have already spread to the release). When [-nas] spreads to the nasal stop, [+nas] must delink from the closure phase of the stop.

(14) *təgŋ* 'much'



The example in (14) allows us to capture an important generalization in Northern Pame, that oral vowels affect nasal consonants by virtue of their opposing nasal specifications.

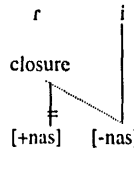
The next set of data to be looked at are nasal consonants that precede oral vowels. Unlike the previous examples, the facts of Northern Pame are that nasal stop onsets surface differently. Consider the examples in (15).

(15) A nasal consonant followed by an oral vowel.

Nouns			**Adjectives**		
nĩ-niu^{12}	[nəɾiu^{12}]	'your thirst'	mã-hãĩ^{12}t		'tall.sg.'
nu-thu^{2}	[ɾuthu^{2}]	'my chilies'	ma-hãĩ^{12}t	[βahai^{12}t]	'tall.pl.'
nĩ-miu^{12}	[nibiu]	'your cactus'	mã-sa^{12}		'corn seed.sg.'
ni-miu^{12}	[riβiu^{12}]	'your cacti'	ma-sa^{12}	[βasa^{12}]	'corn seed.pl.'

In these examples, alveolar nasal stops become a flapped *ɾ*, and *m* alternates with the bilabial fricative *β*. In other words, we only get the closure manifestation of the same process that occurs postvocalically. We can account for this under the same proposal given in (7) with the stipulation that there be no Release Projection in Northern Pame except word finally, a fact that the language bears out anyway. Therefore, the following alternation can be explained as exemplified below.

(16) *nəɾiu^{12}* 'your thirst'



By default, the voiced consonant *n* will now derive not as a nasal since there was no release projection for nasal to coexist with its oral counterpart. Instead, a phonetic *ɾ* surfaces in its place. An important note to make with regard to Pame language word structure is that a large majority of words are monosyllabic. Of those that are not (as above), the first (usually unstressed) syllable is almost always open. Thus, it is relatively rare to have a word medial consonant cluster.

The examples in (15) demonstrate another important item as well. As indicated, there are series of prefixes that are determined only by their specification for nasality. More convincingly, both prefix systems (one for nouns, the other for adjectives) mark the singular with nasalization on the prefix, while the plural is oral. Therefore, not only is nasalization distinctive on syllables other than the root, it can also be grammatically important.

6. Nasalization in Yuhup and Bukar-Sadong

There are a number of external reasons that support an account for Northern Pame nasalization in this way. First, it is attested for in other languages throughout the world. For example, Lopes and Parker (1999) have recorded that the language Yuhup (Brazil) has the same process at work as in the following examples:

(17) ndoːgŋ 'species of fruit'
tɔmbɔːgŋ 'eye'
təːdnĩñ 'beating, pounding (with mortar)'

Although Yuhup is like Pame languages in many of the same basic aspects of nasalization, the languages differ in that pre-oral nasal stops surface as poststopped nasals as in 'eye' above. The difference between Yuhup and Northern Pame, therefore, might be explained by how the languages treat release, assuming that the present analysis is on the right track.[5] The question remains as to just how Yuhup handles pre-oral nasal stops intervocalically. Since Yuhup prefers CVC syllables, the data is still unknown on this question.

Yuhup has one other interesting alternation that is quite similar to that of the Northern Pame *n* and *ɾ*. Lopes and Parker write, "Yuhup has no liquid phonemes. However, flap [ɾ] is derived as an allophone of /t/ when it is surrounded by [-consonantal] segments. The alveolar /n/ can be realized as /ɾ/ in the same general environment (340)." The two languages are similar in that, 1) neither has a flap *ɾ*, 2) there is an alternation where *n* surfaces as an allophonic flap *ɾ*, and 3) this process occurs intervocalically. Consider the example below with *t* (no example with *n* is available).

(18) pɔtaːm [pɔɾaːm] 'to suffer'

A second language that demonstrates the spread of [-nas] is the Bukar-Sadong dialect of Land Dyak in Malaysia (Scott 1964, Kenstowics and Kisseberth 1979). The following data illustrate the same surface effects that we have see so far in Northern Pame.

(19) [-nas] spread in Bukar-Sadong (Kenstowicz and Kisseberth 1979: 147).

ntakadn	'taste'	kiɲãm	'feeling
pəlabm	'mango'	pimãĩn	'a game'
kaidn	'cloth'	pəmĩŋ	'dizzy'
padagŋ	'field'	tanĩn	'story'
taʔa:dn	'open'	nuʔa:n	'open'
pəʔadn	'feed'	mãʔãn	'eat'

In Bukar-Sadong, nasal consonants become oralized word finally. This would imply that the [-nas] spreading rule is only progressive. However, one piece of information in Scott (1964) suggests that [-nas] spread operates regressively as well writing, "...the plosive element in the complexes [mp, nt, nc, ŋk] checks nasality, and if a word with one of these in medial position has a final nasal, this last will be preceded by the homorganic plosive as in *pantudn* 'song'" (434). This might indicate a spreading rule where a nasal consonant becomes a post stopped nasal before an oral vowel in the same way that we saw in Yuhup. The difference would be that devoicing occurs in Bukar-Sadong, whereas Yuhup retains voicing.

One final point related to [-nas] spreading in Bukar-Sadong is how this relates to release. In the discussion on Northern Pame above, the claim is that prestopped nasals occurring in word final position are related to a presence of release for all stops word finally. Bukar-Sadong is said to have 'stops [that] are exploded in final position' (Scott 1964: 435 [footnote, 2]). I will assume that such an explosion is the phonetic realization of release.

7. Word Final Neutralization

If Northern Pame word final prestopped nasals were clusters of a voiced stop and a homorganic nasal, the language would be among those marked cases that forego the Laryngeal Constraint (Lombardi 1994). Simply stated, the Laryngeal Constraint prohibits syllable final realization of the underlying features of [voice], [constricted glottis], or [spread glottis][6]. The constraint is commonly manifested in languages such as Spanish, German, Dutch and Thai, but in others it may manifest itself syllable finally while word finally it is subject to exceptions. Languages that allow one or more of the laryngeal features word finally, such as English, are considered to be marked. In the case of Northern Pame, if the sequences *mb*, *nd*, and *ŋg* were underlyingly two distinct segments, we would at least expect word final voiced stops to surface by themselves, a fact that the

language data do not support. In fact, just the opposite exists where a voiceless word final stop will become voiced once it is no longer word final due to suffixation.

(20) Intervocalic voicing after suffixation in Northern Pame.

Root	Pronoun	Plural	Derived Form	Gloss
guti	k		gutik	'my duck'
guti	k	-at	gutiyat	'our duck'
gamɛ̄^{12}s	p		gamɛ̄^{12}s	'my spider'
gamɛ̄^{12}s	p	-at	gamɛ̄^{12}sβat	'our spider'
gaphi^{2}			gaphi	'pig'
gaphi^{2}		-at	gaphiðat	'pigs'

8. Further Implications

By accounting for oralization through the spread of [-nas] we are able to improve our description of both Northern and Central Pame in two ways. First, the flap *ɾ* can be deleted as an underlying segment. This is preferable since the distribution of *ɾ* is quite limited only occurring before oral vowels in an onset position. For both Northern and Central Pame, *ɾ* never occurs word finally although the other sonorants in fact do. If *ɾ* was an underlying segment in the language, we would have to account for the limited distribution of flap *ɾ* as exceptional.[7]

Second, by accounting for *ɾ* as an allophone of *n*, we can simplify any morpheme that has this alternation as a distinction of nasality or orality rather than one of a change of a segment. For example, there is one class of nouns in Northern Pame that has a characteristic *n* prefix which attaches to a vocalic prefix that marks possession. Consider the following in (21).

(21) Northern Pame *n* noun class derivations.

Classifier	Possessor	Root	Underlying	Surface	Gloss
n-	ū?-	thɔ̄^{12}	nū?thɔ̄^{12}		'my rope'
n-	u?-	thɔ̄^{12}	nu?thɔ̄^{12}	[ɾu?thɔ̄^{12}]	'my ropes'
n-	ī-	thɔ̄^{12}	nīthɔ̄^{12}		'(your (sg) rope'
n-	i-	thɔ̄^{12}	nithɔ̄^{12}	[rithɔ̄^{12}]	'(your (pl) rope'
n-	ī?-	thɔ̄^{12}	nī?thɔ̄^{12}		'his rope'
n-	i?-	thɔ̄^{12}	ni?thɔ̄^{12}	[ri?thɔ̄^{12}	'their (pl) rope'

In (21), although on the surface the words for 'my rope', 'your rope', and 'their rope' have a flap *ɾ* in place of *n* as a classifier, this change is predictable based on the status for nasality of the vowel for the possessive prefix.

Central Pame has a similar class of nouns as well illustrated in the pair *nokkoi?* 'my skirt' and *rokkoi?* 'our skirt'. Although Gibson and Bartholomew (1979) do not indicate nasalization on the singular form, we can assume that it exists by virtue of the fact that an *n* precedes it and surely spreads its nasality onto the vowel. Such a phonemic contrast would be difficult to discover. In fact, although we can account for the nasal/oral distinction as the cause for the phonological change in *n*, there is no reason not to believe that the salient change from the speaker's point of view is fundamentally that of the consonant and not of the vowel.

One additional case in Central Pame is that of nouns that begin with the prefix cluster *ŋg* such as in the words *ŋgota^{21}?* 'your (sg.) arrow', *ŋgokwa^{2}* 'your (sg.) solid wall', and *ŋgoco^{12}e* 'your clay pot'. We can account for the cluster as a velar nasal stop that is regressively oralized through [-nas] spread by a following oral vowel. Similar to the examples in (21), there is a morphological distinction between oral and nasal vowels in Central Pame. Below is a proposed derivation for the singular unmarked and possessive forms of 'arrow.'[8]

(22) Central Pame possessive noun derivation (Gibson and Bartholomew 1979: 314).

Classifier (clitic)	Possessor	Root	Phonemic	Phonetic	Gloss
nāt-		ta^{2}?	nātta^{2}?		'arrow'
ŋ	o-	ta^{21}?	ŋota^{21}?	[ŋgota^{21}?]	'my arrow'
ŋ	o-	ta^{2}?	ŋota^{2}?	[ŋgota^{21}	'his arrow'

Unlike Northern Pame therefore, Central Pame allows for the Release Projection before [-nas] spreading occurs allowing for the cluster [ŋg] to surface.[9]

9. Conclusion

This paper set out to account for nasalization in Northern Pame with two aspects in mind. First, that nasalization is present underlyingly on syllables other than the root, and second, that the oral/nasal contrast on vowels affects neighboring nasal consonants. With these facts, it was shown that by appealing to the notion of aperture and by representing oral vowels as [-nas], we can better account for the oralization that nasal consonants receive through a spreading rule. Subsequently, it was shown that by accounting for the alternation of nasal stops with oral stops, we could make a claim that nasalization is productive as an underlying process on syllables other than the root, and furthermore, that it can play a morphological role as well as a lexical one.

NOTES

[1] Avelino (1997), Gibson (1979) and Manrique Castañeda (1967). Southern Pame, once spoken in Jiliapan and Pacula is said to be extinct, thus leaving us with only Central and Northern Pame. Avelino (1997: 32) reports migrations of Central Pame speakers to the towns of Aquismón (San Luis Potosí) and Tancoyol (Querétaro).

[2] I would like to extend my sincere appreciate to Atanácio Gonzalez Gonzalez for his time and effort in providing most of the Northern Pame examples used in this research.

[3] Interestingly, the consonant /h/ is not contrastive syllable finally, although glottal stop is. How these two factors play into release is an interesting question.

[4] Phonetic transcription has been included only for those segments which pertain to nasalization. Otherwise, all the examples are in phonemic form.

[5] An additional difference between the two is that Yuhup has unreleased stops in 'morpheme final position' (Parker 1999: 325).

[6] Sonorants would not fall into this class since they may underlyingly be marked by some other feature such as [+lat] or [+nas] and would later derive their voicing through default rules.

[7] Certainly we can at least account for the fact that *m* and *ŋ* alternate with phonemic *b* and *d*. The question as to whether the voiced stops can be completely explained as predictable through [-nas] spread is still an open question.

[8] I refer the reader to Gibson and Bartholomew (1979) for a discussion on tone alternations that mark possession. In my examples, I represent changes in tone on the root, although admittedly they are a morphological category as well. However, the presence of tone has no consequence on the topic at hand.

[9] If we assume that velar nasals are present underlyingly in Northern Pame, than we would expect them to surface as a velar fricative analogous to the bilabial fricative for bilabial stops. Such morphological alternations with velar nasal and stops, if they exist, must be quite rare. However, Central Pame appears to have kept the distinction.

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