Demorafication in Tübatulabal: Evidence from Initial Reduplication and Stress

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1. Introduction.

In this paper I motivate a rule which removes a mora from the prosodic representation of the syllable in Tübatulabal when the mora dominates a consonant. The rule of Demorafication proposed here appears in (1).

(1) Demorafication

```
σ          σ
|\         |
μ μ   =>   μ        (where ß is a consonant)
| |        |
α ß        α ß
```

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Evidence for Demorafication is important because it contributes to our understanding of weight sensitivity. Hayes (1989) and Archangeli (to appear) have argued that in some languages weightless phonological segments are assigned moraic status by a rule of Weight-by-Position in the course of phonological derivations. The claim here is that the opposite also obtains: in some languages segments which have weight may lose it in the course of phonological derivations through Demorafication.

Support for (1) is drawn from the behaviour of two prosodic operations in Tübatulabal, a process which Voegelin (1935) refers to as Initial Reduplication, and the Tübatulabal Stress Algorithm. The line of reasoning taken in this paper proceeds as follows. The essential properties of Initial Reduplication are the transfer of vowel length from the stem to the prefix and the fact that nasals copy following a short vowel, but not after long vowels. I argue that these facts are best accommodated by an approach in which moras dominating vowels and nasal consonants associate to a reduplicative template, a syllable node, σ. The Stress Algorithm, on the other hand, is sensitive only to moras dominating vowels. Coda consonants, and in particular nasal consonants in the coda of a syllable, are not counted for stress.[2] Furthermore, the metrical behaviour of initially reduplicated prefixes can only be explained if the assignment of stress follows reduplication. Thus, Tübatulabal presents a situation in which a process sensitive to moras dominating both consonants and vowels precedes a process which is sensitive only to vowel weight. In other words, the class of nasal consonants behaves as though it has "lost weight" by the time stress is assigned. To account for the different weight-sensitive behaviours of Initial Reduplication and the Stress Algorithm, I propose that moraic representations after Initial Reduplication has applied are impoverished by the rule of Demorafication in (1) before they are provided as input to the Stress Algorithm.

The remainder of the paper is organised as follows. Data illustrating Initial Reduplication and stress assignment in Tübatulabal are presented and analysed in section 2. The focus of this section is the argument that nasal consonants following short vowels in codas count as moraic[3] for an early process of reduplication, but lose their weighted status prior to stress assignment later in the derivation. In section 3, I show that the Initial Reduplication facts defy explanation under an alternative account in which nasal consonants are *not* moraic. Some concluding remarks are offered in section 4.

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[2] The terms *coda* and *onset* are used for convenience here to denote positions of consonants within a syllable. No assumption of subsyllabic constituent structure is necessarily implied.

[3] By this I mean that a nasal may occupy a mora which does not also dominate a vowel.

2. Initial Reduplication and Stress in Tübatulabal.

Section 2 begins with the description and analysis of the Initial Reduplication facts. The behaviour of oral and nasal consonants in reduplication motivates the representations in (2) where a nasal following a short vowel in a coda occupies a mora, whereas an oral consonant in the same position does not.

```
(2) a.      σ     σ             b.      σ    σ
           /μμ   /μμ                   /μ   /μ\
          / ||  / ||                  / |  / | \
         ? im b  in                  ? u k  u  s
```

Additional evidence for the representation in (2a) from a process of Obstruent Voicing is presented following the analysis of Initial Reduplication. Next, an analysis of stress assignment is undertaken. I argue that even though the behaviour of nasals in reduplication shows that they are moraic when Initial Reduplication applies, they cannot be represented with moras when stress is assigned later in the derivation. The ordering of Initial reduplication before stress assignment motivates Demorafication in (1).

In Initial Reduplication, the first vowel of a verb stem (henceforth, the stem V) is copied immediately to the left of the stem, maintaining the length of the stem V in the prefix (Voegelin, 1935). The forms in (3) show that short stem Vs surface as short in the prefix.[4,5]

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[4] Surface forms in Tübatulabal are complicated by the effects of several rules which apply after Initial Reduplication. The most complex of these is gemination. Voiceless stops (except [?]) and affricates, nasals and [l] are geminated intervocalically after a short vowel. Glides and fricatives are geminated in the same context when the preceding syllable is stressed. Gemination in medial clusters occurs as follows: (i) the second C is geminated if it is a voiceless stop or affricate, (ii) if the first C is /h/, it is geminated when followed by a nasal or glide. Voiceless stops and affricates are geminated word-finally (Voegelin, 1935:61). I follow Voegelin (1935, 1958) in not representing the effects of gemination. Other phonological rules whose effects *are* represented are Final Devoicing, in which an obstruent is devoiced word finally; Nasal Assimilation, which assimilates a nasal consonant to a following obstruent; and Obstruent Voicing, which voices obstruents in the context $\mu\mu\_\mu$ (discussed below). As a reference, stress is marked on all derived forms.

[5] Forms cited in this paper are from Voegelin (1935, 1958). I differ from Voegelin's orthography in representing voiceless and voiced alveopalatal affricates as [C, dZ]; voiceless and voiced alveolar affricates as [c, dz]; a retroflex sibilant as [s]; and an "open o" as [o]. Diphthongs are represented as

(3)	*Stem*	*Reduplicated*	*Gloss (reduplicated form)*
	/nab/	?á-nab-át	'3rd is throwing it'
	/wele?/	?é-welé?	'3rd crawled'
	/pusk/	?u-púsk	'3rd blew it'
	/kï?ïdZ/	?ḯ-kï?ḯC	'it entered tightly'
	/kus/	?u-kus	'3rd honked (a car horn)'

In the forms in (4) where the stem V is long, the reduplicated vowel also surfaces as long.[6]

(4)			
	/huu?/	?úu-húu?	'it leaked'
	/loogo?/	?óo-lóogó?	'3rd is/went crazy'
	/ceeyee?/	?ée-dzééyée?	'it is/got sour'
	/ïïwïn/	?ḯï-?ḯïwḯn	'3rd stood up'
	/yaan/	?áa-yáan-ḯt	'3rd is singing'

Note from (3) and (4) that stem-initial consonants do not surface in the reduplicant. Instead, a glottal stop [?] surfaces before the reduplicated vowel. Similarly, consonants following the stem V are not copied, with a single exception: If a short stem V is followed by a nasal consonant, the nasal is reduplicated if the stem-initial consonant is a stop /p,t,k/ or alveolar affricate /c/. Examples are given in (5).

(5)			
	/pin/	?im-bín	'3rd brought it'
	/cama/	?án-dzamá	'it burned'
	/poŋg/	?om-bóŋk	'3rd put on basket cap'
	/tiŋwa/	?ín-diŋw-át	'3rd is calling s.o. names'
	/kumaawa/	?úŋ-gumáawá	'it is shady'

Forms like *?om-bóŋk* and *?án-dzamá* in (5) show that a nasal is copied regardless of its syllabic affiliation in the stem. The forms in (6) show that a nasal does not surface after a short vowel if the stem begins with a consonant not belonging to

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a vowel followed by a glide. A number of glosses are provided by my own fieldwork. In particular, glosses have been changed where Voegelin cites verbs in the 3rd person masculine singular; in these cases, gender-neutral translations such as those given here are more appropriate.

[6] Since glottal stops in syllable initial position are entirely predictable in Tübatulabal, I represent forms like */ïïwïn/* as vowel-initial underlyingly. Onsetless syllables are provided with an initial [?] through a rule of Default Glottal Insertion, stated in (9).

the set /p,t,k,c/.[7]

(6)	/hamasa/	?a-hámasá	'3rd got sad'
	/wïniig/	?í-wïnïík	'3rd looked back'
	/anaahl/	?á-?anáalh	'3rd fasted'
	/siŋg/	?i-síŋk	'3rd blew 3rd's nose'

Since nasals precede the consonants /h,w/ in forms like *?amhaydZiŋa* 'ten' and *?ín-diŋw-át* '3rd is calling', it can be concluded that a nasal may be copied only before obstruents. A nasal does not surface before a glottal stop in *?á-?anáalh* because under the assumptions adopted here, /?/ is not present underlyingly (see footnote 5 and discussion below); thus, */anaahl/* does not begin with an obstruent underlyingly. The failure of the nasal to surface before /s/ in *?i-siŋk* can be explained in terms of phonotactics: no forms are attested in which a nasal surfaces before this segment. Finally, the forms in (7) show that a nasal following a long stem V is not reduplicated.

(7)	/kuuŋu/	?úu-gúuŋú	*?úuŋ-gúuŋú *?uŋ-gúuŋú	'she married'
	/paandïg/	?áa-báandïk	*?áam-báandïk *?am-báandïk	'3rd made war'
	/maancu?/	?áa-máancú?	*?aam-maancu? *?am-maancu?	'3rd domesticated s.o.'

The forms cited in (3) through (7) show that the essential properties of Initial Reduplication are the transfer of vowel length from the stem to the prefix and the fact that nasals copy following a short vowel, but not after long vowels. These data can be handled straightforwardly if nasal following short vowels occupy moras when reduplication applies. In the analysis proposed here, a syllable node is prefixed to a verb root. The melody of the verb root and prosodic structure subordinate to the syllable level (i.e. moraic structure) is then copied to the left of the root (following McCarthy and Prince, 1986). Copied elements are then associated to the syllable template. These steps in the reduplication algorithm are stated in (8a) through (8c) below. Recent work in prosodic theory claims that templatic association is universally and obligatorily constrained by the Template Satisfaction and Maximization of Association conventions (McCarthy and Prince, 1986, 1990; Spring, 1990; Archangeli, to appear). Template Satisfaction requires that obligatory elements in prosodic templates be filled, while Maximization of Association states that association to a template continues as long as phonological material is available and no

[7] A nasal is also predicted to surface before /C/ following a short vowel. So far, I have found no test cases.

constraints are violated. If these conventions are respected, association continues until the largest syllable possible is formed. In Tübatulabal, nonfinal syllables have the maximal shape CV(V)C (e.g. *máaygɨ́t* '3rd is going', *puskɨ́t* '3rd is blowing', *páandɨ̀gɨ́t* '3rd is making war'). However, as the forms in (3) through (7) demonstrate, the largest possible syllable is not what surfaces in the reduplicant. Instead, only the moraic content of the syllable (assuming nasals are moraic) surfaces, preceded by a glottal stop. Thus, the algorithm for reduplication requires an additional step truncating weightless (nonmoraic) onset and coda segments. The algorithm for Initial Reduplication is stated in (8).[8]

(8) Initial Reduplication.
 a. Prefix a syllable node σ to a verb root.
 b. Copy the melody and moraic structure of the root to the left.
 c. Associate copied elements to the template.
 d. Truncate weightless elements.
 e. Delete a nasal before consonants any segment that is not [+obst].

The step in (8e) is necessitated by the fact that in (6) a nasal does not surface following a short vowel if the stem-initial consonant is not an obstruent (with the exception of /s/ for phonotactic reasons). I have no satisfactory explanation for this property of Initial Reduplication, which is extremely unusual crosslinguistically.[9] Note that there is no step in (8) stating that [ʔ] is inserted into initial position once truncation has applied. In fact, glottal insertion follows from independent requirements of the language. Every syllable in Tübatulabal requires an onset. Evidence to this effect is provided by forms in which two vowels become adjacent as a result of affixation. When vowel-initial morphemes are suffixed to vowel-final Tübatulabal stems, vowel assimilation occurs (if the

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[8] The algorithm in (8) is not the only possible analysis for the Initial Reduplication data. A successful alternative would be to copy the stem plus all of its prosodic structure initially, and then truncate the copied material to the moraic content of the first syllable, following Steriade (1988). The rest of the alternative analysis would proceed just as in the account proposed here. Crucially, the Steriade-esque alternative described here must also assume that coda nasals following short vowels occupy moras.

[9] It has been suggested to me by Diana Archangeli that nasal effects in reduplication might be due to prenasalisation. That is, the effects in (5) might result not from copying a nasal segment in the reduplicant, but instead from associating the feature [+nasal] to the following obstruent. An argument against this analysis is that whether the nasal surfaces or not is entirely dependent on the weight of the vowel in the reduplicant--the syllable *preceding* the obstruent. In a prenasalisation account it is not clear why the stem-initial obstruent would not be affected in both *páandɨ́g* and *ʔimbín*.

vowels are not identical) and the suffix-initial vowel is incorporated into the stem-final syllable.[10] Depending on the suffix, one of the vowels may be deleted (e.g. *hámas-át* '3rd is/was sad' from /*hamasa*/ + /*at*/ (progressive); cf. *?a-hámasá* in (6)), or the two vowels are fused to form a unit which behaves phonologically as a single long vowel (for example, in stress assignment; *?ahámasáan* '3rd got sad for s.o.' from /*hamasa*/ + /*an*/ (benefactive)). Thus, whenever no consonant is available to serve as an onset in a syllable, a glottal stop surfaces in onset position. A rule of Default Glottal Insertion is stated in (9).[11]

(9) Default Glottal Insertion.

```
σ                     σ
μ ...      =>        /μ ...
|                    / |
V                   ?  V
```

Finally, I assume that copied material remaining after association (material in excess of that required to fill the syllable template) is deleted through an operation of Stray Erasure.

The derivation for the stem *?é-welé?* in (3) where a short stem vowel surfaces as short in the reduplicant appears in (10). As a first step, a syllable σ is prefixed to the stem. Next, the melody of the stem and its associated moraic structure is copied beneath the template. The template is then satisfied by associating a mora (the vowel), and then maximised by associating the preceding and following consonants. Stray erasure removes unassociated segments from the representation. Following association, all material in the reduplicant not dominated by a mora is truncated. Finally, Default Glottal Insertion applies in order for the remaining material (in this case, the vowel [e]) to be licensed as a syllable.

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[10] Tübatulabal syllables contain only a single vowel quality. While diphthongs do exist, the second element, which is always high, behaves phonologically like a glide.

[11] As an alternative, Glyne Piggott (p.c.), assuming the presence of a skeletal tier, suggests that in languages with onset requirements, syllables license prevocalic skeletal positions which are spelled out by default if no consonant is available. A less attractive alternative to inserting [?] by default, however this is achieved, would be to truncate only postmoraic consonants and overwrite the onset with [?].

```
(10)
 σ + σ  σ           σ  +  σ  σ           σ   +   σ  σ
    /| /|\                /| /|\        /|\      /| /|\
   |μ |μ |   =>   μ μ    |μ |μ |   =>  |μ | μ   |μ |μ |   =>
   || || |        | |    || || |       || | |   || || |
   we le ?        wele? we le ?        we l e? we le ?
 Affixation          Copy               Association

σ +  σ  σ       σ + σ  σ          σ + σ  σ
/|\ /| /|\      |  /| /|\         /|  /| /|\
|μ | |μ |μ | => μ  |μ |μ |   =>  / μ  |μ |μ |  => ?ewele?
|| | || || |    |  || || |      /  |  || || |
we l we le ?    e  we le ?     ?   e  we le ?
Stray Erasure   Truncation     [?] Insertion         Output
```

The derivation for *?uu-huu?* in (4), where a long vowel is reduplicated, appears in (11) (Stray Erasure does not apply in (11).[12]

```
(11) σ + σ           σ +  σ           σ  +   σ
        /|\\            /|\\          /|\\   /|\\
       | μμ |  =>  μμ  | μμ |   =>  | μμ | | μμ |  =>  N/A
       |  |/ |      |/  |  |/ |      | |/ | | |/ |
       h u  ?      hu?  h u  ?       h u  ? h u  ?
     Affixation        Copy          Association         S.E.

         σ  +  σ                  σ  +  σ
         |\   /|\\               /|\   /|\\
 =>      μμ  | μμ |   =>        / μμ  | μμ |  =>  ?uuhuu?
         |/  |  |/ |           /  |/  |  |/ |
         u   h u  ?           ?   u   h u  ?
        Truncation            [?] Insertion         Output
```

The derivation for items in (5) where a nasal is reduplicated proceeds much as the derivation in (11), with the exception that a mora containing a nasal is available to associate to the template. (12) contains the derivation for *?om-bóŋk* (again, Stray Erasure does not apply).[13]

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[12] There is evidence that long vowels in Tübatulabal should be represented with separate root nodes, as in Selkirk (1989). However, since this is not the point of the discussion here, I use a less controversial representation in which a single root node maps to two moras in the derivations that follow.

[13] In forms like *?án-dzamá*, where an onset nasal surfaces in the reduplicant, I assume that during Association to σ, the nasal associates and generates a mora in the syllable node.

DEMORAFICATION


```
(12) σ + σ          σ  +  σ            σ    +    σ
        /|\\              /|\\           /|\\      /|\\
       | μμ |  =>   μμ    | μμ |  =>    | μμ |    | μμ |  => N/A
       | || |       ||    | || |        | || |    | || |
      p oŋ g      poŋg p oŋ g         p oŋ g    p oŋ g
    Affixation       Copy               Association         S.E.

        σ   +   σ                  σ  +  σ
        |\     /|\\               /|\   /|\\
    =>  μμ    | μμ |   =>        / μμ  | μμ |   =>   ?om-boŋk
        ||    | || |            /  ||  | || |
        oŋ    p oŋ g           ?   oŋ  b oŋ g
        Truncation              [?] Insertion         Output
```

Derivations for the items in (7) where a nasal fails to copy following a long vowel proceed in the same manner as (11). The nasal consonant is not copied in these cases because it is not moraic: the moras of the long vowel exhaust the two-mora limit on Tübatulabal syllables. A nasal following a long vowel may associate to the template as a weightless consonant, only to be truncated in the next step of the derivation.

The main point argued in this section is that coda nasals (following short vowels) occupy moras at the time Initial Reduplication applies. In the account proposed here, oral consonants never surface in the coda of the reduplicant because they do not occupy moras, and nonmoraic material is truncated as part of the reduplicative algorithm. Coda nasals, on the other hand, surface after a short vowel in the reduplicant because they occupy moras, and are thus not truncated. Coda nasals do not surface in the reduplicant following a long vowel because a syllable may contain no more than two moras, both of which are occupied by the vowel. A nasal consonant following a long vowel in a coda does not occupy a mora, and is treated exactly as an oral consonant in reduplication.

This concludes the development of the analysis of Initial Reduplication proposed in this paper. The point of this discussion so far has been to show that an analysis which treats coda nasals as moraic is able to account for the patterns attested in Initial Reduplication. Additional evidence that nasals in codas following short vowels are moraic is the behaviour of another rule, Obstruent Voicing. The effects of obstruent voicing are illustrated in (14), using forms cited earlier. (14a) shows that obstruents are voiced intervocalically when the preceding vowel is long (descriptively, in the context *VV__V*). (14b) illustrates voicing prevocalically after a sequence of a short vowel followed by a nasal (descriptively, *VN__V*. There are no exceptions to voicing in these contexts, whether derived or underived.[14] However, (14c) shows that both voiceless and voiced obstruents are in free variation following a nasal which occurs in a coda after a long vowel (descriptively, *VVN__V*).

(14)	a.	/kuuŋu/	?úu-gúuŋú	'she married'
		/ceeyee?/	?ée-dzéeyée?	'it is/got sour'
	b.	/pin/	?im-bín	'3rd brought it'
		/cama/	?án-dzamá	'it burned'
	c.	/paandïg/	?áa-báandḯk	'3rd made war'
		/maancu?/	máancu?-út	'3rd is domesticating s.o.'

These facts can be explained if the true context for voicing is $\mu\mu\_\mu$. Under this analysis, if coda nasals following a short vowel are moraic in Tübatulabal, then the voiced obstruents in (14a,b) occur in the context for voicing; compare the representations in (15a). However, in (15b) the nasal in *máancu?-út* is weightless, following a bimoraic sequence in a coda; thus the obstruent /c/ does not occur in the context for voicing (it is important that /n/ associate to the syllable node in (15b); if weightless Cs are associated to the preceding mora as in Hayes (1989), then /c/ would still follow a bimoraic sequence).

(15)

```
a.  σ    σ    σ        σ     σ      b.  σ          σ     σ
   /μμ  /μμ  /μ       /μμ   /μμ        /μμ\       /μ    /μ\
  / |/ / |/ / |      / ||  / ||       / |/ \     / |   / | \
 ?  u g  u ŋ  u     ?  im b in       m  a   n c  u ?   u   t
```

The point of this argument is that if nasals are represented as moraic when they occur in codas following short vowels, it is not only possible to collapse two otherwise separate contexts for voicing obstruents (*VV__V* and *VN__V*) into a single context, $\mu\mu\_\mu$; it is also possible to explain why an obstruent is *not* voiced following a coda containing a long vowel-nasal sequence: because the nasal is weightless in this case and separates the obstruent from the critical bimoraic context.

To summarise, in this section I have presented two arguments that nasals in codas following short vowels are moraic, as in (2a). The first argument was that this representation of nasals enables an explanatory account of the patterns attested in Initial Reduplication (the argument that these facts cannot be explained if nasals are not moraic is made in section 4). The second argument was that representing nasals in *VC* codas as moraic permits a perspicuous account of a

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[14] Except for /s/, which has no voiced variant. Recall that another unusual property of /s/ is that unlike other obstruents, it never follows a nasal (whether reduplicated or not) in Tübatulabal forms.

regular process of Obstruent Voicing. We turn now to a description of the stress facts of Tübatulabal.

Normally in sequences of short vowels, stress is assigned to odd numbered vowel moras from the right, as in (16).

(16)	páŋa-tá-l	'the god'	haní-hal-ít	'3rd is visiting'
	ha?íbi?-ít	'3rd is joking'	kúmu?-ún	'of 3rd's own father'
	cámbahá-l	'the carrying net'	haní-?ulú	'your (pl.) house'

The forms in (17) show that if a long vowel is encountered, it is stressed, and the alternating pattern is resumed from the long vowel (i.e., the count begins again with the long vowel as "1").

(17)	?ó-polóoŋ-án	'3rd hit it for s.o.'
	?óo-yóolíin	'3rd plowed it'
	máayg-íl-íiduw-át	'3rd is racing'
	?á-nab-íiw-át	'3rd is being thrown'
	?áa-dzáayáaw-in-íiba?-át	'3rd wants to yell at x'
	haláy?-in-áan-át	'3rd is wetting x for y'
	?á-naŋ-íil-ilóog-íba?-át	'3rd wants to go along pretending s/he is crying'

The pattern of stress in (17) shows that stress in Tübatulabal is quantity sensitive, and thus must refer to syllable content. The patterns illustrated in (16) and (17) are amenable to an analysis in which iambs [$\sigma\mu\ \sigma$] are assigned iteratively from the right edge. Examples appear in (18). Degenerate feet receive stress. Parenthesised units in the following examples indicate metrical foot structure; heads are indicated by *x*, non-heads by a period.

```
(18) (. x)( .  x )(x)            (x)(.  x )(. x )(x)(.  x)
     haláy?-in-áan-át            ?á-naŋ-íil-ilóog-í ba?-át
```

Below I argue that coda nasals are no longer moraic by the time stress applies. Before making this argument, I demonstrate that Initial Reduplication precedes stress assignment. The critical evidence is provided by the forms in (19), which show that initially reduplicated prefixes containing short vowels behave regularly in the alternating stress pattern (long reduplicated vowels, like all long vowels, receive stress).

(19)	?á-nab-át	'3rd is throwing it'	?u-púsk	'3rd blew it'
	?é-welé?	'3rd crawled'	?u-kús	'3rd honked'

If Initial Reduplication follows (the first application of) stress, there are two possible results: either (i) stress does not reapply, in which case no reduplicated prefix should have stress, or (ii) stress applies again after reduplication, in which case reduplication creates a new domain for stress assignment. In this case, every reduplicated prefix should have stress. Forms like *?á-nab-át* in which a reduplicated prefix has stress rule out the first possibility. Forms like *?u-kús* in which a reduplicated prefix is not stressed rule out the second possibility. Whether a prefix is stressed or not is predictable only if reduplicated prefixes are present when alternating stress is assigned.

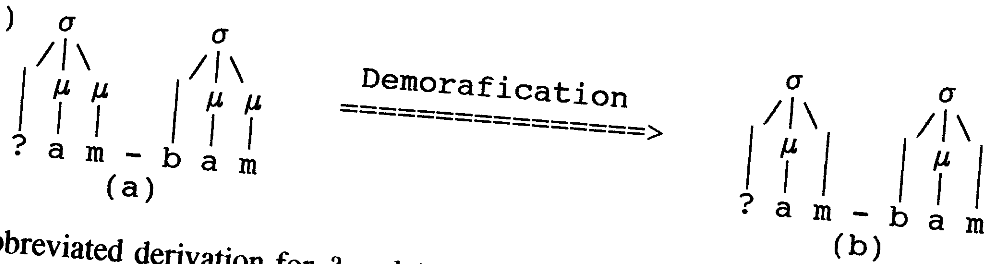
Turning now to the argument for Demorafication in (1), if nasals closing syllables containing a short vowel (CVN syllables) are moraic, as in (2a), then if those nasals remain moraic throughout the derivation, CVN should count as heavy for stress. However, (20) shows that this is not the case. In the unreduplicated forms in (20a), a CVN syllable in a verb stem surfaces with or without stress, depending on the regular stress alternation. The forms in (20b) illustrate the same pattern with forms containing reduplicated VN sequences (i.e., the stress pattern in (20) is parallel to that in (19)).

(20)a.	cə́mbahá-l	'the carrying net (subj.)'	tiŋwá	'3rd summoned'
	cambə́ha-lá	'the carrying net (obj.)'	tíŋw-isá	'3rd will " '
c.	?am-bám	'3rd closed it'		
	?ín-diŋw-áan	'3rd is calling s.o. names for s.o.'		
	?om-bóŋk	'3rd put on basket cap'		

So far, I have argued (i) that nasals in CVN syllables are moraic when Initial Reduplication and Obstruent Voicing apply, (ii) that Initial Reduplication precedes stress assignment, (iii) that stress is quantity sensitive, and finally, (iv) that the Stress Algorithm treats reduplicated prefixes no differently from other morphemes in the language. The critical point is that if coda nasals were dominated by moras at the time stress is assigned, then the syllables containing them should always receive stress, like long vowels in forms such as *?úu-húu?* and *?óo-lóogó?*. However, as demonstrated above, CVN syllables behave instead like light syllables containing short vowels.

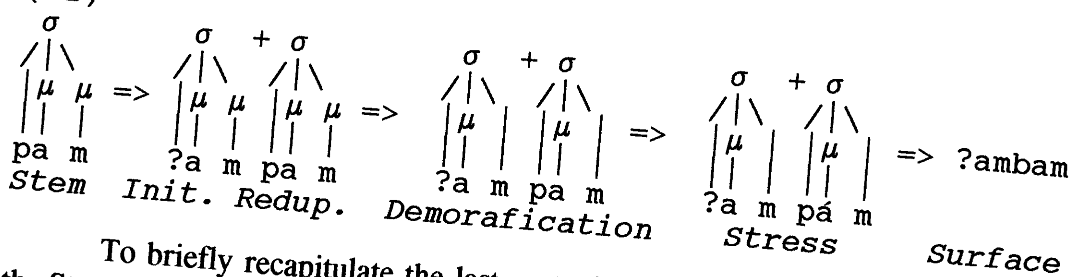
If the nasal closing the first (reduplicated) syllable in each of the forms in (20b) is dominated by a mora at the time Initial Reduplication applies, then the representation for a form such as *?am-bám* after Initial Reduplication is that in (21a). However, if stress assignment is quantity sensitive, then CVN syllables must have only a single mora. If CVN syllables were heavy, they would always receive stress. Thus, the representation of *?am-bám* at the time stress is assigned must be that in (21b). I propose that (21b) is derived from (21a) by the rule of Demorafication in (1).

(21)



An abbreviated derivation for *?am-bám* follows in (22).

(22)



To briefly recapitulate the last part of this section, I have shown (i) that the Stress Algorithm is sensitive only to vowel length distinctions and not to coda nasals, and (ii) that stress assignment follows Initial Reduplication, which is sensitive to moras dominating both vowels and coda nasals. If the analyses of stress assignment and Initial Reduplication presented here are correct, then a paradox arises: an earlier prosodic process (Initial Reduplication) is sensitive to a larger set of weighted elements than a later process (the Stress Algorithm). I have attempted to resolve this paradox by proposing the rule of Demorafication in (1). In the next section I consider an alternative analysis of Initial Reduplication under which the paradox just described would not arise, and show that such an analysis is ultimately unsatisfactory.

3. Difficulties for Alternative Accounts of Initial Reduplication.

Since the evidence that the Stress Algorithm is not sensitive to coda nasals is clear, motivation for Demorafication in (1) hinges on the argument that the facts of Initial Reduplication can be explained only by an analysis in which coda nasals following short vowels are dominated by a mora (which does not also dominate a vowel). If it could be demonstrated that nasals are not independently moraic[15] when Initial Reduplication applies, then support for Demorafication would erode. Since oral and nasal consonants are clearly treated differently in Initial Reduplication, the best alternative analysis would one in which coda oral

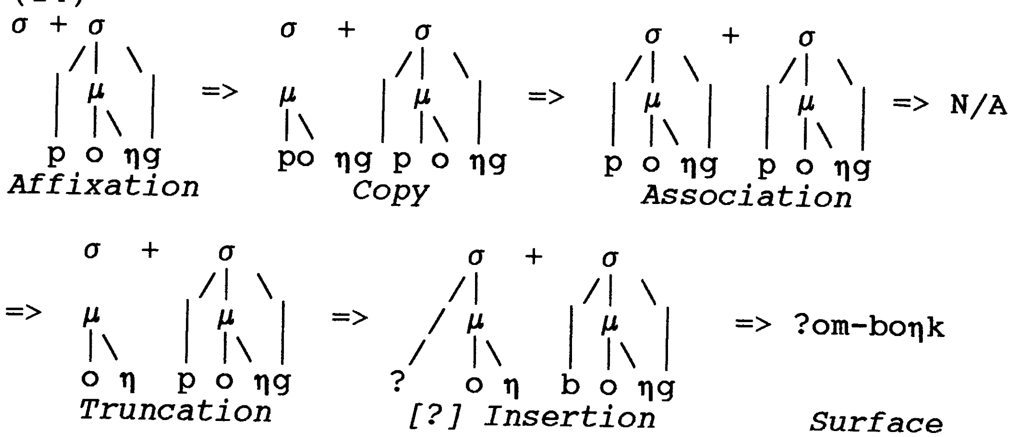
[15] By independently moraic I mean that a segment may occupy its own unit on the moraic tier. Weightless Cs which associate to a mora which contains a vowel (as in Hayes (1989) and below) are not independently moraic.

and nasal consonants differ in their structural representations,[16] but which does not represent a coda nasal as the sole occupant of a mora. One possibility would be that nasals are associated to the mora dominating the preceding vowel while oral consonants report directly to syllable nodes, as in (23).

(23)

Given the representations in (23), reduplication would proceed exactly as in the analysis proposed in section 2. The base and its moraic structure would be copied beneath a prefixed syllable node. Association would follow, and then truncation would delete all elements not dominated by moras. The derivation for *ʔom-bóŋk* under this alternative account is given in (24).

(24)



Under this alternative analysis the correct surface results are obtained for the forms in (3) and (4) where only a vowel is reduplicated, and for the forms in (5) where a nasal is copied after a short vowel. The assumption that nasals, but not other coda consonants, report as weightless appendices to moras also explains why nasals, but not other coda consonants are copied under some conditions. However, crucially, any account in which nasals are weightless fails to explain why a nasal is copied in *ʔom-bóŋkk*, but not in *ʔáa-báandĭk*, where the preceding vowel is long. That is, if weightless nasals report to the mora containing the preceding vowel, then the representation for */paandĭg/* should be that in (25), and the nasal should surface in the reduplicant, since it is dominated by a mora, even

[16] That is, if there is no representational distinction between the coda consonants in stems like */pusk/* and */poNg/*, then it is not possible to provide a principled account for why the nasal reduplicates in *ʔom-bóNk* but not [s] in *ʔu-púsk*.

though it is weightless.

(25)

```
              σ        σ
             /|\      /|\
            / μ μ    / μ \
           /  | |\  /  |  \
          p   a a n d  ï   g
```

4. Conclusion.

To summarise, the main purpose of this paper was to argue that the behaviour of two prosodic operations, Initial Reduplication and stress assignment, in Tübatulabal motivates a rule of Demorafication which removes a mora from the representation of a syllable when the mora contains a consonant. An implication of the analysis of Initial Reduplication presented in section 2 is that elements may first associate to a template, and then be deleted. It was suggested that the reason oral consonants were not incorporated into the template in Initial Reduplication is because the end result of Initial Reduplication is to maintain only moraic material in the template. A glottal stop surfaces initially due to a language-specific requirement that syllables require onsets. Finally, while the loss of a mora in the case discussed here concerns nasal consonants in particular, I expect that to the extent that Demorafication is well-motivated, it should have broader application cross-linguistically.

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