Reduplication in Malagasy

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Our purpose here is to provide a descriptively adequate characterization of Reduplication in Malagasy. Our primary concern is precision and comprehensiveness. We intend that our description will serve as an adequacy test for the various theoretical approaches to reduplication and to Malagasy morphology that we only touch upon here. We do conclude with some challenges Malagasy poses for an Optimality Theoretic account.

Introduction Malagasy, like many Austronesian languages, uses reduplicated forms extensively in everyday discourse. It is not surprising to hear sentences in which essentially every content word is reduplicated.

The primary meaning of reduplication is one of attenuation: fotsy 'white', fotsifotsy 'whitish'; maro 'many', maromaro 'somewhat many'. In some cases reduplication is frequentative: miteny 'speaks', miteniteny 'jabbers'. Used with nouns it often has a derogatory implication: latabatra 'table', latabataatra 'sort of a table'. It is also used optionally in forming comparative adjectives (with no weakening, frequentative, or derogatory interpretation).

I. Defining Malagasy Reduplication

Given: the set of roots of Malagasy (Abinal & Malzac 1888).
Define: the relation "\(x \text{ redup } y\)", read as "\(x\) reduplicates as \(y\)". \(\text{redup}\) is properly a relation as a few forms have two reduplications, but usually just one, given by a function \(\text{Dup}\). Our definition takes the form:

\[ x \text{ redup } y \iff y = \text{Dup}(x) \text{ or } y \text{ satisfies one of four special cases given adhocly later.} \]

Def 1 a. The domain of \(\text{Dup}\) is the set PPW of possible prosodic words.

b. \(\text{Dup}(\sigma) = \text{Basic}(\sigma, \sigma_1, \ldots, \sigma_n)\), where \(\sigma_i\) carries primary stress in \(\sigma\).

We must, obviously, define PPW, stress marked syllable and \(\text{Basic}\), which we now do.
The vowels of Malagasy in standard orthography are \(a, e, i, o = [u]\), with diphthongs aily, ao, oy. Vowel length is not phonemic. Word final \(i\) is \(y\). The Malagasy consonants are given by the table on the next page. Malagasy syllables are all of the form \(cv\), \(c\) a consonant or the empty string, \(v\) a vowel. So all syllables are open and (excluding recent borrowings) there are no consonant clusters. stress marked syllables are represented as pairs \((cv,k)\) where \(k = 0,1,\) or 2. (cv,2) or primary stressed syllables, are abbreviated \(cv\). Secondary stressed syllables, \((cv,1)\), are abbreviated \(cv\); and unstressed syllables, \((cv,0)\), are abbreviated \(cv\). For example, the sequence of stress marked syllables in the word elatra 'wing' is \(<(e,2),(la,0),(tra,0)>\), which abbreviates to \(\hat{e}latra\), just the standard orthography with stress marked. A possible prosodic word is a finite
non-empty sequence of stressed marked syllables exactly one of which has primary stress. PPW is the set of possible prosodic words.

**consonants**: the phoneme *dz* is orthographic *j*. It is the voiced counterpart of *ts*. *tr* and *dr* are single affricates articulated with the blade of the tongue against the alveolar ridge.

*C* or *_NC*, a prenasalized *C*, = orthographic *nC* or *mC*, even when separated by a hyphen indicating a morpheme boundary, as in *n-tr* and *n-dr*. The *C* vs *nC/mC* distinction is phonemic in all cases. Here is a complete set of minimal pairs: *dóho* 'pond' vs *dóombo* 'dull'; *tápoka* 'cut/dilute' vs *támpoka* 'suddenly'; *mándodôna* 'urge (imp)' vs *mândondôna* 'knocks (at a door)'; *éjo* 'here' vs *énto* 'carry (imp)'; *majájana* 'completely separated' vs *majánjana* 'strikes hard'; *ánty* 'there' vs *ánwty* 'knife'; *sédra* 'a challenge' vs *séndra* 'meet (by accident)'; *atrâno* 'be prepared (imp)' vs *atn-trâno* 'at home'; *sóga* 'cotton cloth' vs *sónda* 'pulled back, cleft'; and *máïka* 'rushed' vs *máîka* 'so much the more'.

<table>
<thead>
<tr>
<th>nasals</th>
<th>stops</th>
<th>affricates</th>
<th>fricatives</th>
<th>liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td>labial</td>
<td><em>m</em></td>
<td><em>b</em></td>
<td><em>p</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>m_b</em></td>
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<td>labio-</td>
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<td>dental</td>
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<td>alveolar</td>
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<td><em>n_d</em></td>
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<tr>
<td>alveolar</td>
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<tr>
<td>tongue tip</td>
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<td></td>
<td><em>j</em></td>
<td><em>ts</em></td>
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<tr>
<td></td>
<td><em>n_j</em></td>
<td><em>nTs</em></td>
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<tr>
<td>tongue blade</td>
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<td></td>
<td></td>
<td><em>dr</em></td>
<td><em>tr</em></td>
<td></td>
</tr>
<tr>
<td>velar</td>
<td></td>
<td><em>g</em></td>
<td><em>k</em></td>
<td><em>h</em></td>
</tr>
<tr>
<td></td>
<td><em>n_g</em></td>
<td><em>n_k</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Basic** is a function which combines two possible prosodic words (ppw) to form a single ppw. **Basic** is used in many morphological derivational processes (MDPs), including incorporation of Ns into As and Vs; of As into Ns; **noun compounding**, **genitive constructions** (Paul 1996): V[~act]+Agent, N+Possessor, Prep+NP (most Preps). Three changes take place under **Basic**:

1. nasalization of onsets (**nset**) of certain syllables, defined by: For all *c,v* as above,

\[
n_{set}(c+v) = \begin{cases} 
  n+v & \text{if } c \text{ is empty} \\
  mc+v & \text{if } c = b \text{ or } p \\
  nc+v & \text{if } c = d,t,j,ts,dr,tr,g, \text{ or } k \\
  c+v & \text{otherwise}
\end{cases}
\]  

(Here and later + is strict concatenation)
2. Basic shifts each continuant consonant $f, v, s, z, h, l, r$ to its homorganic stop or affricate, defined by the function $\text{stop}$:

<table>
<thead>
<tr>
<th>x</th>
<th>stop(x)</th>
<th>x</th>
<th>stop(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>$\rightarrow$ p</td>
<td>h</td>
<td>$\rightarrow$ k</td>
</tr>
<tr>
<td>v</td>
<td>$\rightarrow$ b</td>
<td>l</td>
<td>$\rightarrow$ d</td>
</tr>
<tr>
<td>s</td>
<td>$\rightarrow$ ts</td>
<td>r</td>
<td>$\rightarrow$ dr</td>
</tr>
<tr>
<td>z</td>
<td>$\rightarrow$ j</td>
<td>c</td>
<td>$\rightarrow$ c, all other consonants c</td>
</tr>
</tbody>
</table>

Naturalness: voice is invariant under stop: $\text{VOICE}(c) = \text{VOICE}(\text{stop}(c))$, $\text{VOICE}(x) \in \{+, -\}$.

3. Basic reduces (') primary stresses to secondary ones, defined by ':

\[(cv,k) \text{ if } k < 2\]
\[(cv,1) \text{ if } k = 2\]

Of course ' extends to sequences of stress marked syllables by product lifting. That is, if $\sigma = \langle \sigma_1, ..., \sigma_n \rangle$ is a sequence of stress marked syllables then $\tilde{\sigma} = \langle \tilde{\sigma}_1, ..., \tilde{\sigma}_n \rangle$. □

The value of Basic at $\langle \sigma, \tau \rangle$ depends on whether $\sigma$ is weak or pseudoweak:

**Def 2. a** A possible prosodic word $\sigma$ is weak iff $\sigma$ has primary stress on the antepenultimate syllable and the last syllable of $\sigma$ is weak (\(-na, -ka, -tra\)).

Some roots with weak endings are treated as weak by MDPs even though stress is not antepenultimate. We call these roots pseudoweak. Almost all cases are two syllable roots.

**Def 2. b** $r$ is pseudoweak iff $r =$

- tanâna 'village', lalâna 'law' hêna 'diminish', fôka 'absorb', zâtra 'accustomed', trâtra 'caught', poka 'blow', dönâ 'knock', sâina 'mind', léna 'wet, fresh', fètra 'limit', dîtra 'naughty', tátra 'startled', tsôka 'blow', rîtra 'dried up', pîka 'snap', tratra 'caught'...

The pseudo-weak roots have homophones which are not treated as weak by MDPs (and so are not in the list of pseudo-weaks). E.g. hêna 'meat', fôka 'idiotic', sâina 'flag' (<Fr. enseigne) and trâtra 'chest'. Some other roots with weak endings but not pseudoweak are rehêtra 'all', dáka 'a kick', lôka 'bet', têna 'body', sêtra 'brutal', pîtra 'sad look'. We now define Basic:
**Def 3** $\text{Dom(Basic)} = \{<\sigma, \tau>|\sigma, \tau \in \text{PPW}\}$. Let $\sigma = \sigma_1...\sigma_n$ and $\tau = \tau_1...\tau_m$ be possible prosodic words: $\text{Basic}(\sigma, \tau)$ is given by cases:

**Case 1 (Vowel Elision)** $\sigma_n = (cv, k)$ and $\tau_i = (v', k')$

$$\begin{align*}
\sigma & \quad \tau & \quad \text{Basic}(\sigma, \tau) \\
\sigma_1,...,\sigma_{n-1}(cv, k) & (v', k'), \tau_2,...,\tau_m \\
\end{align*}$$

**Case 1.1** $k = 2$ (i.e. $\sigma_n$ carries primary stress). Then $\text{Basic}(\sigma, \tau) = \check{o} + \tau$.

$$\begin{align*}
\sigma & \quad \tau & \quad \text{Basic}(\sigma, \tau) \\
\text{mandà 'refuses'} & \quad \text{ázù 'him'} & \quad \text{mandà ázù} & \quad (= /mandàázù/)
\text{mandà 'many'} & \quad \text{ólona 'people'} & \quad \text{mandà ólona}
\text{bé 'many'} & \quad \text{élatra 'wing'} & \quad \text{bé élatra}
\text{mànomè 'give'} & \quad \text{ítù 'this'} & \quad \text{mànomè ítù}
\text{mànkafy 'delect in'} & \quad \text{ítù 'this'} & \quad \text{mànkafy ítù}
\text{mànkato 'obey'} & \quad \text{ólona 'people'} & \quad \text{mànkato ólona}
\text{mandokà 'Praise! (imp)'} & \quad \text{andriàna 'nobles'} & \quad \text{mandokà andriàna}
\end{align*}$$

Malagasy accepts hiatus here. Vowel coalescence here is ungrammatical. *'/mandázy/*

**Case 1.2** $k < 2$ (and $\sigma_n = (cv, k)$ and $\tau_i = (v', k')$)

**case 1.2.1** $v = v'$ or $v = a$. Then $\text{Basic}(\sigma, \tau) = \check{o}_1,...,\check{o}_{n-1}, (cv', k'), \tau_2,...,\tau_m$

So the final vowel of $\sigma$ elides if it is unstressed $a$ or it is the same as the initial vowel of $\tau$.

Except for reduplication, Vowel Elision is not registered in the orthography of MDPs.

$$\begin{align*}
\sigma & \quad \tau & \quad \text{Basic}(\sigma, \tau) \\
\text{tápakà 'broken'} & \quad \text{élatra} & \quad /tápakélatra/ & \quad (\text{orth: tapaka elatra})
\text{ólona 'person'} & \quad \text{efatra} & \quad /ólonéefatra/ & \quad (\text{orth: olona efatra})
\text{mamítà 'accomplish'} & \quad \text{íraka} & \quad /mamítíráka/ & \quad (\text{orth: mamita iraka})
\text{áloka 'shade'} & \quad \text{áloka} & \quad \text{álokálóka} & \quad \text{a bit of shade}
\end{align*}$$
Vowel Elision is normal in ordinary speech but failure to elide in careful speech is fully intelligible. Note also that several of the derived forms present secondary stresses adjacent to primary ones, not an attested stress pattern at the level of (affixed) roots.

Case 1.2.2 \( v \neq v' \) and \( v \neq a \). Then \( \text{Basic}(\sigma,\tau) = \ddot{\sigma} + \tau \) (as in Case 1.1)

So the final vowel in \( \sigma \) remains (final /i/ may reduce a bit), but stress reduction still applies:

\[
\begin{array}{c c c}
\sigma & \tau & \text{Basic}(\sigma,\tau) \\
\hline
\text{ántso 'call'} & \text{ántso} & \Rightarrow \text{ántsoántso} \quad */\text{ántsántso}/ \\
\text{mijéry 'sees'} & \text{ólona 'people'} & \text{mijéry ólona} \quad */\text{mijerólona}/ \\
\end{array}
\]

Case 2  Consonant Mutation  \( \tau_1 = (cv',k') \) for some consonant \( c \).

\[
\begin{array}{c c c c}
\sigma & \tau & \text{Basic}(\sigma,\tau) & \sigma_1,\ldots,\sigma_{n-1},(cv,k) \\
\hline
\text{mántonány asks} & \text{závatra something} & \Rightarrow \text{mántonány závatra} & (\text{mántonányn- jávatra}) \\
\text{mikápa cuts} & \text{házo wood} & \Rightarrow \text{mikápa házo} & (\text{mikápa-kázo}) \\
\text{máro many} & \text{ánaka children} & \Rightarrow \text{maró ánaka} & (\text{maránaka}/) \\
\text{mandá refuse} & \text{vóla money} & \Rightarrow \text{mandá vála} & (\text{manám-bóla}/) \\
\end{array}
\]

Case 2.1 \( \sigma \) is neither weak nor pseudo-weak. Then \( \text{Basic}(\sigma,\tau) = \ddot{\sigma} + \tau \) (as in Case 1.1)

\[
\begin{array}{c c c c}
\sigma & \tau & \text{Basic}(\sigma,\tau) & \sigma_1,\ldots,\sigma_{n-1},(cv,k) \\
\hline
\text{mántonány asks} & \text{závatra something} & \Rightarrow \text{mántonány závatra} & (\text{mántonányn- jávatra}) \\
\text{mikápa cuts} & \text{házo wood} & \Rightarrow \text{mikápa házo} & (\text{mikápa-kázo}) \\
\text{máro many} & \text{ánaka children} & \Rightarrow \text{maró ánaka} & (\text{maránaka}/) \\
\text{mandá refuse} & \text{vóla money} & \Rightarrow \text{mandá vála} & (\text{manám-bóla}/) \\
\end{array}
\]

Case 2.2 \( \sigma = \sigma_1\ldots\sigma_n \) is weak or pseudo-weak (and \( \tau = (cv',k'),\tau_2,\ldots,\tau_m \))

Case 2.2.1 \( \sigma_n = (ka,k) \) or \( (\text{tra},k) \). Then \( \text{Basic}(\sigma,\tau) = \ddot{\sigma}_1,\ldots,\ddot{\sigma}_{n-1},(\text{stop}(c)+v',k'),\tau_2,\ldots,\tau_m \)
Thus we reduce stress on $\sigma$, elide $\sigma_n$ and replace the initial consonant $c$ of $\tau$ by $\text{stop}(c)$. We exemplify by deriving $\text{mpiváro-kéna} '$meat seller' from $\text{mpivárotra} '$seller' and $\text{héna} '$meat'.

(1) $\text{Basic(}\text{mpivárotra, héna}\text{)} = \text{mpiváro + stop(h) + é + na}$  \hspace{1cm} \text{Case 2.2.1}
\[= \text{mpiváro +k + é + na} \hspace{1cm} \text{Def stop}
\[= \text{mpiváro-kéna} \hspace{1cm} \text{orthography (stress marked)}

Further examples, the first three illustrating non-trivial consonant mutation ($\text{stop}$):

<table>
<thead>
<tr>
<th>$\sigma$</th>
<th>$\tau$</th>
<th>Basic($\sigma, \tau$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>fãntatra 'known'</td>
<td>Rakóto 'Rakoto'</td>
<td>fãta-dRakóto 'known by Rakoto'</td>
</tr>
<tr>
<td>sátroka 'hat'</td>
<td>fótsy 'white'</td>
<td>sátro-pótsy 'white hat'</td>
</tr>
<tr>
<td>matáhotra 'fears'</td>
<td>tódy 'retribution'</td>
<td>matáho-tódy 'fears retribution'</td>
</tr>
<tr>
<td>závatra 'thing'</td>
<td>nisého 'happened'</td>
<td>záva-nisého 'event'</td>
</tr>
<tr>
<td>miáraka 'be together'</td>
<td>mandéha 'goes'</td>
<td>miára-mandéha 'go together'</td>
</tr>
</tbody>
</table>

Case 2.2.2 $\sigma_n = na$.

Then $\text{Basic}(\sigma, \tau) = \tilde{\sigma}_1, \ldots, \tilde{\sigma}_{n-1}, + (\text{nset}(\text{stop}(c) + v'), k') + \tau_2 \ldots \tau_m$

So in this case the final $-na$ of $\sigma$ drops, nasalizing the onset of the initial syllable of the word built from $\tau$ by replacing its initial consonant by its corresponding stop or affricate. Thus,

(2) $\text{Basic(}\text{mánana, vády}\text{)} = m\text{ána} + \text{nset(}\text{stop}(v) + á) + dy$  \hspace{1cm} \text{case 2.2.2}
\[= m\text{ána} + \text{nset(}b + á) + dy \hspace{1cm} \text{def stop}
\[= m\text{ána} + mbá +dy \hspace{1cm} \text{def nset}
\[= m\text{ánam-bády} \hspace{1cm} \text{orthography (stress marked)}$

Some further examples: the first six illustrate the other non-trivial consonant mutations ($\text{stop}$). The last 4 show the application of $\text{nset}$ when the consonant is not weak.

<table>
<thead>
<tr>
<th>$\sigma$</th>
<th>$\tau$</th>
<th>Basic($\sigma, \tau$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mánana</td>
<td>zánaka</td>
<td>mánan-jánaka</td>
</tr>
<tr>
<td>has</td>
<td>offspring</td>
<td>has children</td>
</tr>
<tr>
<td>mihinana</td>
<td>fáry</td>
<td>mihinam-páry</td>
</tr>
<tr>
<td>eats</td>
<td>sugar cane</td>
<td>eats sugar cane</td>
</tr>
</tbody>
</table>
án(a)    sáha    an-tsáha
at       fields   in (the) fields

"      hády    an-kády
ditch   in (the) ditch

"      ráno    an-dráno
water   in (the) water

"      lamósina    an-damósina
back    in (the) back

mánana    pératra    mànam-pératra
has       ring       has a ring

mánana    nánana    màna-nánana
has       friend    has friends

fitiávana    téna    fitiávan-téna
love      self    love of oneself

mánana    didy    mànan-didy
has       rules    has rules

Lastly contrast the pseudoweak a-examples with their non-pseudoweak homonyms (b):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Basic(σ,τ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sáina 'mind'</td>
<td>záza 'child'</td>
<td>sáín-jáza</td>
</tr>
<tr>
<td>b. sáina 'flag'</td>
<td>fotsy 'white'</td>
<td>saina fotsy *saim-potsy</td>
</tr>
<tr>
<td>a. (mi)héna 'decrease'</td>
<td>vídy 'price'</td>
<td>mihém-bídy</td>
</tr>
<tr>
<td>b. héna 'meat'</td>
<td>léna 'fresh'</td>
<td>héna léna *hën-dëna</td>
</tr>
<tr>
<td>a. (mi)fóka 'absorb'</td>
<td>ráno 'water'</td>
<td>mifó-dráno</td>
</tr>
<tr>
<td>b. fóka 'idiotic'</td>
<td>fóka 'idiotic'</td>
<td>fóka fóka *fópóka</td>
</tr>
</tbody>
</table>

This completes the definition and illustration of Basic. ☺☺

An historical explanation for the behavior of weak words While synchronically arbitrary, this behavior of weak roots receives an historical explanation first presented and supported empirically by Dahl (1951, esp. pp 105 – 115). The languages to which Malagasy is most closely related, specifically Maanjan of the S.E. Barito group in Kalimantan (S. Borneo), present a variety of closed syllables. Dahl supports that the shift to open syllables in Malagasy took place under Bantu influence when the Malagasy began settling Madagascar (0 – 400ad). Certain
word final consonants, such as h, s, and l were generally dropped, but words ending in k, tr, n, and r added an a in conformity with the open syllable pattern of Eastern Bantu. The synchronic dropping of these sounds under MDPs then is historically illusory: the derived forms existed before the -a was added and simply did not change (see Keenan 1996 for the role of Inertia in language change). That morphological derivational processes are conservative in this sense is supported elsewhere. Erwin 1996 treats weak roots underlyingly as consonant final forms and derives our roots by a rule of -a epenthesis, thus, roughly, reflecting the history of these forms.

**Examples of Reduplication**

*Roots stressed on the last syllable* (Oxytones)

<table>
<thead>
<tr>
<th>σ</th>
<th>σ₁...σₙ</th>
<th>Dup(σ) = Basic(σ₁,...,σₙ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bé</td>
<td>'big, many'</td>
<td>bé</td>
</tr>
<tr>
<td>vão</td>
<td>'new'</td>
<td>vão</td>
</tr>
<tr>
<td>fý</td>
<td>'delicious'</td>
<td>fý</td>
</tr>
<tr>
<td>rê</td>
<td>'heard'</td>
<td>rê</td>
</tr>
<tr>
<td>pý</td>
<td>'blink'</td>
<td>pý</td>
</tr>
<tr>
<td>omé</td>
<td>'give'</td>
<td>mé</td>
</tr>
<tr>
<td>teté</td>
<td>'drip'</td>
<td>té</td>
</tr>
<tr>
<td>vovó</td>
<td>'bark'</td>
<td>vó</td>
</tr>
<tr>
<td>ampó</td>
<td>'in the heart'</td>
<td>mpó</td>
</tr>
<tr>
<td>indráy</td>
<td>'again'</td>
<td>ndráy</td>
</tr>
<tr>
<td>lèhibé</td>
<td>'big'</td>
<td>bé</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>omémé</td>
<td></td>
<td>omémé (mānomé 'gives'; mānomémé 'gives a bit')</td>
</tr>
<tr>
<td>tetété</td>
<td></td>
<td>tetététété 'drips, drop by drop'</td>
</tr>
<tr>
<td>vovóvó</td>
<td></td>
<td>vovóvó (mivovóvó 'barks some')</td>
</tr>
</tbody>
</table>

To see e.g. that (3) yields omémé as the reduplicated form of omé 'give', observe:

(3) \[ \text{Dup(omé)} = \text{Basic(omé, mé)} \]

\[ \text{Def Dup; me has primary stress} \]

\[ \text{Def Basic, Case 2.1.} \]

□

*Roots stressed on the penultimate syllable* (Paroxytones)

**two syllable roots**

<table>
<thead>
<tr>
<th>σ</th>
<th>σ₁...σₙ</th>
<th>Dup(σ) = Basic(σ₁,...,σₙ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>máro</td>
<td>'many'</td>
<td>máro</td>
</tr>
<tr>
<td>fótsy</td>
<td>'white'</td>
<td>fótsy</td>
</tr>
<tr>
<td>háfa</td>
<td>'different'</td>
<td>háfa</td>
</tr>
<tr>
<td>máinty</td>
<td>'black'</td>
<td>máinty</td>
</tr>
<tr>
<td>máitso</td>
<td>'green'</td>
<td>máitso</td>
</tr>
<tr>
<td>máimbo</td>
<td>'stinky'</td>
<td>máimbo</td>
</tr>
<tr>
<td>máromáro</td>
<td>'somewhat many'</td>
<td></td>
</tr>
<tr>
<td>fotsifótsy</td>
<td>'somewhat white'</td>
<td></td>
</tr>
<tr>
<td>háfaháfa</td>
<td>'somewhat different'</td>
<td></td>
</tr>
<tr>
<td>máintimáinty</td>
<td>'somewhat black'</td>
<td></td>
</tr>
<tr>
<td>máitsomáitso</td>
<td>'somewhat green'</td>
<td></td>
</tr>
<tr>
<td>máimbomáimbo</td>
<td>'somewhat stinky'</td>
<td></td>
</tr>
</tbody>
</table>
**Dup(máro) = Basic(máro,máro) = màromáro** by the definition of Basic, Case 2.1.

**roots of three or more syllables**

\[
\sigma \quad \sigma_1...\sigma_n \quad \text{Dup(\sigma ) = Basic(\sigma_1...\sigma_n)}
\]

<table>
<thead>
<tr>
<th>( \sigma )</th>
<th>( \sigma_1...\sigma_n )</th>
<th>\text{Dup(( \sigma ) ) = Basic(( \sigma_1...\sigma_n ) )}</th>
</tr>
</thead>
<tbody>
<tr>
<td>hadinó</td>
<td>'forget'</td>
<td>dínó</td>
</tr>
<tr>
<td>ontány</td>
<td>'ask'</td>
<td>ntány</td>
</tr>
<tr>
<td>safáry</td>
<td>'feel out'</td>
<td>fáry</td>
</tr>
<tr>
<td>salóndo</td>
<td>'cloudy'</td>
<td>lóndo</td>
</tr>
<tr>
<td>harívá</td>
<td>'evening'</td>
<td>ríva</td>
</tr>
<tr>
<td>álalhélo</td>
<td>'sadness'</td>
<td>héló</td>
</tr>
<tr>
<td>pátalóha</td>
<td>'pants'</td>
<td>lóha</td>
</tr>
<tr>
<td>saláma</td>
<td>'healthy'</td>
<td>láma</td>
</tr>
<tr>
<td>tanóra</td>
<td>'young'</td>
<td>nóra</td>
</tr>
</tbody>
</table>

**Weak words (antepenultimate stress)** (Proparoxytones)

\( \sigma \) is always treated as weak. We illustrate all the consonant mutations:

\[
\sigma \quad \sigma_1...\sigma_n \quad \text{Dup(\( \sigma \) ) = Basic(\( \sigma_1...\sigma_n \) )}
\]

| \( h \rightarrow k \) | háingana | 'quickly' | háingana | háingankáingana 'somewhat quickly' |
| \( l \rightarrow d \) | lávitra | 'far' | lávitra | lávidávitra 'somewhat far' |
| \( f \rightarrow p \) | fántatra | 'known' | fántatra | fantapántatra 'known a bit' |
| \( z \rightarrow j \) | závatra | 'thing' | závatra | závajávatra 'sth of little value' |
| \( s \rightarrow ts \) | sitrana | 'cured' | sitrana | sitrantsítrana 'a bit cured' |
| \( v \rightarrow b \) | véłona | 'alive' | véłona | vélombélona 'more or less alive' |
| \( r \rightarrow dr \) | résaka | 'conversation' | résaka | résadrésaka 'chit-chat' |

Observe: Dup(vélona) = Basic(vélona,vélona) Def Dup

(4) = vélona + nset(stop(v) +é) + lona Def Basic, Case 2.2.2
= vélona + nset(b+é) + lona Def stop
= vélona + mb+é + lona Def nset
= vélombélona. orthography (+stress)

**Weak roots of four or more syllables**

\[
\sigma \quad \sigma_1...\sigma_n \quad \text{Dup(\( \sigma \) ) = Basic(\( \sigma_1...\sigma_n \) )}
\]

<table>
<thead>
<tr>
<th>( \sigma )</th>
<th>( \sigma_1...\sigma_n )</th>
<th>\text{Dup(( \sigma ) ) = Basic(( \sigma_1...\sigma_n ) )}</th>
</tr>
</thead>
<tbody>
<tr>
<td>latábatra</td>
<td>'table'</td>
<td>tábatra</td>
</tr>
<tr>
<td>lávarángana</td>
<td>'verandah'</td>
<td>rángana</td>
</tr>
<tr>
<td>karátsaka</td>
<td>'rustling (leaves)'</td>
<td>rátsaka</td>
</tr>
<tr>
<td>karétoka</td>
<td>'seize with teeth'</td>
<td>rétoka</td>
</tr>
<tr>
<td>potsiatra</td>
<td>'spurt suddenly'</td>
<td>tsiatra</td>
</tr>
<tr>
<td>Root</td>
<td>Meaning</td>
<td>Root</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>satrūtroka</td>
<td>'swelling of face'</td>
<td>trūtroka</td>
</tr>
<tr>
<td>sōmarītaka</td>
<td>'preoccupied'</td>
<td>rītaka</td>
</tr>
</tbody>
</table>

Equally **Dup** yields correct results when the copied portion begins with a vowel:

\[
\sigma \quad \sigma_1...\sigma_n \quad \textbf{Dup}(\sigma) = \textbf{Basic}(\sigma, \sigma_1...\sigma_n)
\]

| áloka | 'shade' | áloka | álokáloka | 'a bit of shade' |
| ivy | 'spit' | ivy | ivivy | 'spittle' |
| óva | 'change' | óva | óvóva | 'little changes' |
| ólika | 'twisting route' | ólika | ólikólika | 'go indirectly' |
| ádana | 'peace, slowness' | ádana | ádanádana | 'a bit peacefully' |
| órotra | 'pull up' | órotra | órotrotrótra | 'pull up a bit' |

Thus **Dup**(óva) = **Basic**(óva, óva) = óvóva by Def **Basic**, Case 1.2.1.

Finally observe that the pseudo-weak roots behave as weak under reduplication.

\[
\sigma \quad \sigma_1...\sigma_n \quad \textbf{Dup}(\sigma) = \textbf{Basic}(\sigma, \sigma_1...\sigma_n)
\]

| héna | 'diminish' | héna | hénkéna | *hēnahénə |
| fōka | 'absorb' | fōka | fōpōka | *fōkafōka |
| zātra | 'accustomed' | zātra | zājātra | *zātrazātra |
| trātra | 'caught', | trātra | trātrātra | *trātratrātra |
| póka | 'blow' | póka | pōpōka | *pōkapóka |
| dōna | 'knock' | dōna | dōdōna | *dōnadōna |
| sāina | 'mind' | sāina | sāintsāina | *sāinasāina |
| léna | 'wet, fresh' | léna | lēndéna | *lénaléna |
| fētra | 'limit' | fētra | fēpētra | *fērafētra |
| dītra | 'naughty' | dītra | didītra | *dītradītra |
| tāitra | 'startled' | tāitra | tāitātra | *tāitratātra |
| rītra | 'dried up' | rītra | rīdrītra | *rītrarītra |
| tsōka | 'blow' | tsōka | tsōtsōka | *tsōkatsōka |

Note the adjacent stresses: <1,2,0> (= secondary + primary + unstressed).

The following roots with weak endings are not in the list of pseudo-weeks:

\[
\sigma \quad \sigma_1...\sigma_n \quad \textbf{Dup}(\sigma) = \textbf{Basic}(\sigma, \sigma_1...\sigma_n)
\]

| dāka | 'a kick' | dāka | dākadāka | *dādāka |
| lōka | 'bet' | lōka | lōkalōka | *lōdōka |
| fōka | 'idiotic' | fōka | fōkafōka | *fōpōka |
téna 'body' téna ténaténa *tènténa
ména 'red' ména mènaména *mèména
sáina 'flag' sáina sáinasáina *sáintsáina
sétra 'brutal' sétra sètrasétra *sèsétra
pitra 'sad look' pitra pitrapittra *pipittra
trátra 'chest' trátra tràtratra *tràtratra

Three special cases and an instance of reanalysis Here we note three cases of reduplication, all of limited extent, which yield forms in addition to those predicated by \textit{Dup}.

1. Problems with \(h\)- initial roots Under \textit{Basic}, a root initial \(h\) only mutates to \(k\). And this is also the most common mutation in reduplication, (5a). But \(h \rightarrow g\), (5b), and \(h \rightarrow \varnothing\), (5c), and possibly \(h \rightarrow tr\), (5d), are also attested.

(5) a. \(h \rightarrow k\)

1. háingana 'quickly' \(\rightarrow\) háingankángana
   hénjana 'stiff, tense' \(\rightarrow\) hénjankénjana
   hinana 'eat' \(\rightarrow\) hinankinana
   híntsana 'fall (leaves, hair)' \(\rightarrow\) hintsankíntsana
   hávana 'relative' \(\rightarrow\) hávankávana

2. hántsika 'arched' \(\rightarrow\) hántsikánntsika
   hitrika 'penetrate' \(\rightarrow\) hitrikítrika
   hítsaka 'foulur aux pieds' \(\rightarrow\) hítsakítsaka

3. hétitra 'thought' \(\rightarrow\) hèvi-kétitra (one speaker)

b. \(h \rightarrow g\) (only with -\(na\) final roots)

hirana 'ray of light' \(\rightarrow\) hirangírana
hílana 'oscillate' \(\rightarrow\) hilangílana
hívina 'shaking of head' \(\rightarrow\) hivingívina

A few roots – \textit{hirina} 'blink' and \textit{hélina} 'sudden appearance' and \textit{hórona} 'a rolling up' accept both \(h \rightarrow k\) and \(h \rightarrow g\) : \textit{hirinkírina/hiringírina}, \textit{hèlinkélina/hèlingélina} and \textit{hórónkóróna/hórongórona}.

c. \(h \rightarrow \varnothing\)

hétitra 'thought' \(\rightarrow\) hétitréittra
hèndratra 'startled' \(\rightarrow\) hèndratréndratra
hòditra 'skin' \(\rightarrow\) hòditróditra
hóndratra 'tremble' \(\rightarrow\) hòdratróndratra
d. $h \rightarrow tr$

<table>
<thead>
<tr>
<th>malagasy</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>hébina 'agitation'</td>
<td>hébina'hébintrébina</td>
</tr>
<tr>
<td>hálona 'sparkling'</td>
<td>hálona'hálontrálona</td>
</tr>
<tr>
<td>hílona 'oscillations'</td>
<td>hílona'hílontrílona</td>
</tr>
<tr>
<td>hólana 'being difficult'</td>
<td>hólana'hólantrólana</td>
</tr>
</tbody>
</table>

The cases in (5a.2) and (5c) could also be analyzed as $h \rightarrow o$. The forms in (5d) cannot be analyzed this way, but they exhaust the cases of this sort in Abinal & Malzac and they are all listed as frozen (the left hand forms above not being separately listed).

Note that $h$ is typically not sounded but we cannot treat even the $h$- words in (5c) as vowel initial with orthographic $h$- a relic since other applications of $Basic$ show the $h \rightarrow k$ shift:

<table>
<thead>
<tr>
<th>malagasy</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>filazána 'saying' + hévitra 'thought'</td>
<td>filazàn-kévitra 'advertising'</td>
</tr>
<tr>
<td>an(a)- 'on, at' + hóditra 'skin'</td>
<td>an-kóditra 'on the skin'</td>
</tr>
</tbody>
</table>

The $h/g$ and $h/o$ alternations are independently attested in official Malagasy with $(m)aN$ prefixation (with $h/o$ more common; Paul 1996):

(6) root $r$

<table>
<thead>
<tr>
<th>malagasy</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>hálatra 'stolen goods'</td>
<td>mangálatra 'steals'.</td>
</tr>
<tr>
<td>hátaka 'ask'</td>
<td>mangátaka 'asks'</td>
</tr>
<tr>
<td>hétahéta 'thirst'</td>
<td>mangétahéta 'is thirsty'</td>
</tr>
<tr>
<td>héty 'cut hair'</td>
<td>manéty 'cuts hair'</td>
</tr>
<tr>
<td>hátona 'approach'</td>
<td>manátona 'approaches'</td>
</tr>
<tr>
<td>hídy 'lock'</td>
<td>manídy 'locks'</td>
</tr>
</tbody>
</table>

The $h/tr$ alternation is not otherwise attested in official Malagasy, but it is attested in various regional varieties. Thus where official Malagasy has $ravín-kazo$ ($ravina$ 'leaf' + hazo 'tree') Northern Betsele has $ravín-trazo$. This dialect variation suggests an historical basis for the $h/tr$ alternation, but we have not pursued this point.

2. $k$-insertion A few vowel initial weak roots ending in $-na$ accept optionally a $k$ inserted initially in the reduplicant (Rahajarizerany 1960;88).

(7) $\sigma$

<table>
<thead>
<tr>
<th>malagasy</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>ádana 'slowness'</td>
<td>ádanádana and ádankádana</td>
</tr>
<tr>
<td>ómana 'preparer'</td>
<td>omanómana and omankómána</td>
</tr>
<tr>
<td>óndana 'pillow'</td>
<td>óndanóndana and óndankóndana</td>
</tr>
<tr>
<td>idína 'descend'</td>
<td>idinidína and idinkidína</td>
</tr>
<tr>
<td>ádina 'exam'</td>
<td>ádinádina and ádinkádina</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dup($\sigma$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ádanádana and ádANKÁdana</td>
</tr>
<tr>
<td>omanómana and OMANKómána</td>
</tr>
<tr>
<td>óndanóndana and óndANKóndana</td>
</tr>
<tr>
<td>idinidína and Idinkídína</td>
</tr>
<tr>
<td>ádinádina and ádinkádina</td>
</tr>
</tbody>
</table>
This variation would receive an historical explanation if it was found that these roots began historically with ḥ. Then the k forms are expected from the application of Basic, Case 2.2.1, to the historical root, and those without the k result from application of Basic once the vowel initial form is taken as the root. So as with the weak roots, reduplication here also would be built on the historically earlier forms.

3. **final vowel retention** In some cases of two syllable vowel initial roots with penultimate stress whose final syllable is not weak, the elision of the final vowel is optional. Thus both óvóva (already given) and òváóva are acceptable reduplications of óva 'change' and ivivy (already cited) and ivivy are acceptable reduplications of ivy 'spit'.

4. **a case of reanalysis** A few Ns have been relexicalized with their third person genitive ending -ny (which does not attract stress to the right), resulting in a form reanalyzed as underlyingly ending in -na. E.g. from sásaka 'half' we form the regular sásany 'its half', now relexicalized as a quantifier meaning 'some'. It reduplicates to sásantsásany 'some, a few'. Similarly from rámbo 'tail' we have rámby 'its tail' and the reduplicated form rámbondrámby 'in the last ranks, towards the end'; again a regular form if we analyze rámby as rambona+ny. And building ultimately from lóha 'head' we have vôalóhany 'at first', which reduplicates to vôalóhandóhany, as though the underlying form were vôalólóha. To handle these cases we shall include -ny among the weak endings.

**Domain of reduplication**

Dom(Dup) includes almost all contentful roots (including contentful Preps: lavitra 'far' => lavidavitra 'somewhat far', akaiky 'near' => akaikikaiky 'somewhat near', tandrify 'opposite' => tandrifindrify 'more or less opposite') and excludes in general grammatical morphemes, number names, demonstratives, and proper names.

(8) a. Tsy faly ve izy? "Is he not happy?"
not happy? he


Number names and demonstrative do enter other sorts of copying structures: distributive numeral formation is illustrated here for telo 'three' => tsitelotelo 'in threes, three by three'. Demonstratives like eo 'here, visible, non-past' form adverbials like eo ho eo 'approximately' and eo no ho eo 'shortly'. Demonstrative adjectives occur as framing expressions: ity tranon-dRabe ity 'this house of Rabe's this' for "this house of Rabe's".

Another class of unreduplicatable roots in Abinal and Malzac (1888) are those of the form ótót, such as tábátába 'noise', sálasála 'hesitation', vězivéy 'run around'; séráséra 'go back and forth, communication'. These forms are obviously frozen reduplications whose base no longer exists as an independent root. All frozen reduplications are of the form ótót, there being none of the sort ótót, e.g. taho-tahotra.
These remarks come close to defining Dom(Dup). There are just two cases where morphemically complex forms reduplicate.

1. Most active verbs prefixed with aN- (forms given with the present tense m- prefix) apply aN- to reduplicated roots:

<table>
<thead>
<tr>
<th>(9)</th>
<th>σ</th>
<th>maN(σ)</th>
<th>Red(σ)</th>
<th>maN(Red(σ))</th>
<th>*Red(maN(σ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>váky 'cut, read'</td>
<td>mamáky</td>
<td>vákváký</td>
<td>mamákiváky</td>
<td>*mamákimáky</td>
<td></td>
</tr>
<tr>
<td>váha 'untie'</td>
<td>mamáha</td>
<td>váhaváha</td>
<td>mamáhaváha</td>
<td>*mamáhamáha</td>
<td></td>
</tr>
<tr>
<td>fótotra 'basis'</td>
<td>mamótotra</td>
<td>fotóptotra</td>
<td>mamótopótota</td>
<td>*mamótomótota</td>
<td></td>
</tr>
<tr>
<td>vàdika 'other side'</td>
<td>mamádika</td>
<td>vàdíbadika</td>
<td>mamádíbadika</td>
<td>*mamádímadika</td>
<td></td>
</tr>
<tr>
<td>véloña 'living'</td>
<td>mamélona</td>
<td>véłombélona</td>
<td>mamélovélona</td>
<td>*mamélovélona</td>
<td></td>
</tr>
<tr>
<td>sóratra 'writing'</td>
<td>manóratra</td>
<td>sóratsóratra</td>
<td>manóratóratra</td>
<td>*manóranóratra</td>
<td></td>
</tr>
<tr>
<td>vángy 'visit'</td>
<td>mamángy</td>
<td>vángivángy</td>
<td>mamángivángy</td>
<td>*mamángimángy</td>
<td></td>
</tr>
</tbody>
</table>

Crucially we see that when maN applies to the roots above, or their reduplicated forms, the initial consonant is lost or modified (Paul, 1996). But that consonant appears in the reduplicant. In the case of the weak sóratra, fotototra, vàdika and véloña it is replaced by its value under stop, exactly the changes predicted by reduplicating the root. Had we reduplicated the maN prefixed form this consonant would not appear, an incorrect result.

But there are other cases where Dup visibly applies to maN prefixed forms. Corresponding cases in Indonesian have motivated analyses of "ovcrapplication" (for which, in Malagasy, we provide an original, if prosaic, analysis). First some examples:

<table>
<thead>
<tr>
<th>(10)</th>
<th>root σ</th>
<th>maN(σ)</th>
<th>σ₁...σₙ</th>
<th>Dup(maN(σ))</th>
<th>maN(Dup(σ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>hóvitra 'shiver'</td>
<td>mangóvitra</td>
<td>ngóvitra</td>
<td>mangóvingóvitra</td>
<td>*mangóvikóvitra</td>
<td></td>
</tr>
<tr>
<td>lá 'refusal'</td>
<td>mandá</td>
<td>ndá</td>
<td>mandândá</td>
<td>*mandálá</td>
<td></td>
</tr>
<tr>
<td>leha 'go'</td>
<td>mandéha</td>
<td>ndéha</td>
<td>mandéhandéha</td>
<td>*mandéhaléha</td>
<td></td>
</tr>
<tr>
<td>lóá 'pay, vomit'</td>
<td>mandóá</td>
<td>ndóá</td>
<td>mandóandóha</td>
<td>*mandóalóá</td>
<td></td>
</tr>
</tbody>
</table>

Clearly the copied part includes the prenasalization induced by maN. So Dup applies to some affixed roots which themselves must be excluded from Dom(redup). The action of Dup is as given: it copies to the right beginning with the stressed syllable, and then applies Basic, modified with the h alternations specific to reduplication. All that is at issue is the identity of the set of forms that the copying function applies to. And clearly this set must include some derived forms in addition to roots. As we find no conditioning factor we can do no better than list those man- verbs that lie in the domain of the reduplication function.

In some cases both the root and the derived man- verb are in the Dom(Dup). So both Dup(maN(σ)) and maN(Dup(σ)) are attested:
(11) root σ  \( maN(σ) \)  \( Dup(maN(σ)) \)  \( maN(Dup(σ)) \)

<table>
<thead>
<tr>
<th>σ</th>
<th>mamóno</th>
<th>mamònòmóno</th>
<th>mamònòvóno</th>
</tr>
</thead>
<tbody>
<tr>
<td>lá́nga 'lie'</td>
<td>mandáinga</td>
<td>mandáingandáinga</td>
<td>mandáingaláinga</td>
</tr>
<tr>
<td>táo 'do'</td>
<td>manáó</td>
<td>manáonáo</td>
<td>manàotáo</td>
</tr>
</tbody>
</table>

*caught in the act! We are witnessing historical change in progress. In (11), children and teenagers are more likely to use the form that reduplicates after \( maN \) prefixation, and older generation speakers are more likely to use the form that reduplicates the root first and then applies \( maN \) prefixation. Once we think of reduplication as a function (or relation) it is easy to see that what is changing is its domain. Verbs built by \( maN \)- are being added to that domain, and in some cases their roots are being removed, in others the roots remain, yielding doublets as in (11). Wrt redup some \( maN \)- forms are being reinterpreted as roots. This is not too surprising: \( maN \) prefixation is partially non-transparent, often destroying the initial consonant of the root making retrieval of the root difficult. Thus while manoratra 'writes' is in fact derived from the root soratra, on purely phonological grounds it could also have been derived from horatra, toratra, foratra and oratra.

Commonly historical changes take the form \( A \rightarrow A,B \rightarrow B \). See Keenan (1996) for the period in English in which both him and himself occurred locally bound.

2. The second case of verbs entering the domain of redup is the 20 odd \( σ \)-prefix roots which exceptionally prefix tense markers (\( m- / n- / h- \)) directly to form active verbs. These roots (Rahajarinzy, p.47-48) are never independent words and lack a suffix passive distinct from the circumstantial form. Some examples:

(12) root σ  \( act(σ) \)  \( Red(act(σ)) \)  \( act(Red(σ)) \)

<table>
<thead>
<tr>
<th>σ</th>
<th>méty 'ok, agrees'</th>
<th>mètiméty</th>
<th>*mètiéty</th>
</tr>
</thead>
<tbody>
<tr>
<td>isy</td>
<td>misy 'there exists'</td>
<td>misimisy</td>
<td>*misy</td>
</tr>
<tr>
<td>ó́dy</td>
<td>módy 'go home'</td>
<td>mòdimódy</td>
<td>*mòdiódy</td>
</tr>
<tr>
<td>ó́nina</td>
<td>mònina 'reside'</td>
<td>mònimumónina</td>
<td>*mònínémonina</td>
</tr>
<tr>
<td>ánana</td>
<td>mánana 'has'</td>
<td>mánamánana</td>
<td>*mànánánanana</td>
</tr>
<tr>
<td>í́nona</td>
<td>minona 'drink a certain ritual poison'</td>
<td>minominona</td>
<td>*minonínona</td>
</tr>
</tbody>
</table>

So the roots in (12) must be excluded from Dom(redup). Rather more often however both the root and the derived verb lie in Dom(redup).

(13) root σ  \( act(σ) \)  \( Red(act(σ)) \)  \( act(Red(σ)) \)

<table>
<thead>
<tr>
<th>σ</th>
<th>máka 'takes'</th>
<th>mákamáká</th>
<th>mákáka</th>
</tr>
</thead>
<tbody>
<tr>
<td>idina</td>
<td>mídina 'descends'</td>
<td>midimídina</td>
<td>midinídina</td>
</tr>
<tr>
<td>ídítra</td>
<td>mídítra 'enters'</td>
<td>midimidítra</td>
<td>miditírdítra</td>
</tr>
<tr>
<td>íla</td>
<td>mila 'needs'</td>
<td>milamila</td>
<td>milaila</td>
</tr>
</tbody>
</table>
íno  míno 'believes'  minomino  minóino
indraña  mindraña 'borrows'  mindramíndraña  mindramíndraña
ita  mita 'cross (water)'  mitamita  mitaita

This full verb reduplication applies also in past and future tense. Thus alongside màkamonàka 'takes a bit' we have nàkanáka 'took a bit' and hâkâhâkà 'will take a little'.

Syntactic Distribution of Reduplicated Forms

In general if $x \text{ redup } y$ then $y$ has the same possibilities of occurrence as $x$ except that it cannot undergo reduplication. More formally,

$$x \text{ redup } y \Rightarrow (1) \quad \exists z \text{ redup } z \quad \text{ and}$$

$$\quad (2) \text{ for all generating functions } (\text{relations}) \ R \neq \text{ redup},$$

$$\quad (\ldots x \ldots) \in \text{ Dom}(R) \iff (\ldots y \ldots) \in \text{ Dom}(R)$$

So if $x$ reduplicates as $y$ and $x$ has an -ina or an a- passive so does $y$. If $x$ forms active verbs with (m)i- or (m)Aunny, so does $y$; is $x$ accepts reciprocal or causative affixation so does $y$; if $x$ forms imperatives so does $y$. In general then a reduplicated form has the same distribution as its unreduplicated counterpart, save that it cannot further reduplicate\(^1\).

And as most items that undergo reduplication are roots, which may fail to be words, it might seem reasonable to think that Reduplication in Malagasy is a lexical process, one that "takes place" in the lexicon. In support of this is the fact that some reduplications have idiosyncratic meanings compared to forms they are reduplications of. Thus from tsangana 'erect (adj)' we form the simple active verb mitsangana 'stands up'. But the reduplicated root mitsangantsangana means 'walks around'. From the root tamby 'salary, payment' we form the active manambi 'hires', but the reduplicated active manambitamby means 'caress, cajole'. Similarly faka 'cause, root' yields the reduplicated passive fakafakaina 'is examined'. And from the root fana 'heat' we have both mafamipana 'lukewarm' and mafanafana 'lively'.

On the other hand the fact that tense markers and the active prefix aN- are sometimes included in the forms that undergo Reduplication argues against this. At the moment then we must just

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\(^1\)Keenan & Polinsky (1998) note one exception (in addition to reduplication itself). Namely, tafa- prefixation. Thus (i) below is natural, but its phonologically well formed reduplication in (ii) is not.

i. Tafiditro (tafa+iditra+o) ny omby
pass+enter+1sg.gen the cow(s)
I got the cows in (or The cows were gotten in by me)

ii. *Tafidi(k)iditro ny omby
acknowledge that the place of Reduplication in standard organizations of grammar is unclear.

This completes our descriptive account of reduplication in Malagasy. We close with a brief and tentative consideration of an Optimality Theoretic (McCarthy & Prince 1995, henceforth M&P95) account of reduplication in Malagasy. To this end we note the following constraints on prosodic words in Malagasy:

(14) A prosodic word in Malagasy is a sequence $\sigma = \sigma_1, \ldots, \sigma_n$ of stress marked syllables satisfying the following PrWd Constraints:

1. Exactly one $\sigma_i$ has primary stress
2. If $\sigma_i$ has primary stress then $i+2 \geq n$
   (= the primary stressed syllable in $\sigma$ is not farther left than antepenultimate position)
3. If primary stress in $\sigma$ is antepenultimate then $\sigma_n = -na, -ka, -tra, -ny,$ or $-ko,$ where $-ny$ and $-ko$ are the 1sg and 3 person genitive suffixes (which do not shift stress rightward). E.g. lâmbo 'clothes' $\Rightarrow$ lâmbo 'my clothes', lámby 'his/their clothes'
4. The rightmost e or diphthongs ao, ai/ai or oi/oi has primary stress (dominated by PrWd(3))
5. $\sigma_1 \neq cv, c$ voiceless. E.g. *$\bar{k}, \bar{t}, \bar{ts}, \bar{tr}$ or *$p$ root or word initially
   (The common agnetive prefix mp- is heard as /p/. Exceptionally one word does begin with "t: ntaolo 'the ancients').
6. for v=0, *e+v tautomorphically (Erwin 1996); also *a+a
7. No subsequence of four contiguous $\sigma_i$ lack consonants

M&P95 represent Reduplication as a pair $<X,Y>$ where $X$ is a pair $<\text{RED}_{stem}>$ and $Y$ is the reduplicated form of $stem$ assumed deconcatenated(!!!) into a pair consisting of a Base (B) and a Reduplicant (R). Crucially $Y$ is an expression in the language, an "output" form, not some sort of noumenal creature underlying the phenomenal world of audible delights. Important constraints on Reduplication are given in terms of identity conditions holding of B and R, S ($stem$) and R, and S and B, as well as language particular conditions on R, e.g. R = PrWd or R = $\sigma$, etc.

Distinguishing B and R is crucial for M&P, but no criteria for making the distinction are offered. They do say that in total Reduplication one can't tell which part is B and which is R, so by implicature one can tell in partial Reduplication. They do at times suggest that B+R corresponds to "base + affix" or "base + copy" on more derivationally oriented theories. Most consistent with their treatment then is the following: when one part of Y is identical to S and the rest is a proper substring of S then the identical part is the B and the substring is R.

The Malagasy order is then presumably Base+Reduplicant, since the most usual pattern with partial reduplication puts the best approximation to a full copy of the Stem leftmost:
(15) teté 'drip'  →  teté + té (mitetété 'drips, drop by drop')
    vovó 'bark'  →  vovó + vó (mivovovó 'barks some')
    ampó 'in the heart'  →  ampó + mpó 'often in the heart' [= a.mpò.mpó]
    indráy 'again'  →  indrá + ndráy 'sometimes' [= i.ndrá.i.ndráy]
    lèhibé 'big'  →  lèhibé + bé 'biggish'

    ontány 'ask'  →  ontáni + ntány (mà.no.ntá.ní.ntá.ny 'asks a bit')
    haríva 'evening'  →  haríva + ríva 'early in the evening'
    álalahélo 'sadness'  →  álalahélo + hélo 'little sadness'
    pátalóha 'pants'  →  (mi)pátalóha + lóha 'wear as pants'
    saláma 'healthy'  →  saláma + láma 'somewhat healthy'
    tanóra 'young'  →  tanóra + nóra 'somewhat young'

But notice that even analyzing e.g. salámáláma 'somewhat healthy' as [saláma][lámá] the Base is not quite identical to the Stem, since it carries no main stress whereas the Stem does. And since a main stress in the Base reduces to secondary stress in the reduplicated form we will get cases (indeed many of them) where a syllable Ω has greater stress than some Ω in the Base but they have equal (secondary) stress in the reduplicated form. This is the case with álalahélo and pátalóha above.

Note also that if we analyze reduplication as Reduplicant + Base then for the basic cases cited above the Base will never be identical to the Stem. We thus adopt (16):

(16) In OT terms, then, if x redup y then y = Base + Reduplicant

Moreover, thinking of the Reduplicant as the "copy" we see that Malagasy falls into the usual pattern that it copies to the side it copies from. Specifically it copies from the righthand side of the Stem and it copies it to the right. Perhaps Reduplication in Malagasy is slightly unusual in that it is suffixal not prefixal, as appears to be the case both for most languages and in particular for most languages genetically related to Malagasy.

(17) Applying some OT generalizations on Reduplication to Malagasy

1. the Reduplicant may be phonologically less marked than the Base or than expressions in the language generally.

This is non-trivially supported: R is never more marked than B or S, and in one case the Reduplicant assumes a less marked form. Namely, in the ò-prefix verbs we may apply Dup to the consonant initial derived form rather than the root: misy → misi+misy, *misişa, *misísy

2. a. General constraints in "Input-Output" relationships apply in Reduplication
   b. Identity constraints applicable in Reduplication apply elsewhere (ideally)

(17.2b) The morphophonological alternations used in Dup (except the marginal h → tr) all occur in other MDPs e.g. ones that use Basic or the h → g, h → ò alternations in maN prefixation.
There are phonological changes used outside of Red that do not occur in Red. E.g. under maN prefixation root initial f-may delete: maN+fótofó = mamótofo; but only fótofófo exists as a reduplicated form. Also (below) affixing induces stress patterns unknown to reduplicated forms.

3. the Reduplicant bears an affix-like relationship to the Base

This seems not to hold. I don't see much similarity between Basic and the suffixing processes discussed by Erwin (1996). Specifically,

1. Affixing induces stress gaps, Basic does not:

fináitra 'is pleased' → (m)ahafináitra 'is pleasing' → fahafinarétina 'circ.nom.'
<0,2,0,0> → <1,0,0,2,0,0> = <1,0,0,0,2,0,0>

2. Basic induces weak stress clashes, affixing does not

filána + hévitra = filán-kévitra 'Advisory board'
<0,2,0,0> + <2,0,0> = <0,1,2,0,0>

fialána + sásatra = fialán-tsásatra 'a rest period, "removal of tiredness"
<0,0,2,0,0> + <2,0,0> = <0,0,1,2,0,0>

fétre + fétre = fétéréta  <2,0> + <2,0> = <1,2,0>

jamóka + móka = jamómóka 'old name for cattle'
<0,2,0,0> + <2,0> = <0,1,2,0>

3. Suffixing (passive, circumstantial, imperative all voices)

a. triggers epenthetic consonant insertion (and some vowel changes), Basic MDPs do not

ex: the passive suffix -ana/-ina:

<table>
<thead>
<tr>
<th>root</th>
<th>passive</th>
<th>(regular)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ãmpy 'help'</td>
<td>ãmpiána</td>
<td>insert [s]</td>
</tr>
<tr>
<td>ãndry 'wait'</td>
<td>ãndrásaná</td>
<td>insert [z]</td>
</tr>
<tr>
<td>ëly 'disperse'</td>
<td>ëlézáná</td>
<td></td>
</tr>
</tbody>
</table>

a'. alternatively, adopting Erwin's (op cit) in which weak roots are consonant final and epenthetic -a is inserted late, we see that Basic triggers final consonant deletion for weak words, suffixing does not.

4. There are no similarities between Basic MDPs and prefixing or infixing.
4. *the Reduplicant is characterized templatically in prosodic terms:*

(core)(light)(heavy) *syllable, foot, prosodic word.*

But the Reduplicant does not seem to satisfy a template of any sort:

a. Were the template just a CV sequence template we would then not get the simple *moramora, salamalama,* etc. If it is CVCV we get wrong results for *lehibe* (*lehibehee* instead of the correct *lehibebe*) and also for e.g. *sarostra* (*sarorotra* instead of *sarostratra*). If CVCVCV then get wrong results for all words with final stress and all with penultimate stress.

b. Replacing CV by σ (a syllable) in (a) above we see that R = σ, R = σσ, and R = σσσ all yield wrong results.

c. R = foot? Feet are minimally and maximally binary (M&P). Given the absence of long vowels and closed syllables one expects feet in Malagasy to be disyllabic. But we can with Erwin count "moras" and accept that cv is bimoraic when v is a diphthong. This gives correct results for indray = *indraindrey* and jay = *jaifay*, as well as salama = *salamalama* and ontany = *ontantintany* assuming that non-diphthongs are short.

But then we fail to predict the existence of reduplicated forms for final stress words: *py = pipy,* ome = *omeme,* ampo = *amponpong* (as well as those ending in stressed e: *be = bebe,* *lehibe = lehibele*). Also the n≥3 syllable weak words are not cleanly generated: *tahotre* = *tahotro,* *rafitra* = *rafidrafitra,* where we seem to have copied three syllables. (But Erwin would derive the final a by an epenthesis rule which applies after moraification and so doesn't count for weight, so e.g. *rafitra* is "really" just the two syllable = one foot *rafet*).

d. R = PrWd? This seems the most plausible. Crucially R must begin with a (primary) stressed syllable and thus satisfy a major condition PrWd(1) for being a prosodic word. It also satisfies PrWd(2) – PrWd(4).

**BUT** 1. The Reduplicant clearly fails PrWd(5): voiceless prenasalized consonants can initiate R.

(18)

<table>
<thead>
<tr>
<th>Reduplicant</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>ampo</td>
<td>ampo + mpo;</td>
</tr>
<tr>
<td>ampirina 'sub. order'</td>
<td>ampiri + mpirina 'be put in order'</td>
</tr>
<tr>
<td>fona 'ask forgiveness'</td>
<td>fo + mpona</td>
</tr>
<tr>
<td>hantona 'suspension'</td>
<td>hanto + nkantona</td>
</tr>
<tr>
<td>man[ontany]</td>
<td>man[ontani + ntany]</td>
</tr>
<tr>
<td>antara 'glacial'</td>
<td>antara + ntara</td>
</tr>
<tr>
<td>antonina 'suitable'</td>
<td>antoni + ntonina</td>
</tr>
<tr>
<td>antsambotra (&lt; sabotra) 'a leap'</td>
<td>antsambo + ntsambotra</td>
</tr>
</tbody>
</table>
hatsikana ‘farce, plaisanterie’  →  hatsika + ntsikana
havana  →  hava + nkavana
hinana  →  hina + nkinana
sasany  →  sasa + ntsasany

2. When R is just one syllable, is it a PrWd? Erwin claims Malagasy bans degenerate feet, but I am doubtful. Here are my counts for one syllable words, based on A&M. Grammatical words are in (19), content words in (20).

(19) sa 'or (in questions)'; fa 'that (complementizer), but'; na 'whether', i and ry 'proper noun articles'; sy 'and (phrasal)'; ny 'definite article', no 'focus particle', ho 'future', ka 'and so', ve, va 'question particle', tsy 'not', mba 'in order to', ao 'there+non-visible', tao 'there+non-visible+past', sao 'lest', hâ/y/kâ 'exclamation'

(20) fe 'thigh'; fy 'delicious'; fo 'heart'; be 'big, many, very'; ra 'blood'; lo 'rotten, spoiled'; le 'refusal', mby 'arrived'; re 'heard'; ro 'sauce'; to 'true, just'; wv 'metal'; zo 'rights'; tsy 'steel', py 'a blink', rây 'father', rây 'received', fôy 'abandoned', vôy 'action of rowing', hôy 'i said', tôy 'like', ndre/ndry 'interjection of surprise or pain', tây 'excrement', mây 'burnt, hurried', lây 'tent', mbây 'step aside', vây 'a boil', ndào 'let's go', jây 'pride', âjô 'big; a big steer with long horns'

Thus Malagasy presents 48 = 18 + 30 one syllable words out of 175 possible ones (7 of the form V: 4 vowels, 3 diphthongs; the latter in need of further study) and 24×7 = 168 of the form CV (24 = 29 consonants less 5 prenasalized ones which do not begin words). So 27.4% of the possible one syllable words are actual. So let's ban the ban.

Actually these data just show that there are real words that do not contain a foot. If we assume the Prosodic Hierarchy (but see Erwin) then many of the single syllable Rs are not feet and so a fortiori not PrWds, even if they are in some other (ordinary) sense words. If we don't require PrWds to be feet then the monoyllabic Rs are not at least immediately a counterexample to the claim that R = PrWd.

But ignoring our first objection above, even if Rs are PrWds they are not minimal ones, since they can be two or more syllables long and a minimal PrWds can be just one syllable long. So lama in salama-lama is not a minimal PrWd, nor is tahota in taho-tahota. Whence a requirement that R be a PrWd leaves a lot of room open. (But it does commit us to something). Thus it will not distinguish the following:

(21) (a) salâma + lâma  (b) salâ + malâma  (c) sa + lâmâlâma

Note that these forms are the same string, they just differ wrt which parts are the Base and Reduplicant. In general,

5. A reduplicated form deconcatenates into a part which matches the Stem and a partial copy of the Stem.
This generalization holds for the examples in (22) where R matches the Stem in the first four cases and the Base matches it in the last case (modulo stress mismatch):

(22) táhotra 'fear' $\Rightarrow$ tâho + táhotra  
(m)pêtrakạ 'sits' $\Rightarrow$ (m)pêtra + pêtrakạ  
tápaka 'broken' $\Rightarrow$ tâpa + tápaka  
nâmâna 'friend' $\Rightarrow$ nâmâ + nâmâna  
salâmâ 'healthy' $\Rightarrow$ salâmâ + láma

But in (23) and (24) neither B nor R match S mod stress (syllabification marked)

(23) hài.nga.na $\Rightarrow$ hài.nga. + nkái.nga.na  
là.vi.tra $\Rightarrow$ là.vi. + dá.vi.tra  
fâ.nta.tra $\Rightarrow$ fâ.nta. + pá.nta.tra  
zà.va.tra $\Rightarrow$ zà.va. + jà.va.tra  
sì.tra.na $\Rightarrow$ sì.tra. + ntsì.tra.na  
vè.lo.na $\Rightarrow$ vè.lo. + mbé.lo.na  
ré.sa.ka $\Rightarrow$ ré.sa. + dré.sa.ka

(24) latâbatra 'table' $\Rightarrow$ latâba + tâbatra  
làvarángana 'verandah' $\Rightarrow$ làvarânga + ndrángana  
karátsaka 'rustling (leaves)' $\Rightarrow$ karâtsa + drâtsaka  
satrôtroka 'swelling of face' $\Rightarrow$ satrôtro + trôtroka  
sômarîtaka 'preoccupied' $\Rightarrow$ sômarîta + drîtaka

In short, a reduplicated form cannot in general be deconcatenated into a part that matches the Stem and another (partial) copy of itself.

6. **Stem-Base identity universally outranks Base-Reduplicant and Stem-Reduplicant identity: $I(S,B) > I(B,R), I(S,R)$**

This generalization correctly picks (21a) over (21b) and (21c) above. But the reduplication of 3 syllable weak roots whose initial consonant is invariant under stop yield forms as in (22) in which R is an exact copy of Stem, Base being truncated. Also problematic here is finding what prevents reduplications like

ťâhotra $\Rightarrow$ tâhotra-tâho

The primacy of $I(S,B)$ would seem to favor the righthand side above over the correct tâho-tâhotra. One is inclined to say that RightAnchor(S,R) $>$ RightAnchor(S,B), but this is just a particular case of the violation of (6). Another natural reaction based on knowledge of the language is that adjacent unstressed syllables are unacceptable in the output of reduplications. But they are not otherwise bad. Indeed suffixing creates such stress gaps in reduplicated forms:

(m)pêtrapêtrakạ + CIRC $\Rightarrow$ ipêtrapétrahana
Worth emphasizing here is that there is nothing independently bad about weak syllables occurring word internally:

-ka- alakamisy 'Thursday'; takalo 'exchange'; akâno 'clothes
-na- (m)ânana 'has'; ánatra 'moral, lesson'
-tra- fâtratra 'exceedingly'; (m)ipêtrakà 'sits'

**Interim conclusion** A convincing OT analysis of Red in Malagasy remains to be given.

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